USDA Natural Resources Conservation Service

Ecological site F220XY204AK
Subalpine Forests Organic Wet Slopes

Last updated: 3/10/2025
Accessed: 05/12/2025

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

This area is in the Southern Alaska Region and includes the higher elevations of the Coast, St. Elias, Chugach, and Kenai Mountains. The area makes up about 26,335 square miles. The terrain consists of steep, rugged, high-relief mountains. Glaciers and ice fields make up about 54 percent of the area. Unglaciated portions of the area are deeply incised with narrow to broad valleys. Flood plains and stream terraces on valley floors rapidly give rise to steep alluvial fans and mountain footslopes. Elevation ranges from sea level at the base of tidewater glaciers and ice fields to 18,008 feet at the summit of Mt. St. Elias (USDA 2006).

During the Pleistocene epoch, the area was covered with glacial ice. As the glacial ice melted, sediments were deposited by the melting ice. However, most of the original glacial deposits have eroded away or have been buried by colluvium and slope alluvium, which covers more than 90 percent of the present unglaciated landscape. The remaining glacial and glaciofluvial deposits and recent fluvial deposits are generally restricted to the bottoms of the larger valleys. Paleozoic, Mesozoic, and Lower Tertiary stratified sedimentary rocks, and occasionally Paleozoic intrusive rocks, underlie much of the area and are exposed on steep mountain slopes and ridges (USDA 2006).

Miscellaneous (non-soil) areas make up more than 90 percent of this MLRA. The most common miscellaneous areas are rock outcrop, rubble land, chutes, and glaciers. The dominant soil orders in this area are Spodosols and Histosols. The soils in the area have a cryic soil temperature regime or a subgelic soil temperature class, a udic or aquic soil moisture regime, and mixed or amorphic mineralogy (USDA 2006).

While both alpine and subalpine plant communities characterize the vegetation in this area, most of the unglaciated terrain in this region is in the true alpine zone. Alpine vegetation consists of a variety of dwarf scrub and herbaceous communities. Low willow scrub is common in drainages. Lichens, scattered herbs, and dwarf shrubs dominate bedrock exposures and very shallow soils. In general, there is little or no plant growth at elevations above about 7,500 feet (USDA 2006). At lower elevations, subalpine vegetation consists of a variety of mountain hemlock and tall scrub communities. These subalpine plant communities typically occur at elevations between 1500 to 3000 feet (Boggs et al. 2010, Carstensen 2007, Jaques 1983; Martin et al. 1995).

The area is almost entirely undeveloped wild land. Remote wild-land recreation is the principal land use in this area. The rugged, high mountains, extensive glaciers and ice fields, and wilderness qualities of the area attract visitors from around the world. Small rural communities along the road system are the only permanent settlements. Part of

the Wrangell-St. Elias Bay National Park and Preserve, the Glacier Bay National Park and Preserve, the Misty Fjords National Monument, the Chugach National Forest, and the Tongass National Forest are in this MLRA.

Classification relationships

National Vegetation Classification – Ecological Systems: Alaskan Pacific Maritime Subalpine Mountain Hemlock Woodland (CES204.143) (NatureServe 2015)

Ecological site concept

This subalpine site occurs on mountain slopes and depressions at the lowest subalpine bands of elevation and represents a transition from warmer coastal rainforests to colder subalpine forests. This site has a harsh climate where tree species from lower elevations like western hemlock are no longer dominant. The soils are wet for much of the growing season and are very poorly drained. These wet soils are Histosols and are formed in saturated organic material. Bedrock typically occurs within 15 to 35 inches.

The reference plant community is an open forest (25-60% cover) dominated by coniferous trees, ericaceous shrubs, and wetland indicator plant species. While mountain hemlock is the dominant tree species, western hemlock and Sitka spruce can also be an occasional stand component (Martin et al. 1995). Common understory species include oval-leaf blueberry, Alaska blueberry, deer cabbage, green false hellebore, strawberryleaf raspberry, deer fern, and fernleaf goldthread (Martin et al. 1995, Landfire 2009). The primary disturbance processes that maintain this plant community are exposure to cold temperatures, wind, blowdown, and avalanches (NatureServe 2018).

