Ecological site R220XY349AK
Subalpine Scrub Gravelly Dry Chutes

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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

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.

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 (nonsoil) areas make up about 23 percent of this MLRA. The most common miscellaneous areas are chutes, rock outcrop, rubble land, beaches, riverwash, 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 lower elevations. Due to warmer temperatures, western red cedar and Alaska cedar are more prevalent in the southern portion of this 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. As elevation increases, mountain hemlock becomes the dominant tree in forested stands, which marks the transition to subalpine vegetation. The subalpine life zone typically occurs at elevations between 1500 to 3000 feet (Boggs et al. 2010, Carstensen 2007, Martin et al. 1995). Other common subalpine plant communities include tall alder scrub and bluejoint-forb meadows. Alpine vegetation occurs at even higher elevations, which marks the transition to the Southern Alaska Coastal Mountains Area (MLRA 222).

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.

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 within the area. 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.

Classification relationships

USFS Ecoregion Province: Marine Mountains (M240), Forest-Meadow High (M242b) (Bailey 2007)

U.S. EPA Level III Ecoregion: Pacific Coastal Mountains (119) (Gallant et al. 2010)

National Vegetation Classification – Ecological Systems: Alaskan Pacific Maritime Alder-Salmonberry Shrubland (CES204.152) (NatureServe 2015)

Biophysical Settings: Alaskan Pacific Maritime Alder-Salmonberry Shrubland (BpS 7816520) (LANDFIRE 2009)

Alaska Natural Heritage Program Landcover Class: Low-Tall Shrub: Alder-Salmonberry (Boggs et al. 2016)

Alaskan Vegetation Classification: Tall Alder Scrub (Viereck et al. 1992)

Ecological site concept

This subalpine site occurs on avalanche chutes. Avalanche chutes are typically not forested and support fast growing shrub species and an assortment of grasses and forbs. While an avalanche chute can go from the alpine to sea-level, this site covers the portion of an avalanche chute in the subalpine life zone. The soils are dry for much of the growing season and are considered moderately well to well drained. Soils are gravelly and composed of a mixture of colluvium and residuum. Bedrock typically occurs within 20 inches.

The reference plant community is closed tall scrub dominated by Sitka alder and salmonberry. Areas where avalanche remove this tall scrub community support highly diverse herbaceous meadows (Landfire 2009; Boggs et al. 2008).

Associated sites

F220XY200AK	**Subalpine Forest Gravelly Dry Slopes** Occurs on similar bands of elevation on dry soils that support forested communities.
F220XY338AK	**Subalpine Forests Dry Organic Slopes** Occurs on similar bands of elevation on dry organic soils that support forested communities.

F220XY204AK	**Subalpine Forests Organic Wet Slopes** Occurs on similar bands of elevation on wet organic soils that support forested communities.

Similar sites

R220XY358AK	**Subalpine Scrub Gravelly Dry Slopes** Both sites have tall scrub plant communities. R220XY358AK does not occur in avalanche chutes.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Alnus viridis ssp. sinuata* (2) *Rubus spectabilis*
Herbaceous	Not specified

Physiographic features

This site occurs on avalanche chutes on mountain backslopes and footslopes within the subalpine lifezone, which typically occurs at 1500 to 3000 feet depending on slope and aspect. This site likely occurs at much higher elevations on warm southerly slopes and at much lower elevations on cold northernly slopes. Avalanche chutes can have very steep erosional surfaces and gently sloping depositional surfaces. Hence, slopes are highly variable ranging from 5 to 90 percent. This site does not experience flooding or ponding, but rather generates runoff to adjacent, downslope ecological sites.

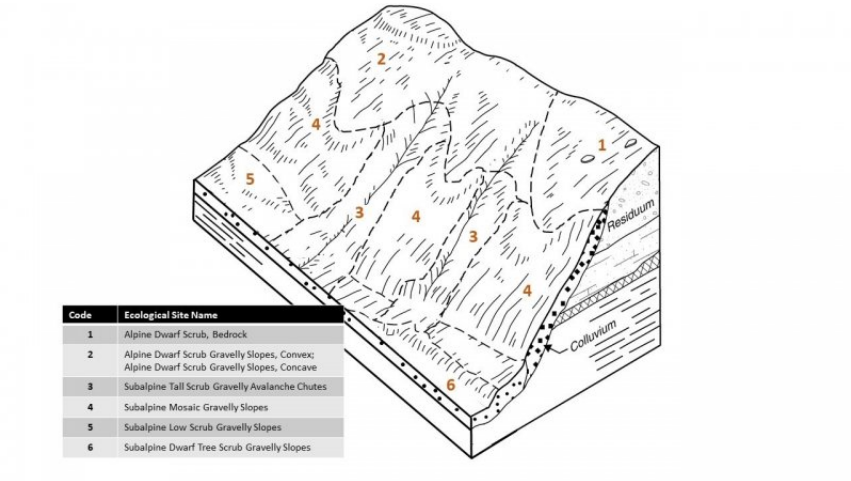


Figure 2. Representative block diagram of Subalpine Tall Scrub Gravelly Avalanche Chutes and associated ecological sites.

