Ecological site F220XY441AK
Maritime Forest Gravelly Slopes

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

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 mountain slopes of upland mountains with slopes ranging from 20 to 70%. Flooding and ponding is not known to occur on these well-drained soils. Soil textures are loamy-skeletal formed in colluvium derived from metamorphic rock. No water table is associated with this site and soil depth is limited by lithic contact between 20 and 45 inches. This site occurs from 0 to 2800 feet above sea level.

The reference state for this site supports three plant community phases driven by windthrow events. The reference community phase is characterized as a closed needleleaf forest composed primarily of mature mixed conifers including Sitka spruce, mountain hemlock, and western hemlock. Common understory species include oval-leaf blueberry, strawberryleaf raspberry, spreading woodfern, stairstep moss, Schreber's big red stem moss, and goose neck moss.

Associated sites

F220XY442AK	**Maritime Forest Loamy Steep Slopes** On mountain slopes where these ecological sites abut, ecotonal plant communities that have characteristics from each ecological site are common. In ecological site F220XY442AK, soils are somewhat-poorly to moderately-well drained.

Similar sites

F220XY468AK	**Maritime Forest Loamy Slopes Warm** Ecological site F220XY468AK supports a similar plant community, also driven by windthrow events, but occur on moderately-deep soils with paralithic contact within 40 inches.

Table 1. Dominant plant species

Tree	(1) *Tsuga heterophylla* (2) *Tsuga mertensiana*
Shrub	(1) *Rubus pedatus* (2) *Vaccinium ovalifolium*
Herbaceous	(1) *Hylocomium splendens* (2) *Rhytidiadelphus loreus*

Physiographic features

This site occurs on upland mountains slopes of 20 to 70%. Flooding and ponding does not occur on this site and soils are well-drained. Elevations range from sea level to 2800 feet above sea level and a shallow water table is not known to be associated with this site. Soil textures are loamy-skeletal.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	0–2,800 ft
Slope	20–75%
Water table depth	60–0 in
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	0–2,800 ft
Slope	5–100%
Water table depth	60–0 in

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)	55-145 in
Frost-free period (actual range)	84-170 days
Freeze-free period (actual range)	119-218 days
Precipitation total (actual range)	35-172 in
Frost-free period (average)	120 days
Freeze-free period (average)	168 days
Precipitation total (average)	97 in

