

# 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

The Southern Alaska Coastal Mountains (MLRA 222) encompasses the Pacific Border Ranges and Coast Mountains physiographic provinces (Wahrhaftig 1965). Spanning approximately 26,355 square miles, the elevation ranges from sea level at the base of glaciers and ice fields to 18,008 feet at Mt. St. Elias. The MLRA was covered by glacial ice during the Pleistocene epoch, a time period spanning from 2.6 million to 11,700 years ago. During interglacial periods glacial extent was reduced, leaving behind various glacial deposits. Over time these deposits have been eroded or buried by colluvium and slope alluvium, which now covers more than 90 percent of the unglaciated landscape. 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-NRCS 2006).

This landscape lies in the true alpine zone where glacial ice is, and has been, the dominant ground cover. Glacial ice encompassed all the MLRA during the Late Wisconsinan glaciation, 25,000 – 21,000 years ago (Kauffman et al. 2011). Changes in climatic conditions following this period resulted in the recession of some glaciers and slowly exposed new surfaces for inhabitation by terrestrial ecosystems. Pioneer plant communities began to establish on the new substrate within the first 30 years and consisted mostly of evergreen, herbaceous dwarf shrubs with some pockets of low shrubs. These communities quickly transitioned to tall shrubs within 100 years of deglaciation. By approximately 13,000 years ago, four stable plant communities emerged across the non-glaciated landscape – ericaceous dwarf shrub, low shrub, tall shrub, and herbaceous communities – and form the present-day ecosystems (Boggs et al. 2010).

### 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 Alpine Dwarf Shrubland (CES204.310) (NatureServe 2015)

Biophysical Settings: Alaskan Pacific Maritime Herbaceous Dwarf Shrubland (BpS 7816430) (LANDFIRE 2009)

Alaska Natural Heritage Program Landcover Class: Dwarf Shrub (Boggs et al. 2016)

Alaskan Vegetation Classification: Cassiope Dwarf Shrub Tundra (Viereck et al. 1992)

### Ecological site concept

Alpine Dwarf Scrub Gravelly Slopes, Concave ecological sites occur on concave snow accumulation areas on

alpine mountain slopes (Viereck et al. 1992; DeVelice et al. 1999; Boggs et al. 2008). The soils are moist, thin and stony, and formed in colluvium over weathered residuum (Viereck et al. 1992; Boggs et al. 2008).

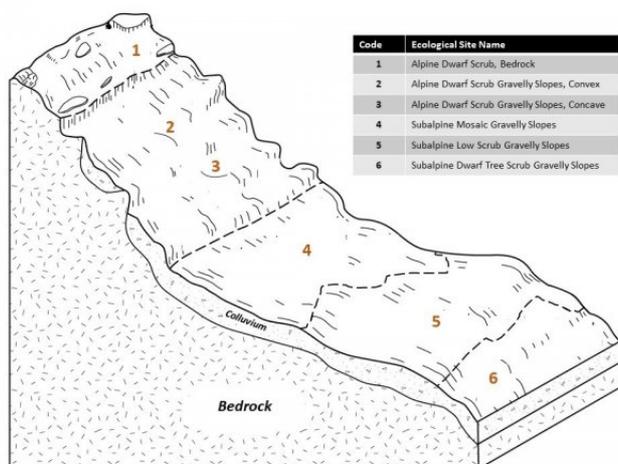
The reference vegetation on this ecological site is defined by dwarf shrubs. Alaska bellheather (*Harrimanella stelleriana* (Pall.) Coville) and partridgefoot (*Luetkea pectinata* (Pursh) Kuntze) are the dominant dwarf shrubs, with western moss heather (*Cassiope mertensiana* (Bong.) G. Don) increasing in importance in the southern half of the MLRA. Herbs are a minor component of this site. Continuous exposure to cold temperatures, extended snow accumulation, and a short growing season maintain this plant community (Viereck et al. 1992; DeVelice et al. 1999; Boggs et al. 2008).

