USDA Natural Resources Conservation Service

# Ecological site F220XY468AK
# Maritime Forest Loamy Slopes Warm

Last updated: 3/10/2025
Accessed: 05/13/2025

## General information

**Provisional**. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

## MLRA notes

Major Land Resource Area (MLRA): 220X–Alexander Archipelago-Gulf of Alaska Coast

The Alexander Archipelago-Gulf of Alaska Coast area consists of a narrow arc of islands and lower elevation coastal mountains in the Southern Alaska Region. This area spans from the Alexander Archipelago in southeastern Alaska, north and west along the coast of the Gulf of Alaska and Prince William Sound, and further west to the southern tip of the Kenai Peninsula and the northeastern islands of the Kodiak Archipelago. The area makes up about 27,435 square miles (USDA 2006). The terrain primarily consists of low to moderate relief mountains that are deeply incised. Throughout the area glaciers, rivers, and streams have cut deep, narrow to broad valleys. The broader valleys have nearly level to strongly sloping flood plains and stream terraces. Alluvial and colluvial fans and short footslopes are common in the valleys along the base of the mountains. Rocky headlands, sea cliffs, estuaries, and beaches are common along the coast.

This area includes the Municipality of Juneau, Alaska's capital, and a number of smaller coastal towns and villages. Federally administered lands within this MLRA include Admiralty Island National Monument and part of Misty Fjords National Monument, Tongass National Forest, Chugach National Forest, and Glacier Bay, Wrangell-St. Elias, and Kenai Fjords National Parks and Preserves. The southern terminus of the Trans-Alaska Pipeline is in Valdez. During the late Pleistocene epoch, the entire area was covered with glacial ice. The numerous fjords of the Alexander Archipelago and Prince William Sound were formed chiefly as a result of glacial scouring and deepening of preglacial river valleys. Most glacial deposits have been eroded away or buried by mountain colluvium and alluvium, which cover about 90 percent of the present landscape. The remaining glacial and glaciofluvial deposits are generally restricted to coastal areas. During the Holocene epoch, volcanic activity within and adjacent to this area deposited a layer of volcanic ash of varying thickness on much of the landscape in the southeastern and northwestern parts of the area. Paleozoic, Mesozoic, and Lower Tertiary stratified sedimentary rocks and Cretaceous and Tertiary intrusive rocks underlie much of the area and are exposed on steep mountain slopes and ridges (USDA 2006).

The dominant soil orders in this MLRA are Spodosols, Histosols, and Entisols. Soils in the area typically have a cryic soil temperature regime, an udic moisture regime, and have mixed minerology. Spodosols are common on mountains and hills having been formed in gravelly or cobbly colluvium, glacial till, and varying amounts of silty volcanic ash. These Spodosols commonly range from shallow to deep, are well to somewhat poorly drained, and typically classify as Humicryods or Haplocryods. Histosols that are poorly to very poorly drained occur on footslopes, discharge slopes, and valley floors. These wet histosols commonly classify as Cryosaprists, Cryohemists, and Cryofibrists. Histosols that are well drained occur on steep mountainsides. These dry Histosols commonly classify as Cryofolists. Entisols are common on flood plains, stream terraces, and outwash plains having been formed in silty, sandy, and gravelly to cobbly alluvium. These Entisols are generally deep, range from well to somewhat poorly drained, and commonly classify as Cryaquents and Cryofluvents. Miscellaneous (non-soil) areas make up about 23 percent of the MLRA. The most common miscellaneous areas are avalanche chutes, rock outcrop, rubble land, beaches, river wash, and water.

This area represents the northern extent of the Pacific temperature rainforest and is characterized by productive

stands of conifers. Western hemlock and Sitka spruce are the dominant trees on mountains and hills at the lower elevations. Due to warmer temperatures, western red cedar and Alaska cedar are more prevalent in the southern part of the area. Black cottonwood and mixed forest types occur on flood plains. Areas of peat and other sites that are too wet for forest growth support sedge-grass meadows and low scrub. The transition to subalpine and alpine communities typically occurs at elevations between 1500 to 3000 feet (Boggs et al. 2010, Carstensen 2007, Martin et al. 1995), which characterize the vegetation of the Southern Alaska Coastal Mountains area.

