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
BG	Bunchgrass
BWBS	Boreal White and Black Spruce
CDF	Coastal Douglas-fir
CWH	Coastal Western Hemlock
ESSF	Engelmann Spruce — Subalpine Fir
ICH	Interior Cedar — Hemlock
IDF	Interior Douglas-fir
MH	Mountain Hemlock
MS	Montane Spruce
PP	Ponderosa Pine
SBPS	Sub-Boreal Pine — Spruce
SBS	Sub-Boreal Spruce
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]
Abies amabilis (amabilis fir)	-	-	-	+	-	-	-	-	-	+++	-	+++	(+)	-
A. grandis (grand fir)	-	-	++	++	+	-	-	-	-	-	++	+	-	-
A. lasiocarpa (subalpine fir)	-	-	-	++	+++	(+)	+++	++	+++	++	-	+	+++	-
Chamaecyparis nootkatensis (yellow-cedar)	-	-	-	-	-	-	-	-	-	+++	-	++	(+)	-
Juniperus scopulorum (Rocky Mountain juniper)	+	+	++	-	-	-	+	(+)	-	-	++	(+)	-	-
Larix laricina (tamarack)	-	-	-	-	-	-	(+)	++	-	-	-	-	-	-
L. lyallii (alpine larch)	-	-	-	-	-	-	-	-	-	-	-	-	++	-
L. occidentalis (western larch)	-	+	+++	++	+++	-	-	-	-	-	-	-	+	-
Picea engelmannii (Engelmann spruce)	-	-	+	++	+++	-	-	-	-	+	-	-	+++	-
P. engelmannii x *glauca* (hybrid white spruce)	-	(+)	++	++	+++	+	+++	-	-	-	-	-	++	-
P. glauca (white spruce)	-	(+)	+	-	+	+++	++	+++	+++	-	-	-	+	-
P. glauca x *sitchensis* (Roche spruce)	-	-	-	++	-	-	-	-	-	(+)	-	++	-	-
P. mariana (black spruce)	-	-	-	+	-	-	++	+++	+	-	-	-	-	-
P. sitchensis (Sitka spruce)	-	-	-	-	-	-	-	-	-	+	+	+++	-	-
Pinus albicaulis (whitebark pine)	-	-	-	-	-	-	-	-	-	+	-	-	++	-
P. banksiana (jack pine)	-	-	-	-	-	-	-	(+)	-	-	-	-	-	-
P. contorta (lodgepole pine)	(+)	-	+++	++	+++	+++	+++	+++	++	+	++	++	+++	-
P. flexilis (limber pine)	-	-	(+)	-	-	-	-	-	-	-	-	-	(+)	-
P. monticola (western white pine)	-	-	+	++	+	-	-	-	-	+	+	++	+	-
P. ponderosa (ponderosa pine)	+	+++	+++	+	-	-	-	-	-	-	-	-	-	-
Pseudotsuga menziesii (Douglas-fir)	+	++	+++	++	+++	+	++	-	-	(+)	+++	+++	+	-
Taxus brevifolia (western yew)	-	-	+	++	-	-	-	-	-	-	++	++	-	-
Thuja plicata (western redcedar)	-	(+)	++	+++	+	-	+	-	-	+	++	+++	+	-
Tsuga heterophylla (western hemlock)	-	-	+	+++	+	-	(+)	-	-	++	+	+++	+	-
T. mertensiana (mountain hemlock)	-	-	-	+	-	-	-	-	-	+++	-	+	++	-

TABLE 5. Continued

Angiosperms	BG	PP	IDF	ICH	MS	SBPS	SBS	BWBS	SWB	MH	CDF	CWH	ESSF	AT[b]
Acer macrophyllum (bigleaf maple)	-	-	+	-	-	-	-	-	-	-	++	++	-	-
Alnus rubra (red alder)	-	-	-	-	-	-	-	-	-	-	+++	+++	-	-
Arbutus menziesii (arbutus)	-	-	-	-	-	-	-	-	-	-	++	+	-	-
Betula neoalaskana (Alaska paper birch)	-	-	-	-	-	-	-	++	-	-	-	-	-	-
B. occidentalis (water birch)	+	+	+	(+)	-	-	(+)	+	-	-	-	-	-	-
B. papyrifera (paper birch)	+	+	++	++	+	-	++	++	-	-	+	+	-	-
Cornus nuttallii (western flowering dogwood)	-	-	+	-	-	-	-	-	-	-	++	++	-	-
Populus balsamifera ssp. *balsamifera* (balsam poplar)	-	-	-	-	-	-	+	++	+	-	-	-	-	-
P. balsamifera ssp. *trichocarpa* (black cottonwood)	+	+	+	++	+	+	++	+	-	-	++	++	+	-
P. tremuloides (trembling aspen)	+	++	+++	++	++	+	+++	+++	+	-	+	+	+	
Prunus emarginata (bitter cherry)	-	-	+[c]	++[c]	-	-	+[c]	-	-	-	++	+	-	-
Quercus garryana (Garry oak)	-	-	-	-	-	-	-	-	-	-	++	(+)	-	-
Rhamnus purshiana (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 17: Spruce — Willow — Birch Zone

by

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LOCATION AND DISTRIBUTION

The Spruce — Willow — Birch zone (SWB) is the most northerly subalpine zone in British Columbia (Figure 62). It extends north from 56.5-57°N latitude, well into the Yukon Territory and the Mackenzie District of the Northwest Territories, where it reaches 60-70°N latitude. In British Columbia, the SWB occupies the middle elevations of the northern Rocky Mountains; the Cassiar and northernmost Omineca and Skeena mountains; that part of the St. Elias Mountains that extends into the Haines Triangle; and much of the Stikine, Yukon, and Liard plateaus. Elevations of the SWB in northern British Columbia range between 1000 and 1700 m in the southern portion of the zone, and between 900 and 1500 m in the north. The SWB is usually the subalpine zone above the Boreal White and Black Spruce zone (BWBS) in northern British Columbia, occupying a position comparable to that of the Engelmann Spruce — Subalpine Fir zone above the lower elevation zones further south.

