16680

Temperate Pacific Tidal Salt and Brackish Marsh

BpS Model/Description Version: Nov. 2024

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Amy Miller | Amy\_E\_Miller@nps.gov | Karen Dillman | kdillman@fs.fed.us |
| None | None | None | None |
| None | None | None | None |

Reviewer: Robin Innes

Vegetation Type

Herbaceous Wetland

Map Zones

73, 75, 76, 77, 78, 80

Model Splits or Lumps

This Biophysical Setting (BpS) is lumped with: Temperate Pacific Intertidal Flat (BpS 16690)

Intertidal Flats are modeled with the Tidal Salt and Brackish Marsh because of their successional relationship and because Intertidal Flats may be barren and therefore not mappable as BpS.

Geographic Range

This system is found along the North Pacific coastline from Prince William Sound through southeast AK. Its distribution is limited by the lack of area with fine sands and silts, disturbance by sea ice, limited tidal amplitude, low water salinity, short growing season, and low soil temperature (Bliss 1988).

Biophysical Site Description

The following paragraph was taken from the draft Boreal Ecological Systems description (NatureServe 2008a):

Tidal marshes often have sediment inputs from a freshwater source. The surface gradients are flat. Progradation of the tidal marsh front will occur if sedimentation exceeds erosion. Tidal marshes represent the area of transition from maritime to freshwater terrestrial systems and encompass a complex range of plant communities and ecotones including marshes and herbaceous or barren mudflats. They also feature a range of salinity conditions from saline to nearly fresh. (Tidal marshes in large bays with a high volume of freshwater input, such as Nushagak Bay or Turnagain Arm, may be entirely fresh.) Soils are silts and clays and are periodically inundated by tidal fluctuation. The frequency of flooding may vary from twice daily (lower salt marsh) to once per growing season (upper coastal marsh). Tidal marshes have a limited distribution along the Gulf of Alaska and British Columbia coastline due to the topography and geomorphology of the coast, which features steep slopes and deep fjords and offers limited protection from wave action (National Wetland Working Group 1988).

Tidal flats form a narrow band along oceanic inlets and are more extensive at the mouths of larger rivers. Algae are the dominant vegetation on mudflats where little vascular vegetation is present due to the twice daily tidal flooding of salt or brackish water. The dominant processes are tectonic uplift or subsidence, isostatic rebound, and sediment deposition.

Vegetation Description

The following information was taken from the draft Maritime Ecological Systems description (NatureServe 2008b):

Coastal marshes are often dominated by a near monotypic stand of *Carex lyngbyaei*. These sites often form an ecotone with freshwater wetlands (Viereck et al. 1992). Higher salt marshes often feature *Carex ramenskii, Poa eminens, Argentina egedii,* and *Deschampsia caespitosa*. Frequently inundated lower salt marshes may feature any of the following species: *Puccinellia* spp., *Salicornia* spp., *Triglochin maritimum, Plantago maritima, Cochlearia officinalis*, *Spergularia canadensis, Honckenya peploides,* or *Glaux maritima* (Viereck et al. 1992).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| CALY3 | *Carex lyngbyei* | Lyngbye's sedge |
| POEM | *Poa eminens* | Largeflower speargrass |
| AREG | *Argentina egedii* | Pacific silverweed |
| DECA18 | *Deschampsia caespitosa* | Tufted hairgrass |
| PUCCI | *Puccinellia spp.* | Alkaligrass |
| SALIC | *Salicornia spp.* | Pickleweed |
| TRMA4 | *Triglochin maritimum* | Seaside arrowgrass |
| CARA4 | *Carex ramenskii* | Ramensk's sedge |

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

Disturbance Description

Common disturbances in the marsh and mudflat system can include freshwater and tidal flooding, storm surge and ice shove.

The following was taken from the draft Ecological Systems Description (NatureServe 2008a) for this type:

Primary succession on the tidal marsh will progress through a series of stages leading from pioneer species establishing on the newly exposed tide flats to a marsh with creeks, levees, and ponds. Pioneer species such as *Cochlearia* spp., *Triglochin maritimum, Plantago maritima,* *Puccinellia pumila*, and *Carex lyngbyaei* first establish on the tide flats. The newly established vegetation slows the water, allowing for sediment deposition. Water slowed at the edges of swards causes high rates of deposition, typically of coarser sediments. Less sediment is available for deposition in the middle of the sward or marsh further removed from the channel. These differential accretion rates and stabilization by the vegetation leads to the formation of levees (on the edge of the swards and channels) and ponds. The soil surface will continue to increase relative to the mean high tide because of accretion. Because soil surface height is a function of water height, it eventually equilibrates at or above mean high tide or the height of the backed upriver channels.

Tidal creeks are formed through a combination of previously established drainage patterns and the coalescing of adjacent swards of vegetation (Steers 1977), primarily *Carex lyngbyaei*, for regions of the northern Pacific coast. The creeks become more entrenched as the surface height increases.

