



Canadian National Vegetation Classification (CNVC) Classification nationale de la végétation du Canada

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Rocky Mountain Subalpine – High Montane Forest Forêts subalpines et des montagnes de haute altitude des Rocheuses

Macrogroup M020

Cool Temperate Forest & Woodland

D194 Rocky Mountain Forest & Woodland

M890 Rocky Mountain Intermontane Subboreal Forest

M020 Rocky Mountain Subalpine – High Montane Forest

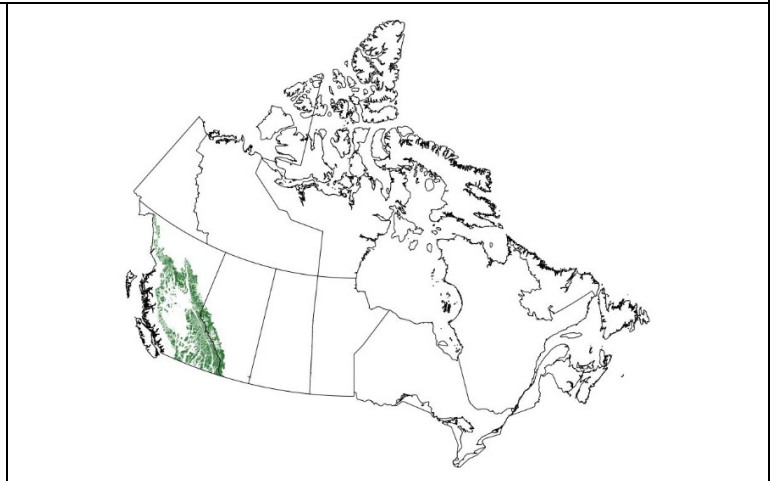
CM020a Dry Rocky Mountain Mid-Montane Forest

CM020b Dry Rocky Mountain High Montane & Subalpine Forest

CM020c Humid Rocky Mountain High Montane & Subalpine Forest

M500 Central Rocky Mountain Mesic Lower Montane Forest

M501 Central Rocky Mountain Dry Lower Montane – Foothill Forest

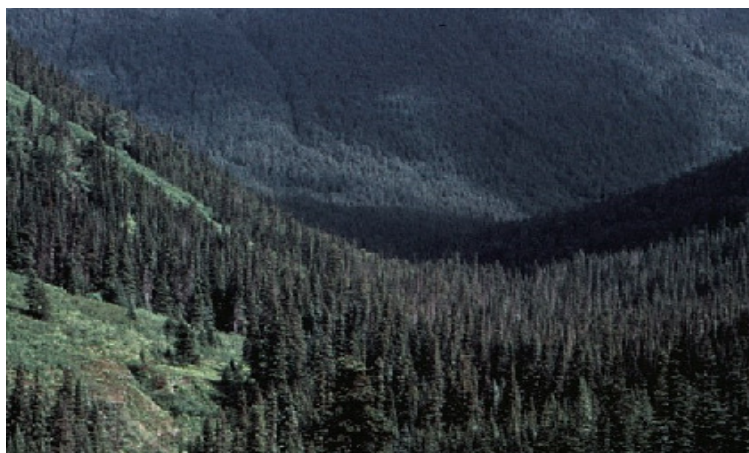


Concept

M020 describes North American continental, temperate subalpine and high montane treed vegetation of the Western Cordillera. The Canadian expression includes mid- to high-elevation forests and woodlands of southern and central British Columbia (BC), southern and west-central Alberta, and southwestern Saskatchewan. Canopies are usually evergreen coniferous, although some cold-deciduous broad-leaved species are found in mid-elevation montane forests and local occurrences of cold-deciduous conifer species are found in southern parts of the Canadian range. Stands of M020 vary from closed forests to very open short-statured woodlands, becoming more open and patchy with higher elevation and often occurring as tree islands or ribbons in a matrix of grasslands, meadows or shrublands at elevational treeline. At the highest elevations or on the sites most exposed to wind, trees can be “flagged” or damaged by blowing snow and ice crystals as well as severe cold. Avalanches, windthrow, insect infestations and stand-replacing fires are the most widespread forms of natural disturbance. Dominant tree species include subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), lodgepole pine (*Pinus contorta* var. *latifolia*) and interior spruce (*Picea engelmannii* x *glauca*). Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* var. *glauca*) and trembling aspen (*Populus tremuloides*) are common in mid-elevation montane forests, especially on warm aspects. Mountain hemlock (*Tsuga mertensiana*), limber pine (*Pinus flexilis*), whitebark pine (*Pinus albicaulis*), subalpine larch (*Larix lyalli*) and western larch (*L. occidentalis*) are characteristic trees in some areas. Understory species composition is highly diverse and varies with environmental conditions. The ericaceous species mountain huckleberry (*Vaccinium membranaceum*), white-flowered rhododendron (*Rhododendron albiflorum*), grouseberry (*V. scoparium*) and false azalea (*Menziesia ferruginea*) are common and often dominant. Characteristic herbs include arnicas (*Arnica cordifolia*, *A. latifolia*), five-leaved dwarf bramble (*Rubus pedatus*), three-leaved foamflower (*Tiarella trifoliata*), Sitka valerian (*Valeriana sitchensis*), single-flowered clintonia (*Clintonia uniflora*), oak fern (*Gymnocarpium dryopteris*) and green false hellebore (*Veratrum viride*). Mosses and liverworts include red-stemmed feathermoss (*Pleurozium schreberi*), broom mosses (*Dicranum* spp.), ragged mosses (*Brachythecium* spp.) and leafy liverworts (*Barbilophozia* spp.).