ECOLOGICAL CONDITIONS

The climate of the Spruce — Willow — Birch zone is evidently an interior subalpine type, although long-term climatic data (see Table 4) are available from only two stations, Cassiar (Figure 63) and Muncho Lake. Cassiar is more representative of the zone as a whole, whereas Muncho Lake represents the drier, eastern portion of the zone fairly well. Mean annual temperature is about -0.7 to -3°C. Temperature averages above 10°C for probably just 1 month, although up to 3 months is possible at some medium elevations like Muncho Lake. Mean annual precipitation is 460-700 mm, with 35-60% as snowfall. Winters are long and cold, summers brief and cool. Moist Pacific air from the west frequently causes sudden, often violent, local storms during summer. A more stable air mass usually prevails in the winter, but cold spells can be broken by chinook winds.

Lower elevations of the SWB are generally forested, mainly by white spruce and subalpine fir. Indeed, in British Columbia the zone could well be called the spruce — fir — willow — birch zone, in view of the abundance of subalpine fir. A general pattern apparent in many valleys is of intermittent to closed forest cover of white spruce plus variable amounts of pine and aspen in the valley bottoms and on lower slopes. Higher on the slopes subalpine fir dominates, especially on northern and eastern exposures, where it often forms nearly pure stands. Black spruce, lodgepole pine, and trembling aspen are relatively minor species, although all can be locally abundant. However, none of these three minor species is nearly as common and widespread in the SWB as they are in the BWBS. It appears that wildfires have been less frequent and extensive in the SWB than in the adjacent BWBS, and extensive seral stands of lodgepole pine are uncommon though they do occur, as in the upper Jennings — Little Rancheria rivers. Balsam poplar is uncommon, and Engelmann spruce, paper birch, and tamarack are absent from the SWB.

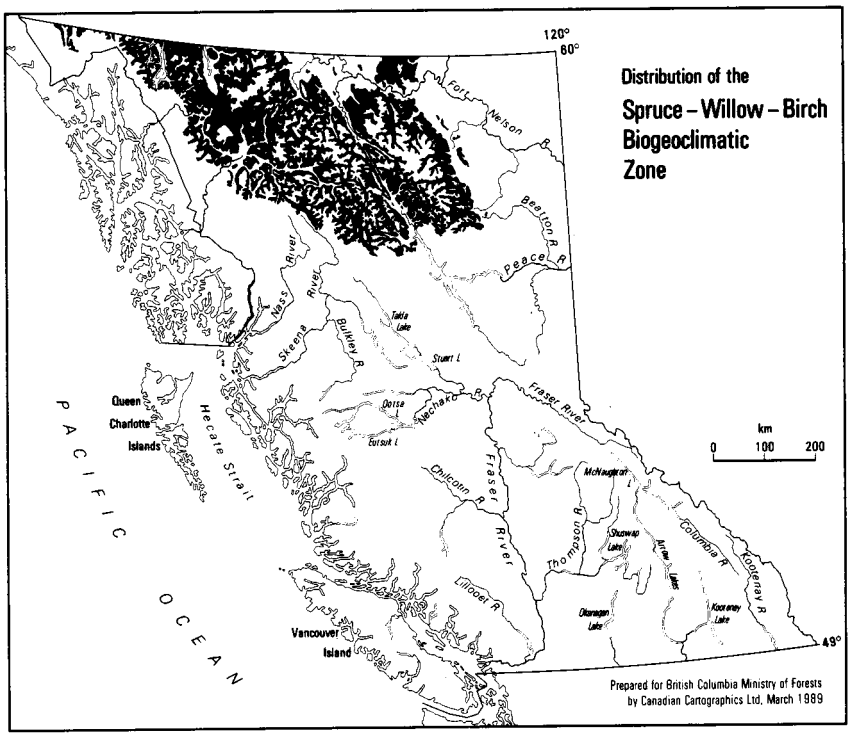


FIGURE 62. Spruce — Willow — Birch zone.

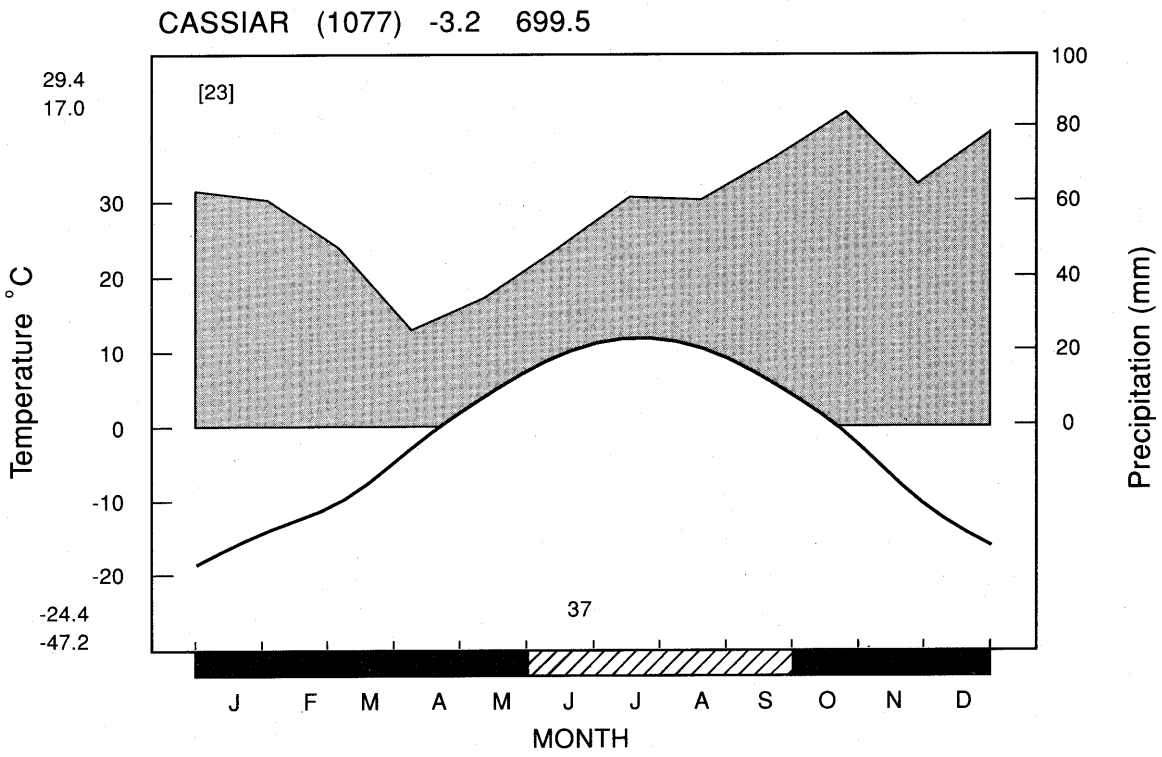


FIGURE 63. Representative climatic diagram for the Spruce — Willow — Birch zone.