The progradation of the marsh front will be partially limited by water depth. As stated by Batten et al. (1978) "precise leveling done by NOS (National Oceanic Survey) at three study sites (in the Gulf of Alaska) shows that the marshes do not extend far seaward of mean higher high water (MHHW). Generally, only a few tufts of *Puccinellia nutkaensis* and other halophytes are present at MHHW and transition to the luxuriant stands of *Carex lyngbyaei* that constitute the bulk of most marshes occurs substantially above this mark."

In June of 2013 an extensive search was done by Fire Effects Information System staff to locate information for a synthesis on [fire regimes of Alaskan coastal herbaceous communities and active inland dunes](http://www.fs.fed.us/database/feis/fire_regimes/AK_coastal/all.html), with few results (Innes 2013). The synthesis found no record of fire in Alaskan tidal salt and brackish marshes (Innes 2013). In general, fires in this BpS were likely to be very infrequent due to frequent spray or inundation by water (Drury 1956).

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

Small patch

Adjacency or Identification Concerns

Issues or Problems

It is unclear what the proportion of the landscape in each class and the disturbance probabilities should be.

Native Uncharacteristic Conditions

*Cotula coronopifolia*, an invasive plant that infests tidal flats, is found in large areas of southeast AK. It is suspected to be carried by birds, will likely never be eradicated, and has the potential to invade across the region in time.

Comments

During LANDFIRE National this system was created for the AK Maritime region and did not receive review for other regions in the state. The model description was developed based on information from the Ecological Systems description (NatureServe 2008a, NatureServe 2008b). Amy Miller provided input on the description and the state-and-transition model and Karen Dillman reviewed the 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 | B | B | B | B | B | B | B | B | B | B |
| Herb | >1.0 | B | B | B | B | B | B | B | B | B | B |
| Shrub | 0-0.5 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | B | B | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | B | B | 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 58 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| COCHL4 | *Cochlearia* spp. | Scurvygrass | Upper |
| TRMA4 | *Triglochin maritimum* | Seaside arrowgrass | Upper |
| PLMA3 | *Plantago maritima* | Goose tongue | Upper |
| PUPU3 | *Puccinellia pumila* | Puccinellia pumila | Upper |

Description

Herbaceous Mudflat. This class includes barren or vegetated mudflats. Common species include *Cochlearia* spp., *Triglochin maritimum, Plantago maritima, Puccinellia pumila*, and *Carex* *lyngbyei*. This class is maintained by annual flooding.

*Maximum Tree Size Class*  
None

Class B 42 Late Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| CALY3 | *Carex lyngbyei* | Lyngbye's sedge | Upper |
| POEM | *Poa eminens* | Largeflower speargrass | Upper |
| PUCCI | *Puccinellia* spp. | Alkaligrass | Upper |
| SALIC | *Salicornia* spp. | Pickleweed | Upper |

Description

Tidal Marsh. Tidal marshes are often dominated by *Carex lyngbyei*. Higher salt marsh vegetation may include *Carex ramenskii, Poa eminens, Argentina egedii,* and *Deschampsia caespitosa*. Frequently inundated lower salt marshes may include any of the following species: *Puccinellia* spp., *Salicornia* spp., *Triglochin maritimum, Plantago maritima, Cochlearia officinalis*, *Spergularia canadensis, Honckenya peploides*, or *Glaux maritima* (Viereck et al. 1992). This class is maintained by annual flooding.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Late1:ALL | 49 |
| Late1:ALL | 50 | 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 | 0.0667 | 15 | Yes | 0 |
| Optional 1 | Late1:ALL | Early1:ALL | 0.0033 | 303 | Yes | 0 |

Optional Disturbances

Optional 1: tidal flooding

References

Batten, A.R., S Murphy, D.F. Murray. 1978. Definition of coastal wetlands by floristic criteria. USEPA no. 804965-01. US Environmental Protection Agency, Corvalis Environmental Research Laboratory, Corvalis, OR. 490 p.

Bliss, L. C. 1988. Arctic tundra and polar desert biome. In: Barbour, Michael G.; Billings, William Dwight, eds. North American terrestrial vegetation. New York: Cambridge University Press: 1-32.

Innes, Robin J. 2013. Fire regimes of Alaskan coastal herbaceous communities and active inland dunes. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/fire\_regimes/AK\_coastal/all.html [2016, June 28].

National Wetlands Working Group. 1988. Wetlands of Canada. Ecological Land Classification Series No. 24. Sustainable Development Brach, Environment Canada, Ottawa, Ontario, and Polyscience Publications Inc., Montreal, Quebec. 452 pp.

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

NatureServe. 2008b. International Ecological Classification Standard: Terrestrial Ecological Classifications. Draft Ecological Systems Description for the Alaska Maritime Region.

Steers, J.A. 1977. Physiography. In: Chapman, V.J. ed. Wet coastal ecosystems. Amsterdam, NY. Elsevier:31-60.

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