

Pacific Montane Forest



General Description

The *Pacific Montane Forest* zone occurs at high elevations in the coastal and insular mountain systems of British Columbia (BC) below treeline. It covers an area of approximately 39,000 km² in the windward Coast Mountains, and on Vancouver Island and Haida Gwaii. This zone represents the central portion of North American Pacific coastal high montane and subalpine forests, extending from Alaska to Baja, Mexico. The maritime climate is cool and wet. Landcover is dominated by evergreen coniferous forests and woodlands.

Vegetation

On most upland sites closed forests are typical at lower and mid-elevations, transitioning to short-statured open woodlands in a parkland landscape at subalpine elevations. Canopies mostly comprise a mixture of evergreen coniferous tree species. A deep heavy, long-lying snowpack is characteristic of the environment, creating distinct growth patterns and stand structures in these forests and woodlands. On steep slopes, at higher elevations and where late-melting snow occurs, treed stands become more open and patchy, often occurring as tree islands or ribbons in a matrix of grasslands, meadows, heaths or shrublands. At treeline, microsites determine tree distribution and the forest/woodland patches are found where snow melts earliest, while areas with the latest lying snow contain sedge, heath or meadow vegetation. At

higher elevations, deep long-lying snowpacks often create “elfinwood” stands of stunted, scrubby trees; where tree stems emerge above the snow they develop characteristic krummholtz growth forms in response to physical damage by blowing snow and ice crystals. Understory structure varies from dense to sparse, and is typically dominated by ericaceous low and dwarf shrubs as well as conifer regeneration. Most closed forests have a well-developed bryophyte layer on the forest floor.

Broad-scale disturbances (especially wildfire) are rare in these forests and woodlands; windthrow, avalanches and landslides are the main stand-replacing mechanisms. Otherwise, gap replacement of single or small groups of trees is the common regeneration process. Overall, stands tend to be old and uneven-aged; taller stands can be structurally diverse and multi-storied. Forest harvesting is a disturbance factor in some lower elevation areas, but other human modification of the landscape is minor overall.

Mountain hemlock (*Tsuga mertensiana*) is the characteristic tree species. Other common trees include Pacific silver fir (*Abies amabilis*), yellow-cypress (*Callitropsis nootkatensis*) and western hemlock (*T. heterophylla*). On Haida Gwaii, Sitka spruce (*Picea sitchensis*) is often codominant in these forests. Treed wetlands are dominated by the same tree species, with yellow skunk cabbage

(*Lysichiton americanus*) a characteristic of the understory.

Common upland shrubs include oval-leaved blueberry (*Vaccinium ovalifolium*), mountain huckleberry (*V. membranaceum*), false azalea (*Menziesia ferruginea*), red huckleberry (*V. parvifolium*) and copperbush (*Elliottia pyroliflora*). At higher elevations, various heath species are common, including pink mountain heather (*Phyllodoce empetriformis*), crowberry (*Empetrum nigrum*) and white mountain heather (*Cassiope mertensiana*). Characteristic herb/dwarf shrub species include five-leaved dwarf bramble (*Rubus pedatus*), twistedstalks (*Streptopus* spp.), deer fern (*Blechnum spicant*), green false hellebore (*Veratrum viride*), three-leaved foamflower (*Tiarella trifoliata*), fern-leaved goldthread (*Coptis asplenifolia*) and deer cabbage (*Nephrophyllidium crista-galli*). Pipecleaner moss (*Rhytidiopsis robusta*), broom mosses (*Dicranum* spp.) and lanky moss (*Rhytidiadelphus loreus*) are the most common forest bryophytes.