Associated sites

F220XY338AK	**Subalpine Forests Dry Organic Slopes** Occurs on similar bands of elevation on dry organic rich soils.
F220XY200AK	**Subalpine Forest Gravelly Dry Slopes** Occurs on similar bands of elevation on dry soils, leading to differences in reference plant community assemblages..

Similar sites

F220XY200AK	**Subalpine Forest Gravelly Dry Slopes** Both sites occur in a similar band of elevation and have similar overstory and understory species. F220XY200AK has more productive trees and less wetland indicator species.

Table 1. Dominant plant species

Tree	(1) *Tsuga mertensiana*
Shrub	(1) *Vaccinium ovalifolium* (2) *Vaccinium alaskaense*
Herbaceous	(1) *Nephrophyllidium crista-galli* (2) *Veratrum viride*

Physiographic features

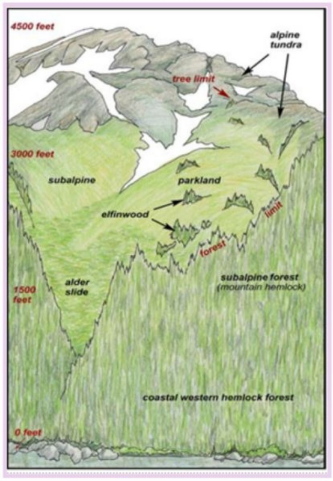

Figure 1.

Table 2. Representative physiographic features

Slope shape across	(1) Concave

Climatic features

Cloudy conditions, high annual precipitation with long periods of snow cover, and moderate to cold temperatures characterize the climate of this area. The average annual precipitation throughout most of this area is 120 to 200 inches and can reach 250 inches or more at the highest elevations (USDA-NRCS 2006). The average annual snowfall in this area ranges from about 200 to 800 inches and can greatly exceed the annual snowmelt in many places, as evidenced by the abundance and extent of glaciers and ice fields (USDA-NRCS 2006). Site precipitation is at a minimum during the months of April through July and a maximum during the months of September through December.

At higher elevations, freezing temperatures are likely to occur during any month of the year. For this site, the growing season occurs over a short duration of time. For instance, July and August are the only months in which the representative low minimum monthly temperatures are not below freezing.

Table 3. Representative climatic features

Frost-free period (characteristic range)	95-133 days
Freeze-free period (characteristic range)	147-184 days
Precipitation total (characteristic range)	1,549-3,683 mm
Frost-free period (actual range)	84-170 days
Freeze-free period (actual range)	119-218 days
Precipitation total (actual range)	1,143-4,369 mm
Frost-free period (average)	119 days
Freeze-free period (average)	168 days
Precipitation total (average)	2,540 mm