In Canada, M020 occurs within the mountains and high plateaux of interior British Columbia, in the Rocky Mountains, in the foothills of southwestern Alberta and in the Cypress Hills of southeastern Alberta and southwestern Saskatchewan. Elevations extend from approximately 850 mASL to 2300 mASL, depending on location. The macroclimate is dry to subhumid, temperate and continental, with cold, snowy winters and short, cool summers. However, subregional orographic effects create highly variable climatic regimes: mean annual temperatures vary from -1°C to +3°C; annual precipitation varies from 400 mm to >2000 mm, much of it falling as snow. All parts of the range experienced Pleistocene glaciation; soils are mostly Luvisols, Brunisols and Podzols developed in glacial surficial materials.

Three subtypes characterize regional variation in the Canadian range of M020. Subtype CM020a [Dry Rocky Mountain Mid-Montane Forest] characterizes montane forests that occur at mid-elevations in relatively drier, warmer climates of southern BC, western Alberta and southwestern Saskatchewan. CM020b [Dry Rocky Mountain High Montane & Subalpine Forest] occurs at higher elevations in the drier climates of southern BC and southwestern Alberta. CM020c [Humid Rocky Mountain High Montane & Subalpine Forest] occurs over much of the range of M020 in BC and west-central Alberta at higher elevations in more humid climates.



Dense high montane forests dominated by subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*). Open areas in the left foreground are lower portions of avalanche tracks. Central British Columbia. Source: British Columbia Forest Service



Subalpine landscape mosaic at elevational treeline. Trees are mainly subalpine fir (*Abies lasiocarpa*); other vegetation includes *Vaccinium scoparium*, *Pulsatilla occidentalis*, *Antennaria lanata* and *Phyllodoce* spp. Southeastern British Columbia. Source: British Columbia Forest Service



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Vegetation

Physiognomy and Structure

M020 includes upland mid- to high-elevation (see Comments) forests and woodlands that mostly comprise evergreen coniferous tree species, although some cold-deciduous broad-leaved (“hardwood”) species are found in mid-elevation montane forests. In southern parts of the Canadian range, cold-deciduous conifers occur in some areas. Subalpine and montane riparian and wetland forests and woodlands within the range of M020 are described by M034 [Rocky Mountain-Great Basin Montane Riparian & Swamp Forest]. Stands of M020 are generally of mixed species composition and vary from nearly closed forests to very open, short-statured woodlands. Stands become more open and patchy with increased elevation, and often occur as tree islands or ribbons in a matrix of grasslands, meadows or shrublands at elevational treeline. At the highest elevations or on sites most exposed to wind, trees develop characteristic “krummholtz” growth forms, including “flags”, branches on the downwind side of the stem and sub-nival mats of foliage, in response to physical damage by extreme cold and blowing snow and ice crystals. Understory structure varies from dense to sparse, and is usually dominated by cold-deciduous or evergreen broad-leaved shrubs, conifer regeneration and perennial herbs. Most closed forests in M020 have a well-developed bryophyte layer on the forest floor. These forests and woodlands are subject to regular stand replacement or significant modification by wildfire, avalanches and insect outbreaks. Stand structure is simple and even-aged after stand-replacing fire, but generally becomes multi-storied as succession proceeds. Fire cycles are shorter and insect outbreaks more frequent in the climatically drier areas of the range (subtypes M020a [Dry Rocky Mountain Mid-Montane Forest] and M020b [Dry Rocky Mountain High Montane & Subalpine Forest]) and stands are often even-aged, with simple structure. Stands of subtype M020c [Humid Rocky Mountain High Montane & Subalpine Forest], where fire cycles are longer, are frequently multi-aged with two-storied structure.

Floristics

The main tree species in the Canadian range of M020 are *Abies lasiocarpa* (see Comments), *Picea engelmannii*, *Pinus contorta* (see Comments) and *Picea engelmannii* x *glauca*. *Pseudotsuga menziesii* (see Comments) and *Populus tremuloides* are common in mid-elevation montane forests, especially on warm aspects, but are generally absent from the high montane and subalpine. Throughout the Canadian range, M020 forests are characterized by consistent canopy presence of *Picea* spp.: *P. engelmannii* at high montane and subalpine elevations and either *P. glauca* or hybrid *P. engelmannii* x *glauca* in the mid-elevation montane. *A. lasiocarpa* is most common in the high montane and subalpine (subtypes CM020b [Dry Rocky Mountain High Montane & Subalpine Forest] & CM020c [Humid Rocky Mountain High Montane & Subalpine Forest]), often occurring in association with *P. engelmannii*, and strongly dominates in areas of high snowfall. In the dry montane forests described by subtypes CM020a [Dry Rocky Mountain Mid-Montane Forest] & CM020b, *Pinus contorta* stands dominate most landscapes, often in mixture with *Picea* spp., *A. lasiocarpa* and sometimes *Populus tremuloides*. *Tsuga mertensiana* is found in some of the wettest portions of the CM020c range in British Columbia (BC). *Pinus flexilis* occurs on dry rocky sites in southwestern Alberta and adjacent BC. *Larix lyallii* occurs at high elevations at or near treeline in the southern parts of the Canadian range. *Pinus albicaulis* is locally common at higher elevations in CM020b&c. *Larix occidentalis* occurs occasionally in CM020a. In the Alberta high montane and subalpine, *Picea mariana* co-occurs with *Pinus contorta* on mesic and subhygric sites north of the Bow River.

