

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 8: **Bunchgrass Zone**

by

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LOCATION AND DISTRIBUTION

The Bunchgrass zone (BG) comprises the grasslands that dominate the lower elevations of the major southern interior valleys of British Columbia (Figure 26). Specifically, the zone occurs from valley bottoms up to elevations between approximately 700 and 1000 m in the following locations: the Okanagan Valley from the United States border to Summerland; the Similkameen River Valley around Keremeos; the Thompson River Valley from Spences Bridge to Kamloops; the Nicola River Valley; and the middle Fraser and lower Chilcotin River valleys from the Farwell Canyon area to Big Bar. South of the border, both the Okanagan and Similkameen valley systems open into the Columbia Basin, a large region of steppe and shrub-steppe described by Franklin and Dyrness (1973).

The BG generally occurs at elevations below the Ponderosa Pine zone, but grades directly into the Interior Douglas-fir zone in several areas.

ECOLOGICAL CONDITIONS

The climatic processes of southern British Columbia reflect physiography. For example, on the southern Interior Plateau the degree of aridity corresponds to the intensity of the Coast Mountains' rainshadow. The rainshadow is most intense and therefore the climate driest in the deeper valleys. In addition, temperature tends to increase with decreasing elevation. In the most deeply incised valleys, drought restricts tree establishment and grasslands predominate.

The climate of the BG is characterized by warm to hot, dry summers and moderately cold winters with relatively little snowfall (Figure 27 and Table 4). The distribution of precipitation is bimodal (Schaefer 1978; Williams 1983). Typically December and January are the wettest months, while a second precipitation peak occurs in June. The driest months are usually March and April, although in the southern Okanagan, September and October tend to be the driest months. The range between mean monthly temperatures is high (23-27°C), and winters become progressively colder as one moves north and west within the zone. Because spring is normally dry and summer precipitation evaporates before it can contribute to recharging soil moisture, plant growth depends mainly on winter moisture (Williams 1983). Soil moisture depletion begins with the start of the growing season; the plants become increasingly stressed as the summer progresses. Summer drought, exacerbated by warm temperatures, is the primary factor promoting the development of graminoid vegetation.

Floristically the grasslands are characterized by widely spaced bunchgrasses and a well-developed cryptogam crust. A cover of 10-15% shrubs, 60% bunchgrasses, and 25-35% cryptogams is typical of climax conditions. *Agropyron spicatum* (bluebunch wheatgrass) is the characteristic climatic climax grass. *Artemisia tridentata* (big sagebrush) is characteristic of several ecosystems.

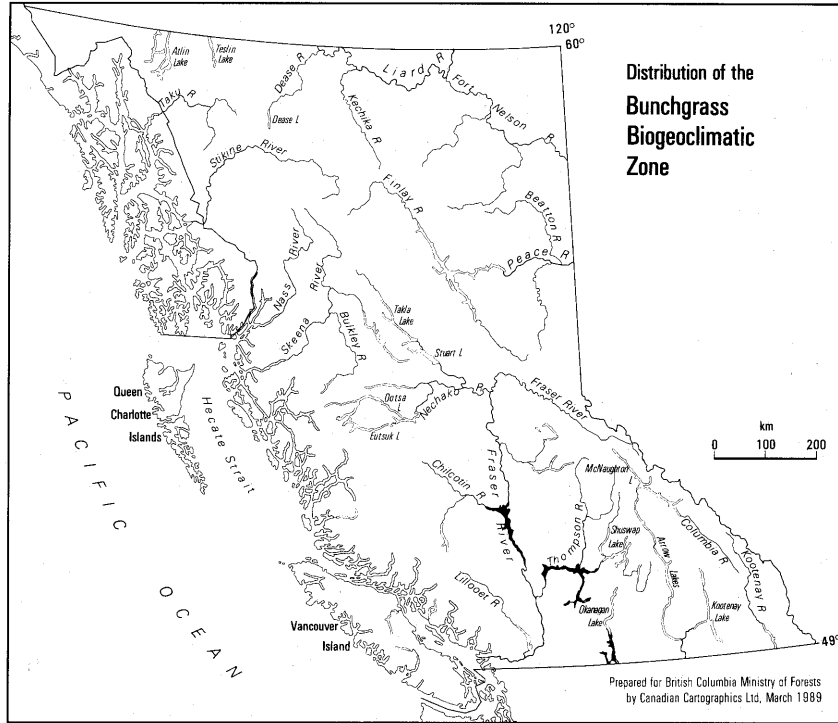


FIGURE 26. Bunchgrass zone.

