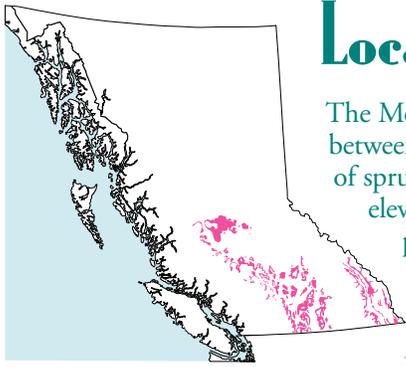


The Ecology of the Montane Spruce Zone

The Montane Spruce Zone occupies a narrow, mid-elevation band in the mountains and plateaus of the dry southern interior of British Columbia. Although the zone is mostly forested, in some areas it contains numerous lakes, wetlands, and meadows. The zone's extensive lodgepole pine forests are an important economic resource, and its climate of cool, dry summers and cold winters makes it a popular area for recreational activities such as hunting, camping, fishing, skiing, and hiking.





Location

The Montane Spruce Zone lies nestled between the high-elevation subalpine forests of spruce and subalpine fir and the lower-elevation forests of Douglas-fir or lodgepole pine in the province's dry southern interior. The zone normally occupies a relatively narrow elevational band of about 300–400 m.

In some areas, though, the zone is rather widespread because the prevailing elevation of the plateaus is in this elevational band. In wetter climatic areas, it occurs at elevations of about 1100–1500 m, and in drier areas at about 1250–1650 m.

The Montane Spruce Zone extends from the Fraser Plateau south to northern Washington, Idaho, and Montana, and east to Alberta.

It occurs on the broad, rising plateau that surrounds the Itcha and Ilgachuz mountains, the Southern Interior Plateau in the Fraser, Thompson, and Okanagan areas, on the lee side of the Coast and Cascade mountains, and in the southern Rocky Mountains and the Rocky Mountain Trench.



Yohetta Valley with Montane Spruce Zone in the valley and Engelmann Spruce–Subalpine Fir and Alpine Tundra zones at higher elevations

Ordeil Steen

Climate

The climate of the Montane Spruce Zone is generally cool, with cold winters and short, dry summers. The climate is largely the result of the zone's high elevations and its location in the strong rainshadow of the Coast and Selkirk mountains. The average temperature gets above 10°C for only 2–4 months of the year. For 5 months of the year, average temperatures stay below 0°C, and night-time below-freezing temperatures are possible, even during the growing season. Precipitation is relatively low. It varies between 300 and 900 mm a year, much of it as snow in the winter. The snowpack usually averages between 60 and 100 cm. May and June are often the wettest months of the growing season; however, summers tend to be dry, and lack of moisture in the growing season can be a problem in some areas. The extended period of drought in summer often leads to large, stand-destroying fires such as those that occurred in 1998.

California bighorn sheep
Ovis canadensis californiana

cover photo: Bill Swan



MoF



Frosted rose leaves

Bill Swan

Ecology

The unique combination of species that characterizes the Montane Spruce Zone reflects its transitional nature. The zone has floristic affinities to the zones that occur above and below it. Canopy species such as subalpine fir and understory species such as grouseberry, black huckleberry, and Utah honeysuckle indicate the Montane Spruce Zone's connection with the Engelmann Spruce–Subalpine Fir Zone, while the occurrence of Douglas-fir, pinegrass, and soapberry reflects its close association with the Interior Douglas-fir and Sub-Boreal Pine–Spruce zones.

The spruce of the Montane Spruce Zone forests also reflects the zone's transitional nature—it is a hybrid between the characteristically high-elevation Engelmann spruce and the lower-elevation, more northerly white spruce.

One of the most distinctive features of this zone is the presence of extensive seral stands of lodgepole pine. These forests dominate the Montane Spruce landscape, and most stands display the even-aged, even-sized canopies that follow wildfires. Frequent stand-replacing fires have had a pervasive influence on this zone. This was especially apparent in southeastern British Columbia in 1985 and in south-central British Columbia in 1998, when mushroom-shaped smoke plumes climbed 5000 m into the sky from fires centred on the Montane Spruce Zone.