Across the Canadian range of M020, *Pinus contorta* is normally the most successful early seral species on dry to mesic, nutrient-poor to medium sites. In the drier climates of CM020a&b, where fire is frequent on the landscape, *P. contorta* dominates on all sites following stand-replacing fire, often forming extensive even-aged stands. Hardwood and conifer-hardwood stands are most common in CM020a where *P. contorta* and *Populus tremuloides* often form even-aged, early seral mixed stands following fire. In high montane and subalpine forests of west-central Alberta, *P. mariana* is often part of the initial post-fire cohort with *P. contorta*. *P. contorta* has low tolerance of heavy snowpack, so is generally absent from areas receiving high snowfall.

Picea spp. (see Comments) are generally common in mid- to late seral stands on mesic to moist sites, however where fire cycles are short (<100 years) they are most common on moist sites. *Picea* spp. can establish immediately following fire or other disturbance that exposes mineral soil seedbeds if there is an adequate seed supply. *Picea* spp. also seed into existing early seral stands, especially of *P. contorta* or *P. tremuloides*, persisting in the understory due to their shade tolerance and eventually growing into the main canopy where, in the absence of fire for extended periods (approximately >120 years), they dominate uneven-aged stands with various species mixes. In the high montane and subalpine forests of subtypes CM020b&c, *Picea engelmannii* is the dominant spruce species. *P. engelmannii* has high tolerance of heavy snowpack, which enables it to co-dominate with *Abies lasiocarpa* in areas of higher snowfall. *Picea glauca* occurs at lower elevations (i.e., approximately < 1100 mASL) of the Alberta portion of the CM020a range; in the BC range and at higher elevations of the Alberta mid-montane, hybrid *Picea engelmannii* x *glauca* prevails.

Abies lasiocarpa is a late seral species that can either invade existing early or mid-seral stands by seeding in from surrounding areas or maintain itself within stands where it is already established. Unlike *Picea* spp., seeds of *A. lasiocarpa* are able to germinate and survive on seedbeds of litter, moss and thick humus. *A. lasiocarpa* is highly shade tolerant, so seedlings persist under closed canopies for many years. *A. lasiocarpa* is very tolerant of heavy snowpack and is the primary tree species in areas of high snowfall. It is prevalent as a canopy dominant or co-dominant, usually in uneven-aged mid- to late seral stands with *Picea* spp., on all but the poorest sites in the range of subtype CM020c, reflecting cold, humid (typically snowy) climatic conditions and a long (270-500 years) to very long (>500 years) fire cycle. In climatically drier CM020a&b, *A. lasiocarpa* occurs most commonly on moist sites.



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Floristics (cont'd)

Pseudotsuga menziesii is a long-lived early seral species that is generally restricted to warm aspects in subtype M020a where it maintains itself by regenerating from seed in existing stands or in post-fire stands, where mineral soil seedbeds are exposed. With its thick bark, it is somewhat resistant to moderate-intensity surface fires and old individuals (“veterans”) can persist in stands for long periods, often as canopy emergents.

Understory species composition and relative abundance vary among subtypes and geographically across the Canadian range of M020 in response to elevation, local site conditions, stand history and subregional climate. Common shrub species of mid-elevation montane forests described in subtype CM020a include *Shepherdia canadensis*, *Spiraea lucida*, *Rosa acicularis*, *Vaccinium membranaceum*, *Lonicera utahensis*, *Paxistima myrsinites*, *Juniperus communis* and *Amelanchier alnifolia*. *Lonicera involucrata* and *Ribes lacustre* are characteristic of moist, rich sites. Common herb/dwarf shrub species include *Linnaea borealis*, *Orthilia secunda*, *Arnica cordifolia*, *Cornus canadensis*, *Calamagrostis rubescens*, *Vaccinium scoparium*, *Fragaria virginiana*, *Goodyera oblongifolia*, *Arctostaphylos uva-ursi*, *Lupinus arcticus*, *Eurybia conspicua*, *Chimaphila umbellata*, *Osmorhiza berteroi*, *Thalictrum occidentale*, *Leymus innovatus* and *Galium boreale*.

In the high montane and subalpine subtypes (CM020b&c), common understory species include *Vaccinium membranaceum*, *Menziesia ferruginea*, *Lonicera utahensis*, *Orthilia secunda*, *Arnica cordifolia*, *A. latifolia*, *Valeriana sitchensis*, *Rubus pedatus*, *Tiarella trifoliata*, *Cornus canadensis* and *Linnaea borealis*. *Ribes lacustre* is common on moist, rich sites. *Rhododendron albiflorum* is often dominant under moist, cool conditions, especially in CM020c. Similarly, *Vaccinium scoparium* is often the dominant understory species in dry montane and subalpine stands of CM020b; in southeastern BC and southwestern Alberta, it co-occurs with *V. myrtilloides*. Ferns (e.g., *Gymnocarpium dryopteris*, *Dryopteris expansa* and *Athyrium filix-femina*), *Veratrum viride* and *Streptopus* spp. (esp. *S. amplexifolius* and *S. lanceolatus*) are characteristic of the cold, moist conditions of M020c; *Oplanax horridus* can be abundant on moist, rich sites in M020c, especially in BC. Near elevational treeline, subalpine forests and woodlands contain significant understory cover of *Cassiope* spp. (especially *C. mertensiana*), *Phyllodoce* spp. (especially *P. empetriformis*) and various alpine forb and graminoid species.