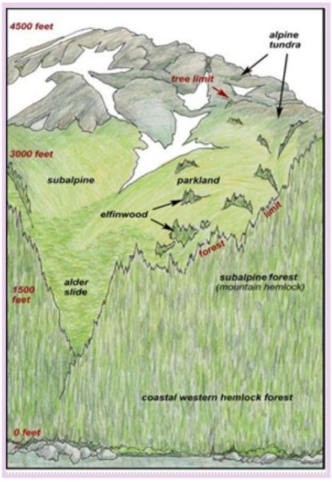


Figure 3.

Table 2. Representative physiographic features

Hillslope profile	(1) Backslope (2) Footslope
Landforms	(1) Mountains > Avalanche chute
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	457–914 m
Slope	5–90%
Water table depth	0 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	305–1,372 m
Slope	5–100%
Water table depth	Not specified

Climatic features

Cloudy skies, moderate temperatures, and abundant rainfall characterize the temperate maritime climate of this area. Winter storms, accompanied by heavy rainfall at lower elevations and snow at higher elevations, are frequent. Moderate to strong, south and southeast winds are common before and during storms. The average annual precipitation is approximately 60 to 140 inches. The average annual snowfall ranges from about 30 to 70 inches along the coast, to as much as 200 inches at higher elevations (USDA 2006). Average annual temperatures are considerably warmer in the Southern portion of this area. The average annual temperature at lower elevations ranges from about 37 degrees F (2.7 degrees C) in the northwest, to 46 degrees F (7.7 degrees C) in the southeast (USDA 2006). The average annual temperatures associated with lower elevation maritime vegetation is considerably warmer compared to higher elevation subalpine vegetation. The average frost-free period is about 105 to 140 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

Climate stations used

- (1) ANNETTE ISLAND AP [USW00025308], Metlakatla, AK
- (2) KETCHIKAN INTL AP [USW00025325], Ketchikan, AK

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

Influencing water features

Due to its landscape position, this site has dry soil. This site is neither associated with or influenced by streams or wetlands. Precipitation is the main source of water for this ecological site. Infiltration is very slow, and surface runoff is high. Surface runoff contributes some water to downslope ecological sites.

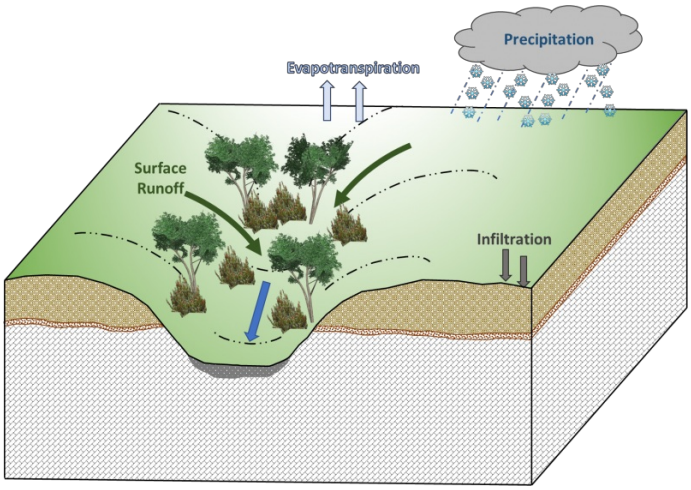


Figure 10. Hydrologic cycling in Subalpine Tall Scrub Gravelly Avalanche Chutes ecological site.

Soil features

Soils formed in gravelly colluvium and/or residuum. Bedrock typically occurs within 20 inches. Rock fragments on the soil surface are common but limited, ranging from 0 to 5 percent cover. Rock fragments in the soil subsurface are abundant, ranging between 40 and 50 percent of the soil profile by volume.

The soil moisture regime for these dry soils is udic. 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).

Figure 11. A typical soil profile associated with this site. This soil is dry and consists of gravelly colluvium and/or residuum over shallow bedrock. This soil was photographed in the Skagway-Klondike Goldrush National Historic Park, Area.

Table 5. Representative soil features

Parent material	(1) Colluvium (2) Residuum
Surface texture	(1) Very cobbly silt loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderately rapid to rapid
Depth to restrictive layer	25–51 cm
Soil depth	25–51 cm
Surface fragment cover <=3"	0–2%
Surface fragment cover >3"	0–3%
Available water capacity (0-101.6cm)	2.54–2.72 cm
Soil reaction (1:1 water) (0-25.4cm)	3.6–6
Subsurface fragment volume <=3" (0-50.8cm)	15–30%
Subsurface fragment volume >3" (0-50.8cm)	20–30%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	20–51 cm
Soil depth	20–51 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	1.78–5.08 cm
Soil reaction (1:1 water) (0-25.4cm)	Not specified

Subsurface fragment volume <=3" (0-50.8cm)	Not specified
Subsurface fragment volume >3" (0-50.8cm)	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.