For many decades, logging, commercial fishing, and mining have been the primary industrial land uses throughout much of the area. In recent years, changes in public interests, land use policies, and timber economics have contributed to a significant decline in the timber industry. Commercial fishing continues to be an important industry and most communities support a fleet of boats and fishing related facilities. A number of mines operate in the area and others have been prospected and proposed. Tourism and wildland recreation are becoming increasingly important. Subsistence hunting, fishing, and gathering provide food and a variety of other resources to local residents and remain the principal economy for residents of remote villages.

## Ecological site concept

This site occurs on glacially modified hillslopes in the Deception Hills of Dry Bay in Glacier Bay National Park and Preserve. Associated slopes are generally steep (20 to 60 percent) and soils are well-drained and coarse-loamy. Soils are moderately deep with paralithic contact occurring from 20-40 inches. This site supports a reference state comprised of two community phases influenced by windthrow events.

The reference plant community is characterized as a closed coniferous forest and is composed of a western hemlock-Sitka spruce overstory with a dense, shrub understory. Sitka alder, salmonberry, and devil's club dominate the shrub layer and ladyfern, woodyfern, and oakfern are some common herbaceous understory species.

## Associated sites

| | |
|---|---|
| F220XY442AK | **Maritime Forest Loamy Steep Slopes**<br>Ecological site F220XY442AK supports a similar plant community and occurs on mountain slopes in colluvial deposits but soils are somewhat poorly to moderately-well drained. |

## Similar sites

| | |
|---|---|
| F220XY432AK | **Maritime Forest Gravelly Plain**<br>Ecological site F220XY432AK occurs in Glacier Bay Inlet on glaciated hillslopes and was historically glaciated during the Little Ice Age which has resulted in younger, less developed soils. |
| F220XY466AK | **Maritime Forest Sandy Plains Eolian**<br>Ecological site F220XY466AK is also in Dry Bay but occurs on uplifted eolian sand ridges that facilitate a rapid successional transition into a closed needleleaf forest driven via isostatic rebound. |
| W1220X433 | **Maritime Forest Loamy Slopes**<br>Ecological site F220XY433AK occurs in Glacier Bay Inlet on glaciated plains and was historically glaciated during the Little Ice Age which has resulted in younger, less developed soils. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Tsuga heterophylla*<br>(2) *Picea sitchensis* |
| Shrub | (1) *Oplopanax horridus*<br>(2) *Rubus spectabilis* |
| Herbaceous | (1) *Gymnocarpium dryopteris*<br>(2) *Athyrium filix-femina* |

## Physiographic features

This site occurs on glaciated hillslopes in close proximity to the ocean. Steep slopes of 20 to 60% are associated with this site and soils are well-drained. Elevations range from 100 to 660 feet above sea level and paralithic

contact occurs between 20 and 40 inches.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Hills > Hillslope |
| Runoff class | Medium |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 30–201 m |
| Slope | 10–35% |
| Water table depth | 152–0 cm |
| Aspect | W, NW, N, NE, E, SE, S, SW |

**Table 3. Representative physiographic features (actual ranges)**

| | |
|---|---|
| Runoff class | Medium |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 30–201 m |
| Slope | 10–60% |
| Water table depth | 152–0 cm |

## Climatic features

Cloudy skies, moderate temperatures, and abundant rainfall characterize the temperate maritime climate of this site. Frequent winter storms may consist of snow or heavy rainfall. Moderate to strong winds from the south and southeast are common before and during storms throughout the year. Annual precipitation ranges from 44-94 inches, and annual snowfall ranges from 30-70 inches along the coast and up to 200 inches at higher elevations (USDA 2006). The average annual temperature at lower elevations ranges from about 38-43 degrees F (3-6 degrees C). The frost-free period ranges from about 90-140 days, and the freeze-free period ranges from about 125-180 days.