In all subtypes, the feathermoss species *Pleurozium schreberi* (often with *Brachythecium* spp., *Ptilium crista-castrensis*, *Hylocomium splendens* and *Dicranum* spp.) is ubiquitous under closed conifer canopies, often covering the forest floor with an extensive carpet. On dry sites, especially under open canopies, ground lichens (mainly *Cladonia* spp. and *Peltigera* spp.) are prevalent. At high montane and subalpine elevations (CM020b&c), *Barbilophozia lycopodioides* and *Rhytidiopsis robusta* are significant elements of the bryophyte layer. *Dicranum* spp. and small *Barbilophozia* spp. (e.g., *B. floerkei*) are common bryophyte species in open subalpine woodlands and forest patches near elevational treeline.

Dynamics

Environmental site characteristics, plant species autecology, seed/propagule availability, and disturbance history (i.e., type, severity and frequency) influence secondary succession trends within the forests of M020. Avalanches, windthrow, insect infestations and stand-replacing fires are the most widespread forms of natural disturbance throughout the Canadian range of M020. Stand conditions that are characteristic of higher fire frequency, including prominence of *Pinus contorta*, *Populus tremuloides* and *Pseudotsuga menziesii*, are described by subtypes CM020a [Dry Rocky Mountain Mid-Montane Forest] and CM020b [Dry Rocky Mountain High Montane & Subalpine Forest]. Fires are much less frequent in forests described by subtype CM020c [Humid Rocky Mountain High Montane & Subalpine Forest], where orographically modified climates create more humid environmental conditions and longer fire cycles. These forests have a higher proportion of late seral stands, characterized by prevalence of *Abies lasiocarpa* and *Picea engelmannii*, and show a greater influence of gap dynamics, especially from localized windthrow, avalanches and insect/disease mortality. Subalpine environments can be harsh and post-fire recruitment slow, so fire-initiated stands are not necessarily even aged.

Regional fire cycles vary from intermediate (100-270 years) to very long (>500 years) within the Canadian range of M020. At high elevations, woodland and parkland stands burn less frequently due to cooler temperatures, long-lying snowpack, higher precipitation, reduced incidence of dry lightning and more open or patchy stand conditions. The cold, humid environment and short growing season in the subalpine hamper regeneration so stand development usually takes longer than on comparable sites at lower elevations. Fires vary considerably in extent, with large fires possible in any part of the range despite modern fire suppression practices. Burn severity is variable within each fire, so a spatial mosaic of burned and residual patches is typical on the post-fire landscape. Forest harvesting, agricultural clearing (at lower elevations) and other industrial activities (e.g., mining and petroleum development) are also significant disturbance factors in some areas.

Site-scale moisture and nutrient status, as well as temperature and wind regimes, are important determinants of secondary succession. On mesic to dry sites at mid- to high montane elevations, post-burn conditions are usually suitable for seed germination and growth of *Pinus contorta*. On warm sites in subtype CM020a, *Populus tremuloides* and *Pseudotsuga menziesii* are also common early seral species. If seed sources are available, *Picea* spp. and *Abies lasiocarpa* seed-in from adjacent unburned areas during the mid- to late seral stages and, over time (usually more than 120 years), can grow into the main canopy and eventually become dominant as the early seral species decline. In the prolonged absence of fire, *A. lasiocarpa* (and to a lesser extent *Picea* spp.) self-replaces by gap dynamics when death of mature trees creates canopy openings that release seedlings from the understory.



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Dynamics (cont'd)

In cases of disturbance other than fire, secondary succession immediately includes *A. lasiocarpa* and *Picea* spp. if they were present in the pre-disturbance stand or if seed sources exist nearby. Post-fire stand structure is usually simple and even aged, but multi-storied, multi-aged structure can develop in the absence of fire or where regeneration establishes slowly.

A variety of diseases and insects are endemic to these forests. Typically, mortality is limited to individual or small groups of trees within stands, but occasional broad-scale infestations are capable of creating changes in tree species dominance at both the stand and landscape levels. Lodgepole pine dwarf mistletoe (*Arceuthobium americanum*), Schweinitzii butt rot (*Phaeolus schweinitzii*), red ring rot (*Phellinus pini*), hard pine stem rusts (*Endocronartium harknessii*, *Cronartium* spp.), tomentosus root rot (*Inonotus tomentosus*) and armillaria root disease (*Armillaria ostoyae*) are widespread in forests of M020, causing mortality of young trees and increasing the susceptibility of older trees to windthrow and insect attack.

Mountain pine beetle (*Dendroctonus ponderosae*), spruce beetle (*D. rufipennis*), Douglas-fir beetle (*D. pseudotsugae*) and western balsam bark beetle (*Dryocoetes confusus*) have a history of frequent outbreaks in these forests. Likewise, the defoliator western spruce budworm (*Choristoneura occidentalis*) occasionally erupts in outbreaks that affect *P. menziesii*, *A. lasiocarpa* and *Picea* spp. High-severity outbreaks of any of these insects are influential in stand development and succession.

