

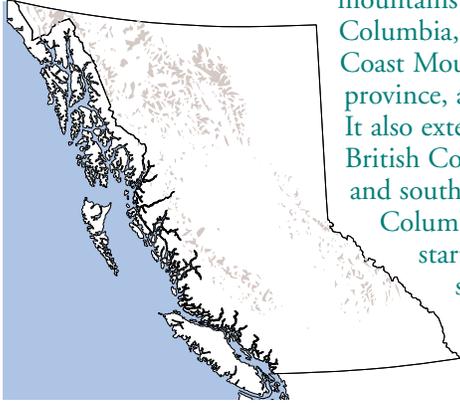
The background of the page is a photograph of a high-altitude mountain landscape. In the foreground, a vibrant turquoise lake is nestled in a valley. The surrounding mountains are rugged and covered in patches of snow and ice. The sky is a pale, hazy blue. On the left side of the page, there is a vertical decorative border with a white, stylized leaf or branch pattern on a grey background.

# The Ecology of the Alpine Tundra Zone

Located high in the mountains of British Columbia, the Alpine Tundra Zone is a rugged, treeless environment treasured by skiers and hikers. With short, cool summers and winters too tough for all but sturdy ungulates such as mountain sheep, mountain goats, and caribou, the province's alpine regions are a harshly beautiful land of ice, snow, and rock mixed with tundra and colourful flower meadows.



# Location



The Alpine Tundra Zone occurs on mountains throughout British Columbia, but especially along the Coast Mountains, in the north of the province, and in the southeast corner. It also extends beyond the borders of British Columbia to the north, east, and south. In southeastern British Columbia, alpine elevations start at about 2250 m, in the southwest at 1600 m, in the northeast at about 1500 m, and in the northwest at about 1500 to 1000 m.



# Terrain

At the high altitudes typical of this zone, the terrain is often steep and rugged, with tall cliffs and rocky, snow-capped peaks. Much of the landscape is rock, ice, and snow, but some areas have stretches of flatter, gently rolling terrain, probably smoothed by glacial action. Glaciers also scoured out valleys and shaped steep cliffs and valley walls. When they melted, glaciers left a variety of special alpine landforms such as basin-like cirques. Talus slopes occur where gravity has caused frost-shattered fragments of rock to slide or fall down the slope.

In alpine regions, the physical environment dictates the vegetation. Whether the terrain is gentle or extremely rough, the smallest differences in the microenvironment are important. In the open and windy places typical of the alpine tundra, even a few centimetres difference in topography have a pronounced effect on factors that influence plants – soil temperature, depth of thaw, exposure to wind, and drifting snow. The result is a complex mosaic of vegetation and soil types. At the middle and lower elevations of the zone, depending on the topography, there is a mix of patchy or patterned vegetation, along with limited areas of continuous vegetation cover. Soils are typically shallow and derived from weathered bedrock. Since cold retards the process of weathering, soils develop slowly in this zone. Occasional areas of permafrost also occur here.



Peter Trisker

# Climate

The Alpine Tundra Zone has the harshest climate of any of the zones in British Columbia. Temperatures are cold for most of the year, with much wind and snow. Temperatures remain low even during the growing season, which has an exceptionally short frost-free period. Mean annual temperatures range from 4° to 0°C, and the average monthly temperature stays below

0°C from seven to eleven months of the year.

The Alpine Tundra Zone is the only zone in British Columbia where the mean temperature of the warmest month is less than 10°C. A great deal of precipitation falls in this zone, mostly as snow.



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# Ecosystems

Vegetation in the Alpine Tundra Zone is relatively scarce and occurs primarily at middle and lower elevations of the zone and in moister, snowier regions. Plants are typically small, close to the ground, and often widely separated by soil or rock. Where the soil is bare, vegetation is absent because of frost action or soil creep, or both. The zone is treeless, except for some stunted, or krummholz, forms which grow at the tree line.

Timberline species are mostly sub-alpine fir, Engelmann spruce, or mountain hemlock, along with whitebark pine, yellow-cedar, lodgepole pine, white spruce, or alpine larch.

In the alpine tundra as a whole, most vegetation is made up of low-growing, evergreen dwarf shrubs. Some important ones include partridgefoot, kinnikinnick, crowberry, lingonberry, and alpine-azalea. Alpine heath, dominated by mountain-heathers, is abundant in the zone's coastal regions and in moister, snowier climates in the southern interior. White mountain-avens occurs primarily on windswept, largely snow-free ridgecrests, along with lichen and mat-forming herbs. Dwarf willows, grasses, sedges, and lichens characterize alpine vegetation in the northern interior of the province and in drier parts of the southern interior.

A wide variety of alpine grasses and sedges grow throughout the zone, and, in the drier parts, grassy vegetation dominates. These areas include the higher elevations of the south central interior, the Chilcotin district, and the leeward slopes of the Rockies and the Coast Mountains. Dominant grasses and sedges vary from north to south, but drier grass communities commonly include several species of fescue, wheatgrasses and bluegrasses, alpine sweetgrass, purple reedgrass, timber oatgrass, fuzzy-spiked wildrye, and various sedges.