**Table 4. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 95-142 days |
| Freeze-free period (characteristic range) | 147-183 days |
| Precipitation total (characteristic range) | 1,397-3,683 mm |
| Frost-free period (actual range) | 84-170 days |
| Freeze-free period (actual range) | 119-218 days |
| Precipitation total (actual range) | 889-4,369 mm |
| Frost-free period (average) | 120 days |
| Freeze-free period (average) | 168 days |
| Precipitation total (average) | 2,464 mm |

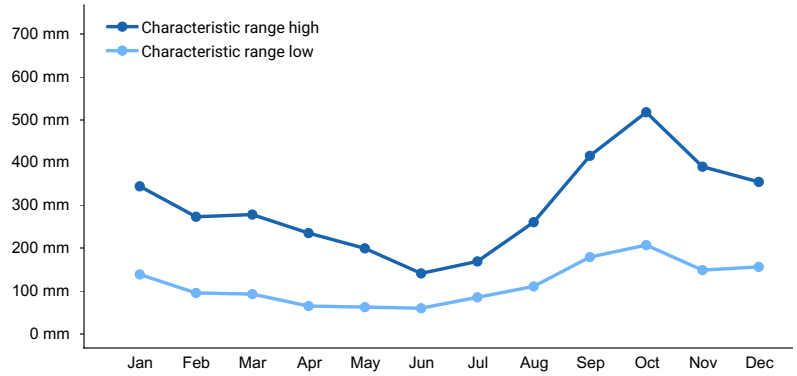



**Figure 1. Monthly precipitation range**

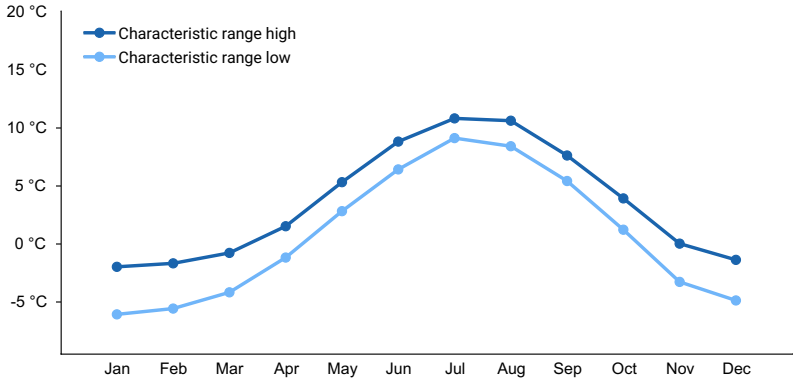



**Figure 2. Monthly minimum temperature range**

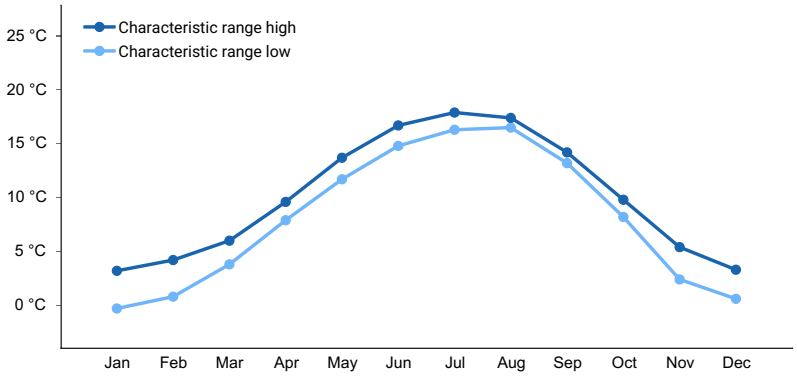



**Figure 3. Monthly maximum temperature range**

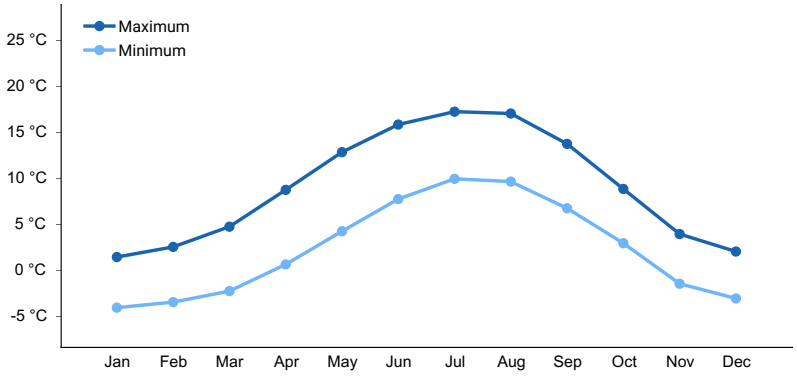



**Figure 4. Monthly average minimum and maximum temperature**

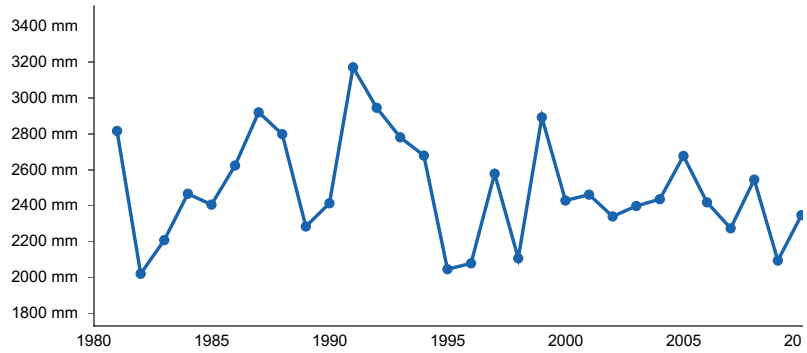



**Figure 5. Annual precipitation pattern**

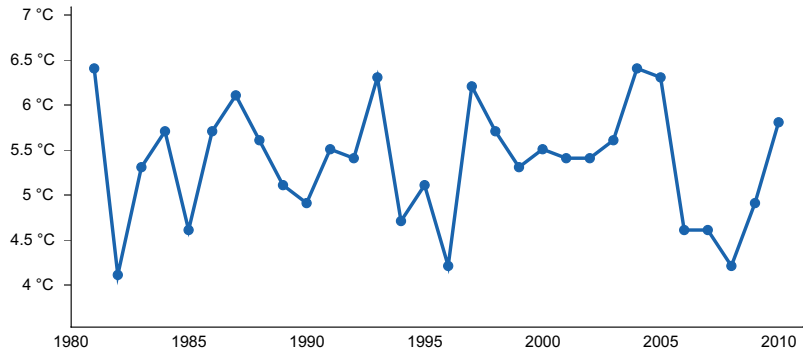



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) GUSTAVUS [USW00025322], Gustavus, AK
- (2) GLACIER BAY [USC00503294], Gustavus, AK
- (3) YAKUTAT STATE AP [USW00025339], Yakutat, AK
- (4) SKAGWAY AP [USW00025335], Skagway, AK
- (5) HAINES AP [USW00025323], Haines, AK
- (6) SELDOVIA AP [USW00025516], Homer, AK
- (7) MAIN BAY [USC00505604], Valdez, AK
- (8) CORDOVA M K SMITH AP [USW00026410], Cordova, AK
- (9) SITKA AIRPORT [USW00025333], Sitka, AK
- (10) JUNEAU INTL AP [USW00025309], Juneau, AK
- (11) ANNETTE ISLAND AP [USW00025308], Metlakatla, AK
