

TABLE 4. Climatic characteristics for the biogeoclimatic zones of British Columbia

| Zone | Range and reference station | Lat. (°′) | Long. (°′) | Elevation (m) | Mean annual precip. (mm) | Mean summer precip. (May-Sept) (mm) | Mean precip. of driest month (mm) | Mean precip. of wettest month (mm) | Driest month | Wettest month |
|------|-----------------------------|-----------|------------|---------------|--------------------------|-------------------------------------|-----------------------------------|------------------------------------|--------------|---------------|
| AT | Old Glory Mtn. | 49 09 | 117 55 | 2347 | 755.5 | 287.0 | 40.0 | 84.1 | Jul | Dec |
| BG | Max | | | 588 | 335.7 | 174.5 | 17.3 | 55.4 | | |
| | Min | | | 297 | 205.6 | 98.0 | 8.0 | 27.3 | | |
| | Kamloops | 50 40 | 120 20 | 379 | 241.7 | 111.4 | 8.0 | 36.1 | Mar | Jan |
| BWBS | Max | | | 840 | 503.7 | 305.3 | 24.3 | 879.0 | | |
| | Min | | | 382 | 327.1 | 144.7 | 8.3 | 41.1 | | |
| | Fort Nelson A | 58 50 | 122 35 | 382 | 451.8 | 297.9 | 16.7 | 84.3 | Apr | Jul |
| CDF | Max | | | 223 | 1262.6 | 238.3 | 38.6 | 232.9 | | |
| | Min | | | 8 | 647.2 | 107.3 | 13.4 | 119.2 | | |
| | Victoria Int'l A | 48 39 | 123 26 | 19 | 872.9 | 141.9 | 18.1 | 157.3 | Jul | Dec |
| CWH | Max | | | 671 | 4386.8 | 1162.0 | 151.0 | 625.4 | | |
| | Min | | | 0 | 990.2 | 159.3 | 16.8 | 145.7 | | |
| | Haney UBC RF Admin | 49 16 | 122 34 | 143 | 2140.1 | 467.8 | 65.5 | 331.7 | Jul | Dec |
| ESSF | Max | | | 1862 | 1995.4 | 424.5 | 64.8 | 297.4 | | |
| | Min | | | 863 | 514.1 | 204.6 | 26.6 | 57.4 | | |
| | Boss Mountain | 52 06 | 120 53 | 1532 | 1177.1 | 401.6 | 63.5 | 140.6 | May | Dec |
| ICH | Max | | | 1085 | 1419.0 | 439.3 | 57.2 | 224.3 | | |
| | Min | | | 314 | 497.7 | 199.9 | 21.4 | 57.8 | | |
| | Revelstoke | 51 00 | 118 12 | 456 | 1063.7 | 325.0 | 51.4 | 177.0 | Apr | Jan |
| IDF | Max | | | 1128 | 1198.9 | 290.7 | 37.6 | 208.8 | | |
| | Min | | | 122 | 295.1 | 107.5 | 13.5 | 34.8 | | |
| | 150 Mile House | 52 07 | 121 56 | 738 | 414.2 | 214.0 | 15.8 | 60.7 | Apr | Jun |
| MH | Hollyburn Ridge | 49 23 | 123 12 | 930 | 2954.3 | 694.4 | 106.9 | 434.8 | Jul | Dec |
| MS | Max | | | 1554 | 663.8 | 252.1 | 38.5 | 108.1 | | |
| | Min | | | 1128 | 380.8 | 158.2 | 17.9 | 45.2 | | |
| | Peachland Brenda Mines | 49 52 | 120 00 | 1520 | 638.3 | 197.0 | 29.3 | 89.1 | Apr | Dec |
| PP | Max | | | 939 | 604.5 | 270.3 | 30.7 | 77.6 | | |
| | Min | | | 244 | 319.5 | 86.3 | 11.0 | 34.5 | | |
| | Kelowna | 49 54 | 119 28 | 354 | 332.2 | 136.3 | 15.3 | 45.1 | Apr | Dec |
| SBPS | Max | | | 1219 | 517.8 | 299.8 | 21.1 | 86.5 | | |
| | Min | | | 914 | 464.1 | 242.6 | 20.8 | 36.4 | | |
| | Alexis Creek Tautri Creek | 52 33 | 123 11 | 1219 | 464.1 | 242.6 | 20.8 | 57.6 | Apr | Jun |
| SBS | Max | | | 1245 | 1588.2 | 352.6 | 36.8 | 278.7 | | |
| | Min | | | 488 | 438.9 | 188.9 | 15.2 | 49.8 | | |
| | Prince George A | 53 63 | 122 40 | 676 | 628.3 | 300.8 | 27.4 | 68.2 | Apr | Aug |
| SWB | Cassiar | 59 17 | 129 50 | 1078 | 699.5 | 275.1 | 25.7 | 84.2 | Apr | Oct |

Zone key

| | | | |
|------|----------------------------------|------|--------------------------|
| AT | Alpine Tundra | IDF | Interior Douglas-fir |
| BG | Bunchgrass | MH | Mountain Hemlock |
| BWBS | Boreal White and Black Spruce | MS | Montane Spruce |
| CDF | Coastal Douglas-fir | PP | Ponderosa Pine |
| CWH | Coastal Western Hemlock | SBPS | Sub-Boreal Pine — Spruce |
| ESSF | Engelmann Spruce — Subalpine Fir | SBS | Sub-Boreal Spruce |
| ICH | Interior Cedar — Hemlock | SWB | Spruce — Willow — Birch |

TABLE 5. Occurrence^a of trees in the biogeoclimatic zones of British Columbia

| Gymnosperms | BG | PP | IDF | ICH | MS | SBPS | SBS | BWBS | SWB | MH | CDF | CWH | ESSF | AT ^b |
|---|-----|-----|-----|-----|-----|------|-----|------|-----|-----|-----|-----|------|-----------------|
| <i>Abies amabilis</i> (amabilis fir) | - | - | - | + | - | - | - | - | - | +++ | - | +++ | (+) | - |
| <i>A. grandis</i> (grand fir) | - | - | ++ | ++ | + | - | - | - | - | - | ++ | + | - | - |
| <i>A. lasiocarpa</i> (subalpine fir) | - | - | - | ++ | +++ | (+) | +++ | ++ | +++ | ++ | - | + | +++ | - |
| <i>Chamaecyparis</i> <i>nootkatensis</i> (yellow-cedar) | - | - | - | - | - | - | - | - | - | +++ | - | ++ | (+) | - |
| <i>Juniperus scopulorum</i> (Rocky Mountain juniper) | + | + | ++ | - | - | - | + | (+) | - | - | ++ | (+) | - | - |
| <i>Larix laricina</i> (tamarack) | - | - | - | - | - | - | (+) | ++ | - | - | - | - | - | - |
| <i>L. lyallii</i> (alpine larch) | - | - | - | - | - | - | - | - | - | - | - | - | ++ | - |
| <i>L. occidentalis</i> (western larch) | - | + | +++ | ++ | +++ | - | - | - | - | - | - | - | + | - |
| <i>Picea engelmannii</i> (Engelmann spruce) | - | - | + | ++ | +++ | - | - | - | - | + | - | - | +++ | - |
| <i>P. engelmannii</i> <i>x glauca</i> (hybrid white spruce) | - | (+) | ++ | ++ | +++ | + | +++ | - | - | - | - | - | ++ | - |
| <i>P. glauca</i> (white spruce) | - | (+) | + | - | + | +++ | ++ | +++ | +++ | - | - | - | + | - |
| <i>P. glauca</i> <i>x sitchensis</i> (Roche spruce) | - | - | - | ++ | - | - | - | - | - | (+) | - | ++ | - | - |
| <i>P. mariana</i> (black spruce) | - | - | - | + | - | - | ++ | +++ | + | - | - | - | - | - |
| <i>P. sitchensis</i> (Sitka spruce) | - | - | - | - | - | - | - | - | - | + | + | +++ | - | - |
| <i>Pinus albicaulis</i> (whitebark pine) | - | - | - | - | - | - | - | - | - | + | - | - | ++ | - |
| <i>P. banksiana</i> (jack pine) | - | - | - | - | - | - | - | (+) | - | - | - | - | - | - |
| <i>P. contorta</i> (lodgepole pine) | (+) | - | +++ | ++ | +++ | +++ | +++ | +++ | ++ | + | ++ | ++ | +++ | - |
| <i>P. flexilis</i> (limber pine) | - | - | (+) | - | - | - | - | - | - | - | - | - | (+) | - |
| <i>P. monticola</i> (western white pine) | - | - | + | ++ | + | - | - | - | - | + | + | ++ | + | - |
| <i>P. ponderosa</i> (ponderosa pine) | + | +++ | +++ | + | - | - | - | - | - | - | - | - | - | - |
| <i>Pseudotsuga menziesii</i> (Douglas-fir) | + | ++ | +++ | ++ | +++ | + | ++ | - | - | (+) | +++ | +++ | + | - |
| <i>Taxus brevifolia</i> (western yew) | - | - | + | ++ | - | - | - | - | - | - | ++ | ++ | - | - |
| <i>Thuja plicata</i> (western redcedar) | - | (+) | ++ | +++ | + | - | + | - | - | + | ++ | +++ | + | - |
| <i>Tsuga heterophylla</i> (western hemlock) | - | - | + | +++ | + | - | (+) | - | - | ++ | + | +++ | + | - |
| <i>T. mertensiana</i> (mountain hemlock) | - | - | - | + | - | - | - | - | - | +++ | - | + | ++ | - |