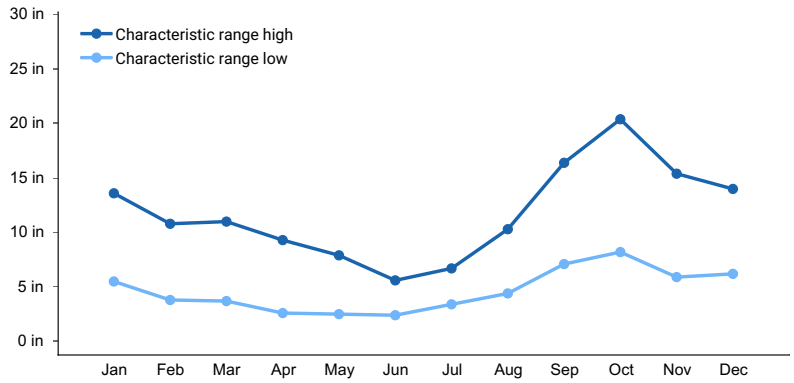


Figure 1. Monthly precipitation range

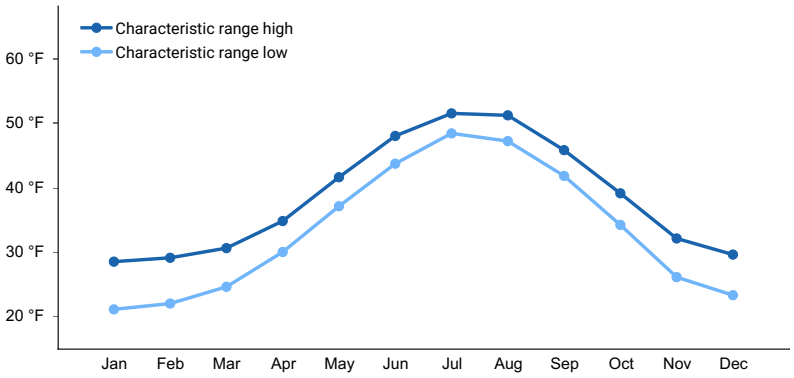


Figure 2. Monthly minimum temperature range

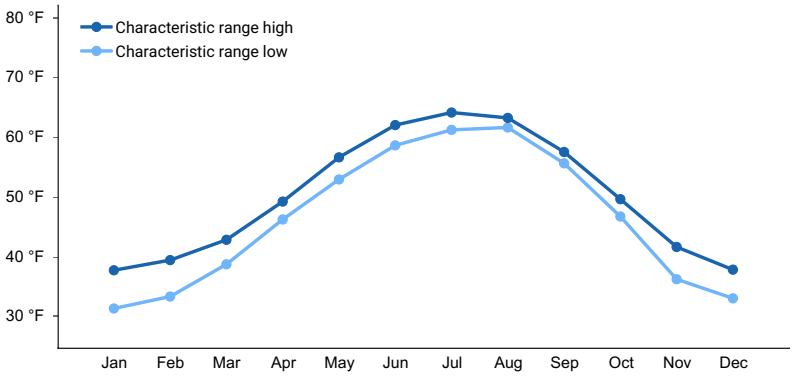


Figure 3. Monthly maximum temperature range

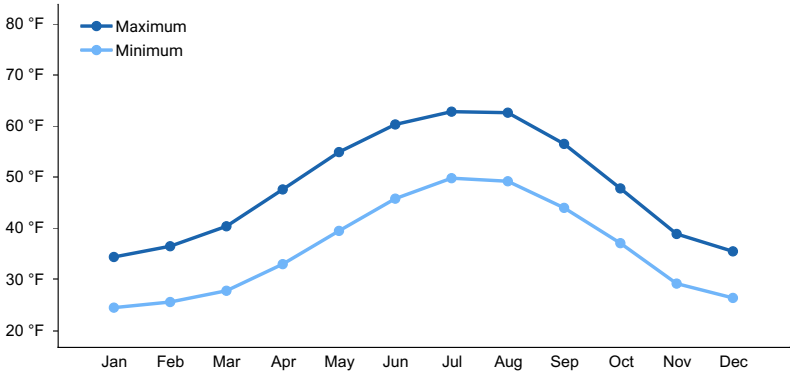


Figure 4. Monthly average minimum and maximum temperature

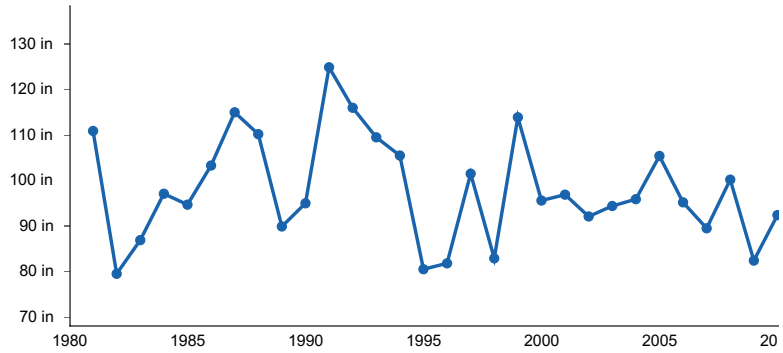


Figure 5. Annual precipitation pattern

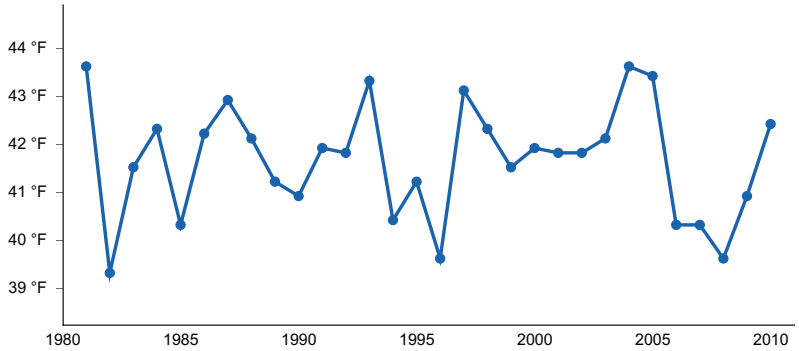


Figure 6. Annual average temperature pattern

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 its landscape position, this site is not influenced by streams or wetlands. Most of the plant-available moisture enters the site as precipitation.

Soil features

The soils of this site are formed in moderately deep colluvial deposits derived from metamorphic rock and soil textures are loamy-skeletal. Soils moisture regime is udic and ponding and flooding does not occur on these well-drained soils.

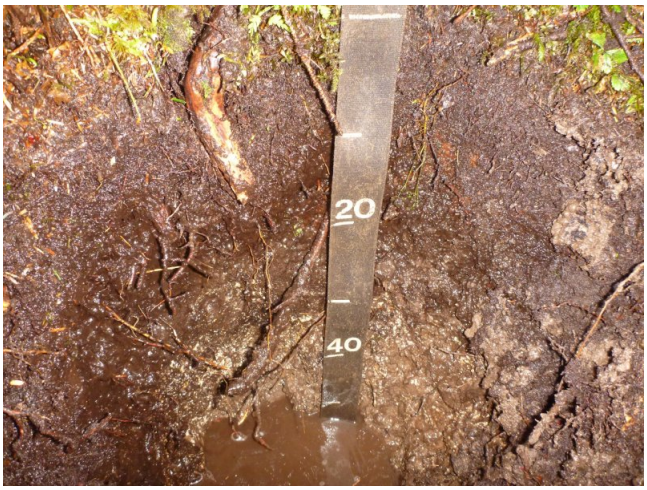


Figure 7. Typical soil profile associated with Bergbay soils in Glacier Bay National Park and Preserve-Gustavus Area, Alaska.

Figure 8. Typical soil profile associated with Foad soils in Glacier Bay National Park and Preserve-Gustavus Area, Alaska.

Figure 9. Typical soil profile associated with Wachusett soils in Glacier Bay National Park and Preserve-Gustavus Area, Alaska.

Table 5. Representative soil features

Parent material	(1) Colluvium–metamorphic rock
Surface texture	(1) Gravelly silt loam (2) Silt loam (3) Stony silt loam (4) Very cobbly sandy loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained

Permeability class	Moderate
Depth to restrictive layer	20–44 in
Soil depth	20–44 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	0.8–1.9 in
Calcium carbonate equivalent (0-40in)	0%
Clay content (0-20in)	3–6%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-10in)	3.6–6
Subsurface fragment volume <=3" (0-60in)	17–21%
Subsurface fragment volume >3" (0-60in)	7–40%

Table 6. Representative soil features (actual values)

Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	20–59 in
Soil depth	20–59 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	0.8–1.9 in
Calcium carbonate equivalent (0-40in)	0%
Clay content (0-20in)	2–8%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-10in)	3.6–6.5
Subsurface fragment volume <=3" (0-60in)	0–27%
Subsurface fragment volume >3" (0-60in)	0–40%

Ecological dynamics

This site is associated with mountain slopes in upland, costal mountains along the Gulf of Alaska. Until about