In recent years, mountain pine beetle has caused significant economic and ecological impacts to *Pinus contorta* forests in British Columbia (BC), including much of the range of M020 (particularly M020a). Within its historic range in interior BC, beetle cycles occur every 20-40 years. At low population densities, the insect preferentially attacks and kills older, less vigorous trees, creating canopy gaps. At epidemic levels however, mass attacks can extend over large areas and overwhelm the defenses of vigorously growing immature pines. Climate change and forest management practices, including fire suppression, have likely contributed to these unprecedented beetle densities.

Presence of slow-growing *Pinus albicaulis* is decreasing in the Canadian range of M020 due to the invasive pathogen white pine blister rust (*Cronartium ribicola*) and the impact of recent mountain pine beetle outbreaks. *P. albicaulis* is now considered an endangered species in Canada and is protected by the federal Species at Risk Act.



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Environment

Climate

In the lee of the Coast Mountains, rain shadow effects on moist Pacific air masses create relatively dry to subhumid conditions within the continental temperate climate of southern and central British Columbia (BC). However, areas of high orographic precipitation result when westerly air flows rise over the mountains of interior BC and, ultimately, the Rocky Mountains. In the rain shadow of the Rockies, west-central and southern Alberta receive considerably less precipitation annually than does the windward side in BC.

M020 forests develop at mid- to high elevations within these mountain systems in a climate generally characterized by cold, snowy winters and moderately short, cool summers. Latitude and orographic effects significantly modify climatic characteristics across the range, generating highly variable regional to local climates. Latitude, rain shadow effects and elevation influence annual regional temperature and precipitation patterns; for example, a greater proportion of precipitation falls as snow in higher elevation subalpine areas. Relatively warm, dry montane climates characterize mid-elevations in southern BC and along the slopes and valleys of the Rocky Mountains in Alberta. Slope and aspect control local insolation patterns and modify site-scale snow deposition; southerly and westerly slopes are warm aspects where snowmelt occurs earlier in the spring, and northerly and easterly slopes are cool aspects where snowmelt is later and wind deposition of snow is often greater.

In the Canadian range, mean annual temperatures vary from approximately -1°C to +3° C; warmer temperatures are associated with mid-elevation montane areas (subtype CM020a [Dry Rocky Mountain Mid-Montane Forest]) and colder temperatures with subalpine areas near elevational treeline. At higher elevations, frost is possible in any month and occurs most frequently in locations with cold air drainage or ponding, such as closed topographic depressions. The growing season of M020 forests and woodlands is short, averaging less than 800 growing degree days above 5°C (GDD), although mid-elevation montane forests can average >1000 GDD. Climatically drier areas receive as little as 400 mm of total precipitation annually, whereas areas within wetter subregional climates can receive >2000 mm. Summer rainfall varies between approximately 200 and 650 mm. Areas with greater total precipitation also have greater snowfall. The mid-elevation montane areas of Alberta and southern BC (CM020a) typically receive the lowest total precipitation (400-650 mm) and the lowest snowfall (approximately 150-450 cm). Subalpine areas receive more snow, often constituting the majority of total annual precipitation, varying from approximately 330 to >1500 cm (the highest amounts occur in CM020c [Humid Rocky Mountain High Montane & Subalpine Forest]). Snow depth varies locally, with some sites nearly snow-free because of high winds, while snow accumulation is high on lee slopes and in forest openings; in some forests, late-melting snowpacks provide the majority of growing season moisture.

Physiography, Geology, Topography and Soils

In Canada, M020 primarily occurs in the southern portion of the Cordilleran physiographic region, including most mountain ranges and high plateaux of interior British Columbia (BC), in the Rocky Mountains and in the foothills of western Alberta. These forests and woodlands occupy mid- to high elevations along the eastern side of the Coast Mountains as far north as the Yukon border; in the Skeena, Omineca and Rocky Mountains south of approximately latitude 57°30'; and in the Columbia and Cascade Mountains, Columbia Highlands and Interior Plateau of south-central BC. In Alberta, the Rocky Mountain foothills south of approximately the Bow River also support forests included in subtype CM020a [Dry Rocky Mountain Mid-Montane Forest], as do the highest elevations of the Cypress Hills of southeastern Alberta and southwestern Saskatchewan.

Geology and topography within the Canadian range of this Macrogroup are highly diverse. The terrain of the Cordilleran physiographic region is a complex mixture of high mountains (up to 3000 mASL), plateaux, hill systems, valleys and trenches. The Coast and Omineca Mountains consist predominantly of crystalline igneous and metamorphic rocks, while the rest of the Interior and all of the Eastern Systems of the Cordillera comprise faulted and folded Paleozoic, Mesozoic or Tertiary sedimentary, and often carbonate-rich, rocks. Mid-montane forests of subtype CM020a occur between approximately 1000 mASL and 1500 mASL in moister climates and from 850 to 1800 mASL in drier areas. High montane and subalpine forests and woodlands extend to elevational treeline: in subtype CM020b [Dry Rocky Mountain High Montane & Subalpine Forest] elevations are between approximately 1500 and 2300 mASL throughout the range; in subtype CM020c [Humid Rocky Mountain High Montane & Subalpine Forest] between approximately 1200 and 2300 mASL in the southern portion of the range and from 900 to 1700 mASL in the northern part of the range.