TABLE 5. Continued

| Angiosperms | BG | PP | IDF | ICH | MS | SBPS | SBS | BWBS | SWB | MH | CDF | CWH | ESSF | AT ^b |
|--|----|----|----------------|-----------------|----|------|----------------|------|-----|----|-----|-----|------|-----------------|
| <i>Acer macrophyllum</i> (bigleaf maple) | - | - | + | - | - | - | - | - | - | - | ++ | ++ | - | - |
| <i>Alnus rubra</i> (red alder) | - | - | - | - | - | - | - | - | - | - | +++ | +++ | - | - |
| <i>Arbutus menziesii</i> (arbutus) | - | - | - | - | - | - | - | - | - | - | ++ | + | - | - |
| <i>Betula neoalaskana</i> (Alaska paper birch) | - | - | - | - | - | - | - | ++ | - | - | - | - | - | - |
| <i>B. occidentalis</i> (water birch) | + | + | + | (+) | - | - | (+) | + | - | - | - | - | - | - |
| <i>B. papyrifera</i> (paper birch) | + | + | ++ | ++ | + | - | ++ | ++ | - | - | + | + | - | - |
| <i>Cornus nuttallii</i> (western flowering dogwood) | - | - | + | - | - | - | - | - | - | - | ++ | ++ | - | - |
| <i>Populus balsamifera</i> ssp. <i>balsamifera</i> (balsam poplar) | - | - | - | - | - | - | + | ++ | + | - | - | - | - | - |
| <i>P. balsamifera</i> ssp. <i>trichocarpa</i> (black cottonwood) | + | + | + | ++ | + | + | ++ | + | - | - | ++ | ++ | + | - |
| <i>P. tremuloides</i> (trembling aspen) | + | ++ | +++ | ++ | ++ | + | +++ | +++ | + | - | + | + | + | - |
| <i>Prunus emarginata</i> (bitter cherry) | - | - | + ^c | ++ ^c | - | - | + ^c | - | - | - | ++ | + | - | - |
| <i>Quercus garryana</i> (Garry oak) | - | - | - | - | - | - | - | - | - | - | ++ | (+) | - | - |
| <i>Rhamnus purshiana</i> (cascara) | - | - | - | ++ ^d | - | - | - | - | - | - | ++ | + | - | - |

^a Occurrence classes: +++(abundant); ++(common); +(present but uncommon); (+)(very rare); -(absent).

^b Tree species occur only in krummholz form in the Alpine Tundra zone.

^c *P. emarginata* occurs in these zones, but only rarely as a (small) tree.

^d Rarely as a small tree.

Chapter 12: Montane Spruce Zone

by

G.D. Hope, W.R. Mitchell, D.A. Lloyd, W.L. Harper, and B.M. Wikeem

| | |
|--|-----|
| LOCATION AND DISTRIBUTION | 184 |
| ECOLOGICAL CONDITIONS | 184 |
| NOTES ON CLASSIFICATION | 186 |
| SUBZONES | 186 |
| SOME REPRESENTATIVE SITE ASSOCIATIONS | 187 |
| Hybrid spruce — Falsebox — Feathermoss | 187 |
| Lodgepole pine — Grouseberry — Pinegrass | 190 |
| Hybrid spruce — Gooseberry — Grouseberry | 190 |
| Hybrid spruce — Horsetail — Leafy moss | 191 |
| WILDLIFE HABITATS | 191 |
| RESOURCE VALUES | 193 |
| LITERATURE CITED | 194 |

LOCATION AND DISTRIBUTION

The Montane Spruce zone (MS) occurs in British Columbia at middle elevations between 53° and 49°N latitude (Figure 42). The zone extends from the northern limits of the Fraser Plateau to the U.S. border, specifically on: 1) the Southern Interior Plateau, 2) the lee side of the Coast and Cascade mountains, and 3) the southern Rocky Mountains and Rocky Mountain Trench. The MS also extends south into Washington, Idaho, and Montana. Elevations range from 1100 to 1500 m in wetter parts of the zone, and from 1250 to 1700 m in drier areas.

The MS is found elevationally above the Interior Douglas-fir (IDF) or Sub-Boreal Pine — Spruce (SBPS) zones, over most of their ranges, and below the Engelmann Spruce — Subalpine Fir zone (ESSF).

ECOLOGICAL CONDITIONS

The MS has a cool, continental climate characterized by cold winters and moderately short, warm summers (Figure 43). The climate of the zone is between that of the ESSF and the IDF (or SBPS). As well, it has similarities to that of the Sub-Boreal Spruce zone (Table 4). Mean annual temperature is 0.5-4.7°C. The average temperature is below 0°C for 5 months of the year and above 10°C for 2-4 months. Mean annual precipitation ranges from 380 to 900 mm; the growing season is sufficiently warm and dry that moisture deficits can occur, particularly in the drier subzones.

The MS was included in the ESSF of Krajina (1969). It has strong floristic affinities with the ESSF, such as climax stands of spruce and subalpine fir, and prominence of *Vaccinium membranaceum* (black huckleberry) in zonal ecosystems, as well as some affinity with the IDF as indicated by the abundance of *Calamagrostis rubescens* (pinegrass), *Paxistima myrsinites* (falsebox), and occasionally Douglas-fir in zonal ecosystems. However, the MS lacks many species characteristic of the IDF and ESSF. Thus, even though the MS is characterized as a transitional zone, it does have its own unique combination of species because of its intermediate nature. Hybrid white spruce is common, rather than Engelmann spruce. Characteristic understory species are *Lonicera utahensis* (Utah honeysuckle) and *Vaccinium scoparium* (grouseberry), in addition to those listed above.

One of the most distinctive features of the MS landscape is the extensive, young and maturing seral stands of lodgepole pine that have formed following wildfire. In wetter subzones, and on wet sites in all areas, maturing seral stands contain mixtures of lodgepole pine, hybrid white spruce, and subalpine fir. Hybrid white spruce and subalpine fir are the dominant, shade-tolerant, climax trees; however, lodgepole pine's frost tolerance, resistance to drought, and serotinous cones all favour its establishment after fire. Under the lodgepole pine canopy, frost and surface drying are reduced, and hybrid white spruce and subalpine fir can regenerate.