- (12) PETERSBURG 1 [USW00025329], Petersburg, AK
- (13) KETCHIKAN INTL AP [USW00025325], Ketchikan, AK
- (14) PELICAN [USC00507141], Hoonah, AK

## Influencing water features

Due to topographic position, this site is not associated with streams or wetlands.

## Soil features

The soils of this site formed in moderately deep colluvium over residuum with paralithic bedrock occurring between 20-40 inches. Soils associated with this site are well-drained with coarse-loamy textures and around 30% course rock fragments. No ponding or flooding occurs on this site and the soil moisture regime is udic.

**Figure 7. Typical soil profile associated with Kaknau soils in Glacier Bay National Park and Preserve-Gustavus Area, Alaska.**

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Colluvium<br>(2) Residuum |
| Surface texture | (1) Very fine sandy loam |
| Family particle size | (1) Coarse-loamy |
| Drainage class | Well drained |
| Permeability class | Moderate |
| Depth to restrictive layer | 51–99 cm |
| Soil depth | 51–99 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-25.4cm) | 2.29–3.81 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Clay content (0-50.8cm) | 5% |
| Electrical conductivity (0-101.6cm) | 0 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 5.5–6.3 |
| Subsurface fragment volume <=3" (0-152.4cm) | 0% |
| Subsurface fragment volume >3" (0-152.4cm) | 30% |

**Table 6. Representative soil features (actual values)**

| | |
|---|---|
| Drainage class | Well drained |
| Permeability class | Moderate |
| Depth to restrictive layer | 51–99 cm |