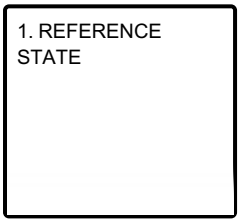
This ecological site occurs on avalanche chutes in the subalpine. The primary disturbance for this site is avalanches, which can remove and kill large swaths of woody vegetation. Hence, terrain prone to avalanche do not typically support stands of trees. These subalpine avalanche chutes typically support quick growing shrub species like alder and a highly diverse assemblage of forbs and graminoids.

The subalpine life zone typically occurs between 1500 and 3000 feet of elevation and can be further divided into the forested and parkland subzones (Carstensen 2007). Within the lower elevation forested subzone, alder thickets are dense with meadows primarily dominated by bluejoint and fireweed (Landfire 2009). As elevation increases, alder becomes patchy and alpine plants become more dominant, which marks the transition to the parkland subzone. At these higher elevations, meadows become highly diverse forb-sedge dominant communities (Landfire 2009).

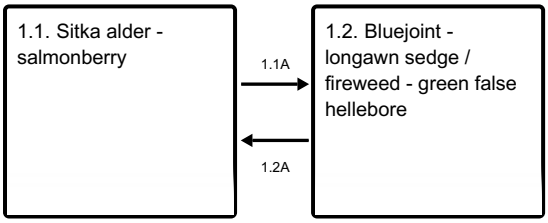
The state-and-transition model that follows provides a detailed description of each known state, community phase, pathway, and transition. This model is based on available experimental research, field observations, literature reviews, professional consensus, and interpretations.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - Avalanche destroys and removes woody vegetation

1.2A - Time and recovery after an avalanche.

State 1
REFERENCE STATE

Community 1.1
Sitka alder - salmonberry

The plant community is characterized as closed tall scrub (Viereck et al., 1992), which has 75 percent or greater cover of shrubs 5 feet and taller. At lower elevation, dominant shrubs are Sitka alder and salmonberry. Other

common species include beaverd spirea, Barclay’s willow, red elderberry, bluejoint, common ladyfern, and western oakfern. At higher elevations, alpine species become more dominant and alder stands become patchy. Common alpine species include black crowberry, oval-leaf willow, and white arctic mountain heather.

Dominant plant species

- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- beauverd spirea (*Spiraea stevenii*), shrub
- Barclay's willow (*Salix barclayi*), shrub
- red elderberry (*Sambucus racemosa*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous
- spreading woodfern (*Dryopteris expansa*), other herbaceous
- claspleaf twistedstalk (*Streptopus amplexifolius*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous

Community 1.2
Bluejoint - longawn sedge / fireweed - green false hellebore

Figure 12. Herbaceous meadow in an avalanche chute near Skagway, Alaska.

This community phase represents areas where avalanche removed the majority of woody vegetation and are characterized as herbaceous meadows. These herbaceous meadows can be highly diverse. Common species are bluejoint, longawn sedge, fireweed, and green false hellebore.

Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- longawn sedge (*Carex macrochaeta*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous
- green false hellebore (*Veratrum viride*), other herbaceous
- Sitka valerian (*Valeriana sitchensis*), other herbaceous
- common cowparsnip (*Heracleum maximum*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- claspleaf twistedstalk (*Streptopus amplexifolius*), other herbaceous
- bride's feathers (*Aruncus dioicus*), other herbaceous
- Nootka lupine (*Lupinus nootkatensis*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

The downward movement of snow and debris erodes the hillslope. The resulting deposition either covers or obliterates the existing vegetation.

Pathway 1.2A
Community 1.2 to 1.1

Following an avalanche, time and recovery allows for succession.

Additional community tables

Animal community

The subalpine parkland zone of MLRA 222 provides desirable habitat opportunities for many wildlife species. The matrix of herbaceous meadows, low and tall shrubs, and small stands of stunted trees offer foraging opportunities and thermal and protective cover. Herbivores – such as Sitka deer (Odocoileus hemionus sitkensis), mountain goats (Oreamnos americanus), and hoary marmot (Marmota calligata) – readily graze the herbaceous meadows. Grouse (Dendragapus spp.) and ptarmigan (Lagopus spp.) utilize these meadows and low shrub communities for hunting insects. A small portion of bears (Ursus sp.), mostly sows with cubs, forage in this zone throughout the summer. Lastly, various songbirds will utilize the tall shrubs and stunted trees for nesting cover (Carsten 2007).

Inventory data references

Tier 2 sampling plots used to develop the reference state, community phase 1.1 and 1.2:

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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	05/13/2025
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):**

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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:**