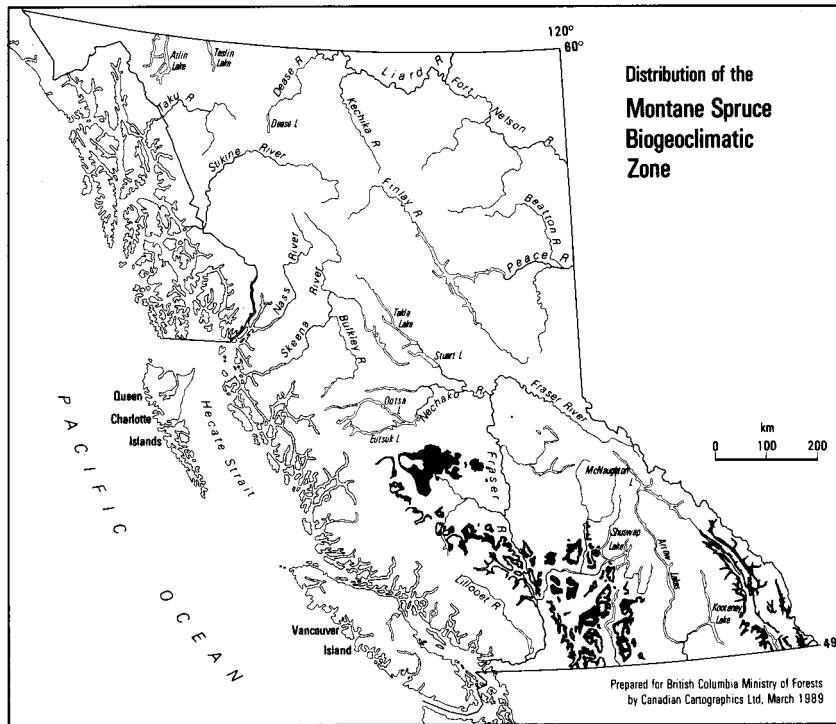


FIGURE 42. Montane Spruce zone.

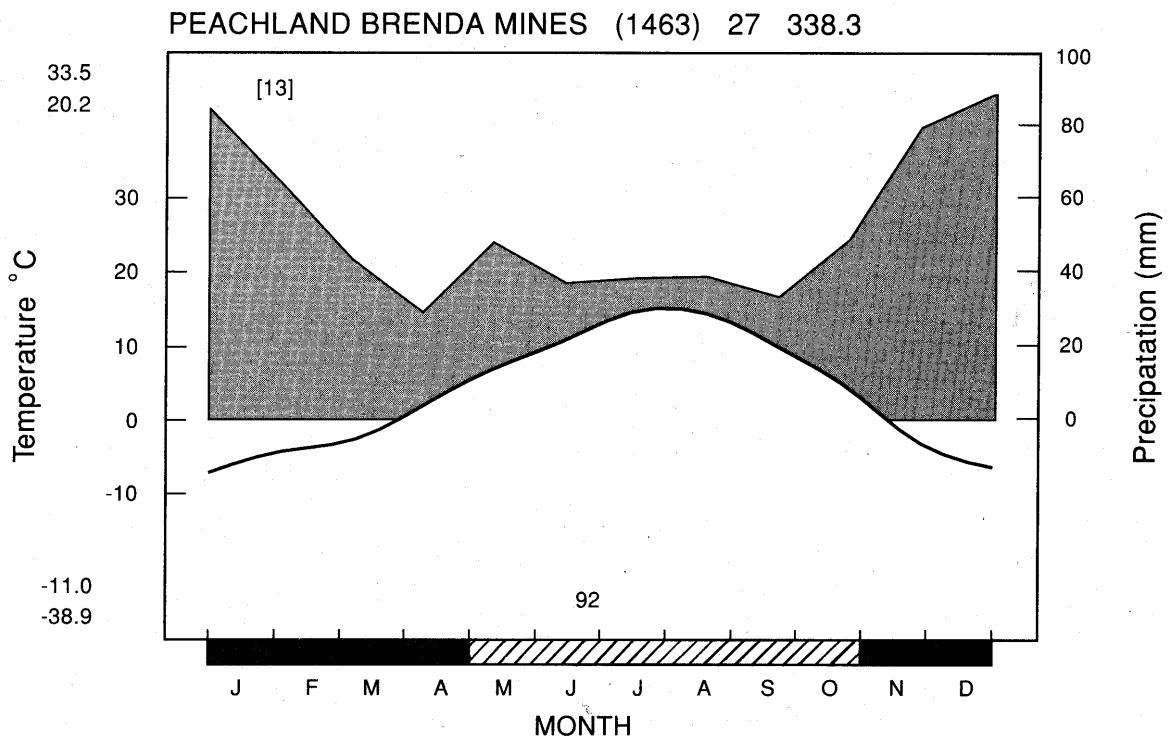


FIGURE 43. Representative climatic diagram for the Montane Spruce zone.

Douglas-fir is an important seral species in zonal ecosystems, and is a climax species on warm, south-facing slopes in the driest ecosystems. Western larch is confined to the eastern part of the zone, where it frequently occurs as a seral species after fire. Western redcedar occurs in the wetter parts of the zone, transitional to the Interior Cedar — Hemlock zone. Trembling aspen is a common seral species throughout the zone. Black cottonwood occurs on some wet sites.

On the extensive loamy to clayey morainal deposits (derived largely from volcanic bedrock), zonal and drier ecosystems have soils that are dominantly Brunisolic or Orthic Gray Luvisols and Eutric Brunisols. Humo-Ferric Podzols and Dystric Brunisols develop on coarser-textured deposits or in wetter parts of the zone. Humus forms in zonal ecosystems are commonly Hemimors and Hemihumimors, ranging from 3 to 10 cm in thickness.

Grassland ecosystems are uncommon in the MS, occurring only on south-facing upper slopes and ridges in the driest subzones. Vegetation on these sites is dominated by grasses such as *Agropyron spicatum* (bluebunch wheatgrass) and *Festuca idahoensis* (Idaho fescue).

In the mountainous topography typical of the MS, wetlands are uncommon. Where terrain is more subdued, wetlands occur more frequently. The most common wetland type consists of a fen community of *Salix* spp. (willows), *Carex* spp. (sedges), and *Aulacomnium palustre* (glow moss).

NOTES ON CLASSIFICATION

The Ministry of Forests has designated the MS as a new zone, previously included by Krajina (1969) as a southern, lower elevation part of the ESSF. The MS is closely related to several vegetation zones described by other authors in British Columbia (McLean 1970) and the adjacent U.S.A. (Franklin and Dyrness 1973; Pfister *et al.* 1977).

SUBZONES

Five subzones have been recognized in the MS (Table 25). *Vaccinium scoparium* and *Linnaea borealis* (twinline) are characteristic of all subzones except the MSdc (Figure 44). All subzones have lodgepole pine, hybrid white spruce, *Orthilia secunda* (one-sided wintergreen), and a moderate to high cover of *Pleurozium schreberi* (red-stemmed feathermoss). Common species include *Lonicera utahensis*, *Paxistima myrsinites*, *Vaccinium membranaceum*, *Goodyera oblongifolia* (rattlesnake-plantain), *Calamagrostis rubescens*, *Arnica cordifolia* (heart-leaved arnica), *Cornus canadensis* (bunchberry), and *Chimaphila umbellata* (prince's pine).

The two coldest MS subzones occur on the lee side of the Coast Mountains. The MSxv occurs at middle to upper elevations on the western Fraser Plateau and at middle elevations on the eastern slopes of the Coast Mountains. This subzone lacks many of the common species of other MS subzones and has several species not found

on zonal sites in the others, specifically *Juniperus communis* (common juniper), *Empetrum nigrum* (crowberry), and *Cladina* lichens. The MSdc subzone occurs northwest and west of Lillooet in the Coast Mountains. It is very species-poor on zonal ecosystems, relative to other subzones.