**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Harrimanella stelleriana</i> (2) <i>Luetkea pectinata</i>
Herbaceous	Not specified

## Physiographic features

Alpine Dwarf Scrub Gravelly Slopes, Concave ecological sites occur on alpine mountain slopes. They are commonly associated with Alpine Dwarf Scrub Gravelly Slopes, Convex ecological sites at high elevations. They are reported from 1600 to 3200 feet ASL on the Chugach National Forest and from 1500 to 4000 feet ASL on the Glacier Bay National Park and Preserve (DeVelice et al. 1999; Boggs et al. 2008). The site does not experience flooding, but rather generates runoff to adjacent, downslope ecological sites.



**Figure 1. Representative block diagram of Alpine Dwarf Scrub Gravelly Slopes, Concave and associated ecological sites.**

## Climatic features

Climate data and analyses are derived from 30-year averages gathered from National Oceanic and Atmospheric Administration (NOAA) weather stations contained within the range of an ecological site. However, no weather stations are available for this ecological site. The following information is a general climate description of the MLRA.

The Southern Alaska Coastal Mountains falls into two Köppen-Geiger climate classifications (Peel et al. 2007): tundra climate (ET) dominates the majority of the MLRA with small portions falling into the subarctic with cool summers and year around rainfall climate (Dfc). In the tundra climate, average temperatures are below 50°F for all months of the year, while the subarctic climate can experience highs above 50°F. Precipitation does not differ significantly across the seasons, but due to the high latitude environment solar radiation extremes occur with seasonal variability. The soil temperature regime of MLRA 222 is classified as cryic, where the mean annual soil temperature is between 32°F and 46°F (USDA-NRCS 2006).

Temperature and precipitation are affected by latitude, elevation, and proximity to maritime or continental zones.

The average annual temperature and length of freeze-free period are not known. At the higher elevations, freezing temperatures are likely to occur during any month of the year. Most of the precipitation occurs as snowfall with rainfall increasing in importance in the southeast. Average annual precipitation is 120 to 200 inches but can be 250 inches or more at the highest elevations. Average annual snowfall ranges from about 200 to 800 inches. The snowfall greatly exceeds the annual snowmelt in many places, as evidenced by the abundance and extent of glaciers and ice fields (USDA-NRCS 2006).

## Influencing water features

Alpine Dwarf Scrub Gravelly Slopes, Concave ecological sites are not influenced by wetland or riparian water features. Precipitation is the main source of water for this ecological site. Infiltration is likely very slow (Hydrologic Group D), and surface runoff is high. Surface runoff contributes some water to downslope ecological sites.

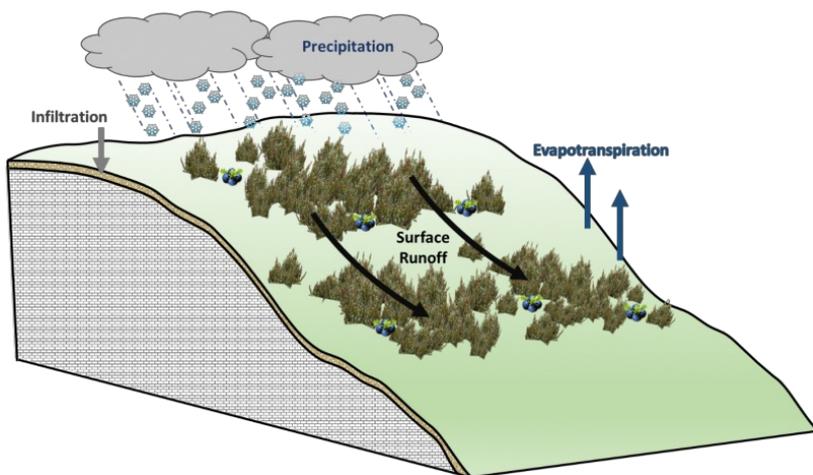


Figure 2. Hydrologic cycling in Alpine Dwarf Scrub Gravelly Slopes, Concave ecological sites.

## Soil features

No soil survey data is currently available for this ecological site. The following is a general description based on a review of the scientific literature.

Soils of this ecological site occur in areas of snow accumulation. They are shallow, stony mineral soils formed in colluvium over bedrock (Viereck et al. 1992; DeVelice et al. 1999; Boggs et al. 2008).

