17090

North American Arctic-Subarctic Coastal Dune and Beach

BpS Model/Description Version: Nov. 2024

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| --- | --- | --- | --- |
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Reviewer: Robin Innes, Lindsey Flagstad

Vegetation Type

Herbaceous

Map Zones

67, 68, 72, 76, 80

Geographic Range

This Biophysical Setting (BpS) occurs along Alaska's arctic coastline, from the Aleutian Islands and Bristol Bay lowlands in southwestern Alaska to the North Slope on the Arctic Ocean, including along the Beaufort Sea, Chukchi Sea, Bearing Sea, and Alaska Peninsula.

Biophysical Site Description

This BpS consists of coastal beaches, beach dunes, and vegetation that has stabilized sand deposits. Cobble beaches are also included. Soils are dry to mesic (often exposed to salt spray and occasionally tidally inundated) and typically sandy. Patch size is small to moderate and often linear. Exposure to salt spray and periodic overwash is common and creates vegetation zonation in response to salinity. On early seral sites the unstable soils are sandy, well drained and circumneutral with no organic horizon. While permafrost overlain by a deep active layer (>80 cm) is present in northwestern Alaska, its presence is intermittent to the south and absent on dunes of Nunivak Island.

Vegetation Description

Bare sand or cobble are common. Three existing plant communities may dominate the system although the exact species composition varies geographically:

1-Salt-tolerant forb communities occur just above mean high tide and are dominated or co-dominated by *Cochlearia groenlandica* (= *Cochlearia officinalis*)*, Honckenya peploides,* and/or *Mertensia maritima*.

2-As dune height and distance from the ocean increase, sites are dominated by the *Leymus mollis*. This class that may include near-dominance by *Leymus mollis* to more species-rich associations, including *Leymus mollis*, *Lathyrus japonicus* *var*. *maritimus* (= *Lathyrus* *maritimus*), *Achillea millefolium* *var*. *borealis*, *Festuca rubra, Fragaria chiloensis, Senecio pseudoarnica, Deschampsia beringensis, Heracleum maximum,* and *Poa eminens*.

3- Older dunes support a mixture of dwarf-shrubs (including *Arctostaphylos rubra, Betula nana,* and *Empetrum nigrum*) which often grow in narrow stringers on the older beach ridges behind the *Leymus mollis* zone. Herbaceous species are common, including *Chamerion latifolium, Cornus suecica*. *Lathyrus japonicus* *var*. *maritimus*, *Conioselinum chinense*, and *Cnidium cnidiifolium* are uncommon east of Cape Lisburne.

Classes 2 and 3, described above, are above the high tide line but still experience storm surges, high winds, and salt spray.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| LEMO8 | *Leymus mollis* | American dunegrass |
| COGR6 | *Cochlearia groenlandica* | Danish scurvygrass |
| EMNI | *Empetrum nigrum* | Black crowberry |
| ARRU | *Arctostaphylos rubra* | Red fruit bearberry |
| LAJAM | *Lathyrus japonicus var. maritimus* | Beach pea |
| MEMA3 | *Mertensia maritima* | Oysterleaf |
| POEM | *Poa eminens* | Largeflower speargrass |
| HOPE | *Honckenya peploides* | Seaside sandplant |
| COCH2 | *Conioselinum chinense* | Chinese hemlockparsley |
| CNCN | *Cnidium cnidiifolium* | Jakutsk snowparsley |

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

Disturbance Description

Processes that define the system include the erosion and accretion of sand by water or wind, through the process of tidal inundation, long-shore transport, storm surge, and dune formation. Herbaceous species stabilize the sand deposits (dunes, beaches), and the older deposits support dwarf-shrubs mixed with herbaceous species. Vegetation dynamics are driven by salinity and sand deposition, both of which vary depending on the exposure of the coastline and frequency and duration of inundation by tidal water. Beach succession is not always unidirectional; changes in beach topography and elevation that increase the exposure to coastal processes may cause less salt tolerant species to die and halophytic herbs to regain dominance.

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 lack of contemporary fire records suggests that fire in Arctic and sub-Arctic marine beach and beach meadows is rare. No studies reported fire frequency and fire is believed to have been rare in coastal herbaceous communities (Innes 2013).

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

Patch size is small to moderate and often linear.

Adjacency or Identification Concerns

This type is found adjacent to the coastline.

Issues or Problems

Native Uncharacteristic Conditions

This type is not departed from its “Reference Condition.”

Comments

In 2021 NatureServe merged the Alaska Arctic Marine Beach and Beach Meadow (BpS 1709) and Aleutian Marine Beach and Beach Meadow (BpS 1725) Ecological Systems. Kori Blankenship and Pat Comer merged the BpS concepts into this unified description. Blankenship also modified the state-and-transition model to include an early successional herbaceous state and a later successional state where shrubs could establish.

For LANDFIRE National BpS 1709 and 1725 were drafted and modeled by Kori Blankenship and Keith Boggs. Janet Jorgenson reviewed 1709 and Jeff Williams reviewed 17250.

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 | B | B | B | B | B | B | B | B | B | B |
| Shrub | 0.5-1.0 | B | B | B | B | B | B | B | B | B | B |
| 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 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 5-10 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 10-25 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | 25-50 | UN | UN | UN | UN | UN | UN | UN | UN | UN | UN |
| Tree | >50 | UN | UN | 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 50 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| COGR6 | *Cochlearia groenlandica* | Danish scurvygrass | Upper |
| LEMO8 | *Leymus mollis* | American dunegrass | Upper |
| LAJAM | *Lathyrus japonicus var. maritimus* | Beach pea | Upper |
| HOPE | *Honckenya peploides* | Seaside sandplant | Upper |

Description

Pioneer herbaceous communities establish. Bare sand or cobbles are common. Coastal herbaceous communities that are exposed to the open ocean are more likely to be buried or flooded compared to inland areas due to the proximity to severe weather in outer coast areas. Storm surge can deposit sediment and bury existing vegetation.

*Maximum Tree Size Class*  
None

Class B 50 Late Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| EMNI | *Empetrum nigrum* | Black crowberry | Upper |
| COSU4 | *Cornus suecica* | Lapland cornel | Upper |
| LAJAM | *Lathyrus japonicus var. maritimus* | Beach pea | Upper |
| CHLA13 | *Chamerion latifolium* | dwarf fireweed | Upper |

Description

Over time pioneer species build up the foredune and less stress-tolerant species can establish on dunes further removed from the ocean. Dwarf shrubs may eventually establish. Wind disturbance is common and isolated blowouts occur. Extreme weather or storm surge events might reset succession.

*Maximum Tree Size Class*  
None

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Early1:ALL | 999 |
| Late1:ALL | 1 | 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** |
| Alternative Succession | Early1:ALL | Late1:ALL | 0.002 | 500 | Yes | 0 |
| Optional 1 | Early1:ALL | Early1:ALL | 0.02 | 50 | Yes | 0 |
| Wind or Weather or Stress | Late1:ALL | Late1:ALL | 0.01 | 100 | Yes | 0 |
| Wind or Weather or Stress | Late1:ALL | Early1:ALL | 0.002 | 500 | Yes | 0 |

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