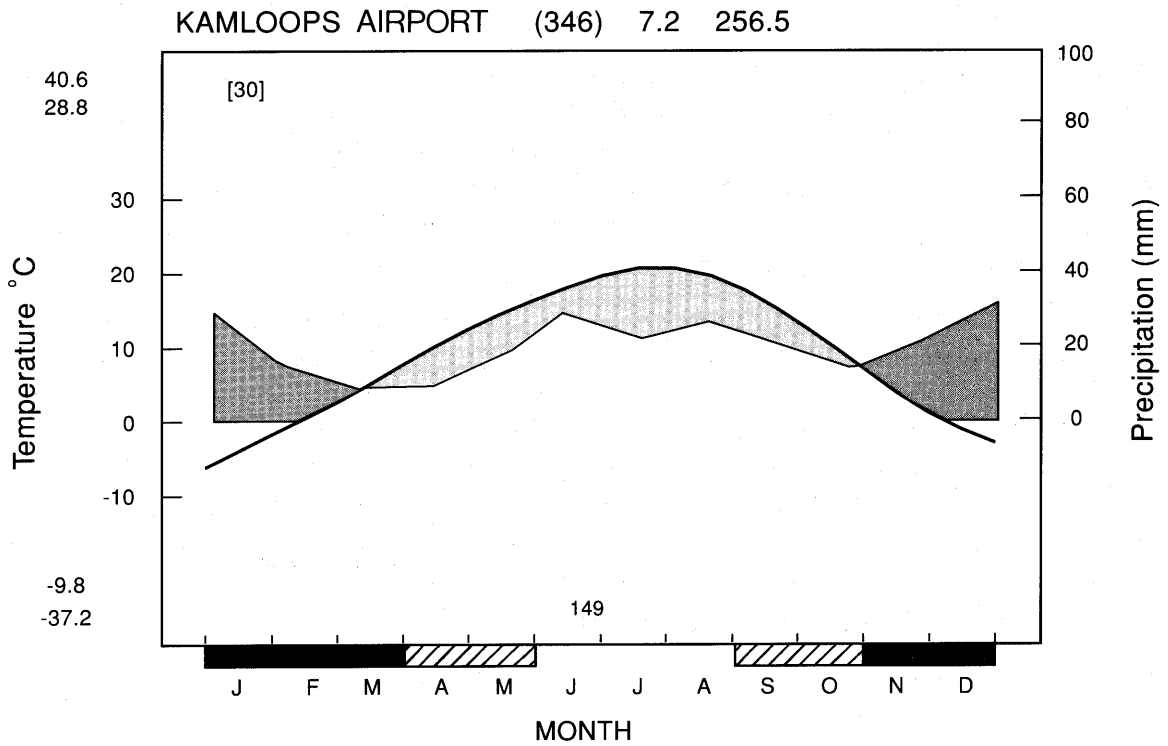


FIGURE 27. Representative climatic diagram for the Bunchgrass zone.

The vegetation of the BG reflects minor changes in topography, aspect, and drainage. Patterns of plant communities are poorly understood because of dramatic alterations in vegetation structure and composition caused by ubiquitous livestock overgrazing. In general, overgrazing results in an increase in abundance of unpalatable or weedy vascular species at the expense of bunchgrasses, particularly *Agropyron spicatum*. For example, sites in fair to poor range condition often have more *Artemisia tridentata*, *Antennaria dimorpha* (low pussytoes), *Stipa comata* (needle-and-thread grass), *Opuntia fragilis* (brittle prickly-pear cactus), and *Bromus tectorum* (cheatgrass).

In the BG, drier sites with sandy, nutrient-poor soils support vegetation dominated by *Stipa comata* and *Sporobolus cryptandrus* (sand dropseed). *Purshia tridentata* (antelope-brush) is also common on these drier sites in the southern Okanagan. Scattered *Stipa hymenoides* (Indian-ricegrass) plants occur on sand dunes. Rock outcrops and sites with shallow soils over bedrock are usually characterized by *Selaginella densa* (compact selaginella). Ponderosa pine and Douglas-fir often grow on steep rocky slopes, on the coarser-textured soils of outwash plains and colluvial fans, and in moist draws. Communities dominated by *Elymus cinereus* (giant wildrye) occur sporadically throughout the zone, generally as patches in seepage areas and along streambanks. In the southern half of the zone, *Festuca scabrella* (rough fescue) or *F. idahoensis* (Idaho fescue) often dominate on steep slopes with a north or east aspect.