In areas of greater moisture, grass usually appears only on steep, south-facing slopes or windy ridgecrests.

However, some seepage or snowbed ecosystems support a variety of grasses or sedges that thrive on wetter conditions. Common species in wetter alpine communities include reedgrass, polargrass, arctic bluegrass, sedges, cotton-grasses, and rushes.

Mountain-heathers  
*Phyllodoce Cassiope* spp.  
Del Meadinger (left), Jim Pojar (right)

# Alpine Meadows

Colourful herb meadows are a familiar feature of the alpine landscape at lower and middle elevations where soils are deeper, and along alpine rivulets or streams. These lush mountain meadows feature an often spectacular display of showy-flowered broad-leaved herbs such as arctic lupine, arrow-leaved groundsel, subalpine daisy, Sitka valerian, Indian hellebore, arnicas, cow-parsnip, cinque-

foils, louseworts, paintbrushes, western pasque-flower, white marsh-marigold, glacier lily, buttercups, mountain sorrel, and mountain sagewort.



Glacier lily  
*Erythronium grandiflorum*  
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Alpine meadow  
Bill Swan



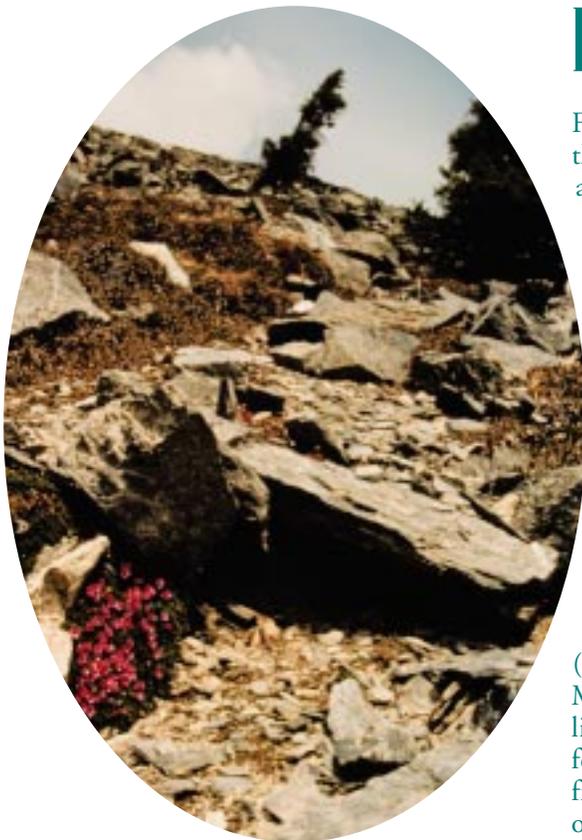
Western anemone seedhead  
*Anemone occidentalis*  
Gunter Marx

## Plant Adaptation

Few flowering plants can survive in the harsh conditions at the highest alpine elevations. However, some species are able to thrive in the gravelly

or rubbly terrain by forming ground-hugging cushions or mats. These plants include moss campion and several species of saxifrage, saxifrage, and whitlow-grass.

On the most exposed ridges, plants adapt by developing fuzzy or hairy covers that help to trap air, reduce water loss, and insulate them from the cold dry winds. Examples are cinquefoil (potentilla), woolly pussytoes, lupines, and silky phacelia. Mosses, liverworts, and lichens can also thrive at the upper limits of vegetation. These plants can grow over bedrock, in fellfields or boulderfields, or as stripes of vegetation on frost-patterned ground. Some of the lichen tundra, especially on limestone, is surprisingly colourful and rich in species.



Purple saxifrage  
*Saxifraga oppositifolia*  
Bill Swan



Moss campion  
*Silene acaulis*  
F. Boas

# Wildlife

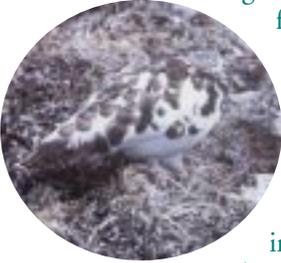
The harsh climate and lack of vegetation make the Alpine Tundra Zone relatively unattractive to wildlife, especially in winter. The alpine tundra along the coast has high snowfalls and extensive icefields and glaciers. Vegetation is sparse. Even mountain goats, which are well adapted to wintering in the alpine tundra, usually go down to forested



Mountain goats  
*Oreamnos americanus*  
MOF

The drier parts of the zone in the east Kootenays and the lee of the Coast Mountains are home to some of the densest populations of mountain goat in North America. Ungulates such as caribou and bighorn sheep also live here. In summer and fall, elk, mule deer, and grizzly bear forage in the lush meadows.

In northern British Columbia where alpine conditions are generally driest and coldest, Stone sheep, mountain goat, and caribou winter on steep, southfacing terrain and mountain plateaus. Grizzly bear, grey wolf, wolverine, hoary marmot, arctic ground squirrel, and Siberian lemming also live here. Birds include ptarmigans, Gyrfalcon, Horned Lark, Snow Bunting, and Rosy Finch.