Upper elevations of the SWB (essentially a scrub/parkland subzone) are dominated by fairly tall (1-4 m high) deciduous shrubs, mainly *Betula glandulosa* (scrub birch) and several willows, including *Salix glauca* (grey-leaved willow), *S. barclayi* (Barclay's willow), *S. planifolia* (tea-leaved willow), *S. barrattiana* (Barratt's willow), *S. alaxensis* (Alaska willow), and *S. lanata* (woolly willow). Scrub birch appears to dominate habitats with nutrient-medium or poorer status, whereas the willows seem to prefer more favourable nutrient regimes. Groves of stunted aspen and balsam poplar occur at timberline in some areas, usually on steep south slopes. It has been hypothesized that the long summer days and short, warm, frostless summer nights promote the dominance of deciduous shrubs in this zone, because the shrubs, after capitalizing on the short but intense growing season, shed their leaves in late summer and thus avoid the killing autumn frosts (Krajina 1975).

In some of the high wide valleys subject to massive cold air ponding, a non-forested mosaic of shrubfields, fens, and dry to moist grassland occupies the valley floor and lowermost slopes; a skirt of forest occurs on the lower slopes; and shrubs again dominate above the intermediate forested belt. This "double treeline" phenomenon is particularly well developed and striking in the northern plateau terrain. Permafrost can be found in such valleys, especially in finer-textured materials above 1200-1400 m. Elsewhere in the SWB, permafrost is sporadic, occurring in pockets mainly on north slopes.

A Lodgepole pine — Scrub birch — Lichen woodland association occurs on some of the driest, poorest sites, usually on rapidly drained outwash deposits. Aspen stands are fairly common on drier sites along the major valleys, usually on the warmer south-facing slopes of valley bottom moraines and glaciofluvial landforms, or on steep, south-facing, colluvial slopes.

Subalpine fir commonly forms open forest and woodland on steep, moist, cold, middle slopes, with best development on northern and eastern exposures. These ecosystems can be characterized as a Subalpine fir — Scrub birch — Crowberry association on Humo-Ferric Podzols. Shrub-dominated ecosystems are widespread and range from swamps and fens to dry colluvial scrub. Some common shrubby associations are:

- *Salix barclayi — Betula glandulosa — Carex aquatilis* (water sedge) fens;
- *Salix (glauca, barclayi, planifolia) — Aulacomnium palustre* (glow moss) wet willow thickets;
- *Salix alaxensis — Epilobium latifolium* (broad-leaved willowherb) — *Drepanocladus uncinatus* (sickle moss) riparian willow thickets;
- *Betula glandulosa — Festuca altaica* (Altai fescue) — *Hylocomium splendens* (step moss) fresh to moist upland scrub;
- *Salix glauca — Betula glandulosa — Festuca altaica* slightly dry to fresh upland scrub;

- *Salix scouleriana* (Scouler's willow) — *Linnaea borealis* (twinflower) — *Festuca altaica* fresh to drier brulé scrub;
- *Juniperus communis* (common juniper) — *Arctostaphylos uva-ursi* (kinnikinnick) dry dwarf scrub.

Wetlands in the SWB are usually the richer or minerotrophic types, including white spruce and tall willow swamps, *Salix — Betula — Carex* (sedge) fens, and *Carex* marshes. Acid, nutrient-poor bogs are uncommon, and generally belong to a Black spruce — Labrador tea — Sphagnum association.

Subalpine grasslands are frequent but not too extensive in this zone, and are of two general types:

A. Dry grassland on steep, colluvial or glaciofluvial, south slopes, with shallow soils on frequently calcareous parent materials. Typical species include *Poa glauca* (glaucous bluegrass), *Calamagrostis purpurascens* (purple reedgrass), *Festuca altaica*, *Elymus innovatus* (fuzzy-spiked wildrye), *Agropyron trachycaulum* (slender wheatgrass), *Saxifraga tricuspidata* (three-toothed saxifrage), *Potentilla pensylvanica* (prairie cinquefoil), *Artemisia frigida* (pasture sage), and *A. campestris* ssp. *borealis* (northern wormwood).

B. Dry to fresh *Festuca altaica* grassland on flat to gently rolling outwash or morainal landforms; sometimes extensive as in above-mentioned, high wide valleys (e.g., upper Stikine drainage); with also typically *Aconitum delphiniifolium* (mountain monkshood), *Artemisia norvegica* ssp. *saxatilis (mountain sagewort), Polemonium caeruleum* (tall Jacob's-ladder), *Potentilla diversifolia* (diverse-leaved cinquefoil), *Carex macloviana* (thick-headed sedge), *Phleum alpinum* (alpine timothy); and numerous other forbs and grasses.

SUBZONES

There has been insufficient study of the SWB in British Columbia to distinguish and characterize subzones. It is clear that there are consistently throughout the zone two elevational subzones: a lower subzone of generally open forest and an upper subzone of deciduous scrub. It also appears that the dry cold climate of the Yukon Plateau (southwestern Yukon in the lee of the St. Elias Mountains) penetrates into British Columbia in the Atlin area, and may be reflected in a drier subzone. Beyond that, the SWB appears to be fairly uniform across the northern part of the province, although the SWB in the Haines Triangle is probably different but remains something of a mystery.