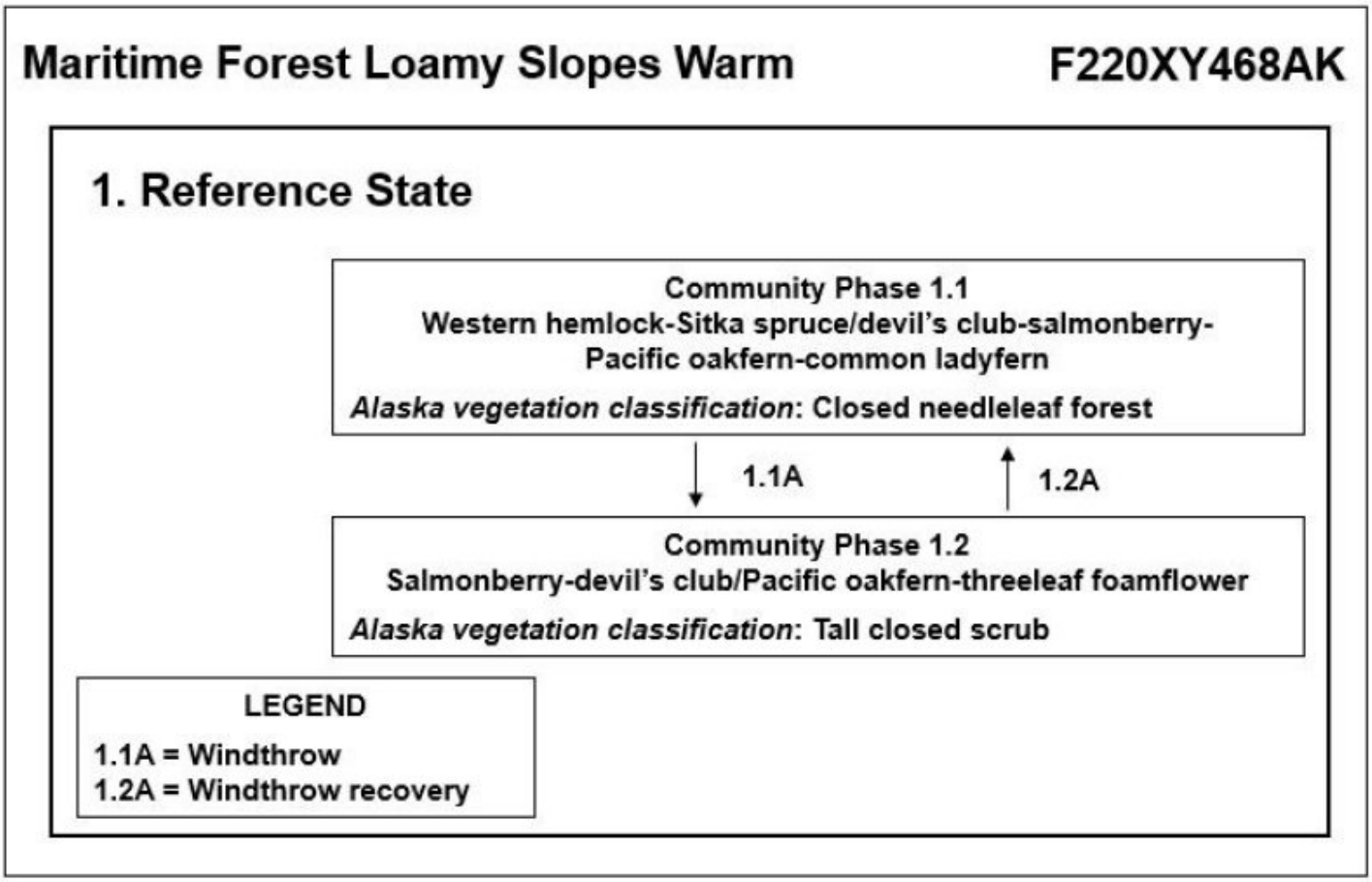
| | |
|---|---|
| Soil depth | 51–99 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-25.4cm) | 2.29–3.81 cm |
| Calcium carbonate equivalent (0-101.6cm) | 0% |
| Clay content (0-50.8cm) | 5% |
| Electrical conductivity (0-101.6cm) | 0 mmhos/cm |
| Sodium adsorption ratio (0-101.6cm) | 0 |
| Soil reaction (1:1 water) (0-101.6cm) | 5.5–6.3 |
| Subsurface fragment volume <=3" (0-152.4cm) | 0% |
| Subsurface fragment volume >3" (0-152.4cm) | 30% |