Lac Le Jeune, Kamloops—central part of the zone—lodgepole pine, Douglas-fir, and pinegrass

MoF



Gilnockie Creek—southeast part of the zone—western larch, lodgepole pine, and grouseberry

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Subalpine fir and hybrid white spruce commonly occur beneath the canopy of lodgepole pine forests in areas where the ground remains moist enough to support their regeneration. Subalpine fir and hybrid white spruce are the main climax tree species in the zone, but they rarely dominate because of the frequent stand-replacing fires and the inability of these species to regenerate successfully in large openings. They are relatively infrequent as major components of the overstorey, except in riparian areas and on cooler aspects. In wetter climatic areas and on wet sites that receive subsurface seepage, maturing stands contain a mix of lodgepole pine, hybrid white spruce, and subalpine fir.

Douglas-fir, western larch, western redcedar, trembling aspen, and black cottonwood occur in parts of the southern two-thirds of the zone. Trembling aspen is a seral species on many sites. Western redcedar is found in the wetter parts of the zone and black cottonwood occurs on some riparian sites. Douglas-fir is both an important seral species and an occasional climax species on steep southern slopes. Western larch, which can be found only in the eastern part of

the zone, is often a seral species that establishes after a fire. Both Douglas-fir and western larch develop fire-resistant bark with age. As a consequence, these species often survive forest fires and years later tower over younger regenerating stands surrounding these old veterans.



F. Boas
Sitka alder
Alnus crispa ssp. sinuata

Grouseberry, pinegrass, heart-leaved arnica, and feathermosses are common to abundant in the understorey in this zone. Other characteristic understorey species are Utah honeysuckle, black huckleberry, Sitka alder, crowberry, twinflower, one-sided wintergreen, rattlesnake-plantain, bunchberry, falsebox, and prince's pine.



R. Love
Heart-leaved arnica
Arnica cordifolia



Ordell Steen
Chilcotin Plateau—northern part of the zone—lodgepole pine, spruce, and feathermosses



Bill Swan
Trembling aspen
Populus tremuloides

Grassland ecosystems are uncommon in the Montane Spruce Zone. Grasslands occur only on warm, dry sites such as south-facing upper slopes and the drier ridges. Wetlands occur quite frequently in the rolling plateau country of the Okanagan Highlands and the Thompson and Fraser plateaus. They are less frequent in the Montane Spruce portions of the Rocky and Purcell mountains and the leeward slopes of the Coast Range.

The most common type of wetland is the fen, where the vegetation consists of willows, sedges, and glow moss. Sedges, Labrador tea, and sphagnum dominate areas that are poorly drained and have poor nutrient conditions.



Wetlands are found mostly in rolling terrain



F. Boas
Bunchberry
Cornus canadensis

Bugs and Fire

Lodgepole pine, the mountain pine beetle, and wildfire have formed an interesting relationship in much of this zone. When lodgepole pines are old and large enough, and present in adequate numbers,



Ordell Steen

mountain pine beetle kills only the larger trees, the remaining intermediate and smaller living trees continue to provide a seed source. The frequency of fire affects cone serotiny—the more often wildfire visits a particular landscape, the more likely

they represent a prime food source for the mountain pine beetle. Following an extensive beetle outbreak, many dead lodgepole pines will be left standing or lying on the forest floor. This accumulation of large fuels sets the stage for a wildfire, which may occur soon after the trees die or decades later.

that pine cones will be serotinous. Where fire is less common, cones are non-serotinous and can open without fire.

This beetle-kill/fuel-buildup/wildfire relationship results in replacement stands that favour lodgepole pine and not other conifers such as Engelmann spruce and subalpine fir. Lodgepole pine is usually an early seral “pioneer” species that capitalizes on its aggressive ability to occupy burned areas and maintain dominance in the landscape.