The entire Canadian range of M020 experienced Pleistocene glaciation, and till blankets and veneers often overlie bedrock. At higher elevations and on steep slopes colluvial materials predominate. Variable topography produces rapid and frequent changes in local site aspect, moisture and nutrient status. Soils range from deep (>100 cm) and well developed to shallow (<20 cm) and rocky. They are typically well to imperfectly drained Podzols, Brunisols and Luvisols, with Gleysols in moist, poorly drained topopositions. Volcanic ash is a common upper soil layer in southern portions of the range.



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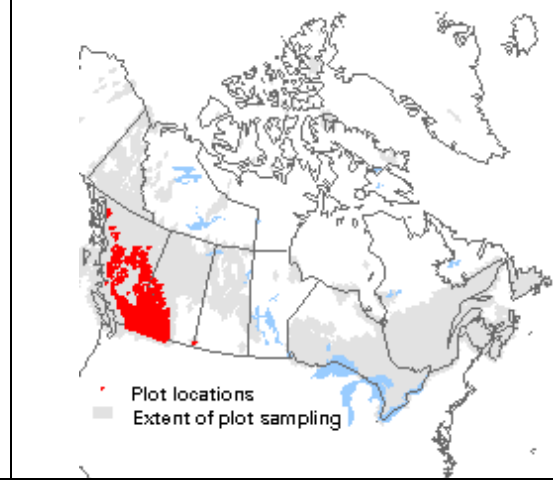
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Distribution and Geographic Range

In Canada, M020 includes primarily mid- to high elevation forests and woodlands of southern and central interior British Columbia, of west-central and southwestern Alberta, and of the Cypress Hills (above approximately 1300 mASL) in southeastern Alberta and southwestern Saskatchewan. The Canadian range is the northern portion of the global range of western North American continental, temperate subalpine and high montane forests and woodlands, which extends southward to western Texas and New Mexico.



Related Concepts

M020 includes upland forests and woodlands that have been described in provincial publications for the Engelmann Spruce – Subalpine Fir and Montane Spruce biogeoclimatic zones in British Columbia; the Subalpine and Montane natural subregions in Alberta; and the Prairie Ecozone in Saskatchewan.

USNVC M020 [Rocky Mountain Subalpine – High Montane Forest] describes the rangewide characteristics of continental, temperate subalpine and high montane forests and woodlands in North America. This CNVC factsheet describes the Canadian expression of this vegetation, which includes conditions treated (at least in part) in USNVC Groups G218 [Rocky Mountain Subalpine Moist Spruce – Fir Forest & Woodland], G219 [Rocky Mountain Subalpine Dry-Mesic Spruce – Fir Forest & Woodland], G220 [Rocky Mountain Lodgepole Pine Forest & Woodland], G221 [Rocky Mountain Subalpine-Montane Limber Pine – Bristlecone Pine Woodland], G222 [Rocky Mountain Subalpine-Montane Aspen Forest & Woodland], G223 [Northern Rocky Mountain Whitebark Pine – Subalpine Larch Woodland] and G345 [Central Rocky Mountain Montane White Spruce Forest].

Subalpine and montane riparian and wetland forests and woodlands within the range of M020 are described by M034 [Rocky Mountain-Great Basin Montane Riparian & Swamp Forest].

Comments

Picea glauca and *P. engelmannii* are closely related wind-pollinated species that hybridize extensively within most of the Canadian range of M020. Genetically, most individual trees have some degree of hybridization in this area. *P. glauca* is adapted to (generally) low-elevation boreal and subarctic environments, while *P. engelmannii* is adapted to high elevation environments south of the boreal zone. The fertile hybrids (*P. engelmannii* x *glauca*) are ecologically similar to the parent species but are typically dominant at intermediate elevations. In the context of M020, *P. engelmannii* is considered the main spruce species in the high montane and subalpine forests described by subtypes CM020b [Dry Rocky Mountain High Montane & Subalpine Forest] & CM020c [Humid Rocky Mountain High Montane & Subalpine Forest], and *P. engelmannii* x *glauca* is the main species in the mid-elevation montane forests of CM020a [Dry Rocky Mountain Mid-Montane Forest]. *P. glauca* occurs at the lowest elevations (approximately <1100 mASL) of CM020a in Alberta and in the Cypress Hills. In the data summaries on pp 10 and 11, species records for *Picea* spp. are reported accordingly, except *P. glauca* records are pooled with those of *P. engelmannii* x *glauca* for CM020a.

Abies lasiocarpa here refers to both *A. lasiocarpa* (subalpine fir) and *A. bifolia* (Rocky Mountain alpine fir), as well as their hybrids, as recognized by VASCAN.

Pseudotsuga menziesii here refers to variety *glauca* (Rocky Mountain Douglas-fir).

Pinus contorta here refers to variety *latifolia* (lodgepole pine).