Towards the zone's upper elevations, moist depressions (swales) are often dominated by *Poa pratensis* (Kentucky bluegrass) and, in the north, *Stipa spartea* (porcupinegrass) is common. Small groves of trembling aspen can occur on wetter sites at the higher elevations (above approximately 750 m). The aspen is commonly associated with *Symphoricarpos occidentalis* (western snowberry), *Poa pratensis*, *Galium boreale* (northern bedstraw), *Vicia americana* (American vetch), *Agropyron repens* (quackgrass), and *Smilacina stellata* (star-flowered false Solomon's-seal). This community type is heavily used by cattle, so in all likelihood the understory vegetation has been considerably altered from the climax condition.

Wetlands are common throughout the zone and include shrub-dominated riparian habitats with *Betula occidentalis* (water birch), *Typha latifolia* (cattail) marshes with shallow open water, and saline meadows with *Distichlis stricta* (alkali saltgrass). Alluvial black cottonwood stands occur to a limited extent on floodplains of rivers. Bunchgrass zone soils are characterized by a thick Ah horizon, developed through the accumulation of organic material released by the decomposition of fine grass roots. Soils belong to the Brown, Dark Brown, Black, and Dark Gray great groups of the Chernozem Order. Humus forms are typically very thin Xerorhizomulls with characteristics of moders (Pawluk and Sanborn 1989).

NOTES ON CLASSIFICATION

In the original biogeoclimatic classification of Krajina (1965, 1969), those grassland areas below 750 m elevation were included in the Ponderosa Pine — Bunchgrass zone (PPBG). The remaining southern Interior grasslands were placed within the Interior Douglas-fir (IDF) and the Cariboo Aspen — Lodgepole Pine (CALP) zones. However, recent analysis of grassland classification indicated that, to be consistent with the philosophy of the classification system, the grasslands below approximately 900 m elevation should be treated as a separate Bunchgrass zone. Indeed, although relatively small in areal extent, they represent the northern limits of large grasslands to the south. The grassland areas above 900-1000 m elevation were incorporated into the IDF zone.

SUBZONES

Two subzones are recognized in the BG (Table 17 and Figure 28) and correspond to two distinct elevational bands of grassland. Historically they have been referred to as the lower and middle grasslands (Spilsbury and Tisdale 1947; van Ryswyk *et al.* 1966; McLean 1969). The BGxh (Very Dry Hot subzone) or lower grassland occurs in the hottest and driest environment of the valley bottoms to approximately 700 m elevation. The hot, dry climate has resulted in fragile ecosystems with limited plant productivity and soil development. Floristically the BGxh is characterized by widely spaced clumps of *Agropyron spicatum*, *Artemisia tridentata*, and many lichen species that encrust the soil surface. Soils are typically silty clay loam to sandy loam Brown Chernozems or Regosols developed from fluvial or lacustrine deposits.

The BGxw (Very Dry Warm subzone) or middle grassland occurs above the BGxh between approximately 700 and 1000 m elevation. It is generally characterized by the absence of big sagebrush. In the somewhat cooler, moister climate, the bluebunch wheatgrass is more closely spaced than in the BGxh. The diversity of forbs, however, is slightly higher and the diversity of lichens is lower. Furthermore, the soils are more deeply developed Dark Brown Chernozems, developed predominantly from compacted gravelly tills.

SOME REPRESENTATIVE SITE ASSOCIATIONS

The following three site associations describe a typical sequence of ecosystems in the BGxw (see Figure 29).

Bluebunch wheatgrass — Selaginella

The Bluebunch wheatgrass — Selaginella association is common on very dry, rock outcrop sites throughout the BG. Soils are predominantly Regosols and humus forms are Xerorhizomulls.

The occasional ponderosa pine or Douglas-fir may be present. Scattered *Artemisia frigida* (pasture sage), *A. tridentata*, and *Chrysothamnus nauseosus* (rabbit-brush) often occur in the shrub layer. *Selaginella densa* (compact selaginella) dominates the herb layer. *Agropyron spicatum* and *Poa sandbergii* (Sandberg's bluegrass) are common grasses and *Lomatium macrocarpum* (large-fruited desert-parsley), *Erigeron linearis* (line-leaved fleabane), and *Antennaria dimorpha* are common herbs. A diverse "lichen" layer, including *Cladonia* spp. and *Diploschistes scruposus*, is typical.