At the highest elevations of this zone, heaths and meadows are interspersed with clumps of trees in a parkland mosaic. Heath communities, mostly comprising moss heathers (*Cassiope* spp.) and mountain heathers (*Phyllodoce* spp.) with a variety of bryophytes (e.g., alpine haircap moss [*Polytrichastrum alpinum*]), usually occur near treeline in areas with late-lying snowbeds. On wet microsites in late snowmelt areas, snow rustwort (*Marsupella brevisimma*) dominates. Meadows develop in seepage areas and along stream edges near treeline; they are characterised by a large diversity of often showy forbs including Sitka valerian (*Valeriana sitchensis*), American cow parsnip (*Heracleum maximum*) and green false hellebore (*Veratrum viride*). Avalanche tracks, often dominated by Sitka alder (*Alnus viridis* ssp. *sinuata*), are common features in steep terrain.

Poorly drained sites in the subalpine often develop shallow peat deposits with bog/poor fen vegetation, typically containing narrow-leaved cottongrass (*Eriophorum angustifolium*) and peat mosses (*Sphagnum* spp.).

Climate

High precipitation and relatively moderate temperatures characterize the high elevation climate of the *Pacific Montane Forest* zone. In general, the macroclimate is maritime temperate, with short cool summers, rainy autumns, and long cool snowy winters. However, local climates vary from hypermaritime on Haida Gwaii and the outer mainland coast, to maritime on Vancouver Island and most of the windward Coast Mountains, to a continental-influenced subarctic climate in the easternmost portions of the range.

Mean annual precipitation is high, usually exceeding 4000 mm (varying between approximately 2000 and 7000 mm). Between 20% and 70% of total precipitation falls as snow, depending on location; a deep and late-melting snowpack is characteristic of the zone. Maximum snowpack depth in late winter varies from as little as 50 cm at lower elevations of hypermaritime areas to >300 cm in wet subalpine areas. The snowpack insulates soils from freezing, which is important for the survival of the major tree species. However, heavy snow buries smaller vegetation, including regenerating trees, which must be resilient to being bent, crushed and frozen as well as being adapted to the short growing season created by late-melting snow. Mean annual temperatures vary from approximately 0° to 5° C and the growing season is short, averaging <1000 growing degree days above 5° C.

Physiography, Geology, Topography and Soils

This zone occurs in the westernmost Cordillera of Canada, where it occupies the windward portions of the Coast Mountains in BC, including the Pacific Ranges, the Kitimat Ranges and the Boundary Ranges. It also occurs in the insular mountains of Vancouver Island and Haida Gwaii. A minor portion of the zone occurs in the Cascade Mountains of southwestern BC and the St. Elias Mountains of northwestern BC. Near the coast, the lower elevation of the zone varies between approximately 600 mASL and 1000 mASL, depending upon latitude and typical snowpack (about 500 mASL on Haida Gwaii). Upper

elevations are near 1600 mASL in the south and 1000 mASL in the north (about 850 mASL on Haida Gwaii). In inland areas, due to lower amounts of snow, elevation thresholds are higher (e.g., in the south, the lower elevation of the zone is 1200 mASL). The zone can occur as low as 400 mASL in valleys with pronounced cold air drainage.

The Coast, Cascade and St. Elias Mountains are primarily crystalline igneous and metamorphic rocks. The Vancouver Island and Queen Charlotte Ranges comprise mostly folded and faulted volcanic and sedimentary Tertiary rocks. The terrain is a complex of high mountains (some >4000 mASL) and valleys.

All of the zone has been glaciated numerous times and the most prevalent parent material is glacial till. Colluvium is also common because of steep mountain slopes, often with bedrock exposures. Parent material textures vary considerably but are mostly coarse to medium-textured with moderate

to high coarse fragment content. Although geologically young, the soils are generally well developed. Organic matter tends to accumulate in the wet, cool climate. Mineral soils are mostly Podzols, with some Folisols; Gleysols occur on moist, poorly drained sites. Peatlands dominated by Organic soils develop in areas with permanently high water tables.

Notes

The *Pacific Alpine Tundra* occurs at higher elevations than the *Pacific Montane Forest* zone. At lower elevations, the *Pacific Maritime Rainforest* is adjoining. Montane conditions on the eastern slopes of the mainland coastal mountains fall within the *Cordilleran Montane Forest*. To the south and northwest, this zone continues into the United States.