Classification of High-elevation, Non-forested Plant Communities in Coastal British Columbia

Summary

Non-forested ecosystems dominate high elevation sites in coastal British Columbia, yet there has never been a comprehensive classification or mapping of all high-elevation community types. The objective of this study is to collate and expand upon previous classifications, and thereby to increase our understanding of the habitats and composition of these plant communities.

Non-forested plant communities occur where trees are permanently absent, or where they can survive only as prostrate or stunted shrubs. Within our region, non-forested communities generally dominate sites that are snow-free for <4 months. We aimed to develop a classification that organizes communities into groups in a way which shows the greatest number of relationships, is easily retained in memory, and is easily conveyed through instructions.

Combining previous studies and new sampling allowed us to prepare the most comprehensive classification of high-elevation, non-forested plant communities in coastal BC to date. We present the classification of plant communities into vegetation units that include (in increasing rank): subassociations, associations, alliances, and orders. Diagnostic tables show floristic affinities among the vegetation units and interpret their relationships to environmental gradients. We describe the environment associated with the vegetation units, then discuss their relationships. Relating predictable patterns of plant communities to environmental gradients also allowed us to suggest eight habitat types that may aid in the future mapping of high-elevation ecosystems (Figure 1).

Study Sites and Methods

The study is concentrated in southern coastal British Columbia (including Vancouver Island, the coastal lowlands, Coast Moun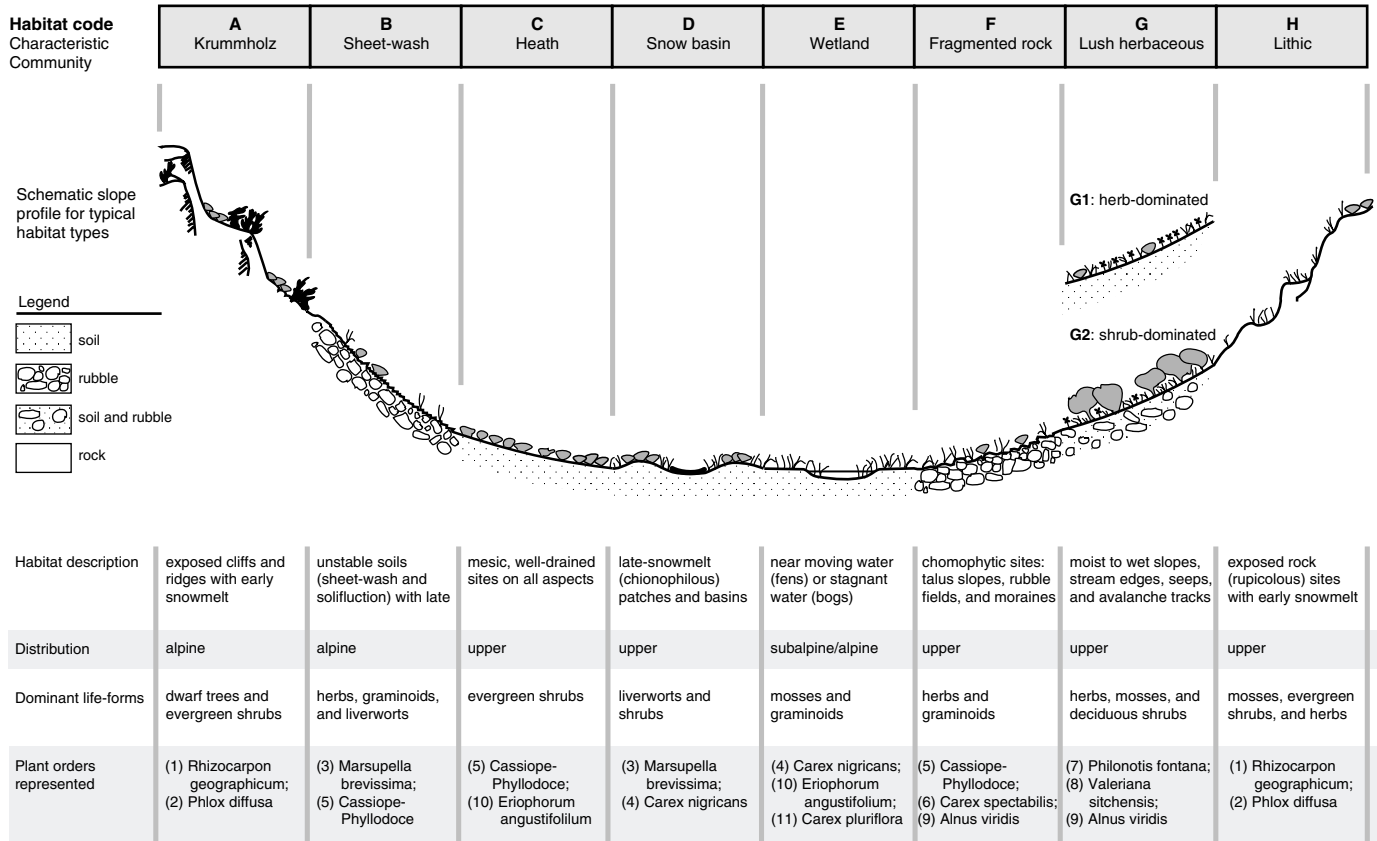tains, and windward slopes of the Cascade Mountains), but it also extends northward towards Prince Rupert. Its main elevational range is from the upper subalpine (parkland MH subzones) to the alpine (AT zone). Our combined dataset of published and unpublished studies included 282 plots (relevés). All were sampled in areas that had no history of human influence.