Zonal soils are Humo-Ferric Podzols or Brunisols, depending on the amount of precipitation (Brunisols being more common in areas of lower rainfall). Depending on the acidity of the parent material, both Eutric (high pH) and Dystric (low pH) Brunisols can occur. On fine-textured parent materials, Gray Luvisols can be found. Hemimors and Mormoders are the most common humus forms on zonal sites.

SOME REPRESENTATIVE SITE ASSOCIATIONS

The following is a typical sequence of ecosystems in the forested SWB (Figure 64).

White spruce — Grey-leaved willow — Scrub birch

This association occurs as open forest and woodland on dry to fresh, moderately well-drained uplands in the lower subzone of the SWB. White spruce generally dominates the moderately developed tree layer. Subalpine fir can be co-dominant, while lodgepole pine and trembling aspen are usually minor in mature stands. Spruce and fir form most of the tree regeneration.

Salix glauca (grey-leaved willow) and *Betula glandulosa* (scrub birch) are the characteristic dominant species of the moderately to very well-developed shrub layer. Other shrubs that often occur include *Salix planifolia*, *S. scouleriana*, *S. bebbiana* (Bebb's willow), *Potentilla fruticosa* (shrubby cinquefoil), and *Shepherdia canadensis* (soopolallie).

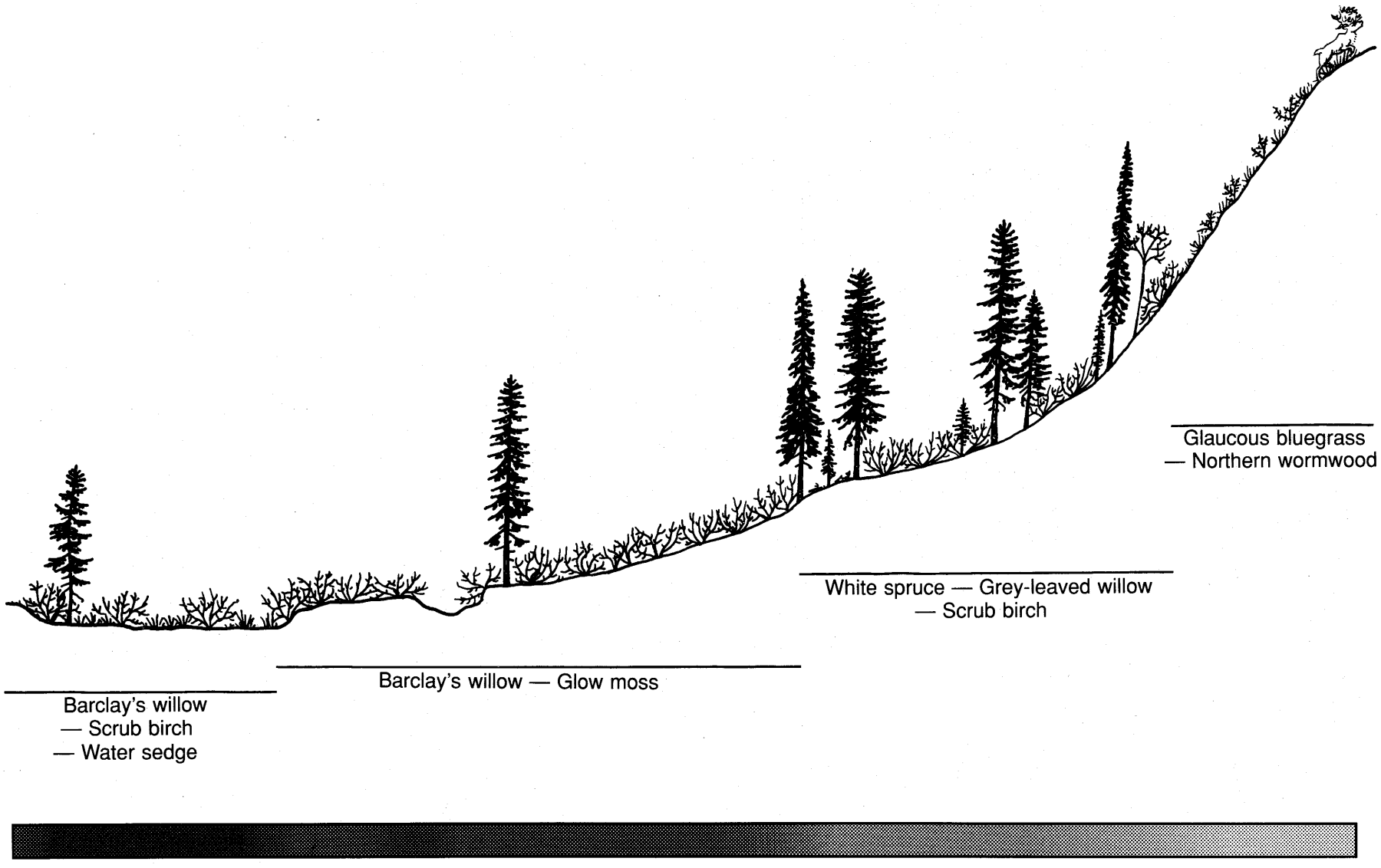
The dwarf shrub/herb layer is generally moderately well developed and typically includes *Empetrum nigrum* (crowberry), *Linnaea borealis*, *Vaccinium vitis-idaea* (lingonberry), *V. caespitosum* (dwarf blueberry), *Festuca altaica*, *Epilobium angustifolium* (fireweed), *Lupinus arcticus* (arctic lupine), and *Mertensia paniculata* (tall bluebells).

The well-developed moss layer is usually dominated by *Pleurozium schreberi* (red-stemmed feathermoss) and *Hylocomium splendens* (step moss) (note that *Ptilium crista-castrensis* [knight's plume] is a minor species in the SWB), but there is a diversity of other cryptogams as well, such as *Dicranum acutifolium*, *Polytrichum juniperinum* (juniper haircap moss), and the lichens *Cladina mitis*, *C. rangiferina* (reindeer lichen), *Cladonia ecmocyna*, *C. gonecha*, *C. gracilis*, *Peltigera aphthosa*, *P. malacea*, and *Nephroma arcticum*.

