

***Andreaea blyttii* Snowbed Plant Association**

Blytt's andreaea Moss Snowbed Plant Association

Statewide

Conservation Status Rank: S4 (apparently secure)

Introduction

The *Andreaea blyttii* (Blytt's andreaea moss) Snowbed Plant Association occurs in alpine environments on siliceous bedrock overlain by snow or flushed by upgradient snowmelt (Figure 1). While this association has only been formally described from the Klondike region, its dominant species, *Andreaea blyttii* has been collected from wet bedrock in alpine environments across Alaska. The same high physiological tolerances that enable *Andreaea blyttii* to survive extreme growing season variation in sunlight, temperature, and moisture are likely to promote its survival amidst rapid climate change (Murray 1988).



Figure 1. The *Andreaea blyttii* Snowbed Plant Association in Klondike Gold Rush National Historical Park, Alaska.

Distribution

The *Andreaea blyttii* Snowbed Plant Association is has been described from Newfoundland and Svalbard and occurs in the British Isles, Norway, and British Columbia (Beland 1982, Elvebakk 1984, Murray 1988, Scofield 1988). In Alaska the association has only been described from the Klondike region yet its dominant

species, *Andreaea blyttii* has been collected from wet bedrock in alpine environments across Alaska (Flagstad and Boucher 2014). The distribution map for the *Andreaea blyttii* plant association (Figure 2) was developed from herbarium collections and select detailed landcover classes of the Alaska Vegetation Map (Boggs et al. 2015a, b) corresponding to wet bryophyte types; types corresponding to peatlands were excluded.

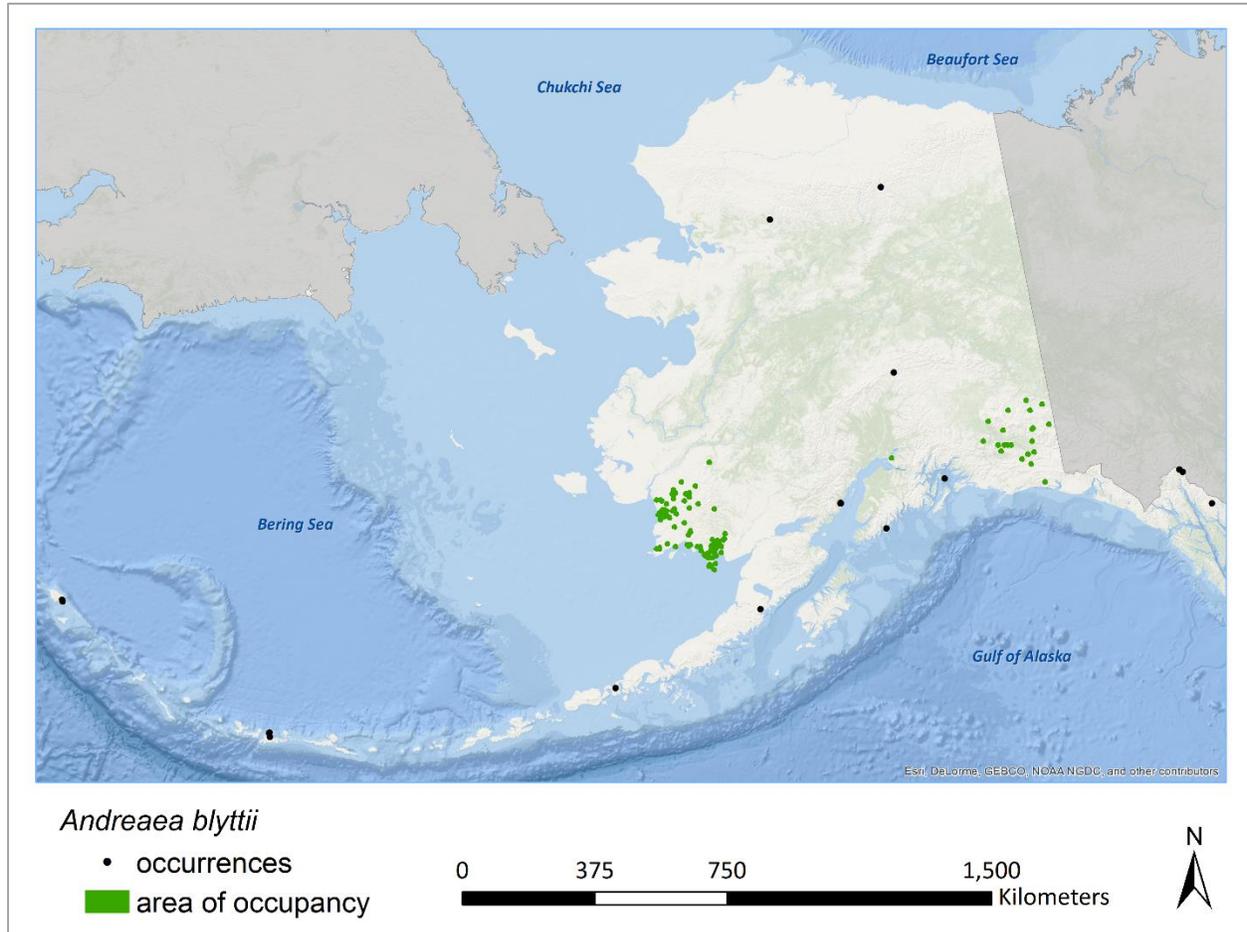


Figure 2. Distribution of the *Andreaea blyttii* Snowbed Plant Association. Note that areas of occurrence in this map are buffered for greater visibility.