## Ecological dynamics

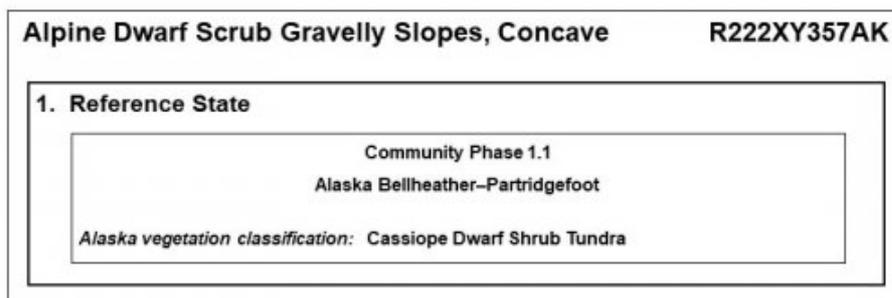
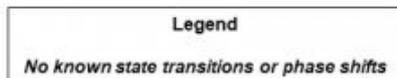
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included.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

The MLRA lies within the true alpine zone where glaciers 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, and tall shrubs. Alpine Dwarf Scrub Gravelly Slopes, Concave ecological sites form an aspect of this vegetative continuum. This ecological site occurs on mountain backslopes on snow accumulation beds. Species characteristic of this ecological site consist of dwarf shrubs.

Located in the alpine life zone, the Alpine Dwarf Scrub Gravelly Slopes, Concave ecological site is exposed to a variety of harsh environmental conditions that drive and maintain the plant community. It is typically under snow for most of the year leaving a short season for plants to grow and reproduce. When the site is snow-free, cold temperatures and high winds in exposed positions further contribute to inhibited plant growth and performance.

The state-and-transition model that follows provides a detailed description of each 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



### State 1

#### STATE 1 - REFERENCE STATE

The reference plant community is categorized as a dwarf shrubland community. The one community phase within the reference state is maintained by exposure to cold temperatures, wind, and a short growing season.

#### Community 1.1

##### Alaska bellheather-Partridgefoot



Figure 3. Alaska bellheather-Partridgefoot reference community phase at Glacier Bay National Park and Preserve (Boggs et al. 2008).

The community is characterized by a near continuous cover of dwarf shrubs. The dominant species include Alaska bellheather and partridgefoot, with western moss heather increasing in importance in the southern half of the MLRA. Associated dwarf scrubs can include bog blueberry (*Vaccinium uliginosum* L.), yellow mountainheath (*Phylodoce glanduliflora* (Hook.) Coville), black crowberry (*Empetrum nigrum* L.), dwarf bilberry (*Vaccinium cespitosum* Michx.), and alpine azalea (*Loiseleuria procumbens* (L.) Desv.). Herbaceous plants are a minor component of this site but can include woodrushes (*Luzula* DC.), wintergreens (*Pyrola* L.), saxifrages (*Saxifraga* L.), and sedges (*Carex* L.) (DeVelice et al. 1999; Boggs et al. 2008). Goose neck moss (*Rhytidiadelphus* (Lindb. ex Limpr.) Warnst.) may average 3 percent cover (Boggs et al. 2008). Patches of bedrock may be present at the surface but typically cover less than 10 percent.

## Additional community tables

### Animal community

Vegetation in this ecological site does not seem to be commonly browsed and grazed as few of the ericaceous dwarf shrubs are palatable. However, while the site may not be an important foraging ground for wildlife, game trails may be abundant. Large mammals, such as Sitka deer (*Odocoileus hemionus sitkensis*), mountain goats (*Oreamnos americanus*), bears (*Ursus* sp.), wolves (*Canis lupus*), and wolverines (*Gulo gulo*), are known to utilize the associated mountain ridges of this site for migration and hunting. A limited number of bird species – e.g., rock ptarmigan (*Lagopus mutus*) and American pipit (*Anthus rubescens*) – can successfully nest in this harsh environment (Carsten 2007).

## Approval

Michael Margo, 6/20/2019

## 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	
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):**  
\_\_\_\_\_
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:**

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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:**

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