Soils are primarily Humo-Ferric Podzols and (Dystric) Brunisols, with also some Gray Luvisols. Typical humus forms are Hemimors and Mormoders.

Glaucous bluegrass — Northern wormwood

The Glaucous bluegrass — Northern wormwood association represents one of several dry subalpine grassland ecosystems that occur on very steep, south-facing colluvial (sometimes glaciofluvial) slopes in the SWB. Grasses and sedges dominate the well-developed herb layer; characteristic species include *Poa glauca* (glaucous bluegrass), *Agropyron trachycaulum*, *Koeleria macrantha* (junegrass), *Festuca altaica*, *F. saximontana* (Rocky Mountain fescue), *Trisetum spicatum* (spike trisetum), *Carex supina* (spreading arctic sedge), *C. petasata* (pasture sedge), and *C. obtusata* (blunt sedge). Typical forbs are *Potentilla pensylvanica*, *Artemisia campestris* ssp. *borealis* (northern wormwood), and *Oxytropis varians* (Alaskan locoweed). The moss layer is generally sparse, but *Tortula ruralis*, *Peltigera canina* (dog lichen), *Parmelia separata*, and *Physconia muscigena* are characteristic species.



Shaded bar indicates growing-season soil moisture; darker shading symbolizes increasing moisture.

FIGURE 64. Simplified schematic diagram of topographic relationships among four common site associations of a lower, forested subzone of the Spruce — Willow — Birch zone.

Other dry grasslands of the SWB can be dominated by one or a combination of *Calamagrostis purpurascens*, *Festuca altaica*, *Elymus innovatus*, and *Agropyron trachycaulum*, but all have very similar physiognomy and are obviously closely related.

These grasslands are best developed over richer parent materials; typical soils are Eutric and Melanic Brunisols or Chernozem-like types. Humus forms are Rhizomulls.

Barclay's willow — Glow moss

Wet willow thickets, characterized by the Barclay's willow — Glow moss association, are widespread on imperfectly drained sites in the valley bottoms on fluvial fans, meander plains, lakesides, and depressions in till plains. Typical soils are Rego Humic Gleysols or Gleyed Regosols. Typical humus forms are Hydromoders.

The shrub stratum is well developed, but variable in that tall shrubs can be lacking or abundant. *Salix glauca*, *S. barclayi* (Barclay's willow), *S. planifolia* and sometimes *S. barrattiana*, *S. commutata* (variable willow), and *S. pseudomonticola* (mountain willow) are prominent willows, and *Potentilla fruticosa* is common.

The dwarf shrub/herb layer is moderately to well developed and rich in species. Common species include *Festuca altaica*, *Luzula parviflora* (small-flowered woodrush), *Poa leptocoma* (bog bluegrass), *Petasites frigidus* var. *palmatus* (palmate coltsfoot), *Salix myrtillifolia* (bilberry willow), *Rubus arcticus* (dwarf nagoonberry), *Aconitum delphiniifolium*, *Mertensia paniculata*, *Polemonium caeruleum*, *Stellaria longipes* (long-stalked starwort), *Senecio pauciflorus* (rayless alpine butterweed), *Calamagrostis canadensis* (bluejoint), and *Carex atrata* (blackened sedge).

The moss layer is moderately developed and characteristically hummocky. Prominent species are *Aulacomnium palustre* (glow moss), *Hylocomium splendens*, and *Peltigera aphthosa*. Important associates include *Polytrichum strictum*, *Drepanocladus uncinatus*, *Plagiomnium venustum*, and *Peltigera scabrosa*.

Barclay's willow — Scrub birch — Water sedge

A common wetland type of the SWB can be termed a moderately rich (weakly minerotrophic) shrubby fen. The Barclay's willow — Scrub birch — Water sedge association usually develops on Terric Mesisols or Humisols and Humic Gleysols with Hydromor or Hydromoder humus forms.

Trees are often lacking; if present, they are usually white spruce, widely scattered, stunted, and slow-growing. *Salix barclayi* (Barclay's willow), *Betula glandulosa* (scrub birch), *Salix glauca*, *S. planifolia*, *Potentilla fruticosa*, and *Ledum groenlandicum* (Labrador tea) dominate the moderately to well-developed shrub stratum.

A moderately developed to dense dwarf shrub/herb layer is always present. *Carex aquatilis* (water sedge) is usually most abundant, followed by *Salix myrtillifolia* and *Empetrum nigrum*. Common associates are *Arctostaphylos rubra* (red bearberry),

Oxycoccus oxycoccos (bog cranberry), *Rubus chamaemorus* (cloudberry), *R. arcticus*, *Equisetum arvense* (common horsetail), *Carex disperma* (soft-leaved sedge), *C. vaginata* (sheathed sedge), and *Arctagrostis latifolia* (polargrass).

The cryptogamic layer (mainly mosses) is usually well developed and markedly hummocky. Prominent species include *Aulacomnium palustre*, *Tomenthypnum nitens* (golden fuzzy fen moss), *Paludella squarrosa*, *Drepanocladus exannulatus*, *Sphagnum capillaceum* (common red sphagnum), *S. recurvum*, *Plagiomnium ellipticum*, *Calliergon cordifolium*, and *Polytrichum strictum*.

WILDLIFE HABITATS

The SWB has the harshest climate of all the forested zones in British Columbia, second only to the non-forested Alpine Tundra zone. The climate of the SWB has a profound effect on wildlife (Table 35), an effect especially noticeable during late summer when many species, birds in particular, begin migration to avoid the abrupt early autumns and long bitter winters.