## Ecological dynamics

This site is associated with glaciated hillslopes in the Deception Hills area of Dry Bay in Glacier Bay National Park and Preserce. Until about 10,000 years ago, this area had many large continental-scale glacial ice sheets that advanced and retreated many times over the millennia (Chapin 1994). In Glacier Bay, glaciers reached maximum extent about 1750 AD when the glaciers terminated into the Icy Strait (Hall et al. 1994). Since then, glaciers of Glacier Bay have thinned and retreated nearly 65 miles up the bay. Numerous tidewater glaciers still exist in this area, including Johns Hopkins Glacier, Grand Pacific Glacier, Lamplugh Glacier, McBride Glacier, and Muir Glacier (Lawson 2015). The 250-year glacial retreat is attributed to less regional snowfall in the mountains, rising winter temperatures, and decreased cloud cover and lower precipitation during the growing season in summer (Hall et al. 2003).

The Dry Bay area is surrounded by numerous glaciated mountain ranges, most notably the glacier-rich Fairweather and St. Elias Ranges. Meltwater from the glaciers, including Alsek Glacier, cumulatively forms the silt-rich Alsek River and associated tributaries that surround the Deception Hills. The Deception Hills are considered glacial refugia. They were not glaciated during the Little Ice Age; thus, they do not have alluvial soils, which are common throughout Dry Bay. The soils in the Deceptions Hills have characteristics of loess, including ash (andic properties) throughout the profile, low bulk density, and a relatively high water holding capacity. This ecological site occurs on steep slopes at lower elevations proximal to the ocean and supports an open needleleaf forest driven by windthrow disturbance.

## State and transition model




**State 1**
**Reference State**

The reference state for this site supports two community phases. The reference community phase is characterized as a closed coniferous forest and is influenced by windthrow events. No alternative states have been observed. The community phase in this report is characterized using the Alaska Vegetation Classification System (Viereck et al. 1992).

**Resilience management.** This state has been observed to be resilient and/or resistant to current disturbance drivers, lacking alternative states and at-risk communities.

**Dominant plant species**

- western hemlock (*Tsuga heterophylla*), tree
- Sitka spruce (*Picea sitchensis*), tree
- devilsclub (*Oplopanax horridus*), shrub

- salmonberry (*Rubus spectabilis*), shrub
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous

## Community 1.1
## Western hemlock - Sitka spruce / devil's club - salmonberry / Pacific oakfern - ladyfern

**Figure 8. Typical plant community associated with community 1.1.**

The reference community phase is characterized as a closed needleleaf community and is composed of a western hemlock - Sitka spruce overstory with a dense, shrub understory. Common understory species include Sitka alder, salmonberry, devil's club, red baneberry, ladyfern, Pacific oakfern, and spreading woodfern. The vegetative stratum that characterizes this community phase is tall trees, medium shrubs, and medium forbs. The forest floor is variable and is covered by herbaceous litter, woody debris, and moss species, including splendid feather moss and Schreberi big red stem moss.

### Dominant plant species

- western hemlock (*Tsuga heterophylla*), tree
- Sitka spruce (*Picea sitchensis*), tree
- devilsclub (*Oplopanax horridus*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous

**Table 7. Soil surface cover**

| | |
|---|---|
| Tree basal cover | 55-75% |
| Shrub/vine/liana basal cover | 60-85% |
| Grass/grasslike basal cover | 0% |
| Forb basal cover | 60-75% |
| Non-vascular plants | 75-80% |
| Biological crusts | 0% |
| Litter | 10-30% |
| Surface fragments >0.25" and <=3" | 0% |
| Surface fragments >3" | 0% |
| Bedrock | 0% |
| Water | 0% |
| Bare ground | 0% |

## Community 1.2
## Salmonberry - devil’s club / Pacific oakfern - threeleaf foamflower

**Figure 9. Typical plant community for community 1.2.**

Community phase 1.2 is characterized as a closed tall scrub community and is primarily composed of salmonberry, devil’s club, and Sitka alder. Common understory forb species include ladyfern, threeleaf foamflower, Pacific oakfern, and pioneer violet. The forest floor is variable and is covered by herbaceous litter, woody debris, and moss species.

