16443

Alaskan Pacific Sitka Spruce Forest and Beach Ridge - Beach Ridge

BpS Model/Description Version: Nov. 2024

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Vegetation Type

Forest and Woodland

Map Zones

73, 77, 78

Geographic Range

This system is found along the Alaska Gulf Coast from Yakutat to Kodiak Island. Specific systems have been described in the Cape Yakataga, Yakutat forelands (Shephard 1993, 1995), the outer coast of Glacier Bay National Park (Boggs et al. 2008a), Copper River Delta (Boggs 2000), Kenai Fjords National Park (Boggs et al. 2008b), and the Kodiak Archipeliago (Fleming and Spencer 2004).

Biophysical Site Description

This Biophysical Setting (BpS) develops on coastal sites that have moved out of the range of tidal influence. Typically, sediment delivered by river outwash or longshore transport is deposited in protected pockets along the coastline where it is retained due to the processes of tectonic and isostatic rebound and sorted into ridges and swales by overwash events (Boggs et al. 2019). The grain size of beach material depends on the source material, the exposure of the coastline, and the energy of the nearshore depositional environment. Systems adjacent to large rivers that are protected from wave erosion will support fine-grained sand beaches and a well-developed beach ridge system, whereas exposed coastlines are more likely to be armored by gravel or cobble and less likely to support a beach ridge system. Ridges form parallel to the coast and increase in age with distance from the coast (Shephard 1995). On the Yakutat Foreland, this type is found on well-drained sandy soils within 10 kilometers of the coast (Shephard 1993). The height of beach ridges varies from 5 meters near the coast to 35 meters further inland (Shephard 1993). Salt spray is a primary factor influencing this community and helps to maintain the dominance of Sitka spruce, which has greater salt tolerance than other conifers in the area. The restrictive abiotic conditions of the supratidal zone produce a consistent species assemblage. Coastal beach communities are often dominated by *Leymus mollis* and salt-tolerant forbs such as *Lathyrus japonicus, Senecio pseudo-arnica, Angelica lucida,* and *Ligusticum scoticum.* *Picea sitchensis* seedlings establish and survive in coastal meadows, about 130 years after beach ridge formation. As the sites become farther removed from the influence of tides and storms, the Sitka spruce woodland may succeed to *Tsuga heterophylla* forest.

Vegetation Description

*Picea sitchensis* is the dominant tree species, although *Tsuga mertensiana* (southcentral Alaska) or *Tsuga heterophylla* (Southeast Alaska) may become codominant with successional age. *Alnus viridis* ssp*. sinuata*, *Oplopanax horridus,* and *Rubus spectabilis* are the most abundant understory shrubs with the contribution of *Vaccinium ovalifolium* increasing with successional age. Other species include *Circea alpina*, *Rubus pedatus*, *Streptopus amplexifolius*, *Tiarella trifoliata*, *Athyrium felix-femina*, *Dryopteris expansa*, and *Gymnocarpium dryopteris* (Shephard 1993). Common moss species include *Hylocomium splendens*, *Rhytidiadelphus loreus*, and *Dicranum* spp. (Shephard 1993). Mature forests usually have very little downed wood or snags. *Calamagrostis nutkaensis* may be common on exposed sites near the coast.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| PISI | *Picea sitchensis* | Sitka spruce |
| OPHO | *Oplopanax horridus* | Devil’s club |
| VAOV | *Vaccinium ovalifolium* | Oval-leaf blueberry |
| ALVIS | *Alnus viridis ssp. sinuata* | Sitka alder |
| RUSP | *Rubus spectabilis* | Salmonberry |
| RUPE | *Rubus pedatus* | Strawberryleaf raspberry |

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

Disturbance Description

*Picea sitchensis* establishes about 130 years after beach ridge formation and may succeed to *Tsuga heterophylla* forest (Shephard 1995). The non-forested beach meadow is likely the early sere of the forested beach ridge community prior to tectonic or isostatic uplift (Shephard 1993), although it is considered a separate BpS by LANDFIRE. As the spruce stands age, understory recruitment decreases. *Tsuga heterophylla* may co-dominate in the later seral stages (Shephard 1993) and/or this type may succeed to *Tsuga heterophylla* forest (Shephard 1995 p.36). Succession to *Tsuga heterophylla* forest is most likely after a wind disturbance and would depend on available seed source. Eventually, peatlands may replace the forested community but that is not considered in this model.