TABLE 17. Synopsis of subzones in the Bunchgrass zone (BG)

Subzone	Code	Old code
Very Dry Hot	BGxh	(BGa,g/PPBGa,g)
Very Dry Warm	BGxw	(BGm,e/PPBGm,e)

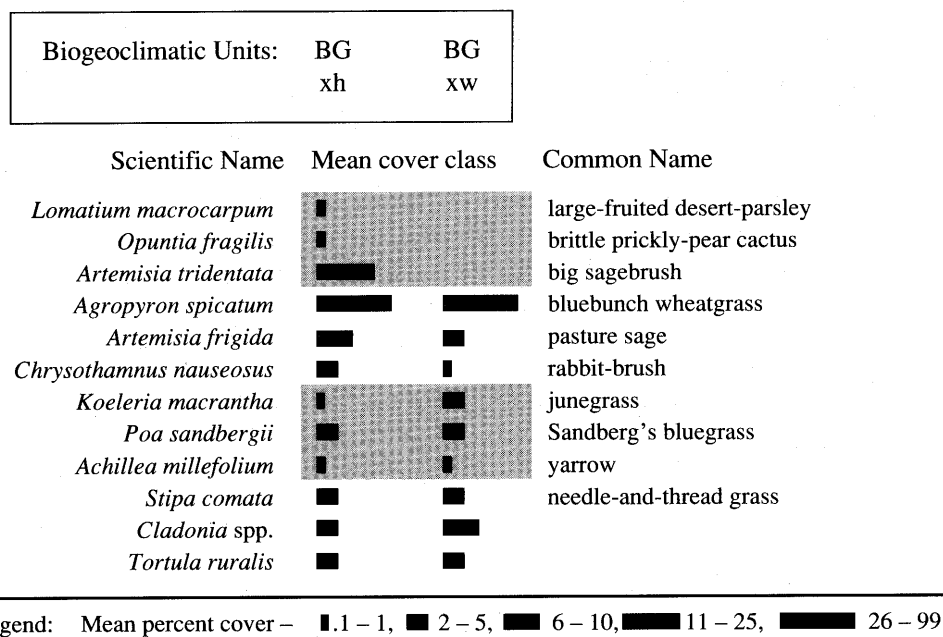


FIGURE 28. Zonal vegetation of subzones of the Bunchgrass zone.