Climate

While this association is expected to occur in alpine environments throughout Alaska, the climate description presented here is restricted to the Klondike region, which is the only location from which this association has been documented. The Klondike region is characterized by a mix of continental and maritime climates that interface from sea level to the high alpine (Nowacki et al. 2000). Similar to much of southeast Alaska, wetness and disturbance are major climatic drivers for the development and maintenance the local ecosystems. However, Klondike’s relative remoteness from the open ocean lessens storm effects and its proximity to the continental interior increases inputs of cold and dry air (Davey et al. 2007, Nowacki et al. 2001). As a result, the Klondike region experiences less precipitation and greater fluctuation in annual temperatures relative to much of southeast Alaska. At Chilkoot Pass, mean monthly wind speeds reach 23.5 m/s, while temperatures dip to -27.9°C and snow reaches depths of over 4 m (for the highly discontinuous period of measurement from 2010 to 2013; RAWs 2014). Average annual precipitation (including water

equivalent of snow) is 59.0 cm with 74.9 cm as snowfall. Mean monthly precipitation for September (wettest month) is 101.7 cm received entirely as rain. The mean monthly precipitation for November (driest month) is 15.3 cm, with 14.4 cm received as snow (for the periods of record from 2004 to 2014 [precipitation] and from 2009 to 2014 [snow]; SNOTEL 2014).

Environmental Characteristics

This association occurs in alpine environments on siliceous bedrock overlain by snow or flushed by upgradient snowmelt. In Alaska, the association has been sampled on exposed, glaciated granite at 1,244 m elevation. In Svalbard the mean mineral soil pH underlying this association was 4.8 (Elvebakk 1984). Although shaded and saturated by snow early in the growing season, sites are exposed to full sun and become mesic to dry during the summer (Murray 1988). As such, desiccation is recognized as the primary threat to the maintenance of this association. While sites experience considerable annual variation in the persistence and distribution of snow, the dark coloration and pulvinate growth form of *Andreaea blyttii* provide some energetic compensation (Elvebakk 1984).

Vegetation and Succession

Plant associations developing over siliceous bedrock that is overlain or flushed by late-lying snow are often dominated by bryophytes, particularly acidophilous species in the *Andreaea* genus (Elvebakk 1984). These snowbed communities are distinct in both their floristics and their spatial transition to adjacent types. Species composition is depauperate with respect to vascular plant taxa, is characterized by low overall diversity, and often includes disjunct occurrences (Beland 1982, Schofield 1969). The moss, *Andreaea blyttii* is dominant with the liverwort, *Anthelia juratzkana*, subdominant. Globally, both these species are characteristic of acidic granite flushed by late-lying snow (Beland 1982) with *Andreaea blyttii* showing extreme snowbed preference in arctic and alpine environments (Elvebakk 1984). In Alaska, *Anthelia juratzkana* may also represent a major component of cryptogamic crust forming over volcanic deposits (Boucher et al. 2012). Minor associates include the sedge, *Carex pyrenaica* ssp. *micropoda* and the lichen *Solorina crocea*.

This association is an early-seral type in avalanche paths and recently-deglaciated sites. Succession is thought to progress from colonization of bare rock by crustose lichens, which are overgrown by foliose lichens and mosses. This lush growth of mosses produces a humic layer and traps mineral soil that ultimately loosens pulvinate mosses such as *Andreaea blyttii* (Elvebakk 1984).

Conservation Status

Rarity: This association is uncommon in Alaska where only one occurrence of the association (Flagstad and Boucher 2014) and 19 collections of the dominant species, which are interpreted to represent occurrences of the association and have been documented.

Threats: This association could be threatened by change in snowfall and/or patterns of snow retention, however the physiological tolerances of the *Andreaea* genus enable its survival of extreme site conditions and through glacial and interglacial climatic swings (Murray 1988).

Trend: Short- and long-term change in extent and condition is not expected.

Species of Conservation Concern

No animal or plant species of conservation concern are known or suspected to occur within this plant association. Additional study is required to evaluate whether this plant association supports species of conservation concern.

Classification Concept Source

This association has been described in Newfoundland and Svalbard by Beland (1982) and Elvebakk (1984), respectively. The first documentation of the association in Alaska was by Flagstad and Boucher (2014).

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