TABLE 25. Synopsis of subzones in the Montane Spruce zone (MS)

| Subzone | Code | Old code |
|-----------------------|------|-----------|
| Very Dry Very Cold MS | MSxv | (MSd) |
| Very Dry Cool MS | MSxk | (MSc) |
| Dry Cold MS | MSdc | (MSb4) |
| Dry Cool MS | MSdk | (MSa) |
| Dry Mild MS | MSdm | (MSb1/b2) |

On the southern Interior Plateau, there are two subzones. The MSxk subzone occurs at mid-elevations in the central part of the Thompson Plateau and southern edge of the Fraser Plateau, from the U.S. border north to Clinton — Bonaparte Lake. The MSdm occurs on the lee side of the Cascade Mountains from Lytton to the U.S. border, on the east and south sides of the Thompson Plateau from Little Fort to northeast of Princeton, and east of Okanagan Lake in the Okanagan Highland from Lumby to the U.S. border.

In the southeast of the province, from Golden to the U.S. border, the MSdk occurs on midslopes of the Rocky Mountain Trench and in valley bottoms and lower valley slopes of the eastern Purcell and Rocky mountains.

SOME REPRESENTATIVE SITE ASSOCIATIONS

The four site associations described here are common in the MS. They form a typical sequence in the MSdm (Figure 45).

Hybrid spruce — Falsebox — Feathermoss

This zonal association is common in the MSdm.

Soils are typically well-drained Orthic and Eluviated Dystric Brunisols, Orthic Humo-Ferric Podzols, or Brunisolic Gray Luvisols, developed on thick morainal deposits composed primarily of volcanic materials. Humus forms are moderately thick (5-10 cm) Hemimors or Hemihumimors.

Lodgepole pine, hybrid white spruce, and subalpine fir form mixed, maturing seral stands. Douglas-fir can be a component of these stands.

The shrub layer is moderately well developed, consisting primarily of *Paxistima myrsinites* (falsebox), *Vaccinium membranaceum*, and a low cover of *Lonicera utahensis*. Both hybrid white spruce and subalpine fir are regenerating conifers.

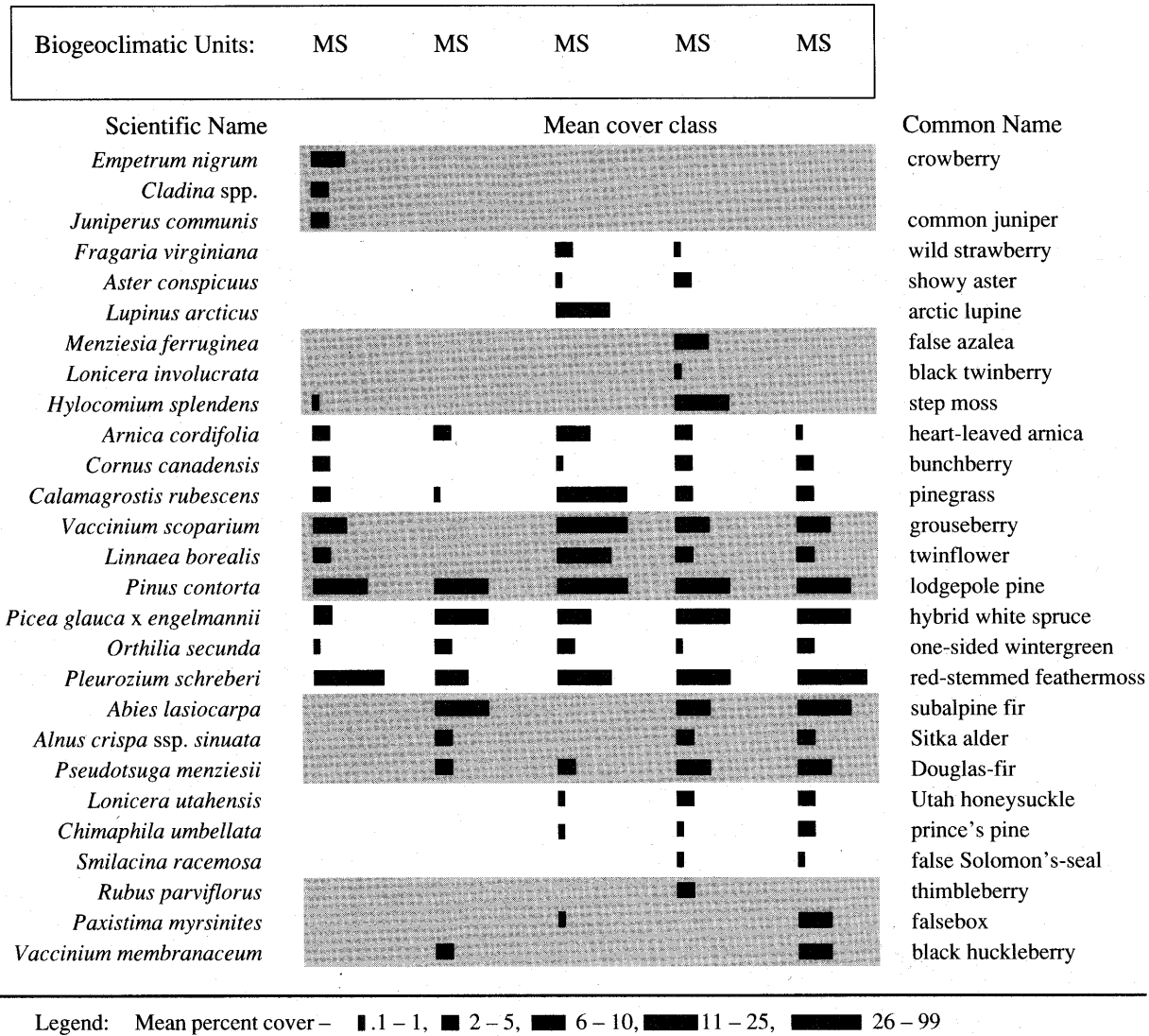


FIGURE 44. Zonal vegetation of subzones of the Montane Spruce zone.