White-tailed Ptarmigan  
*Lagopus leucurus*  
MOELP

elevations along the coast in winter. Ungulates are also absent in winter, but in summer Roosevelt elk, black-tailed deer, and mule deer forage in the krummholz and meadows in the lower elevations. Summer also sees a larger variety of birds such as the Golden Eagle and the White-tailed Ptarmigan and mammals such as the wolverine and hoary marmot. The endangered Vancouver Island marmot also occurs in coastal alpine regions.



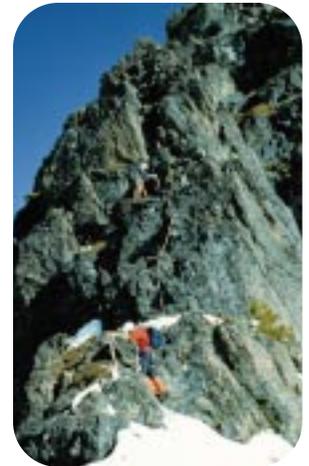
Hoary marmot  
*Marmota caligata*  
MOF

# Aboriginal Uses

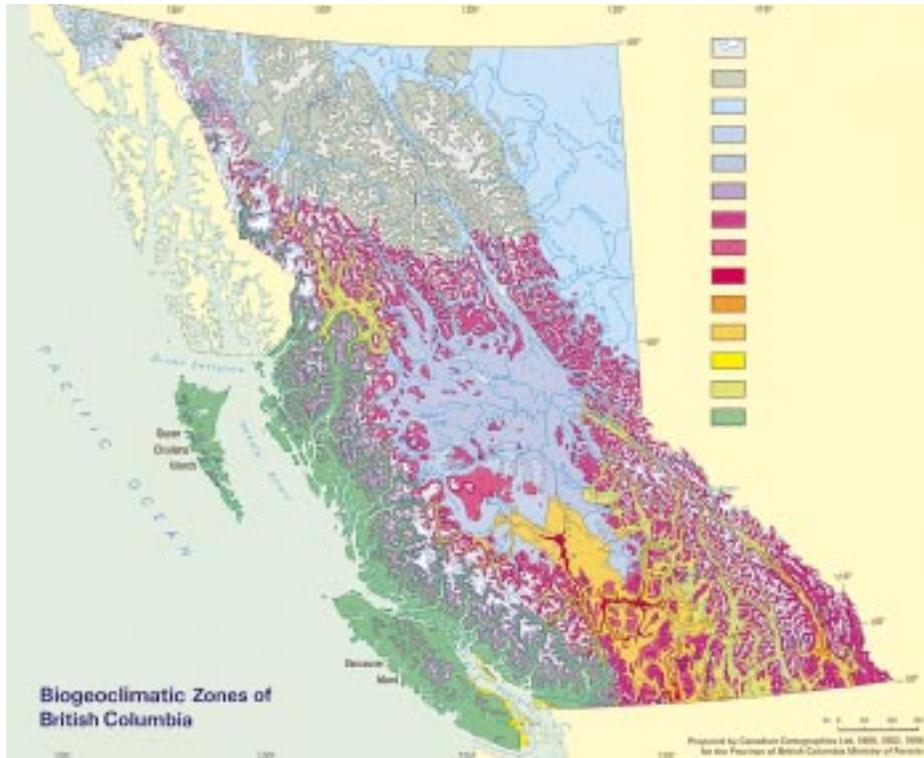
Despite its rugged terrain and relative lack of vegetation, Aboriginal groups had many uses for the alpine tundra. Although food was more plentiful in other zones, indigenous people of the Interior Plateau may have gathered spring beauty (Indian potato) and the edible corms of the yellow glacier lily in wet alpine meadows. Aboriginal hunters also valued alpine wildlife such as mountain goat, mountain sheep, and marmots as a source of food and of materials for clothing and religious ceremonies. The stark alpine landscape also has spiritual significance for Aboriginal peoples. Unusual or startling landforms such as caves, stupendous cliffs, and isolated rocks or stone pinnacles have always had the ability to inspire reverence and fire the imagination. Examples of such "power spots" include the Giant Cleft and Stone City in Cathedral Lakes, the Man Who Turned to Stone, which sits perched on a ridge above Kitlope Lake, and several volcanic features in Mt. Edziza Park.

# Resources

The Alpine Tundra Zone is one of the major playgrounds of the province. Because of its mountainous terrain and high snowfall, the alpine tundra is attractive to skiers and snowmobilers. Camping, hiking, horse-back riding, and hunting are also popular activities in parts of the zone located near urban centres. In certain localities in the drier alpine regions of south-central British Columbia, ranchers send their cattle and sheep in search of summer range and forage.



Gunter Mann



The Alpine Tundra Zone is one of 14 biogeoclimatic or ecological zones within British Columbia. These zones are large geographic areas that share a similar climate within the province. Brochures in this series explore each zone.



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