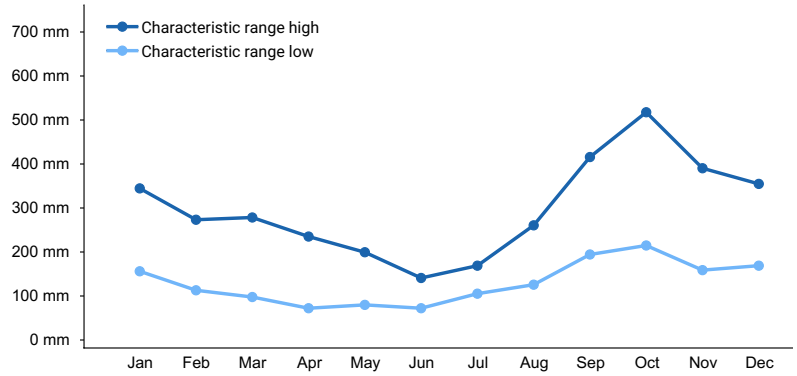

Figure 2. Monthly precipitation range

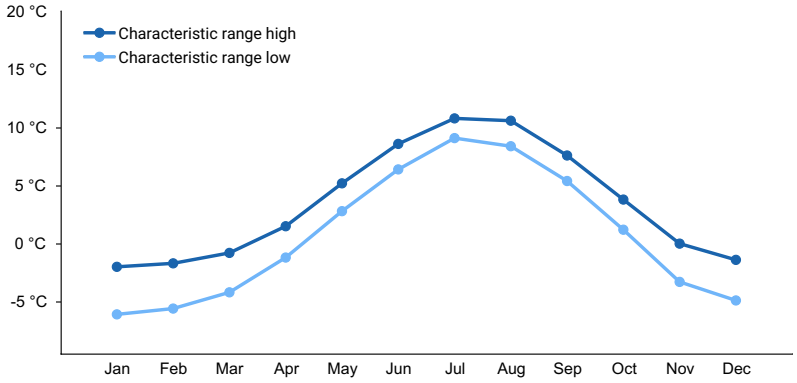

Figure 3. Monthly minimum temperature range

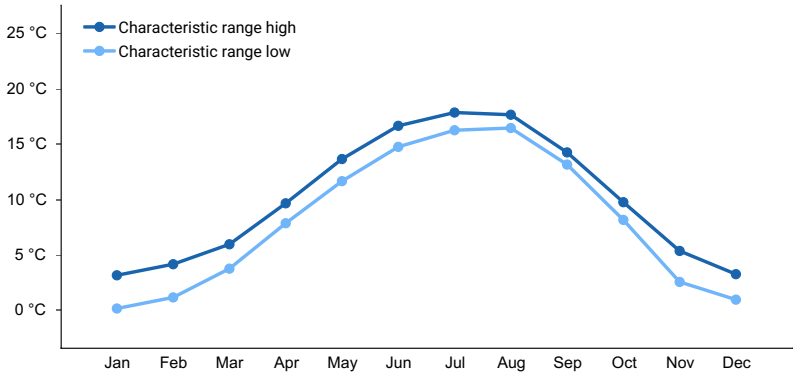

Figure 4. Monthly maximum temperature range

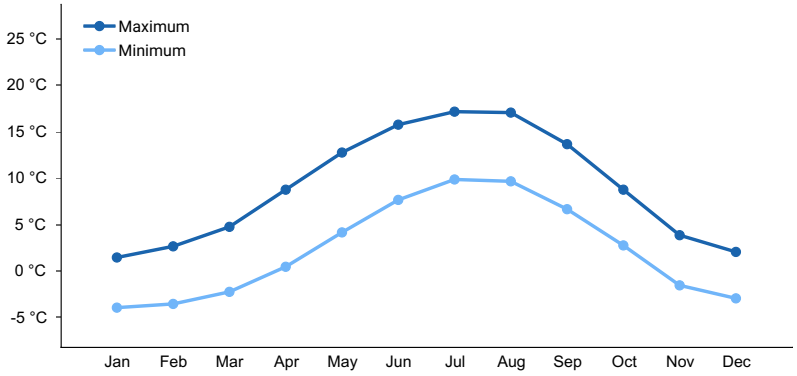

Figure 5. Monthly average minimum and maximum temperature

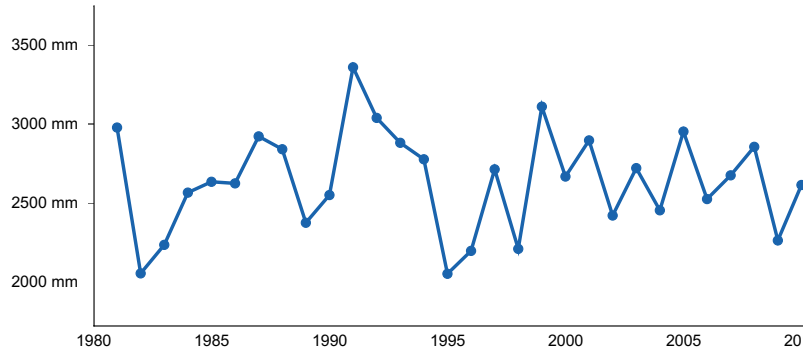

Figure 6. Annual precipitation pattern

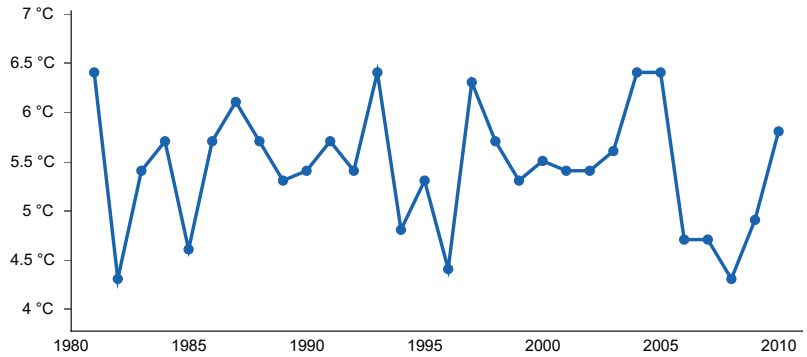

Figure 7. Annual average temperature pattern

Climate stations used

- (1) HOONAH [USC00503695], Hoonah, AK
- (2) PELICAN [USC00507141], Hoonah, AK
- (3) SELDOVIA AP [USW00025516], Homer, AK
- (4) MAIN BAY [USC00505604], Valdez, AK
- (5) CORDOVA M K SMITH AP [USW00026410], Cordova, AK
- (6) YAKUTAT STATE AP [USW00025339], Yakutat, AK
- (7) HAINES AP [USW00025323], Haines, AK
- (8) GLACIER BAY [USC00503294], Gustavus, AK
- (9) GUSTAVUS [USW00025322], Gustavus, AK
- (10) JUNEAU INTL AP [USW00025309], Juneau, AK
- (11) SITKA AIRPORT [USW00025333], Sitka, AK
- (12) PETERSBURG 1 [USW00025329], Petersburg, AK
- (13) KETCHIKAN INTL AP [USW00025325], Ketchikan, AK
- (14) ANNETTE ISLAND AP [USW00025308], Metlakatla, AK

Influencing water features

During the growing season, these very poorly drained soils tend to have a water table near the soil surface (0 to 6 inches) for the entire growing season. Depth to the water table may decrease following summer storm events or spring snowmelt and increase during extended dry periods.

Due to the perceived depth and persistence of a water table, wetland indicator plants are common in the reference state.

Soil features