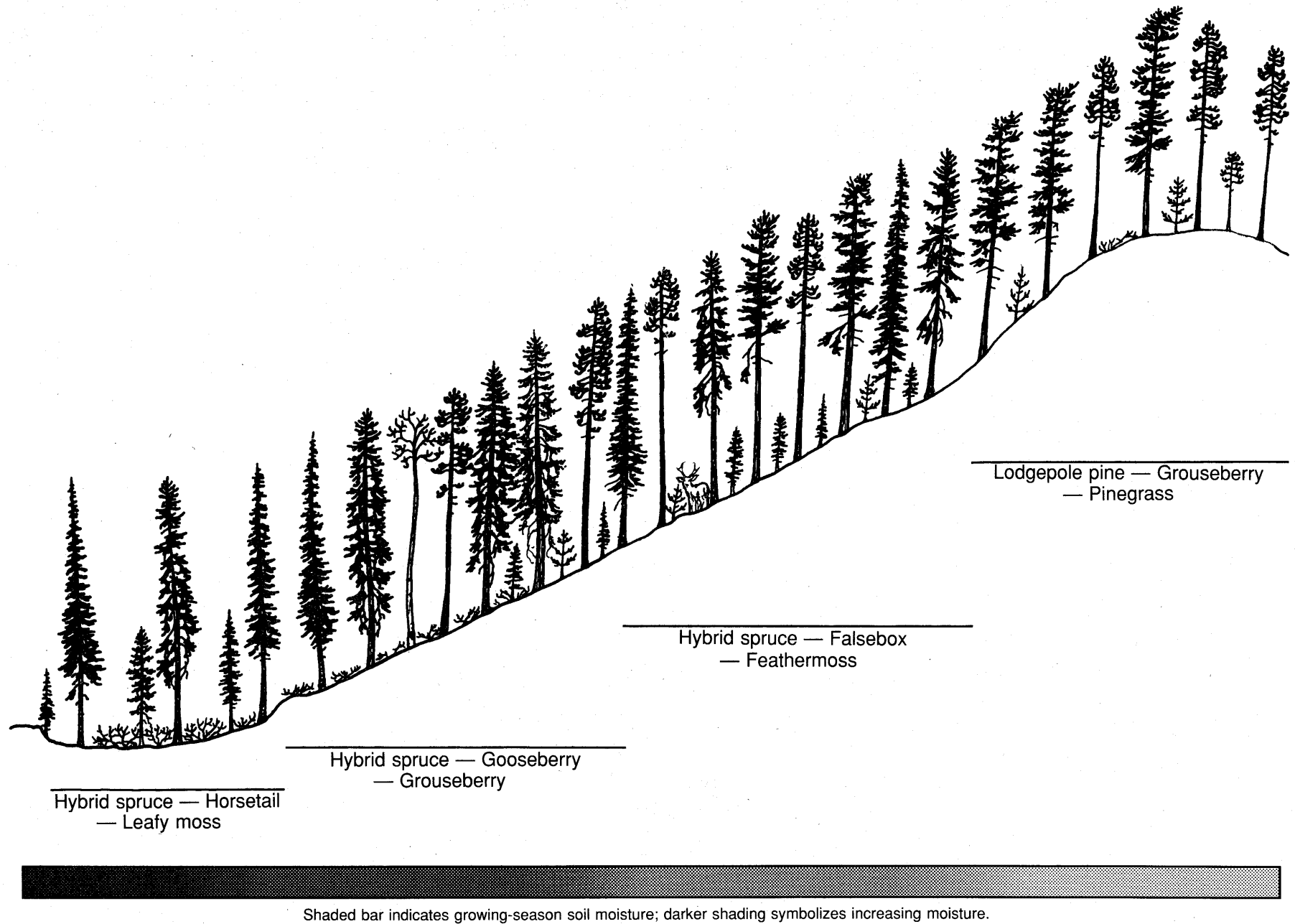


FIGURE 45. Simplified schematic diagram of topographic relationships among four common site associations of a dry, mild subzone of the Montane Spruce zone.

Common species in the herb layer are *Vaccinium scoparium*, *Linnaea borealis*, *Orthilia secunda*, *Goodyera oblongifolia*, *Chimaphila umbellata*, and *Cornus canadensis*.

A well-developed moss layer is the dominant feature of the understory. It is composed primarily of *Pleurozium schreberi* (red-stemmed feathermoss), with lesser amounts of *Ptilium crista-castrensis* (knight's plume) and other mosses and lichens.

Lodgepole pine — Grouseberry— Pinegrass

The Lodgepole pine — Grouseberry — Pinegrass association, and other similar pinegrass-dominated site associations, are found on very dry sites in all the MS subzones except the MSxv. Soils are generally Orthic Dystric and Eutric Brunisols and Brunisolic Gray Luvisols. Humus forms are typically thin (2-4 cm) Hemimors and Hemihumimors.

These sites are characterized by open, mature seral stands of lodgepole pine, with regenerating hybrid white spruce and subalpine fir. Douglas-fir is often a component of these stands, especially on south-facing slopes.

The shrub layer is poorly developed. It contains *Lonicera utahensis*, *Paxistima myrsinites*, *Spiraea betulifolia* (birch-leaved spirea), and occasionally *Vaccinium membranaceum* and *Shepherdia canadensis* (soopolallie).

The herb layer, which dominates the understory, contains *Calamagrostis rubescens* (pinegrass), *Vaccinium scoparium* (grouseberry), and *Linnaea borealis*. *Arctostaphylos uva-ursi* (kinnikinnick) is often present.

The moss layer is poorly developed, but *Pleurozium schreberi* is usually present.

Hybrid spruce — Gooseberry — Grouseberry

This association occurs on moist and very moist, nutrient-poor to -rich sites in the MSdm and MSxk. A similar association occurs on these sites in the MSdc, but lacks *Vaccinium scoparium*. Soils are usually gleyed subgroups of Brunisols, Gray Luvisols, or Humo-Ferric Podzols. Humus forms include Hemihumimors, Mormoders, and Hemimors.

These sites support mature seral and maturing climax stands of hybrid white spruce, subalpine fir, and lodgepole pine, occasionally with scattered Douglas-fir.

The shrub layer is dominated by *Ribes lacustre* (black gooseberry), and also contains *Lonicera involucrata* (black twinberry), *L. utahensis*, and *Vaccinium membranaceum*. *Alnus crispa* ssp. *sinuata* (Sitka alder) and *Rubus parviflorus* (thimbleberry) can be present.

The herb layer is moderately developed and contains *Vaccinium scoparium* (grouseberry), *Orthilia secunda*, *Cornus canadensis*, *Tiarella unifoliata* (one-leaved foamflower), *Linnaea borealis*, *Rubus pedatus* (five-leaved bramble), and *Arnica cordifolia*.

The moss layer is moderately well developed with *Pleurozium schreberi* dominant.

Hybrid spruce — Horsetail — Leafy moss

This association occurs on wet, nutrient-medium to -very rich sites in most MS subzones. It generally occurs in wet depressions and receiving sites adjacent to swamps, and along streams. Soils are usually gleyed subgroups of Brunisols and Humo-Ferric Podzols; Gleysols also occur. Humus forms include Hydromoders, Humimors, and occasional Mulls.

Stands are open and dominated by hybrid white spruce, with lesser amounts of subalpine fir. The shrub layer is moderately well developed and dominated by *Ribes lacustre* and *Lonicera involucrata*.

The well-developed herb layer is dominated by *Equisetum arvense* (common horsetail), but also contains *Vaccinium scoparium*, *Cornus canadensis*, *Rubus pedatus*, and *Streptopus amplexifolius* (clasping-leaved twistedstalk).

The well-developed moss layer is dominated by *Aulacomnium palustre* and *Mnium*, *Rhizomnium*, and *Plagiomnium* spp. (leafy mosses).

WILDLIFE HABITATS

The main ecological factors affecting the fauna of this zone (Table 26) are the cold, snowy winters, short, warm summers, extensive lodgepole pine forests, and sloping mountainous topography. Wildlife that inhabit this zone are adapted to either survive or avoid the deep snows of winter. With the exception of Caribou and occasionally Moose, most ungulates migrate to lower elevations during winter to escape deep snow.

The extensive seral stands of lodgepole pine provide summer and fall range for Moose and Mule Deer, with good thermal and hiding cover in the dense regeneration thickets. Birds, such as the Three-toed Woodpecker and Black-backed Woodpecker, that forage on bark-inhabiting insects are common in the pine forests. The northern parts of the MSxv, in the western Chilcotin, contain extensive dry lodgepole pine forests with a substantial terrestrial lichen ground cover, and provide important winter habitat for Caribou.

In the mature coniferous forests of hybrid white spruce and subalpine fir, many species occur that also inhabit similar, more extensive habitats in the adjacent ESSF. Fisher, Marten, Red Squirrel, Southern Red-backed Vole, Great Gray Owl, and Red Crossbill are some examples. Moose and Mule Deer probably select these habitats because of higher forage production compared to dense seral stands of lodgepole pine.

Steep south-facing grassland slopes, though not extensive in the MS, are locally important as foraging areas for California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Mule Deer, Golden-mantled Ground Squirrel, Golden Eagle, and Mountain Bluebird. Avalanche tracks, with their lush forage production, are feeding habitats for Grizzly Bear, Black Bear, Mountain Goat, Rocky Mountain Elk, and Moose. Rocky cliffs provide escape cover for Mountain Goat, California Bighorn Sheep, and Rocky Mountain Bighorn Sheep, and talus provides denning areas for Common Pika and Golden-mantled Ground Squirrel.