“Montane” vegetation occurs in mountainous terrain below the elevational treeline. The term “subalpine” is applied to the transitional band between the treed “montane” and the non-treed “alpine” elevational zones. The vegetation of M020 occurs at mid- to high elevations in the mountains of the North American Western Cordillera, including forests and woodlands of “mid-montane”, “high montane” and “subalpine” vegetation zones. Often, lower elevations in this mountainous region are dominated by vegetation that is described in M501 [Central Rocky Mountain Dry Lower Montane – Foothill Forest] or M500 [Central Rocky Mountain Mesic Lower Montane Forest]; these are termed “lower montane” forests and woodlands by the CNVC. Although valleys and lower slopes in some mountainous areas are occupied by vegetation of M020, we employ these terms to describe the typical elevational sequence of vegetation in the Canadian Western Cordillera.



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Rocky Mountain Subalpine – High Montane Forest

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Source Information

Number of Source Plots for M020: 5225 (Canadian National Vegetation Classification. 2015. CNVC Master Database [VPro13/MSAccess 2010 format]. Natural Resources Canada, Sault Ste. Marie, ON.; BECMaster ecosystem plot database [VPro13/MSAccess 2010 format]).

Information Sources (data):

Alberta Environment and Parks. 2014. Ecological Site Information System (ESIS). Govt. AB, Edmonton, AB. (739 plots)

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Concept Authors: D. Meidinger, W. MacKenzie, K. Baldwin, USNVC

Description Authors: D. Meidinger and K. Baldwin

Date of Concept: April, 2015

Date of Description: July, 2017

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The information contained in this factsheet is based on data and expert knowledge that is current to the date of description. As new information becomes available, the factsheet will be updated.

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Rocky Mountain Subalpine – High Montane Forest

Macrogroup M020

Forêts subalpines et des montagnes de haute altitude des Rocheuses

Comparison of Vegetation Characteristics for Rocky Mountain Forest Macrogroups

Lifeform	Species Name	n=2509	n=2627	n=1821	n=5225	Species Common Name
		M500 Mesic Low Montane	M501 Dry Low Montane	M890 Subboreal	M020 Subalpine	
Tree	<i>Tsuga heterophylla</i>	■■■■■				western hemlock
	<i>Thuja plicata</i>	■■■■■				western red cedar
	<i>Pinus ponderosa</i>		****			ponderosa pine
	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>	■■■■■	■■■■■	****		Rocky Mountain Douglas-fir
	<i>Pinus contorta</i> var. <i>latifolia</i>	****	■■■■■	■■■■■	■■■■■	lodgepole pine
	<i>Picea engelmannii</i> x <i>glauca</i>	■■■■■	****	■■■■■	****	interior spruce
	<i>Abies lasiocarpa</i>	■■■■■		■■■■■	■■■■■	subalpine fir
	<i>Picea engelmannii</i>				■■■■■	Engelmann spruce
Shrub	<i>Vaccinium ovalifolium</i>	■■■				oval-leaved blueberry
	<i>Acer glabrum</i>	■■■	***			Rocky Mountain maple
	<i>Paxistima myrsinites</i>	■■■	■■■			falsebox
	<i>Berberis aquifolium</i>		■■			holly-leaved barberry
	<i>Symphoricarpos albus</i>		■■■			thin-leaved snowberry
	<i>Shepherdia canadensis</i>		■■■	■■■		soapberry
	<i>Spiraea lucida</i>	**	■■■	■■		shiny-leaved meadowsweet
	<i>Rosa acicularis</i>		■■	■■		prickly rose
	<i>Lonicera involucrata</i>			■■■		bracted honeysuckle
	<i>Vaccinium membranaceum</i>	■■■		■■■	■■■■■	mountain huckleberry
	<i>Rhododendron albiflorum</i>				■■■■■	white-flowered rhododendron
	<i>Menziesia ferruginea</i>	***			****	false azalea
Herb/ Dwarf Shrub	<i>Athyrium filix-femina</i>	***				common lady fern
	<i>Gymnocarpium dryopteris</i>	■■■■■		****	****	common oak fern
	<i>Tiarella trifoliata</i>	■■■		***	■■■■■	three-leaved foamflower
	<i>Clintonia uniflora</i>	■■■		■■	***	single-flowered clintonia
	<i>Orthilia secunda</i>	■■	*	■	■■	one-sided wintergreen
	<i>Linnaea borealis</i>	■■■	■■■■■	■■■■■	■■■■■	twinflower
	<i>Calamagrostis rubescens</i>		■■■■■	■■■■■		pine reedgrass
	<i>Eurybia conspicua</i>		■■■■■	■■		western showy aster
	<i>Fragaria virginiana</i>		■	■		wild strawberry
	<i>Arnica cordifolia</i>		***	■■	■■■■■	heart-leaved arnica
	<i>Rubus pubescens</i>			■■		dwarf raspberry
	<i>Vaccinium caespitosum</i>			■■		dwarf bilberry
	<i>Pyrola chlorantha</i>			■		green-flowered pyrola
	<i>Chamerion angustifolium</i>			■		fireweed
	<i>Cornus canadensis</i>	■■■		■■■	■■■■■	bunchberry
	<i>Rubus pedatus</i>	■■■		■■■	■■■■■	five-leaved dwarf bramble
	<i>Valeriana sitchensis</i>				■■■■■	Sitka valerian
	<i>Vaccinium scoparium</i>				■■■■■	grouseberry
	<i>Arnica latifolia</i>				***	broad-leaved arnica
	<i>Veratrum viride</i>				**	green false hellebore
Moss/ Lichen	<i>Rhytidiopsis robusta</i>	■■■■■			***	pipecleaner moss
	<i>Hylocomium splendens</i>	■■■■■	***	■■■■■	***	stairstep moss
	<i>Dicranum</i> spp.	■■■	■■■	■■■	■■■■■	broom mosses
	<i>Pleurozium schreberi</i>	■■■■■	■■■■■	■■■■■	■■■■■	red-stemmed feathermoss
	<i>Ptilium crista-castrensis</i>	■■■■■		■■■■■	***	knight's plume moss
	<i>Brachythecium</i> spp.	■■■	■■■	***	■■■■■	ragged mosses
	<i>Barbilophozia lycopodioides</i>				■■■■■	greater pawwort