The soils of this site formed in saturated organic material that is primarily peat or mucky peat. The pH of the organic material ranges between extremely acidic and very strongly acidic (3.5 to 5.0 pH). Bedrock typically occurs at

depths of 15 to 35 inches. Rock fragments do not typically occur on the soil surface. Rock fragments in the soil subsurface range between 0 and 10 percent of the soil profile by volume.

The soil moisture regime for these wet soils is aquic. The temperature regime for this site is classified as cryic, where the mean annual soil temperature is between 32°F and 46°F (USDA-NRCS 2006). Soils of this ecological site are Histosols and are typically classified as Lithic Cryosaprists or Lithic Cryohemists.

Table 4. Representative soil features

Parent material	(1) Organic material
Surface texture	(1) Peat (2) Mucky peat
Drainage class	Very poorly drained
Permeability class	Slow to moderately rapid
Depth to restrictive layer	38–89 cm
Soil depth	38–89 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	9.65–25.91 cm
Soil reaction (1:1 water) (0-25.4cm)	3.5–5
Subsurface fragment volume <=3" (0-88.9cm)	0–10%
Subsurface fragment volume >3" (0-88.9cm)	0%

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	23–102 cm
Soil depth	23–102 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	0.51–27.43 cm
Soil reaction (1:1 water) (0-25.4cm)	3.5–6
Subsurface fragment volume <=3" (0-88.9cm)	Not specified
Subsurface fragment volume >3" (0-88.9cm)	Not specified

Ecological dynamics

The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and

ecological processes are described to inform land management decisions.