Moose and Caribou are the most abundant and widespread ungulates found in the SWB, particularly in summer. Valley bottoms provide the best winter range for both species, but much of this zone is abandoned by mid-winter because of deep snow. Mountain Goat tolerate the deep snow better than most ungulates because of the steep terrain they inhabit. They are locally abundant wherever suitable steep, rugged terrain occurs. Because of the favourable topography, Mountain Goat appear to be more numerous in the wetter regions of this zone, most notably on the lee side of the Coast Range. Stone Sheep are found where steep south-facing grasslands associated with rugged terrain occur. They are particularly abundant in the Rocky Mountain Foothills and the Kechika Mountains. Dall Sheep are found only in the extreme northwestern corner of the province and typically summer in the SWB. Rocky Mountain Elk and Mule Deer are uncommon except in the Rocky Mountain Foothills. Both Grizzly Bear and Black Bear occur in the SWB, although the former is often more common. No reptiles occur in this zone and the Western Toad, Wood Frog, and Spotted Frog are the only amphibians.

Closed to open conifer forests are the most common type of treed habitat in the SWB. Open stands of lodgepole pine, developed on coarse textured soils such as those found in upper reaches of the Turnagin and Jennings rivers, are important as Caribou winter range. Caribou paw or nuzzle through the snow on these sites for ground lichens, which are the major part of their winter diet. Large mammals such as the Moose, Grizzly Bear, and Gray Wolf are found in these areas primarily in summer. Other typical forest species include the Spruce Grouse, Common Raven, Gray Jay, Boreal Chickadee, Red-breasted Nuthatch, Three-toed Woodpecker, Ruby-crowned Kinglet, Red Squirrel, Wolverine, and Marten.

TABLE 35. Selected wildlife habitats and species in the Spruce — Willow — Birch zone (adapted from Wildlife Branch 1989)

Habitat	Habitat distribution	Representative wildlife species	Wildlife species at risk[a]
Coniferous and mixed coniferous/ deciduous forests	Extensive	Moose, Rocky Mountain Elk, Black Bear, Gray Wolf, Lynx, Wolverine, Porcupine, Snowshoe Hare, Red Squirrel, Deer Mouse, Least Weasel Northern Goshawk, Northern Hawk-owl, Spruce Grouse, Three-toed Woodpecker, Common Raven, Gray Jay, Yellow-bellied Sapsucker, Hermit Thrush, Swainson's Thrush, Dark-eyed Junco, Wilson's Warbler, Bohemian Waxwing, Ruby-crowned Kinglet, Boreal Chickadee, Red-breasted Nuthatch	♦ Caribou, Gray-cheeked Thrush
Willow — birch shrublands in valley bottoms	Extensive	Moose, Black Bear, Gray Wolf, Wolverine, Lynx, Snowshoe Hare, Arctic Ground Squirrel, Brown Lemming Golden Eagle, Northern Goshawk, Willow Ptarmigan, Northern Shrike, Wilson's Warbler, Brewer's Sparrow, Tree Sparrow, Smith's Longspur	♦ Caribou, Plains Bison, Grizzly Bear, Tundra Shrew, Hudsonian Godwit
Grasslands	Limited areal extent	Moose, Stone Sheep, Arctic Ground Squirrel Golden Eagle, Common Raven, Blue Grouse, Say's Phoebe	♦ Caribou, Dall Sheep, Plains Bison, Grizzly Bear, Gyrfalcon
Rugged and steep, open south aspects	Common	Mountain Goat, Stone Sheep, Brown Lemming Willow Ptarmigan	♦ Dall Sheep, Gyrfalcon
Wetlands, shallow lakes, and streams	Limited areal extent	Moose, Black Bear, Beaver, Muskrat, Mink, Meadow Vole, Northern Bog Lemming, Arctic Shrew, Water Shrew Northern Harrier, Red-throated Loon, Mallard, Northern Pintail, Bufflehead, California Gull, Red-necked Phalarope, Least Sandpiper, Semipalmated Plover Western Toad, Wood Frog, Spotted Frog	♦ Plains Bison, Grizzly Bear, Arctic Loon, Arctic Tern, Lesser Golden-Plover
Riparian areas and floodplains	Limited areal extent	Moose, Black Bear, Gray Wolf, Beaver, Muskrat Ruffed Grouse, American Redstart, Northern Waterthrush Western Toad, Wood Frog	♦ Caribou, Grizzly Bear, Arctic Tern

[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.

Open, shrubby, valley bottom habitats are a characteristic feature of the SWB. These habitats are important as summer range for Moose and Caribou, but are usually too exposed and snowy to be used as winter range. The Willow Ptarmigan, Arctic Ground Squirrel, Gyrfalcon, and Wilson's Warbler are commonly observed here in summer.

Wetlands and shallow lakes are not as abundant or productive as those found in the BWBS. Beaver are the most common furbearers associated with this habitat, with lodges occasionally observed near treeline, where willow and birch shrubs are the only available food source. Moose wade through these areas in summer to find aquatic vegetation and escape biting insects. Other representative species include the Northern Harrier, Mallard, Northern Pintail, Bufflehead, Arctic Tern, California Gull, Red-necked Phalarope, and Red-throated Loon.

Reduced snow depths on open south-facing slopes favour wintering Stone Sheep, Dall Sheep, Mountain Goat, and Moose. Less typical species such as Rocky Mountain Elk and Mule Deer winter in the Rocky Mountain foothills where there is less than average snowfall. The Golden Eagle, Gyrfalcon, Common Raven, Blue Grouse, Say's Phoebe, and Arctic Ground Squirrel are other characteristic species.

Young seral forests and shrublands are extensive and have a wide diversity of species. The Moose, Snowshoe Hare, Lynx, Porcupine, Dark-eyed Junco, American Robin, Wilson's Warbler, and Bohemian Waxwing are typical wildlife associated with these habitats.

Although not extensive, floodplain and riparian habitats are the most important areas in the SWB for Moose because of good browse production. Other species typical of these habitats include the Northern Waterthrush, American Redstart, and Ruffed Grouse.

Although not native to this zone, one of the largest populations of Plains Bison occurs in the Muskwa River area, the result of an introduction in the 1970's.

RESOURCE VALUES

There is no forestry or agriculture in the SWB, and it is unlikely there will be, at least in the near future. The main resource uses are hunting, by both residents and guided non-residents, and trapping.