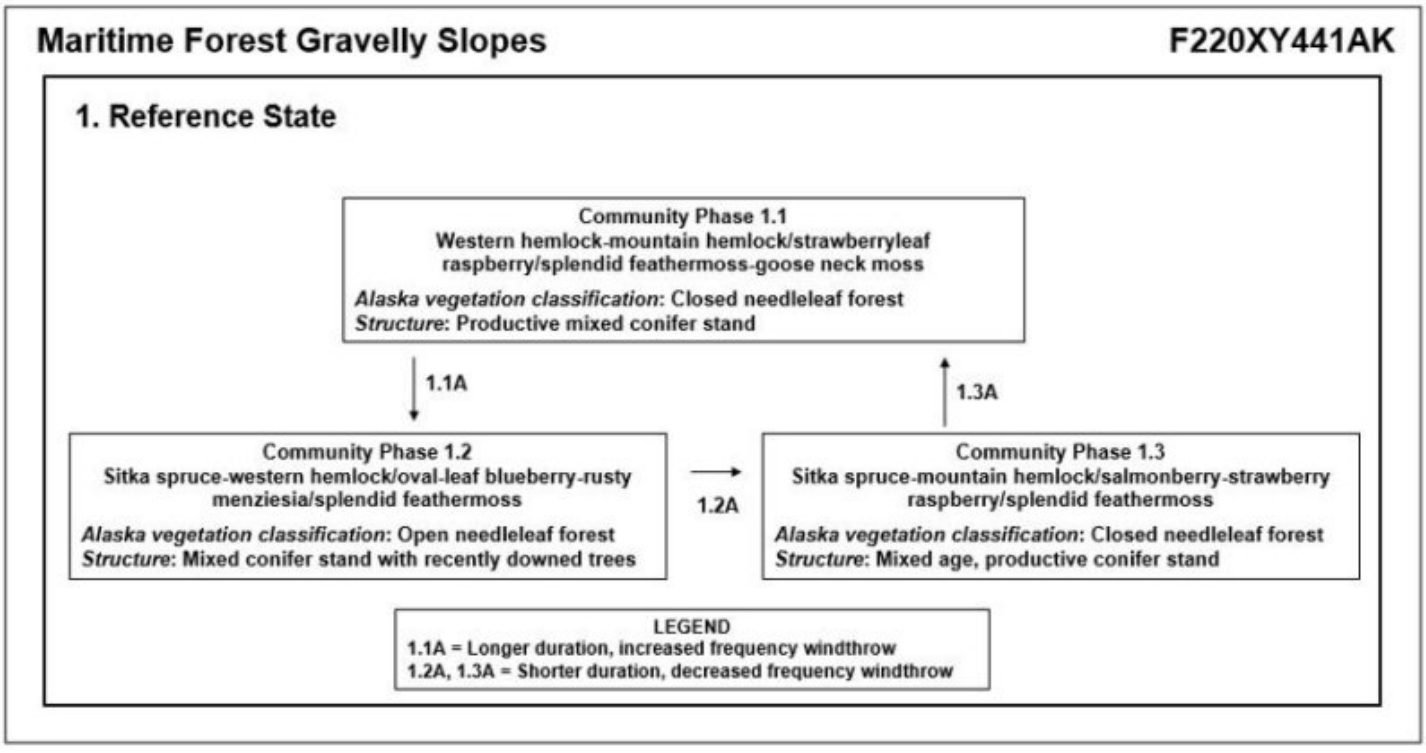
10,000 years ago, this area had many continental-scale ice sheets that advanced and retreated many times over millennia (Chapin 1994). The final advance of these glaciers occurred during the Little Ice Age, which peaked about 1750 AD. Since then, many glaciers have thinned and retreated inland, while numerous tidewater glaciers still exist in the area (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).

During the past 250 years of glacial retreat, meltwater transported and deposited a large amount of silt and sediment via numerous short, high-gradient rivers. Alluvial and colluvial fans and long footslopes are common in the valleys along the base of the mountains. Drainageways dissect these fans and flats, which ultimately feed into the streams, rivers, and estuaries along the coastal plain.

This ecological site is associated with the Outer Coast and Excursion Inlet, which are older landscapes within Glacier Bay National Park and Preserve. Although the Outer Coast and Excursion Inlet areas were historically glaciated, they were not glaciated during the Little Ice Age and thus are older landscapes than those of Glacier Bay Inlet. Mountain backslopes are associated with these older landscapes and are the most common landform feature along the Outer Coast and Excursion Inlet. Ecological site F220XY441AK is on these mountain backslopes.