TABLE 26. Selected wildlife habitats and species in the Montane Spruce zone
(adapted from Wildlife Branch 1989)

| Habitat | Habitat distribution | Representative wildlife species | Wildlife species at risk ^a |
|--|------------------------------|---|--|
| Young seral forests | Extensive | Moose, Mule Deer, Black Bear, Lynx, Coyote, Little Brown Myotis, Snowshoe Hare, Porcupine, Heather Vole, Deer Mouse, Masked Shrew Northern Goshawk, Northern Hawk Owl, Northern Pygmy-Owl, Ruffed Grouse, Three-toed Woodpecker, Black-backed Woodpecker, Wilson's Warbler, Rufous Hummingbird, Pine Grosbeak, Western Tanager, Dark-eyed Junco, Yellow-rumped Warbler | ◆ Grizzly Bear |
| Mature coniferous forests | Extensive | Moose, Mule Deer, Cougar, Lynx, Coyote, Black Bear, Fisher, Marten, Red Squirrel, Snowshoe Hare, Silver-haired Bat, Little Brown Myotis, Long-legged Myotis, Southern Red-backed Vole, Deer Mouse, Masked Shrew Barred Owl, Great Gray Owl, Spruce Grouse, Pileated Woodpecker, Black-backed Woodpecker, Three-toed Woodpecker, Steller's Jay, Clark's Nutcracker, Varied Thrush, Red Crossbill, Golden-crowned Kinglet, Mountain Chickadee, Red-breasted Nuthatch Long-toed Salamander | ◆ Caribou, Grizzly Bear |
| Steep, south aspect grasslands | Limited areal extent | Rocky Mountain Elk, Mule Deer, Cougar, Golden-mantled Ground Squirrel Golden Eagle, Blue Grouse, Mountain Bluebird | ◆ California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Grizzly Bear |
| Avalanche tracks | Limited areal extent | Mountain Goat, Moose, Rocky Mountain Elk, Mule Deer, Black Bear | ◆ Grizzly Bear |
| Rocky cliffs and talus | Limited areal extent | Mountain Goat, Common Pika, Golden-mantled Ground Squirrel Golden Eagle | ◆ California Bighorn Sheep, Rocky Mountain Bighorn Sheep |
| Riparian areas, wetlands, meadows, floodplains, lakes, and streams | Common, limited areal extent | Moose, Mule Deer, Black Bear, Coyote, Long-tailed Weasel, Little Brown Myotis, Water Vole, Deer Mouse, Western Jumping Mouse, Meadow Jumping Mouse Ruffed Grouse, Harlequin Duck, American Dipper Western Toad, Spotted Frog, Long-toed Salamander | ◆ Caribou, Grizzly Bear, Tailed Frog |

^a Wildlife species and subspecies at risk are those on the preliminary Red and Blue Lists proposed in the Provincial Wildlife Strategy, B.C. Ministry of Environment (October 1989 draft).

∇ Red-listed wildlife species. These are being **considered** by the Wildlife Branch for designation as endangered or threatened in British Columbia.

◆ Blue-listed wildlife species. The Wildlife Branch considers these species "sensitive" and/or deserving of management attention. Population viability is a concern for these species because of (a) major declines in population numbers; or (b) major changes in habitat that will further reduce existing distribution. Species that are generally suspected of being vulnerable, but for which information is too limited to allow designation in another category, are included in this category.

Riparian areas and waterbodies are very important summer habitats for a variety of mammals, birds, and amphibians because they are, in a sense, wet islands in a matrix of fairly dry forest. Moose and Mule Deer often select these habitats in the summer to drop and rear their calves and fawns, because of the abundant forage and dense security cover. The American Dipper and Harlequin Duck can be observed foraging in fast-moving streams. Amphibians in this zone, such as the Spotted Frog, Western Toad, and Long-toed Salamander, are usually not far from a pond or stream.

RESOURCE VALUES

Forest harvesting, both for sawlogs and pulpwood, is very active in the MS. Mountain pine beetle (*Dendroctonus ponderosae*) has caused widespread mortality in mature pine stands and, during the 1980's, much of the logging in the MS concentrated on removing beetle-affected timber.

The primary agricultural use of the MS is cattle grazing. It is the second most important zone in the province, after the IDF, in providing forested summer range for cattle. Temporary forage production after fires and logging, both of seeded and native species, and forage produced by grass-sedge meadows are important. Zonal and drier ecosystems with seral stands of lodgepole pine provide some grasses (mainly *Calamagrostis rubescens*) and forbs, but forage production increases markedly after logging. Cutblocks, skid trails, and logging roads are often seeded with a variety of domestic species, notably orchardgrass (*Dactylis glomerata*) and clovers (*Trifolium* spp.).

Fur harvesting is an important resource use of this zone.

The MS is also important for recreation. Many valuable fishing, camping, and hunting areas lie within the zone. The zone is popular for other activities, such as hiking and horseback riding in summer, and cross-country skiing and snowmobiling in winter.

The zone makes an important contribution to spring and early summer runoff. In the dry Thompson Plateau and Okanagan Highland, the contribution of this runoff to overall watershed flow is important, although the early snow melt in the MS means that middle and late summer contributions are low.

LITERATURE CITED

- Franklin, J.F. and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. U.S. Dep. Agric. For. Serv., Gen. Tech. Rep. PNW-8. Portland, Oreg.
- Krajina, V.J. 1969. Ecology of forest trees in British Columbia. *Ecol. West. N. Amer.* 2:1-146.
- McLean, A. 1970. Plant communities of the Similkameen Valley, British Columbia, and their relationships to soils. *Ecol. Monogr.* 40:403-424.
- Pfister, R.D., B. Kovalchik, S. Arno, and R. Presby. 1977. Forest habitat types of Montana. U.S. Dep. Agric. For. Serv., Gen. Tech. Rep. INT-34. Ogden, Utah.
- Wildlife Branch. 1989. Regional wildlife habitat maps. B.C. Min. Environ., Victoria, B.C. 15 maps, 1:500000.

4.2 Ponderosa Pine Zone (PP)

The PP is restricted to the driest sections of the southern Rocky Mountain Trench, north of Cranbrook and on the southeast side of Lake Kooconusa, and to sections of the Kettle River Valley around Midway and Grand Forks. On zonal sites of the PP, open stands of ponderosa pine are common. Grasses, predominantly bluebunch wheatgrass, dominate the understory.

Two variants of the dry hot PP subzone (PPdh) occur in the Nelson Forest Region. The PPdh1 occurs in the west and the PPdh2 is located in the southern Rocky Mountain Trench.

4.3 Interior Douglas-fir Zone (IDF)

In the East Kootenay, the IDF surrounds the PP, covering much of the Rocky Mountain Trench as far north as Golden. The zone also runs up the Granby River north of Grand Forks, and is quite extensive north and west of Midway into the Okanagan Highlands. Zonal sites in the IDF typically have pure Fd or mixed seral stands of Fd, Lw, and Pl. The understory is dominated by pinegrass and shrubs such as birch-leaved spirea and soaplilie.

Three IDF variants occur in the Nelson Forest Region: the IDFdm1, IDFdm2, and IDFxh1 (Table 4.1). Two undifferentiated IDF units are also recognized. The IDFdm2 is the most widespread IDF variant in the region and occurs in valley bottoms and lower slopes of the Rocky Mountain Trench and major tributary valleys from Golden south. The IDFdm1 occurs in the Kettle, West Kettle, Boundary, and Granby drainages around Grand Forks.

The IDFxh1 occurs in valley bottoms and lower slopes from Christina Lake to Grand Forks and from Midway to Rock Creek between the PPdh1 and the IDFdm1.

The two undifferentiated IDFun units cover small areas in the East and West Kootenay. One occurs on south-facing, lower slopes on the east side of Lower Arrow Lake, from Syringa Creek Park north to Broadwater. The other occurs in valley bottoms and lower slopes from Canal Flats to Invermere.

4.4 Montane Spruce Zone (MS)

The MS occurs in the dry climatic region on the mid-slopes of the Rocky Mountain Trench and the Rockies south of Golden and the eastern Purcell Mountains south of the Spillimacheen River. In the west, the MS is located on mid-slopes in the Okanagan Highlands and Midway Range of the Monashee Mountains. Zonal sites in the MS commonly have Sxw and Bl with an understory of Utah honeysuckle, grouseberry, twinflower, and pinegrass. Seral Pl stands are common due to frequent fires in the past.

The MSdk and the MSdm1 are the two MS subzones/variants that occur in the Nelson Forest Region. The MSdk is more widespread and occurs in the East Kootenay. The MSdm1 is found in the western part of the region and also occurs in the Kamloops Forest Region.