Where extensive wildfires occur, post-fire regeneration of lodgepole pine forms even-aged forests that will again become susceptible to the mountain pine beetle in about 80 years. So, whether the beetles precede the wildfire or the wildfire precedes the beetles, the two are intimately linked.

Lodgepole pine will regenerate after a wildfire thanks to its serotinous cones, which are sealed by a resin bond that breaks open in the heat of a fire. After a fire, the opened cones release seeds into the burned area. Because the



Mountain pine beetle
Dendroctonus ponderosae

Canadian Forest Service



Bill Swan

Beetle-killed pine stands—Kootenay River valley

Wildlife

Many of the wildlife species that occur in the Montane Spruce Zone have adapted to the zone’s fire regime, often taking advantage of the beetle-killed lodgepole pine or the young shrub- or herb-dominated plant communities that occupy burned lands for 10–20 years after a disturbance.

Wildlife that live in this zone must be able either to survive or to avoid the deep winter snows. Except for caribou and occasionally moose, most ungulates migrate to lower elevations to escape the deep snow. At other times in the year, moose and mule deer find summer and fall range in the wetter forests, clearings,

or wetlands.

The dense undergrowth of regenerating spruce and subalpine fir also provides good protection for these

ungulates. Caribou find winter habitat in the western Chilcotin parts of the zone, where the lichen cover on the floors of the dry lodgepole pine forests provide a substantial source of food.

Birds such as the Three-toed Woodpecker, Black-backed Woodpecker, and Pine Grosbeak inhabit the pine forests where they feed on insects that live in the bark of pine trees. Mature forests of hybrid white spruce and subalpine fir provide food and cover for moose and mule deer as well as for a variety of birds and fur-bearing mammals. Examples include fisher, marten, porcupine, Great Gray Owl, Red Crossbill, red squirrel, and southern red-backed vole.



Jared Hobbs

Pine Grosbeak
Pinicola enucleator



Jared Hobbs

Great Gray Owl
Strix nebulosa



Ken Bowen

Common pika
Ochotona princeps

Rocky cliffs and warm, dry grassland areas such as steep, south-facing slopes provide forage for California and Rocky Mountain bighorn sheep, mule deer, mountain goat, golden-mantled ground squirrel, Golden Eagle, and Mountain Bluebird. Avalanche tracks are uncommon in the Montane Spruce Zone; however,

where they occur, the dense, fresh vegetation can provide lush forage for grizzly bear, black bear, and Rocky Mountain elk. Common pika and ground squirrel often make their dens where there are talus slopes.

In the less mountainous areas, the Montane Spruce Zone contains some of the most extensive wetland complexes in the southern interior. These wetlands provide important summer habitat for a variety of animals,

including waterbirds and amphibians. Because the wetlands are islands of moisture in an otherwise dry forest environment, moose and mule deer often choose them as places to rear their young. The food in fast-moving streams attracts the American Dipper and Harlequin Duck, and amphibians such as spotted frog, western toad, and long-toed salamander inhabit the areas around ponds and streams.



Ken Bowen

Black bear
Ursus americanus



Ken Bowen

Porcupine
Erethizon dorsatum

Resources

Timber harvesting is an important economic activity in the Montane Spruce Zone. Sawlogs and pulpwood from this zone constitute a substantial source of fibre in the dry southern interior. During the 1980s, in the southern part of the zone, much of the harvesting concentrated on salvaging trees killed by the mountain pine beetle.

The main agricultural activity in this zone is grazing, both on forage provided by reseeding after logging and in wetlands. Seeded cutblocks, landings, and road rights-of-way represent a significant and important new source of forage for cattle.

Some fur harvesting takes place here, and recreation use is important. Many valuable fishing, camping, and hunting areas are located here. Other popular activities include hiking and horseback riding in summer and cross-country skiing and snowmobiling in winter.