Legend

Constancy:
Black bar >= 50%
Grey bar >= 30%
Asterisk >= 20%

Cover:
5 bars >= 25%
4 bars >= 10%
3 bars >= 3%
2 bars >= 1%
1 bar < 1%



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Rocky Mountain Subalpine – High Montane Forest

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Forêts subalpines et des montagnes de haute altitude des Rocheuses

Comparison of Vegetation Characteristics for Macrogroup Subtypes in M020

Lifeform	Species Names	n=972	n=1464	n=2789	Species Common Name
		CM020a Dry Mid-Montane	CM020b Dry Subalpine	CM020c Humid Subalpine	
	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>	■ ■ ■ ■			Rocky Mountain Douglas-fir
	<i>Picea engelmannii</i> x <i>glauca</i>	■ ■ ■ ■			interior spruce
	<i>Pinus contorta</i> var. <i>latifolia</i>	■ ■ ■ ■	■ ■ ■ ■	****	lodgepole pine
	<i>Abies lasiocarpa</i>	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	subalpine fir
	<i>Picea engelmannii</i>	****	■ ■ ■ ■	■ ■ ■ ■	Engelmann spruce
Shrub	<i>Amelanchier alnifolia</i>	**			saskatoon
	<i>Paxistima myrsinites</i>	■ ■ ■ ■			falsebox
	<i>Rosa acicularis</i>	■ ■			prickly rose
	<i>Spiraea lucida</i>	■ ■			shiny-leaved meadowsweet
	<i>Shepherdia canadensis</i>	■ ■ ■ ■			soapberry
	<i>Lonicera involucrata</i>	■ ■	**		bracted honeysuckle
	<i>Juniperus communis</i>	■ ■ ■ ■	***		common juniper
	<i>Lonicera utahensis</i>	■ ■	**		Utah honeysuckle
	<i>Ribes lacustre</i>	■ ■ ■ ■	**	■ ■	bristly black currant
	<i>Vaccinium membranaceum</i>	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	mountain huckleberry
	<i>Rhododendron albiflorum</i>		■ ■ ■ ■	■ ■ ■ ■	white-flowered rhododendron
	<i>Menziesia ferruginea</i>		****	■ ■ ■ ■	false azalea
<i>Vaccinium ovalifolium</i>			***	oval-leaved blueberry	
Herb/ Dwarf Shrub	<i>Thalictrum occidentale</i>	**			western meadow-rue
	<i>Osmorhiza berteroi</i>	*			mountain sweet cicely
	<i>Chimaphila umbellata</i>	**			common pipsissewa
	<i>Eurybia conspicua</i>	***			western showy aster
	<i>Arctostaphylos uva-ursi</i>	***			common bearberry
	<i>Goodyera oblongifolia</i>	■			Menzies' rattlesnake-plantain
	<i>Calamagrostis rubescens</i>	■ ■ ■ ■			pine reedgrass
	<i>Fragaria virginiana</i>	■ ■	**		wild strawberry
	<i>Linnaea borealis</i>	■ ■ ■ ■	***	***	twinflower
	<i>Vaccinium scoparium</i>	■ ■ ■ ■	■ ■ ■ ■		grouseberry
	<i>Arnica cordifolia</i>	■ ■ ■ ■	■ ■ ■ ■	***	heart-leaved arnica
	<i>Valeriana sitchensis</i>		■ ■ ■ ■	■ ■ ■ ■	Sitka valerian
	<i>Rubus pedatus</i>	***	***	■ ■ ■ ■	five-leaved dwarf bramble
	<i>Arnica latifolia</i>		***	***	broad-leaved arnica
	<i>Tiarella trifoliata</i>		***	■ ■ ■ ■	three-leaved foamflower
	<i>Veratrum viride</i>			■ ■	green false hellebore
<i>Gymnocarpium dryopteris</i>			■ ■ ■ ■	common oak fern	
<i>Streptopus lanceolatus</i>			***	rose twisted-stalk	
Moss/Lichen	<i>Peltigera aphthosa</i>	■ ■	■ ■	**	common freckle pelt lichen
	<i>Pleurozium schreberi</i>	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	red-stemmed feathermoss
	<i>Cladonia</i> spp.	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	clad and reindeer lichens
	<i>Barbilophozia lycopodioides</i>		***	■ ■ ■ ■	greater pawwort
	<i>Rhytidiopsis robusta</i>		***	***	pipecleaner moss

Legend

Constancy:	Black bar >= 50%	Cover:	5 bars >= 25%	2 bars >= 1%
	Grey bar >= 30%		4 bars >= 10%	1 bar < 1%
	Asterisk >= 20%		3 bars >= 3%	