MS

Montane Spruce Zone

Overview

Location and Distinguishing Features The Montane Spruce Zone occurs at middle to high elevations, below the ESSF Zone, in dry climates of the western Cariboo Forest Region. It is distinguished from other zones in the Region by the following set of characteristics:

- 1) forests are dominated primarily by lodgepole pine and occasionally by hybrid white spruce and/or subalpine fir;
- 2) hybrid white spruce and/or subalpine fir are common in lodgepole pine stands;
- 3) western redcedar, western hemlock, and ponderosa pine are absent; Douglas-fir is rarely present on zonal sites;
- 4) black crowberry or grouseberry are often present in the undergrowth on zonal sites (uncommon in MSdc2 and MSdv);
- 5) ESSF Zone indicator species (Sitka valerian, white-flowered rhododendron, and mountain sagewort) are absent from zonal sites; these species may be found on cool north aspects and on cold air accumulation sites.

The MS Zone represents a transition between the SBPS or IDF zones at lower elevations and dry ESSF subzones at higher elevations. In the Cariboo Forest Region, it occurs below the ESSF_{xv} and ESSF_{xc} and has considerable similarities to these zones as well as to the SBPS Zone. It does not occur below the wetter ESSF subzones such as the ESSF_{wk}. The boundary between the MS and SBPS zones can be determined based on the occurrence of subalpine fir, grouseberry, black crowberry, western meadowrue, or arctic lupine in the MS. The border between the MS and ESSF zones is less distinct.

In the Cariboo Forest Region, the MS Zone occurs on the broad, rising plateau surrounding the Itcha and Ilgachuz mountains; the leeward side of the Coast Mountains from Tweedsmuir Park to the Camelsfoot Range; and on the Camelsfoot and Marble ranges. Elevation ranges are generally 1250–1500 m in the Itcha–Ilgachuz area and 1450–1700 m in the Coast Mountains and Marble Range. The MS Zone is also well represented in the Kamloops (Lloyd *et al.* 1990) and Nelson (Braumandl and Curran 1992) forest regions.

Climate The Montane Spruce Zone has a cool, continental climate characterized by cold winters and moderately short, warm summers (Hope *et al.* 1991). Although there are no long-term climatic data from this zone in the Cariboo Forest Region, the location of the MS Zone above the SBPS and, to a lesser extent, above the IDF, implies that temperatures are colder, growing seasons are shorter, and precipitation is greater than in these other zones. Short-term data from the Itcha–Ilgachuz area indicate that night-time subfreezing temperatures are common during the growing season (Steen *et al.* 1990). Mean annual precipitation is small but probably slightly greater than the 440 mm recorded in the SBPS. Mid winter snowpack depths are commonly 60–100 cm.

The cool summers and cold winters of the MS Zone result largely from its position in the strong rainshadow of the Coast Mountains and its high elevations. The low precipitation, dry air, and clear skies in the rainshadow result in significant night-time radiation cooling and low overnight temperatures.

TABLE 10 Environmental characteristics of MS subzones and variants in the Cariboo Forest Region

| | MSxv | MSxk | MSdc2 | MSdv |
|-------------------------------|--|-------------------|-------------------------------|---------------|
| Area (km) | 8731 | 605 | 798 (MSdc2 and MSdv combined) | |
| Elevation range (m) | 1450– 1700 (S) 1250– 1500 (N) | 1450– 1700 | 1200– 1525 | 1150– 1700 |
| Climate | no data | no data | no data | no data |
| Soils | | | | |
| Zonal soils ^a | E.DYB. (BR.GL) | E.DYB. (BR.GL) | BR.GL | BR.GL |
| Zonal humus form ^b | HR | HR | HR | HR |

^aE.DYB. = Eluviated Dystric Brunisol; BR.GL = Brunisolic Gray Luvisol

^bHR = HemiMor

Vegetation Lodgepole pine forests dominate the MS landscape. Most stands have an even-aged, even-sized canopy, which originated following wildfire. Hybrid white spruce is the principal tree species in the understory, followed by subalpine fir and lodgepole pine. In many stands, especially those less than 80–100 years old, tree regeneration is sparse. Due to the slow growth of spruce and subalpine fir under a pine canopy in these cold, dry climates, the lodgepole pine forests are long-persisting seral stages. For example, many lodgepole pine stands more than 200 years old have only scattered spruce and subalpine fir in the canopy. The undergrowth vegetation on zonal sites is a low-growing carpet of mosses and lichens, low herbaceous plants, and dwarf shrubs with very few tall shrubs or tall herbaceous plants. In the MS_{xv}, which occurs along the Coast Mountains and in the Itcha–Ilgachuz area, the undergrowth is dominated by mosses, lichens, crowberry, grouseberry, twinflower, and other low forbs. In the MS_{xk} in the Marble Range and Hihium Lake area, the undergrowth is dominated by pinegrass, twinflower, and feathermosses, with scattered grouseberry. Lichens are common but less abundant than in the SBPS Zone. Other stand types in the MS Zone include spruce stands on moist lower slopes and at the edge of wetlands and streams, and Douglas-fir forests on some south-facing slopes where the MS Zone occurs above the IDF Zone. Deciduous forests are uncommon.

Wetlands are moderately common in portions of the MS Zone with gently sloping terrain and poorly defined drainage channels. Shrub-carrs and fens are predominant types. Grasslands are uncommon in the MS but moist meadows and shrub-carrs occur frequently in topographic basins where cold air accumulates.

Soils Soils of the MS Zone are developed primarily on loam and sandy loam morainal parent materials derived from weathering of basalt and a variety of other bedrock types. Local areas of sandy soils on glaciofluvial materials or on morainal deposits derived from granitic and metasedimentary rocks are also present. Soil development is weak, and predominant soil types are Eluviated Dystric Brunisols and Brunisolic Gray Luvisols. Podzols occur on some sandy parent materials. The forest floor is typically thin (<5 cm) and humus forms are predominantly hemimors.

Seepage volumes are generally higher in the MS than in the SBPS. Moist soils, resulting from seepage, often limit soil warming on lower slopes and in basins and therefore limit vegetation production.

Subzones of the MS Zone in the Cariboo Forest Region

Four subzones, one represented by a single variant, occur in the Cariboo Forest Region.

MSxk - Very Dry Cool MS Subzone

MSxv - Very Dry Very Cold MS Subzone

MSdv - Dry Very Cold MS Subzone

MSdc - Dry Cold MS Subzone

MSdc2 - Tatlayoko Variant

MSxk Subzone The MSxk is interpreted to be the warmest MS subzone in the Cariboo Forest Region. In British Columbia it occurs in the central part of the Thompson Plateau and on the southern edge of the Fraser Plateau, north from the U.S. border to the Clinton area. In the Cariboo Forest Region it occurs in the Hihium Lake, Bonaparte Lake, and eastern Marble Range area at elevations above the IDFdk3 and below the ESSFxv or ESSFxk. It has many similarities, in terms of climate and zonal site vegetation, to the SBPSmk subzone, but is differentiated from it by the presence of grouseberry on zonal sites. Mature forests on zonal sites are dominated by even-aged, even-sized lodgepole pine and usually contain a few spruce in the forest canopy and regeneration layers. In contrast to other MS subzones, subalpine fir is uncommon and pinegrass is abundant on zonal sites. Deciduous trees are less common than in the SBPS or IDF. The undergrowth vegetation of mature forests on zonal sites is dominated by pinegrass, feathermosses, and twinflower (Table 11). Grouseberry is usually present, although often not abundant. Tree species regeneration is often sparse and is primarily hybrid white spruce. Few shrubs are present.

MSxv Subzone The MSxv is the most extensive subzone of the MS Zone in the Cariboo Forest Region. The largest area of MSxv occurs on the gently rising topography surrounding the Itcha and Ilgachuz Mountains. The subzone also occurs all along the leeward slopes of the Coast Mountains where mid to high-elevation slopes face onto the Interior Plateau. In the inner valleys of the Coast Mountains, it is replaced by the MSdc and MSdv subzones. The MSxv typically occurs above the SBPSxc or SBPSdc and below the ESSFxv.