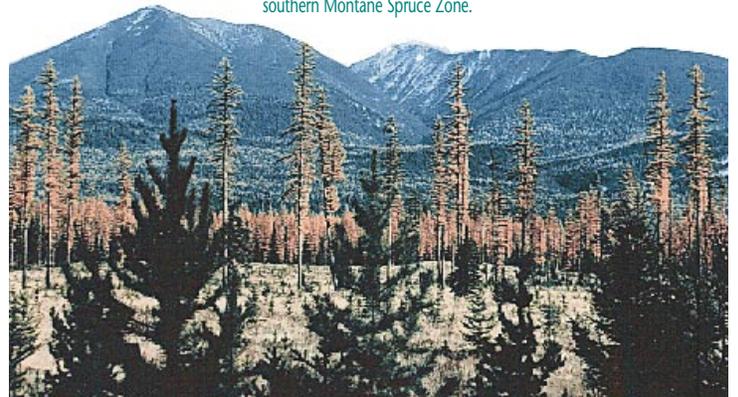
Because the Montane Spruce Zone occupies many areas of rolling plateaus, it contains numerous lakes which provide good fishing as well as hunting for wildlife species that depend on wetlands for their habitat. Moose, for example, have expanded from more northerly latitudes into the Montane Spruce Zone because of the presence of myriad wetlands and riparian areas containing high concentrations of key food species.



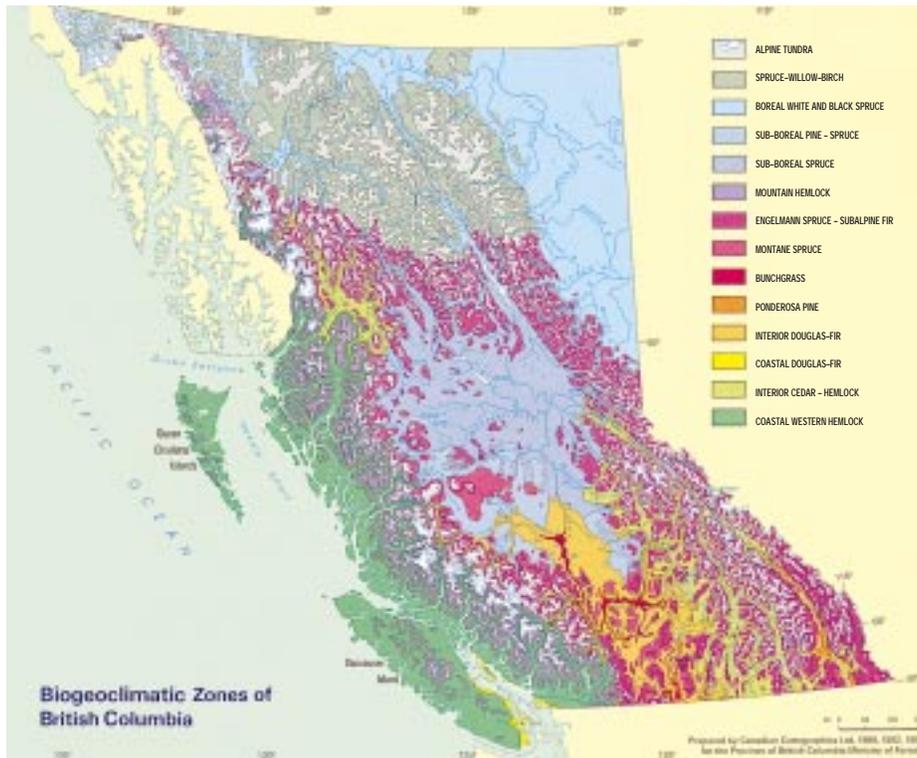
Whiteswan Lake, Rocky Mountains near Invermere

Tom Braumandl

A larch seed-tree cut—a common silviculture system in the southern Montane Spruce Zone.



Tom Braumandl



The Montane Spruce Zone is one of fourteen 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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Detail on British Columbia's Biogeoclimatic Zones
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