### Dominant plant species

- salmonberry (*Rubus spectabilis*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous
- threeleaf foamflower (*Tiarella trifoliata*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous

**Table 8. Soil surface cover**

| | |
|---|---|
| Tree basal cover | 8% |
| Shrub/vine/liana basal cover | 95-100% |
| Grass/grasslike basal cover | 0% |
| Forb basal cover | 70% |
| Non-vascular plants | 20% |
| Biological crusts | 0% |
| Litter | 75% |
| Surface fragments >0.25" and <=3" | 0% |
| Surface fragments >3" | 0% |
| Bedrock | 0% |
| Water | 0% |
| Bare ground | 0% |

## Pathway 1.1a
## Community 1.1 to 1.2

Western hemlock - Sitka spruce / devil's club - salmonberry / Pacific oakfern - ladyfern

Salmonberry - devil's club / Pacific oakfern - threeleaf foamflower

Windthrow events remove overstory species, creating canopy gaps which allow for understory regeneration and successional process. In the event of severe windthrow disturbance, community composition shifts to that of a tall, closed scrubland.

### Pathway 1.2a
### Community 1.2 to 1.1

Salmonberry - devil's club / Pacific oakfern - threeleaf foamflower

Western hemlock - Sitka spruce / devil's club - salmonberry / Pacific oakfern - ladyfern

In the absence of significant windthrow events, overstory species regenerate and dominate the overstory. Eventually, this will lead to a closed needleleaf forest comprised of Western hemlock and Sitka spruce.

## Additional community tables

**Table 9. Community 1.1 forest overstory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) | Diameter (Cm) | Basal Area (Square M/Hectare) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**Table 10. Community 1.1 forest understory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) |
|---|---|---|---|---|---|
| | | | | | |

**Table 11. Community 1.2 forest overstory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) | Diameter (Cm) | Basal Area (Square M/Hectare) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

**Table 12. Community 1.2 forest understory composition**

| Common Name | Symbol | Scientific Name | Nativity | Height (M) | Canopy Cover (%) |
|---|---|---|---|---|---|
| | | | | | |

## Inventory data references

NASIS ID Plant community
2015AK282104 Community 1.1
2015AK282102 Community 1.1
2015AK282103 Community 1.2

## Other references

Brokaw, N.V.L. 1985. The ecology of natural disturbance and patch dynamics. Academic Press, San Diego, California. Pages 53-69.

Chapin, F.S., L.R. Walker, C.L. Fastie, and L.C. Sharman. 1994. Mechanisms of primary succession following

deglaciation at Glacier Bay, Alaska. Ecological Monographs 64: 149-175.

Hall, D.K., C.S. Benton, and W.O. Field, 1994. Changes of glaciers in Glacier Bay, Alaska, using ground and satellite measurements. Physical Geography 16(1): 27-41.

Hall, M.H.P., and D. Fagre. 2003. Modeled climate-induced glacier change in Glacier National Park 1850–2100. BioScience 53:131-140.

Lawson, D.E. 2015. An overview of selected glaciers in Glacier Bay. National Park Service. Retrieved August 15, 2010.

Schoeneberger, P.J., and D.A. Wysocki. 2012. Geomorphic Description System, Version 4.2. Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska.

Schoeneberger, P.J., D.A. Wysocki, E.C. Benham, and W.D. Broderson, editors. 2012. Field book for describing and sampling soils. Version 3.0. U.S. Department of Agriculture, Natural Resources Conservation Service.

Soil Survey Division Staff. 2017. Soil survey manual. U.S. Department of Agriculture Handbook 18.

Viereck, L.A., C.T. Dyrness, A.R. Batten, and K.J. Wezlick. 1992. The Alaska vegetation classification. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station General Technical Report PNW-GTR-286.

## Contributors

Tyler Annetts
Jamin Johanson
Blaine Spellman
Phil Barber
Stephanie Shoemaker

## Approval

Marji Patz, 3/10/2025

## Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

| | |
|---|---|
| Author(s)/participant(s) | |
| Contact for lead author | |
| Date | 05/13/2025 |
| Approved by | Marji Patz |
| Approval date | |
| Composition (Indicators 10 and 12) based on | Annual Production |

## Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth ( in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**