The reference state supports three plant community phases controlled by windthrow events. The reference community phase is characterized as a closed needleleaf forest composed primarily of mature mixed conifers including Sitka spruce, mountain hemlock, and western hemlock. Common understory species include oval-leaf blueberry, strawberryleaf raspberry, spreading woodfern, stairstep moss, Schreber's big red stem moss, and goose neck moss.

State and transition model



State 1
Reference State

The reference state has three associated community phases, the presence of which are dictated temporally and spatially by windthrow. The reference community phase is represented by a closed needleleaf forest (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
- mountain hemlock (*Tsuga mertensiana*), tree
- oval-leaf blueberry (*Vaccinium ovalifolium*), shrub
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- goose neck moss (*Rhytidiadelphus loreus*), other herbaceous

Community 1.1
Western hemlock - mountain hemlock / strawberryleaf raspberry / splendid feathermoss - goose neck moss

Figure 10. Typical plant community associated with community 1.1.

Community phase 1.1 (reference community phase) is characterized as open needleleaf forest composed primarily of western hemlock, mountain hemlock, and Sitka spruce (Viereck et al. 1992). Common shrub species include oval-leaf blueberry, strawberryleaf raspberry, rusty menziesia, devil's club, spreading woodfern, bunchberry dogwood, and Pacific oakfern. The vegetative stratum that characterizes this community phase is tall trees, medium shrubs medium forbs, with a feathermoss ground cover. Common mosses include stairstep moss, Schreber's big red stem moss, and goose neck moss.

Dominant plant species

- western hemlock (*Tsuga heterophylla*), tree

- mountain hemlock (*Tsuga mertensiana*), tree
- Sitka spruce (*Picea sitchensis*), tree
- oval-leaf blueberry (*Vaccinium ovalifolium*), shrub
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- goose neck moss (*Rhytidiadelphus loreus*), other herbaceous

Table 7. Soil surface cover

Tree basal cover	30-70%
Shrub/vine/liana basal cover	5-75%
Grass/grasslike basal cover	0%
Forb basal cover	0-90%
Non-vascular plants	25-90%
Biological crusts	0%
Litter	5-60%
Surface fragments >0.25" and <=3"	0-15%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Community 1.2
Sitka spruce-western hemlock/oval-leaf blueberry-rusty menziesia/splendid feathermoss

Figure 11. Typical plant community associated with community 1.2.

Community phase 1.2 is characterized as open needleleaf forest primarily composed of mature Sitka spruce and western hemlock, (Viereck et al. 1992). Large down woody debris and litter are common. Common understory species include oval-leaf blueberry, Alaska blueberry, strawberryleaf raspberry, and rusty menziesia. The vegetative stratum that characterizes this community phase is tall trees, medium shrubs, medium forbs, with feathermoss species common ground cover. Common ground cover species include stairstep moss, Schreber’s big red stem moss, and goose neck moss.

Dominant plant species

- Sitka spruce (*Picea sitchensis*), tree
- western hemlock (*Tsuga heterophylla*), tree
- rusty menziesia (*Menziesia ferruginea*), shrub
- goose neck moss (*Rhytidiadelphus loreus*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous

Table 8. Soil surface cover

Tree basal cover	30-85%
Shrub/vine/liana basal cover	0-60%
Grass/grasslike basal cover	0-1%
Forb basal cover	5-30%
Non-vascular plants	50-100%
Biological crusts	0%
Litter	5-25%
Surface fragments >0.25" and <=3"	0-15%
Surface fragments >3"	0%
Bedrock	0-5%
Water	0%
Bare ground	0%

Community 1.3
Sitka spruce-mountain hemlock/salmonberry-strawberryleaf raspberry/splendid feathermoss

Figure 12. Typical plant community associated with community 1.3.

