16180

Western North American Boreal Shrub-Sedge Rich and Alkaline Fen

BpS Model/Description Version: Nov. 2024

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Pat Comer | pat\_comer@natureserve.org |  |  |
| Kori Blankenship | kblankenship@tnc.org | None | None |
| None | None | None | None |

Reviewer: Robin Innes, Blaine Spellman

Vegetation Type

Woody Wetland

Map Zones

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

Geographic Range

This Biophysical Setting (BpS) occurs throughout the sub-boreal region of AK and on sites without permafrost in the boreal region.

Biophysical Site Description

This BpS occurs in shallow depressions and basins, pond margins, floodplain depressions, and thermokarst pits with an open hydrologic regime. Fens are nutrient-rich and can have a thick peat layer that may be floating or submerged. Standing water is usually present (Viereck et al. 1992).

Vegetation Description

Dominant species may include *Menyanthes trifoliata, Equisetum fluviatile, Comarum palustre, Calla palustris, Eriophorum angustifolium*, and *Carex aquatilis* (Viereck et al. 1992). Other common but non-dominant species include *Caltha palustris, Chamaedaphne calyculata, Cicuta virosa (= Cicuta mackenzieana), Drosera* spp., *Galium trifidum, Rumex arcticus*, and *Utricularia* spp. (Racine and Walters 1994). Shrubs, including *Andromeda polifolia, Myrica gale, Salix candida, Betula nana*, and *Alnus incana* ssp*. tenuifolia*, are occasionally present but do not exceed 25% cover. Aquatic plants such as *Myriophyllum spicatum, Hippuris vulgaris, Potamogeton* spp., and *Sparganium* spp. may be present, and aquatic mosses are often present (Viereck et al. 1992).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| MYGA | *Myrica gale* | Sweetgale |
| BENA | *Betula nana* | Dwarf birch |
| CHCA2 | *Chamaedaphne calyculata* | Leatherleaf |
| SAPU15 | *Salix pulchra* | Tealeaf willow |
| COPA28 | *Comarum palustre* | Purple marshlocks |
| METR3 | *Menyanthes trifoliata* | Buckbean |
| EQFL | *Equisetum fluviatile* | Water horsetail |
| CACA4 | *Calamagrostis canadensis* | Bluejoint |

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 ponds or low-lying wetlands formed by processes such as glacial recession and floodplain dynamics (oxbows). 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). In the boreal region, fens are often associated with thermokarst processes and flood plain depressions.

In 2015, an extensive literature search was done by Fire Effects Information System staff to locate information for a synthesis on fire regimes of Alaskan wet and mesic herbaceous systems (Innes 2015). The review indicated that most wetland communities in Alaska can have fires during severe weather, but that fens are the least likely to burn because of they have a relatively high water level (Innes 2015). Zoltai et al. (1998) estimated a surface fire return interval of 300 years in fens in subboreal and boreal fens in North America and stated that peat fires in fens were rare.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement |  |  |  |  |
| Moderate (Mixed) |  |  |  |  |
| Low (Surface) | 304 | 100 |  |  |
| All Fires | 304 | 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

Small patch to large patch

Adjacency or Identification Concerns

Issues or Problems

According to the review “Fire regimes of Alaskan wet and mesic herbaceous systems” (Innes 2015): “Fire history studies in Alaskan herbaceous peatland systems are scarce, and our knowledge is incomplete.” This report also notes: “LANDFIRE models estimate the portions of replacement, surface, and mixed-severity fires likely in this system but do not include ground fire, which is an integral fire type in this system.”

Native Uncharacteristic Conditions

Comments

This BpS concept is similar to the Ecological Site Description: [Boreal Herbaceous Peat Flood Plain Depressions](https://edit.jornada.nmsu.edu/catalogs/esd/232X/XA232X01Y207) (ECOLOGICAL SITE XA232X01Y207).

During LANDIFRE National, this BpS was described and modeled by Torre Jorgenson as a complex of systems including marsh, fen, wet meadow, and low shrub peatlands. In 2021 Pat Comer and Kori Blankenship extensively revised the description and model based on major revisions to the Ecological Systems classification for Alaska. As a result, model authorship was changed.

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 | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | A | A | A | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | A | A | A | UN | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | A | A | A | UN | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | A | A | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | A | A | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | A | A | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | A | A | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | A | A | UN | UN | UN | UN | UN | UN | UN | UN |

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 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| METR3 | *Menyanthes trifoliata* | Buckbean | Upper |
| COPA28 | *Comarum palustre* | Purple marshlocks | Upper |
| EQFL | *Equisetum fluviatile* | Water horsetail | Upper |

Description

This class includes fen vegetation, often with standing water. Common species include *Menyanthes trifoliata, Comarum palustre* (syn. *Potentilla palustris*), *Equisetum fluviatile*, and *Carex aquatilis*.

This class may persist under stable hydrologic conditions (frequent flooding). Under drying conditions, it can develop into a wet meadow, and with increased water level it can develop into a marsh.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Early1: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** |
| Surface Fire | Early1:ALL | Early1:ALL | 0.0033 | 303 | No | 0 |

References

DeVelice, R.L., Hubbard, C.J., Boggs, K. et al. 1999. Plant community types of the Chugach National Forest. Tech. Publ. R10-TP-76. Juneau, AK: USDA Forest Service, Alaska Region. 375 p.

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

Innes, Robin J. 2015. Fire regimes of Alaskan wet and mesic herbaceous systems. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/fire\_regimes/AK\_wet\_herbaceous/all.html [2016, August 2].

Jorgenson, M.T. et al. 2003. An ecological land survey for Fort Richardson, Alaska. Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, ERDC/CRREL TR-03019.

Klein, Eric, Edward E. Berg, and Roman Dial. "Wetland drying and succession across the Kenai Peninsula Lowlands, south-central Alaska." Canadian Journal of Forest Research 35.8:1931-1941.

National Wetlands Working Group. 1997. Wetlands of Canada. C.D.A Rubec (ed.). Ecological Land Classification Series No. 24. Environment Canada, Ottawa, and Polyscience Publications Inc., Montreal. 452 p.

NatureServe. 2008. International Ecological Classification Standard: Terrestrial Ecological Classifications. Draft Ecological Systems Description for Alaska Boreal and Sub-boreal Regions.

Racine C.H., and J.C. Walters. 1994. Groundwater-Discharge Fens in the Tanana Lowlands, Interior Alaska, U.S.A., Arctic and Alpine Research, 26:4, 418-426.

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

Zoltai, S.C., L.A. Morrissey, G.P. Livingston, and W.J. de Groot. 1998. Effects of fires on carbon cycling in North American boreal peatlands. Environmental Review. 6(1): 13-24.

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.