LITERATURE CITED

Krajina, V.J. 1975. Some observations on the three subalpine biogeoclimatic zones in British Columbia, Yukon, and MacKenzie District. Phytocoenologia 2(3/4):396-400.

Wildlife Branch. 1989. Regional wildlife habitat maps. B.C. Min. Environ., Victoria, B.C. 15 maps, 1:500 000.

TABLE 4.8. Environmental characteristics of all forested zones in the PRFR, north half

Biogeoclimatic zone	BWBS	SWB	SBS
Extent			
Area	2 479 000 ha	4 854 206 ha	163 278 ha
% of PRFR, north half	17.6%	34.6%	1.2%
Elevation range	300 - 1150 m	900 - 1700 m	100 - 800 m
Physiography			
Physiographic units	Stikine Plateau; Yukon Plateau; Liard Plain; Cassiar Mtns.; St. Elias Mtns.; northernmost Skeena Mtns.	Stikine Plateau; Yukon Plateau; Cassiar Mtns; Liard Plain; St. Elias Mtns.	Eastern valleys of Coast Mtns., Boundary Ranges; westernmost portions of Yukon and Stikine plateaus
Terrain	Flat to rolling plains and plateaus in the east; narrow mountain valleys in the west	Gently rolling plateaus to steep, heavily glaciated mountain slopes	Lower slopes and floors of major river valleys
Climate	Northern continental with frequent arctic airmasses; long, very cold winters and short, dry, quite warm summers	Northern interior subalpine, with frequent arctic airmasses; very long, cold winters and very short, cool summers	Continental, but with slight coastal influence; moister, with longer growing season and milder winters than BWBS
Soils			
Dominant soils	Brunisolic Gray Luvisols; Dystric Brunisols	Humo-Ferric Podzols; Eutric and Dystric Brunisols	Probably Humo-Ferric Podzols and Gray Luvisols
Humus forms	Hemimors; > 10 cm thick	Hemimors and Mormoders	Hemimors
Tree species[a]			
Major coniferous trees	Sw, Sb, Bl, Pl	Sw, Bl, Pl	Sxw, Bl, Pl, Sb
Major deciduous trees	At, Acb or Act, Ep	Willows, At, Acb	Act, Ep (At)

[a] Tree species codes are found in Appendix 3.

TABLE 4.9. Climatic characteristics of all forested zones in the PRFR, north half.

Biogeoclimatic zone		BWBS	SWB	SBS
Sources of climate data L/S/M[a]		2/4/1	1/0/0	
Name of reference station (RS)		Dease Lake	Cassiar	
Elevation of reference station		816 m	1078 m	
Precipitation				
Annual precipitation (mm)				
	range	327 – 461	--	--
	RS	406	700	--
Growing season precip. (mm)				
	range	142 – 223	--	--
	RS	221	275	--
Annual snowfall (cm)				
	range	135 – 205	--	--
	RS	205	295	--
Number of months with snowfall				
	range	9 – 11	--	
	RS	11	11	
Temperature				
Mean annual temp. (°C)				
	range	- 2.9 – 2.0	--	--
	RS	- 1.3	- 3.2	--
Mean temp. coldest month (°C)				
	range	- 26.4 to - 18.2	--	--
	RS	- 19.7	- 19.2	--
Extreme minimum temp. (°C)				
	range	- 52.8 to - 41.7	--	--
	RS	- 51.1	- 47.2	--
Mean temp. warmest month (°C)				
	range	12.0 – 15.6	--	--
	RS	12.5	11.2	--
Extreme maximum temp. (°C)				
	range	29.5 – 36.0	--	
	RS	33.9	29.4	--
Growing degree days >5°C				
	range	659 – 1226	--	--
	RS	748	534	--
Frost-free days				
	range	44 – 110	--	--
	RS	44	37	--

[a] Normalized climatic data L = long-term (Atmospheric Environment Services)
S = short-term (Atmospheric Environment Services)
M = short-term (B.C. Ministry of Environment).

Note: Not all climatic variables are available from short-term stations.

[b] Unnormalized short-term data.

[c] This station probably located in AT zone.