Community phase 1.3 is characterized as a closed needleleaf forest primarily composed of Sitka spruce and mountain hemlock (Viereck et al. 1992). The overstory commonly exhibits a high level of structural diversity with multiple age classes. The ground cover is dominantly moss-covered downed trees. Common species include salmonberry, oval-leaf blueberry, strawberryleaf raspberry, rusty menziesia, bunchberry dogwood, small twistedstalk, and single delight. The vegetative stratum that characterizes this community is tall trees with an understory of medium shrubs and medium forb stratum. The most abundant moss species are stairstep moss and goose neck moss.

Dominant plant species

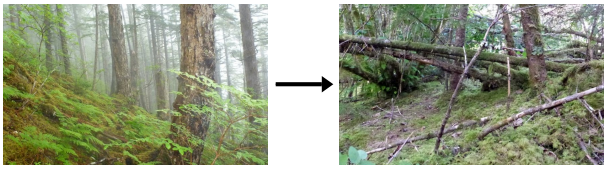
- Sitka spruce (*Picea sitchensis*), tree
- mountain hemlock (*Tsuga mertensiana*), tree
- oval-leaf blueberry (*Vaccinium ovalifolium*), shrub
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous

Table 9. Soil surface cover

Tree basal cover	5-70%
Shrub/vine/liana basal cover	10-75%

Grass/grasslike basal cover	0%
Forb basal cover	5-45%
Non-vascular plants	60-80%
Biological crusts	0%
Litter	20-60%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-1%

Pathway 1.1a
Community 1.1 to 1.3

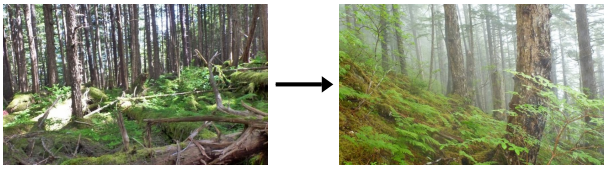


Western hemlock - mountain hemlock / strawberryleaf raspberry / splendid feathermoss - goose neck moss

Sitka spruce-mountain hemlock/salmonberry-strawberryleaf raspberry/splendid feathermoss

Windthrow events reset successional processes by removing overstory species and reducing canopy cover.

Pathway 1.2a
Community 1.2 to 1.1



Sitka spruce-western hemlock/oval-leaf blueberry-rusty menziesia/splendid feathermoss

Western hemlock - mountain hemlock / strawberryleaf raspberry / splendid feathermoss - goose neck moss

Windthrow recovery

Pathway 1.3a
Community 1.3 to 1.2

Sitka spruce-mountain hemlock/salmonberry-strawberryleaf raspberry/splendid feathermoss

Sitka spruce-western hemlock/oval-leaf blueberry-rusty menziesia/splendid feathermoss

Windthrow recovery

Additional community tables

Table 10. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)

Table 11. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)

Table 12. Community 1.2 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)

Table 13. Community 1.2 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)

Table 14. Community 1.3 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)

Table 15. Community 1.3 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)

Inventory data references

NASIS ID Plant Community
2015AK105002 community 1.1
14NP01502 community 1.1
14NP01402 community 1.1
14NP01401 community 1.1
14NP01301 community 1.1
14NP01201 community 1.1
14NP01002 community 1.1
14NP01001 community 1.1
14JP01802 community 1.1
14JP01801 community 1.1
14JP01303 community 1.1
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14JP01203 community 1.1
14JP01001 community 1.1
14JP00902 community 1.1
14JP00804 community 1.1
14JP00803 community 1.1
14JP00802 community 1.1
14JP00801 community 1.1
13TD03701 community 1.1
13TD03503 community 1.1
13TD00802 community 1.1
13TD00302 community 1.1
13TD00101 community 1.1
13NP00702 community 1.1
13NP00402 community 1.1
14DM01003 community 1.2
14DM01002 community 1.2
13TD00901 community 1.2
13TD00602 community 1.2

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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	05/10/2025

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:**