Vegetation data for all datasets were collected using standard methods. Each plot was placed in a portion of a community that was relatively uniform in floristic composition, structure, and site attributes (slope position, aspect, gradient, and ground cover). Plot size increased with increasing floristic diversity and structural complexity of vegetation, varying from 0.5 to 100 m². All plant species present within the plot were identified and their cover was estimated. Environmental data were collected for each data set, including slope position, aspect, and gradient. A soil pit was dug at each plot to describe and identify soils. We estimated SMR and SNR for all plots.

Results and Discussion

Predictable relationships can be used to infer certain environmental conditions from the presence of a given plant community or, conversely, to forecast the presence or development of plant communities given certain environmental conditions. The relationship between these factors in non-forested high-elevation communities may be stronger than in forested communities, since the gradients tend to be steeper. The steepest gradients develop in relation to time of snowmelt, distance from standing or flowing water, and time elapsed since deglaciation or disturbance. Other environmental factors that affect plant communities (and can be used to predict their presence) include: aspect, slope gradient, slope position, parent material, soil texture, and drainage patterns.

Figure 1. Generalized vegetation-environment relationships.

Habitat code Characteristic Community	A Krummholz	B Sheet-wash	C Heath	D Snow basin	E Wetland	F Fragmented rock	G Lush herbaceous	H Lithic
Habitat description	exposed cliffs and ridges with early snowmelt	unstable soils (sheet-wash and solifluction) with late	mesic, well-drained sites on all aspects	late-snowmelt (chionophilous) patches and basins	near moving water (fens) or stagnant water (bogs)	chomophytic sites: talus slopes, rubble fields, and moraines	moist to wet slopes, stream edges, seeps, and avalanche tracks	exposed rock (rupicolous) sites with early snowmelt
Distribution	alpine	alpine	upper	upper	subalpine/alpine	upper	upper	upper
Dominant life-forms	dwarf trees and evergreen shrubs	herbs, graminoids, and liverworts	evergreen shrubs	liverworts and shrubs	mosses and graminoids	herbs and graminoids	herbs, mosses, and deciduous shrubs	mosses, evergreen shrubs, and herbs
Plant orders represented	(1) Rhizocarpon geographicum; (2) Phlox diffusa	(3) Marsupella brevissima; (5) Cassiope-Phyllodoce	(5) Cassiope-Phyllodoce; (10) Eriophorum angustifolilum	(3) Marsupella brevissima; (4) Carex nigricans	(4) Carex nigricans; (10) Eriophorum angustifolium; (11) Carex pluriflora	(5) Cassiope-Phyllodoce; (6) Carex spectabilis; (9) Alnus viridis	(7) Philonotis fontana; (8) Valeriana sitchensis; (9) Alnus viridis	(1) Rhizocarpon geographicum; (2) Phlox diffusa

Schematic slope profile for typical habitat types

G1: herb-dominated

G2: shrub-dominated

Legend

- soil
- rubble
- soil and rubble
- rock

Ordering Information

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References

Brett, R.B., K. Klinka, and H. Qian. 1998. Classification of high-elevation, non-forested plant communities in Coastal British Columbia. Forest Sciences Department, University of British Columbia, Vancouver, BC.