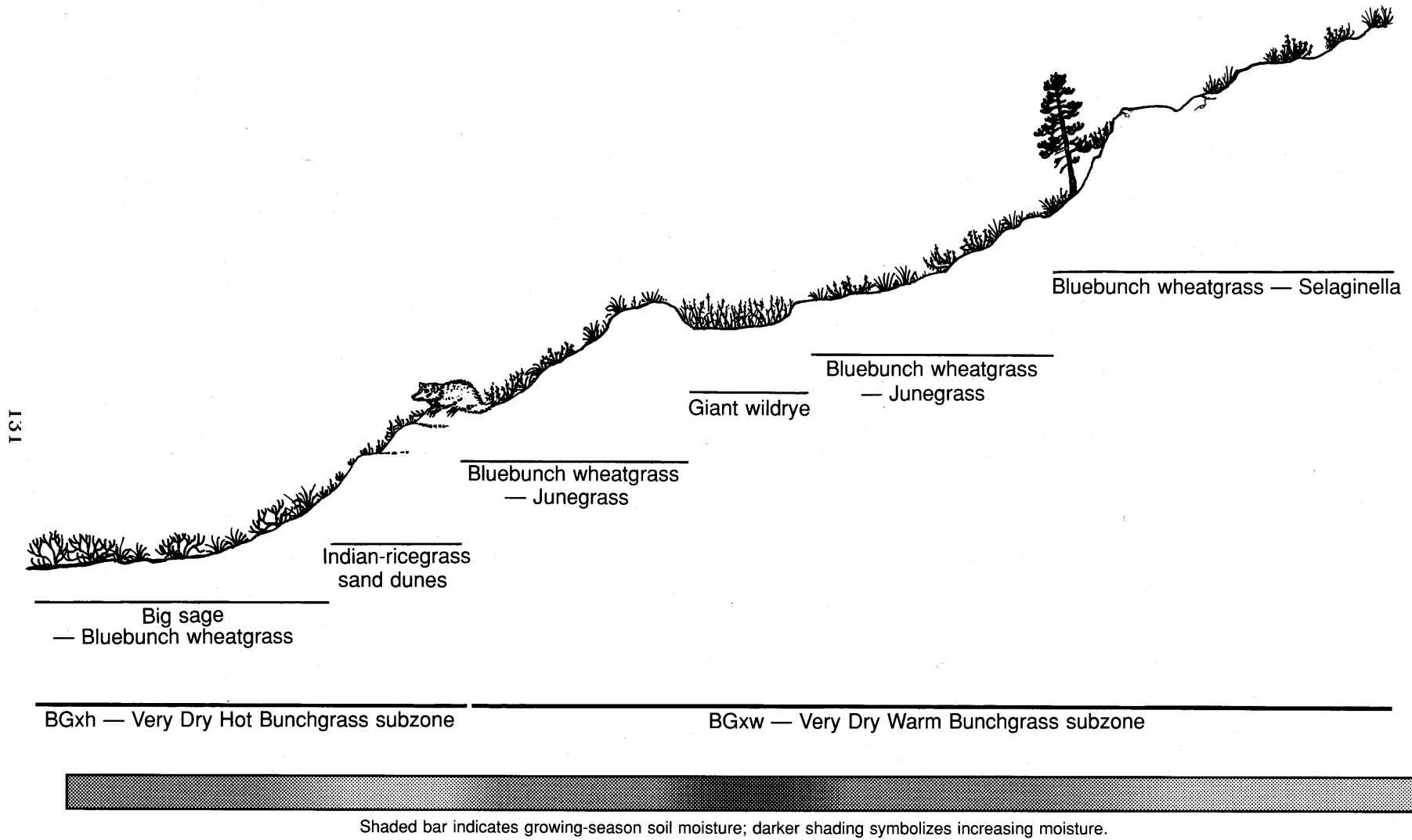


FIGURE 29. Simplified schematic diagram of topographic relationships among common site associations of the Bunchgrass zone.

Bluebunch wheatgrass — Junegrass

The Bluebunch wheatgrass — Junegrass association occupies zonal to slightly drier sites in the BGxm. It most frequently occurs on aeolian-capped till, although it is found on other types of terrain, including glaciofluvial terraces and colluvial-capped till. The till soils are typically loamy-skeletal Orthic Dark Brown Chernozems. The humus forms are Xerorhizomulls.

Undisturbed sites are characterized by well-spaced bunches of *Agropyron spicatum* and a crust of blue-green algae and lichen species. Mosses tend to increase on overgrazed sites while lichen cover declines. *Stipa comata* often increases with overgrazing until extreme disturbance results in invasion by weedy species such as *Bromus tectorum* and *Centaurea* spp. (knapweeds).

In the shrub layer, common species include *Artemisia frigida* and *Chrysothamnus nauseosus*. Both *Poa sandbergii* and *Koeleria macrantha* (junegrass) are common grasses. Common or locally abundant herbs include *Achillea millefolium* (yarrow), *Tragopogon dubius* (yellow salsify), *Antennaria dimorpha*, *Stipa comata*, *Lomatium macrocarpum*, *Crepis atrabarba* (slender hawksbeard), *Opuntia fragilis*, *Linum lewisii* (wild blue flax), *Festuca scabrella*, and *Balsamorhiza sagittata* (arrow-leaved balsamroot). Lichen and moss species frequently include *Cladonia* spp., *Tortula ruralis*, *Ceratodon purpureus*, *Diploschistes scruposus*, and *Bryum caespiticium*.

Giant wildrye

The Giant wildrye association is found on localized moist seepage sites. Soils are Dark Brown Chernozems. They are often alkaline and can be slightly saline as a result of restricted drainage and high surface evaporation. Humus forms are Rhizomulls. *Elymus cinereus* dominates these ecosystems. *Juncus arcticus* (arctic rush), *Carex praegracilis* (field sedge), *Poa pratensis*, and *Rosa woodsii* (Wood's rose) can be minor components. *Bryum caespiticium* is typical of the sparse moss layer.

WILDLIFE HABITATS

Although it is one of the smallest zones in British Columbia, the Bunchgrass zone supports a tremendous diversity and density of wildlife (Table 18). This is partly due to the wide range of habitats created by the juxtaposition of grasslands, shrub-steppe, riparian areas, and forest. Perhaps more importantly, this zone represents an extension of the intermontane steppe of the western Great Basin from the south into the northern forests. As a result of this strategic location, both southern and northern species frequent this zone. For example, southern species such as the Pallid Bat, Burrowing Owl, and Short-horned Lizard reach their northern breeding limit in this zone. On the other hand, northern species that rarely move further south, such as the Snowy Owl and Gyrfalcon, can be found on open rangelands in winter.