Wind is the primary disturbance in this system. Beach ridges tend to have a distinct edge with younger trees on the outside that tend to make them somewhat resistant to windthrow. However, if the young tree buffer is lost, possibly as a result of coastal flooding due to storm surge, they become susceptible to windthrow. The annual probability of wind disturbance for modeling is unclear. In this model it is set to achieve the approximate class percentages that likely occur in a "naturally" functioning system.

Insects and disease play a minor role in beach ridge communities. A reviewer noted that spruce beetle and inadequate nitrogen levels were the cause of disturbance of similar even aged spruce stands in deglaciated areas of Glacier Bay. Although these are different substrates, it is conceivable that the same processes could play out between Glacier Bay and these ridges. There is some evidence of fire in this system, but it appears to be human-caused, very infrequent and limited in extent.

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

Matrix

Adjacency or Identification Concerns

Fen and bog communities can be found in the interspaces between the linear beach ridges (Shephard 1995). Along the coast, the adjacent non-forest vegetation is primarily comprised of a *Leymus mollis* dune community and a *Fragaria chiloensis – Achillea millefolium var. borealis* beach meadow community, which forms further inland on higher ground (Shephard 1995).

Issues or Problems

Native Uncharacteristic Conditions

Comments

10/2021 This description was updated by NatureServe staff and Kori Blankenship based on the updated Ecological Systems classification for Alaska. Edits focused on adjusting the Geographic Range, Biophysical Site Descriptions, and Vegetation Description sections.

This system was created during LANDFIRE National for the AK Maritime region and did not receive review for other regions in the state. This model was developed by Michael Shephard and is largely based on his work (Shephard 1993) on the Yakutat Ranger District. Review comments resulted in minor additions to the description.

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 | B | B | B | B | B | A | A | A | A | A |
| Tree | 5-10 | B | B | B | B | B | B | B | B | B | B |
| 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 30 Early Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PISI | *Picea sitchensis* | Sitka spruce | Upper |
| ALVIS | *Alnus viridis* ssp*. sinuata* | Sitka alder | Lower |
| OPHO | *Oplopanax horridus* | Devilsclub | Lower |
| CANU | *Calamagrostis nutkaensis* | Pacific reedgrass | Lower |

Description

Early, ecotone community between the non-forested beach and the beach ridge. *Picea sitchensis/Oplopanax horridus* community. Found on beach formations < 130yrs old (Shephard 1993). This ecotonal community is characterized by young, very dense stands of *Picea sitchensis* with a moss understory (Shephard 1993).

*Maximum Tree Size Class*  
Med. 9–20" (swd)/11–20" (hwd)

Class B 30 Mid Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PISI | *Picea sitchensis* | Sitka spruce | Upper |
| OPHO | *Oplopanax horridus* | Devilsclub | Lower |
| VAOV | *Vaccinium ovalifolium* | Oval-leaf blueberry | Lower |

Description

Young *Picea sitchensis*/*Oplopanax horridus* community. Found on beach ridge formations 130-300yrs old (Shephard 1993). Cover of *Viburnum edule* and *Vaccinium* ssp. is typically higher during this stage than later seral stages (Shephard 1993). Common moss species include *Hylocomium splendens*, *Rhytidiadelphus loreus*, and *Dicranum* spp. (Shephard 1993).

*Maximum Tree Size Class*  
Large 20" – 40"

Class C 40 Late Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PISI | *Picea sitchensis* | Sitka spruce | Upper |
| OPHO | *Oplopanax horridus* | Devilsclub | Lower |
| RUSP | *Rubus spectabilis* | Salmonberry | Lower |

Description

Middle-Aged and Old. This class combines the Middle-Aged and Old stages defined by Shephard (1993) because they could not be distinguished for mapping using LANDFIRE’s methods. *Picea sitchensis*/*Oplopanax horridus* community which can range from 300 to well over 500 years old. With age, the stand tends to become more open. *Tsuga heterophylla* can eventually be co-dominant (Shephard 1993). *Climacium dendroides* can be found in addition to those moss species listed in the young stage (Shephard 1993).

*Maximum Tree Size Class*  
Very Large 40.0"+

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:CLS | 0 | Mid1:ALL | 129 |
| Mid1:ALL | 130 | Late1:ALL | 299 |
| Late1:ALL | 300 | 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** |
| Wind or Weather or Stress | Mid1:ALL | Early1:CLS | 0.0033 | 303 | Yes | 0 |
| Wind or Weather or Stress | Late1:ALL | Early1:CLS | 0.0033 | 303 | Yes | 0 |

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