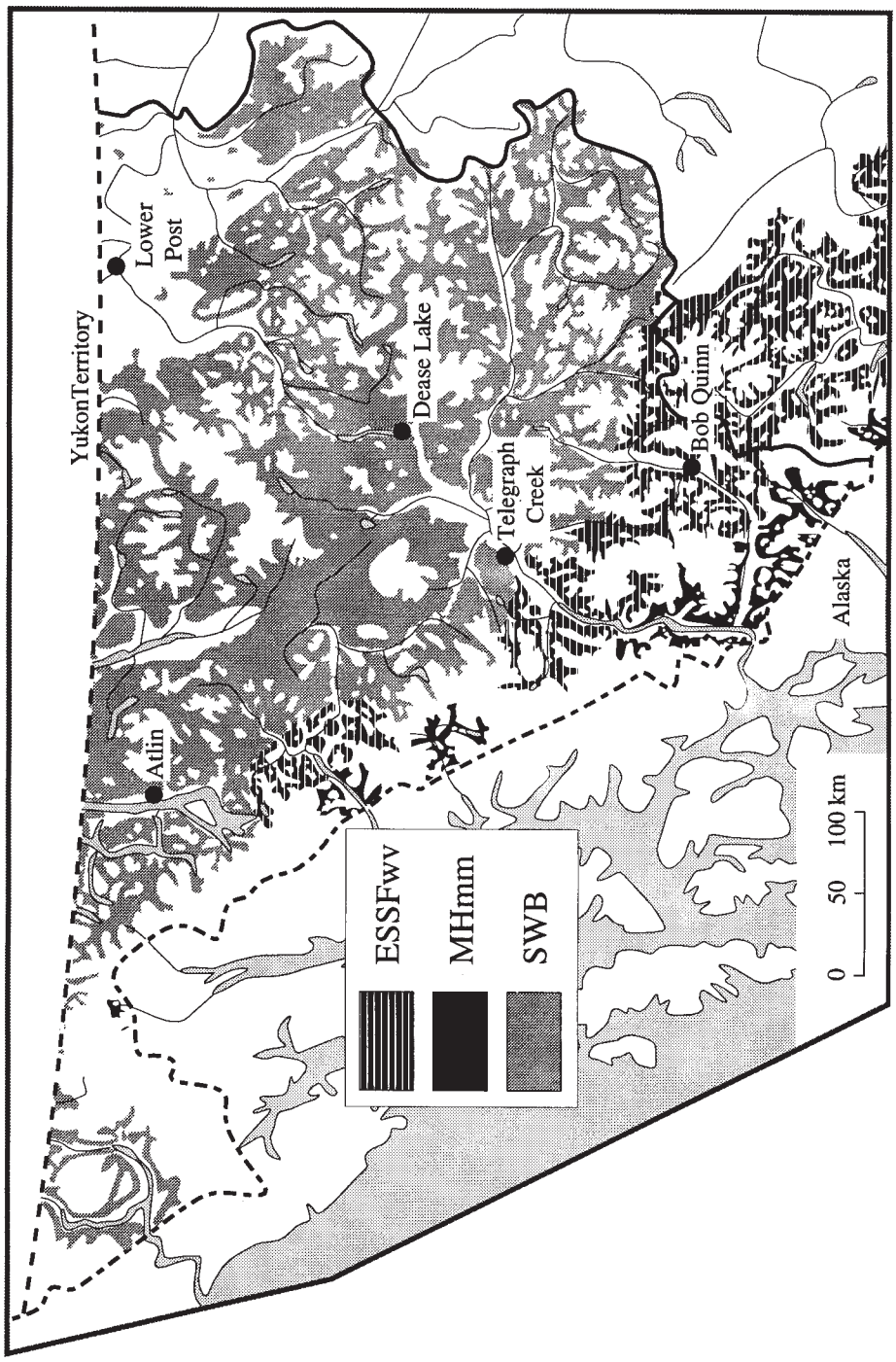
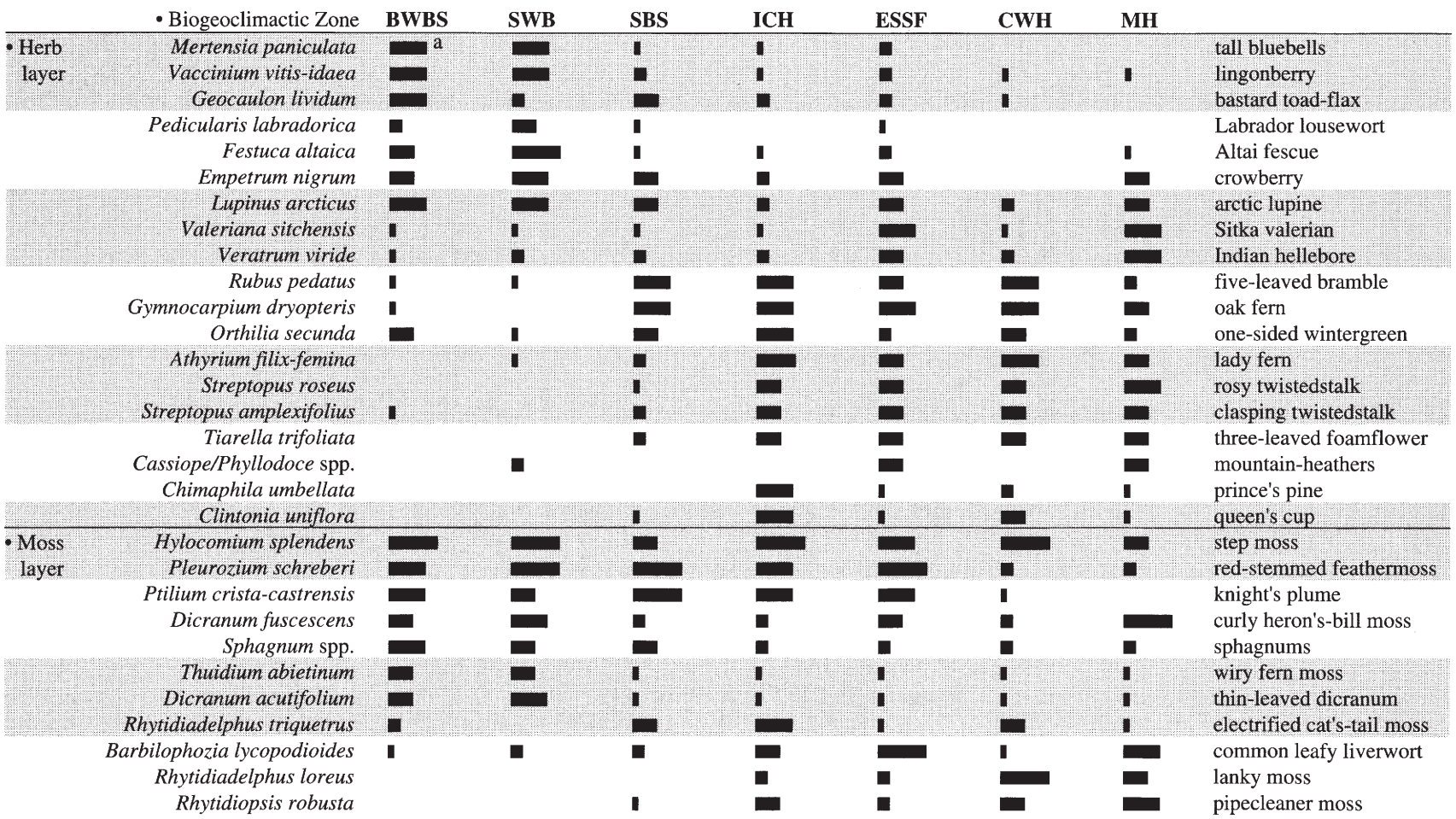


FIGURE 4.17. Distribution of ESSF, MH, and SWB zones in the PRFR, north half.



[a] Bars indicate the relative abundance of plants across all site series within a biogeoclimatic unit. These bars are defined in Section 3.2.2, page 3•6.

FIGURE 4.13. (Continued)