TABLE 18. Selected wildlife habitats and species in the Bunchgrass zone (adapted from Wildlife Branch 1989)

Habitat	Habitat distribution	Representative wildlife species	Wildlife species at risk ^a
Bunchgrass grasslands	Extensive	Rocky Mountain Elk, Coyote, Badger, Northern Pocket Gopher Golden Eagle, Red-tailed Hawk, American Kestrel, Snowy Owl, Turkey Vulture, Sharp-tailed Grouse, Long-billed Curlew, Sandhill Crane, Black-billed Magpie, Horned Lark, Western Meadowlark, Mountain Bluebird, Bank Swallow, Grasshopper Sparrow Western Yellow-bellied Racer, Great Basin Spadefoot Toad	∇ Burrowing Owl, Prairie Falcon, Common Poorwill, White-tailed Jackrabbit, Short-horned Lizard ◆ California Bighorn Sheep, Great Basin Pocket Mouse, Montane Vole, Grasshopper Sparrow, Western Rattlesnake, Gopher Snake
Shrub-steppe	Extensive	Mule Deer, White-tailed Deer, Coyote, Badger, Northern Pocket Gopher American Kestrel, Western Meadowlark, Horned Lark, Vesper Sparrow, Lark Sparrow Western Yellow-bellied Racer, Great Basin Spadefoot Toad	∇ White-tailed Jackrabbit, Pallid Bat, Burrowing Owl, Short-horned Lizard, Tiger Salamander ◆ California Bighorn Sheep, Great Basin Pocket Mouse, Nuttall's Cottontail, Sage Thrasher, Western Bluebird, Lewis' Woodpecker, Brewer's Sparrow, Western Rattlesnake, Gopher Snake
Rocky cliffs and talus	Limited areal extent	Yellow-bellied Marmot, Western Big-eared Bat, Western Long-eared Myotis Golden Eagle, Common Raven, Rock Wren, Violet-green Swallow	∇ Spotted Bat, Pallid Bat, Fringed Myotis, Western Small-footed Myotis, Anatum Peregrine Falcon, Prairie Falcon, Canyon Wren ◆ California Bighorn Sheep, Western Rattlesnake, Night Snake, Gopher Snake, White-throated Swift
Ponderosa pine parkland	Limited areal extent	Rocky Mountain Elk, Mule Deer, White-tailed Deer, Coyote, Badger, Hoary Bat, Northern Pocket Gopher, Golden-mantled Ground Squirrel, Deer Mouse American Kestrel, Blue Grouse, Hairy Woodpecker, Common Nighthawk, Black-billed Magpie, Brewer's Blackbird, Clark's Nutcracker, White-breasted Nuthatch, Pygmy Nuthatch, Dusky Flycatcher, Rufous Hummingbird, Black-chinned Hummingbird Western Yellow-bellied Racer, Rubber Boa	∇ Townsend's Big-eared Bat, Spotted Bat, Fringed Myotis, Flammulated Owl, Common Poorwill ◆ Lewis' Woodpecker, White-headed Woodpecker, Gray Flycatcher, Western Rattlesnake, Gopher Snake
Agricultural areas	Common	Rocky Mountain Elk, Mule Deer, White-tailed Deer, Coyote, Northern Pocket Gopher, Meadow Vole American Kestrel, Canada Goose, Western Meadowlark, Barn Swallow, Black-billed Magpie, Bohemian Waxwing Great Basin Spadefoot Toad	◆ Lewis' Woodpecker, Western Rattlesnake, Gopher Snake

TABLE 18. Continued

Habitat	Habitat distribution	Representative wildlife species	Wildlife species at risk ^a
Riparian areas, wetlands, meadows, and floodplains	Limited areal extent	Mule Deer, White-tailed Deer, Long-tailed Weasel, Western Long-eared Myotis, Western Jumping Mouse Osprey, Long-eared Owl, Screech Owl, American Bittern, Virginia Rail, Sora, Canada Goose, Tundra Swan, Eared Grebe, Wood Duck, Red-winged Blackbird, Black-headed Grosbeak, Bobolink, Northern Oriole, Marsh Wren, Common Yellowthroat, Gray Catbird, Veery Western Skink, Common Garter Snake, Rubber Boa, Painted Turtle, Pacific Treefrog, Western Toad	▽ Spotted Bat, Fringed Myotis, Western Small-footed Myotis, Tiger Salamander ◆ Southern Red Bat, Nuttall's Cottontail, Western Harvest Mouse, Bald Eagle, Great Blue Heron, Black-crowned Night Heron, Yellow-breasted Chat, Yellow-headed Blackbird, Western Bluebird, Western Rattlesnake
Lakes and streams	Common	Muskrat, Beaver Canada Goose, Mallard, American Wigeon, Northern Shoveller, Redhead, Wood Duck, American Coot, American Dipper Painted Turtle, Spotted Frog, Great Basin Spadefoot Toad	▽ Tiger Salamander ◆ Western Grebe, Great Blue Heron, Black-crowned Night Heron

^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.