This MLRA has a harsh climate where glaciers and other miscellaneous areas are the dominant land cover. The non-glaciated areas are inhabited by a vegetative matrix resulting from a complex interaction among elevation, varying microclimates resulting from landscape topography, and natural disturbance regimes. The result is a heterogeneous landscape of ericaceous dwarf shrubs, low shrubs, tall shrubs, and forested plant communities. This site forms an aspect of this vegetative continuum. This ecological site occurs on mountain slopes and depressions on wet organic soils at the lowest subalpine bands of elevation.

This site occurs in the subalpine forest subzone (Carstensen 2007) just above coastal forests dominated by western hemlock and just below the subalpine parkland. Mountain hemlock is the tree species best adapted to the cold temperatures, bitter wind, and deep snowpack associated with the subalpine in this MLRA. Avalanches, creeping snowpack that crushes woody vegetation, fungal pathogens, and blowdown are small-patch disturbances that typically result in mortality of individual or small groups of trees in this site (Viereck et al. 1992; Carstensen 2007; Zouhar 2017; NatureServe 2018). These small-patch disturbances, combined with important site factors like elevation and drainage class, maintain vegetation within this site and the larger subalpine forest subzone.

The state-and-transition model that follows provides a detailed description of each known state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities

1.1. Mountain hemlock / oval-leaf blueberry - Alaska blueberry / deercabbage - green false hellebore

State 1
Reference State

The reference plant community is an open forest (25-60% cover) dominated by coniferous trees, ericaceous shrubs, and wetland indicator species. The one community phase within the reference state is maintained by cold temperatures, wind, avalanches, fungal pathogens, and blowdown (NatureServe 2018).

Community 1.1
Mountain hemlock / oval-leaf blueberry - Alaska blueberry / deercabbage - green false hellebore

The plant community is characterized as an open needleleaf forest (25-60 percent cover) that is composed primarily of mountain hemlock. Western hemlock and Sitka spruce occasionally occur in the canopy but neither is dominant.

While stands are typically open forest, tree cover can at times range down to 15% cover and up to 65% cover. Trees seldomly reach over 50 feet in height (Martin et al. 1995). Common understory species include oval-leaf blueberry, Alaska blueberry, sedges, deercabbage, green false hellebore, strawberryleaf raspberry, deer fern, and fernleaf goldthread.

Dominant plant species

- mountain hemlock (*Tsuga mertensiana*), tree
- western hemlock (*Tsuga heterophylla*), tree
- Sitka spruce (*Picea sitchensis*), tree
- oval-leaf blueberry (*Vaccinium ovalifolium*), shrub
- Alaska blueberry (*Vaccinium alaskaense*), shrub
- sedge (*Carex*), grass
- deercabbage (*Nephrophyllidium crista-galli*), other herbaceous
- green false hellebore (*Veratrum viride*), other herbaceous
- strawberryleaf raspberry (*Rubus pedatus*), other herbaceous
- deer fern (*Blechnum spicant*), other herbaceous
- fernleaf goldthread (*Coptis aspleniifolia*), other herbaceous

Additional community tables

Other references

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Zouhar, K. 2017. Fire regimes in Alaskan mountain hemlock ecosystems. In: Fire Effects Information System (Online). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available: https://www.fs.fed.us/database/feis/fire_regimes/AK_mountain_hemlock/all.html. (Accessed 23 October 2018).

Contributors

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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	05/12/2025
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:

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

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

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

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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:**

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17. **Perennial plant reproductive capability:**