TABLE 11 MS vegetation table - zonal sites^a

| | Biogeoclimatic Unit | MSxv | MSxk | MSdc2 | MSdv | |
|-----------------------------|--|----------------------|-------------|--------------|-------------|-----------------------------|
| Tree Layer | <i>Pinus contorta</i> | ■■■■ | ■■■■ | ■■■■ | ■■■■ | lodgepole pine |
| | <i>Picea engelmannii</i> x <i>glauca</i> | ■ | | ■ | | hybrid white spruce |
| | <i>Abies lasiocarpa</i> | | | ■■■ | | subalpine fir |
| Shrub Layer | <i>Vaccinium membranaceum</i> | | ■■ | | | black huckleberry |
| | <i>Rhododendron albiflorum</i> | | ■ | | | white-flowered rhododendron |
| | <i>Juniperus communis</i> | ■■■ | ■■■ | | ■ | common juniper |
| | <i>Shepherdia canadensis</i> | ■ | ■■■ | ■ | ■■■■ | soopolallie |
| | <i>Rosa acicularis</i> | ■ | ■■■ | | ■■■ | prickly rose |
| | <i>Picea engelmannii</i> x <i>glauca</i> | ■■■ | ■■■ | | ■■■ | hybrid white spruce |
| | <i>Abies lasiocarpa</i> | | | ■■■ | ■■■ | subalpine fir |
| | <i>Lonicera involucrata</i> | | | | ■■ | black twinberry |
| | <i>Empetrum nigrum</i> | ■■■ | | | | crowberry |
| | <i>Vaccinium scoparium</i> | ■■■ | ■■■ | | ■ | grouseberry |
| Herb Layer | <i>Cornus canadensis</i> | ■■■ | ■ | ■ | ■■■ | bunchberry |
| | <i>Vaccinium caespitosum</i> | | ■■■ | | ■■ | dwarf blueberry |
| | <i>Arctostaphylos uva-ursi</i> | | ■ | | | kinnikinnick |
| | <i>Orthilia secunda</i> | ■ | ■■■ | ■■ | ■ | one-sided wintergreen |
| | <i>Calamagrostis rubescens</i> | | ■■■■■ | | ■■■■■ | pinegrass |
| | <i>Linnaea borealis</i> | ■■■ | ■■■ | ■■■ | ■■■■ | twinflower |
| | <i>Arnica cordifolia</i> | ■■■ | ■■■ | ■■■ | ■■■ | heart-leaved arnica |
| | <i>Epilobium angustifolium</i> | ■■■ | | | ■■■ | fireweed |
| | <i>Aster conspicuus</i> | | ■■■ | | ■■■ | showy aster |
| | <i>Fragaria virginiana</i> | | | | ■■■ | wild strawberry |
| | <i>Osmorhiza chilensis</i> | | | | ■■ | mountain sweet-cicely |
| | <i>Galium boreale</i> | | | | ■■ | northern bedstraw |
| | <i>Thalictrum occidentale</i> | | | | ■■■ | western meadowrue |
| | <i>Lupinus arcticus</i> | | | | ■■■ | arctic lupine |
| | Moss Layer | <i>Cladonia</i> spp. | ■■■ | | | |
| <i>Cladonia</i> spp. | | ■■■ | ■■■ | ■■■ | ■ | cladonia lichens |
| <i>Pleurozium schreberi</i> | | ■■■■■ | ■■■■■ | ■ | ■■■■■ | red-stemmed feathermoss |
| <i>Dicranum</i> spp. | | ■■■ | ■ | ■■■ | ■■■ | heron's-bill mosses |
| <i>Peltigera aphthosa</i> | | ■■■ | ■■■ | | ■■■ | freckle pelt |

^aData are for zonal sites only.

Species abundance: ■ present in 40–60% of plots surveyed; ■■ >60% of plots, mean cover <1%; ■■■ >60% of plots, mean cover 1–7%;

■■■■ >60% of plots, mean cover >7–15%; ■■■■■ >60% of plots, mean cover >15%

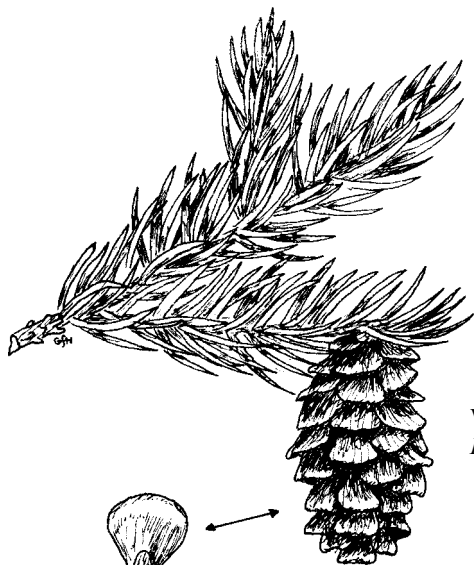
The MSxv is the coldest and driest subzone of the MS in British Columbia and also one of the least productive biogeoclimatic units for tree growth. Winters are cold and summers are cool with frequent growing-season frost. Mature forests on zonal sites are predominantly even-aged, even-sized lodgepole pine forests with scattered hybrid white spruce. Subalpine fir is common in the southern but not the northern parts of the subzone. Vegetation succession in this climate is very slow, and pine stands more than 200 years old often have few spruce or subalpine fir trees in the canopy. In contrast to other subzones of the MS, Douglas-fir is absent from all ecosystems of the MSxv, and crowberry is common on zonal sites. The undergrowth vegetation on zonal sites is dominated by crowberry, grouseberry, a small number of low forb species (such as bunchberry), mosses, and lichens. Feathermosses, especially red-stemmed feathermoss, dominate the moss layer. Very few medium or tall shrubs are present. In contrast to the SBPSxc, mature pine stands have a relatively closed canopy and little pine regeneration in the understory. Mountain pine beetle, which has caused extensive mortality of lodgepole pine trees in the SBPS, has much less impact in the MSxv.

MSdc2 Variant The MSdc is a relatively small subzone that occurs in the valleys of the Coast Mountains in the Kamloops and Cariboo forest regions. In the Cariboo Forest Region it is represented by the MSdc2 variant, which occurs in the valleys of Chilko and Tatlayoko lakes, Mosley Creek, and Klinaklini and Atnarko rivers above the IDFdw and below the ESSFxv. The climate in this area is moderated somewhat by coastal influences and, as a result, winters are less cold and summers have less frequent frost than in the MSxv. Mature forests on zonal sites are predominantly lodgepole pine stands, often with moderate amounts of subalpine fir and trembling aspen, scattered spruce, and occasionally Douglas-fir. The undergrowth of these stands contains more species and is more productive than that of the MSxv. The undergrowth is dominated by low- to medium-height forbs and grasses with comparatively few mosses or lichens. The shrub layer is typically sparse and consists mostly of soopolallie and Sitka alder. Common herbaceous plants are heart-leaved arnica, twinflower, and bunchberry. In contrast to the MSxv, grouseberry and crowberry are seldom present.

MSdv Subzone The MSdv is a very small subzone that occurs only in the Cariboo Forest Region. It occurs east of Chilko Lake in valley bottoms and on lower valley slopes of the Yohetta Valley and Taseko Lakes area. Forests are dominated by lodgepole pine but frequently include hybrid white spruce in the canopy and both spruce and subalpine fir in the understory. Douglas-fir is absent. Shrubs are moderately abundant on zonal sites and are predominantly soopolallie, prickly rose, and black twinberry. The undergrowth is distinguished from that of the MSdc2 by the presence of common arctic lupine, greater vascular plant cover (particularly pinegrass and showy aster), and a greater number of grass and forb species.



Lodgepole pine
Pinus contorta



White spruce
Picea glauca

Whitebark pine
Pinus albicaulis