A large number of wildlife species in the BG are of provincial or national significance because of their rarity or uniqueness. Many are restricted to the southern half of the Okanagan Valley; for example, the Great Basin Pocket Mouse, Pallid Bat, Spotted Bat, Canyon Wren, White-Throated Swift, Burrowing Owl, Great Basin Spadefoot Toad, and Tiger Salamander.

Grassland ecosystems provide habitat for Rocky Mountain Elk, California Bighorn Sheep, and a host of small mammals, birds, and reptiles. Wildlife dependent on this habitat have been adversely affected by overgrazing by cattle and introduction of noxious weeds. Furthermore, much habitat has been lost through extensive conversion of the grasslands to agricultural and residential developments. As a result, there are a large number of species from this habitat that are at risk in British Columbia (Table 18).

Wildlife species of the shrub-steppe ecosystems are similar to those of the grasslands; a few species are lost, such as the Grasshopper Sparrow, but several others are added including Mule and White-tailed Deer, Sage Thrasher, and Brewer's Sparrow.

Rocky cliffs and talus provide breeding habitat for many animals whose existence in British Columbia is considered at risk. These species include the rare Spotted Bat and Pallid Bat, Anatum Peregrine Falcon, Canyon Wren, White-throated Swift, Western Rattlesnake, Night Snake, and Gopher Snake.

Small pockets of trees can occur within the Bunchgrass zone, producing a completely different wildlife habitat from the adjacent dry open steppe. These are very productive areas, supporting numerous wildlife species. Where ponderosa pine occurs in moist, shady draws and on coarser textured soils, habitat is provided for species such as the White-headed Woodpecker, Clark's Nutcracker, Lewis' Woodpecker, Townsend's Big-eared Bat, and Yellow-pine Chipmunk. Riparian woodlands of mountain alder, black cottonwood, trembling aspen, and willows, also support a rich fauna, including the Wood Duck, American Kestrel, California Myotis, Western Harvest Mouse, Water Shrew, and Western Skink.

Lakes and streams in the BG either remain open year-round or are the first to thaw in the spring. As such they provide important staging areas for migrating waterfowl in spring. Along the margins of large lakes and streams, hard-stem bulrushes and cattails provide habitat for Marsh Wren, Red-wing Blackbird, Sora, American Bittern, Muskrat, and many reptiles and amphibians.

The BG contains several non-native wildlife species. The California Quail, Ring-necked Pheasant, and Chukar were introduced directly. The Gray Partridge invaded from introductions in Washington State. Rock Doves occur in this zone as a result of accidental escapes from captivity. The European Starling and House Sparrow invaded from introductions in the eastern United States.

The Sage Grouse, which occurred in the BG, is the only native species known to have been extirpated from British Columbia. The Burrowing Owl was extirpated, but considerable effort is now underway to re-introduce this species in the South Okanagan. The Burrowing Owl's status should be considered tentative at this time. The White-tailed Jackrabbit and the Short-horned Lizard may also be near extirpation.

RESOURCE USES

The BG has high agricultural capability. With irrigation the land supports orchards, vineyards, and alfalfa production.

Grasslands are critical to the livestock industry in British Columbia. The native vegetation is used for early spring, late fall, and winter livestock range. *Agropyron spicatum* is the most productive and important forage species throughout the zone.

The occurrence of other forage species is somewhat variable, depending on the subzone and the past grazing history of the area, but can include *Koeleria macrantha*, *Aristida longiseta* (red three-awn), *Balsamorhiza sagittata*, *Eriogonum heracleoides* (parsnip-flowered buckwheat), and numerous other forbs (Tisdale 1947; McLean and Marchand 1968). *Amelanchier alnifolia* (saskatoon), *Prunus virginiana* (choke cherry), and *Purshia tridentata* can be important browse species. However, the dominant shrubs in this zone, *Artemisia tridentata* and *Chrysothamnus nauseosus*, have little grazing value for domestic livestock.

Water sports, wildlife viewing, and hiking are popular in the BG because of the warm, dry climate and the water courses and lakes in the major valleys.

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BG

Bunchgrass Zone

Overview

Location and Distinguishing Features The Bunchgrass (BG) Zone includes all portions of the Cariboo Forest Region where grasslands are the climax vegetation on zonal sites. Forests occur on moist sites and cool north-facing slopes but zonal sites are generally too dry for the establishment of forest vegetation. In the Cariboo Forest Region, the BG Zone occurs in the Fraser River valley in the southern half of the Region and in the lower Chilcotin River valley. It occurs primarily at elevations below 800 m. The Bunchgrass Zone also occurs in major river valleys in the Southern Interior of British Columbia (Nicholson *et al.* 1991). The northern limit of the BG Zone in British Columbia is approximately the confluence of the Fraser and Chilcotin rivers in the Cariboo Forest Region.

