Ecological site R222XY357AK
Alpine Dwarf Scrub Moist Gravelly Slopes

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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): 222X–Southern Alaska Coastal Mountains

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, avalanche 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). Alpine plant communities characterize the vegetation in this area. 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) and are associated with the Alexander Archipelago-Gulf of Alaska Coast area (MLRA 220X). 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 Alpine Dwarf Shrubland (CES204.310) (NatureServe 2015) Biophysical Settings: Alaskan Pacific Maritime Herbaceous Dwarf Shrubland (BpS 7816430) (LANDFIRE 2009)

Ecological site concept

This alpine site occurs on moist and rocky soils on protected mountain slopes. The alpine is characterized as having very short growing seasons, cold temperatures, and high winds. The soils are somewhat poorly to moderately well drained with bedrock typically occurring within 20 inches. Protected slopes are prone to deep and persistent snowpack and occur on concave shaped slopes or colder northerly slopes. When compared to adjacent slopes in more exposed positions, the deeper snowpack results in comparatively warmer winter soil temperatures and a shorter growing season. These protected positions support a unique assemblage of highly adapted alpine vegetation, which is markedly different from plant communities on more protected positions of these mountain slopes. The reference plant community is ericaceous dwarf scrub. Species diversity can be high with a diverse range of shrub, graminoid, and forb species. The most abundant shrub species are Alaska bellheather and partridgefoot. Other common species in late season snow beds include western moss heather, yellow mountainheath, and narcissus anemone (Jaques 1983).

Associated sites

R222XY352AK	**Alpine Dwarf Scrub Dry Organic Slopes** Occurs in the alpine on dry organic soils that are shallow to bedrock.
R222XY356AK	**Alpine Dwarf Scrub Dry Gravelly Slopes** Occurs in the alpine on exposed slopes that have shallower snowpack and longer growing seasons.
R222XY360AK	**Alpine Herbaceous Wet Organic Depressions** Occurs in the alpine on wetter, organic-rich soils that support graminoid communities rather than ericaceous shrub communities.

Similar sites

R222XY356AK	**Alpine Dwarf Scrub Dry Gravelly Slopes** Both sites occur on mineral soils in the alpine, however site 356 occurs on exposed slopes with dry soils. Partridgefoot and Alaska bellheather can occur but are not dominant species.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Luetkea pectinata* (2) *Harrimanella stelleriana*
Herbaceous	Not specified

Physiographic features

This site occurs on mountain shoulders and backslopes in the alpine, and typically occurs between 2000 to 4500 feet in elevation, depending on slope and aspect. This site likely occurs at much higher elevations on warm southerly slopes and at much lower elevations on cold northerly slopes. Slopes have a concave shape that collects snowdrifts. Slopes typically range from 65 to 90 percent. This site does not experience flooding or ponding. The soils have a seasonally-high water table early in the growing season due to snowmelt. Water Table is a free zone of water, not a direct ground water table.

Figure 1. The influence of elevation on the vegetation life zones of a typical Southeast Alaska mountainside. Aspect and slope are additional factors that control vegetation life zones on a mountainside (Carstensen 2007).

Table 2. Representative physiographic features

Hillslope profile	(1) Shoulder (2) Backslope
Slope shape across	(1) Concave

Landforms	(1) Mountains > Mountain (2) Mountains > Mountain slope
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	610 – 1,370 m
Slope	70 – 90 %
Water table depth	20 – 80 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	None to frequent
Ponding frequency	Not specified
Elevation	310 – 2,020 m
Slope	10 – 100 %
Water table depth	Not specified

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 4 Representative climatic features

Frost-free period (characteristic range)	50-120 days
Freeze-free period (characteristic range)	60-130 days
Precipitation total (characteristic range)	3,610-4,930 mm
Frost-free period (actual range)	30-150 days
Freeze-free period (actual range)	40-160 days
Precipitation total (actual range)	3,050-6,350 mm
Frost-free period (average)	90 days
Freeze-free period (average)	70 days
Precipitation total (average)	4,270 mm

Influencing water features

This site is neither associated with nor influenced by streams or wetlands. Snow melt and precipitation are the main source of water for this ecological site. Snowmelt creates a seasonally-high zone of free water early in the growing season, but is not tied to a ground water table. Infiltration is very slow, and surface runoff is high. Surface runoff contributes some water to downslope ecological sites.

Wetland description

n/a

Soil features

Soils typically formed in gravelly colluvium and/or weathered residuum with a thin layer of organic material on the surface. Bedrock typically occurs within 20 inches of the soil surface. Surface rock fragments do not commonly occur. Rock fragments in the soil subsurface often range between 30 and 40 percent of the soil profile by volume.

The soil moisture regime is udic and the temperature regime for this site is cryic, where the mean annual soil temperature is between 32°F and 46°F (USDA-NRCS 2006). Soils were most commonly in the Entisols order but were occasionally Inceptisols or Spodosols

Table 5. Representative soil features

Parent material	(1) Organic material (2) Colluvium (3) Residuum

Surface texture	(1) Gravelly loam (2) Gravelly sandy loam (3) Very gravelly sandy loam
Family particle size	(1) Loamy-skeletal
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Moderately rapid to rapid
Depth to restrictive layer	30 – 50 cm
Soil depth	30 – 50 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-50.8cm)	3.3 – 7.87 cm
Soil reaction (1:1 water) (0-25.4cm)	4.5 – 10
Subsurface fragment volume <=3" (0-50.8cm)	20 – 40 %
Subsurface fragment volume >3" (0-50.8cm)	10 – 20 %

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	20 – 150 cm

Soil depth	20 – 150 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-50.8cm)	1.02 – 8.89 cm
Soil reaction (1:1 water) (0-25.4cm)	3.6 – 8.4
Subsurface fragment volume <=3" (0-50.8cm)	20 – 40 %
Subsurface fragment volume >3" (0-50.8cm)	0 – 70 %

Ecological dynamics

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 on dry soils in the alpine.

Located in the alpine life zone, this site is exposed to a variety of harsh environmental conditions. Since this site is under snow for most of the year, plants have a short season to grow and reproduce. When the site is snow-free, cold temperatures and high winds also inhibit plant growth and performance. This harsh climate maintains vegetation within this site and prevents the establishment and growth of dominant subalpine species like mountain hemlock and Sitka alder.

Since this site occurs on cold and/or concave shaped slopes that collect snow and have persistent snow beds, only select species can grow and be productive. Species that commonly occur under the most persistent snow beds are partridgefoot, Cooley’s false buttercup, and Eschscholtz’s buttercup (Jaques 1973). Common species under less persistent snow beds include western moss heather, yellow mountainheath, mountain hairgrass, narcissus anemone, western buttercup, pioneer violet, and Sierra shootingstar (Jaques 1973, Boggs et al. 2007)

State and transition model

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

To be determined.

Hydrological functions

To be determined.

Recreational uses

To be determined.

Wood products

To be determined.

Other products

To be determined.

Other information

To be determined.

Inventory data references

Tier 2 sampling plots used to develop the reference state, community phase 1.1: Skagway-Klondike Gold Rush National Historical Park (National Park Service), Skagway, Alaska – Plot numbers as recorded in NASIS: 11DM02402 and 11NP06706.

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Approval

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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	08/16/2024
Approved by	
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):**

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

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

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

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

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

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

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

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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:**