Not all grasslands of the Cariboo Forest Region are included in the BG Zone. Grasslands are also common in forest-grassland parklands in parts of the Interior Douglas-fir (IDF) Zone, especially in the very dry (IDF_{xw} and IDF_{xm}) subzones (see IDF Zone description). However, the climax vegetation on zonal sites in the IDF zone is a forest community. Where grasslands are present on zonal sites, they are primarily a seral stage in the development of forests. In the transition between the BG and IDF zones, some grasslands are long-persisting seral stages.

Grasslands of the IDF Zone are distinguished from those of the BG Zone by having common porcupine grass, spreading needlegrass, and Rocky Mountain fescue but little or no needle-and-thread grass in late seral vegetation on zonal sites.

Climate The BG Zone includes the warmest and driest areas of the Cariboo Forest Region. The climate is characterized by warm to hot, dry summers and moderately cold winters with little snowfall (Table 3). Peak snowpack is generally less than 50 cm, and, for much of the winter, snow may be absent on sun- or wind-exposed areas. Soils are generally moist for only a short time in the spring (April–early June) following snowmelt. By early summer, soils are typically very dry due to little precipitation and the high evaporation rates. Precipitation is greatest in December–January and in June. Near-surface soils are typically frozen during winter months.

BGC UNITS

The dry climate of the BG Zone is due in part to valley topography influences. Solar heating of valley slopes results in valley heating, relatively strong convection currents, and reduced precipitation onto valley slopes.

TABLE 3 Environmental characteristics of BG subzones in the Cariboo Forest Region

	BGxh3	BGxw2
Area (km ²)	269	627
Elevation range (m)	400–650	650–900
Climate		
Precipitation (mm)		
Mean annual	330	345
Mean summer	177	197
Mean winter	153	148
Mean annual snowfall (cm)	71	180
Temperature(°C)		
Mean annual	5.9	5.0
Mean - warmest month	19.0	17.3
Mean - coldest month	-10.6	-9.9
Frost-free days	182	169
Soils		
Zonal soils ^a	O.B	O.B
Zonal humus form ^b	RMu	RMu

^aO.B = Orthic Brown Chernozem

^bRMu = RhizoMull

Vegetation Native vegetation on zonal sites of the BG Zone is characterized by bunchgrasses, several low forbs and small grasses, scattered shrubs, and a crust of lichens, mosses, and cyanobacteria on soil surfaces. Bluebunch wheatgrass is the characteristic dominant grass of the climax vegetation and is present on most sites. Other common grasses include needle-and-thread grass, junegrass, Sandberg's bluegrass, spreading needlegrass, sand dropseed, and porcupine grass. Compact selaginella, yarrow, cut-leaved daisy, Hoelboell's rockcress, large-fruited desert parsley, pasture sage, and low pussytoes are common forbs. Big sagebrush is common and often dominates the vegetation at low elevations of the zone. Rabbit-brush and common juniper are also common, although rarely dominant, shrubs.

Riparian communities are relatively small and infrequent in the BG Zone but are characterized by a rich variety of tall shrub and herbaceous species. Douglas-fir is present on many of these sites. Wetlands are generally uncommon in the BG and occur most frequently at upper elevations of the zone on the low-relief terrain of the plateau.

Vegetation of the BG Zone has been modified nearly everywhere by domestic grazing. This has resulted in an increase of weedy species (both native and non-native), a significant decrease in the abundance of climax bunchgrass species, and increased abundance of pussytoes, pasture sage, line-leaved fleabane, and other grazing increasers. In addition, the soil litter layers and the crust of lichens/mosses/cyanobacteria have been significantly reduced. However, non-native weeds are not as common in the Cariboo Forest Region grasslands as they are in grasslands of southern British Columbia.

Soils Soils on zonal sites of the BG Zone are primarily Brown Chernozems developed on loamy glacial till derived primarily from basalt rocks. In most areas, a veneer of stone-free silt and fine sand, 10–50 cm thick, is present over the glacial till. This veneer is generally assumed to be wind-deposited but may partly result from soil faunal activity. The veneer contrasts sharply with the gravelly till on which it lies. An organically enriched Ah horizon is typically 10–20 cm thick and a carbonate layer is usually present within 20–50 cm of the surface. Humus forms are primarily thin Rhizomulls.