

## **Chapter 9: Ponderosa Pine Zone**

by

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## LOCATION AND DISTRIBUTION

The Ponderosa Pine zone (PP) occurs at low elevations along the very dry valleys of the southern Interior Plateau of British Columbia (Figure 30). The PP occurs as a thin band in the bottoms and/or on lower sidewalls of the valleys of the Fraser River in the Lytton-Lillooet area, the lower Thompson, Nicola, Similkameen and lower Kettle rivers, Okanagan Lake, and the southern Rocky Mountain Trench. Elevations range from 335 to 900 m. The zone is located between 49 and 51°N latitude in British Columbia, and extends south of the border into eastern Washington and Oregon. The PP in British Columbia represents the northern limits of a zone that is much more extensive in the western USA.

Typically, the PP's elevation falls between that of the Bunchgrass (BG) and Interior Douglas-fir (IDF) zones.

## ECOLOGICAL CONDITIONS

The PP is the driest and, in summer, the warmest forested zone in British Columbia (Figure 31 and Table 4). Mean annual temperature ranges from 4.8 to 10°C. Mean monthly temperature is above 10°C for 5-6 months and below 0°C for 2-5 months. The pronounced rainshadow cast by the Coast Mountains over the southern Interior Plateau is strongly expressed in the PP. Mean annual precipitation is 280-500 mm, with 15-40% as snowfall. Summers are very warm; mean July temperature is 17-22°C. The hot, dry summers result in large moisture deficits during the growing season. Winters are cool with light snow cover.

The forests of the PP landscape are dominated by ponderosa pine. Stands are often very open and parklike with a ponderosa pine canopy and an understory dominated by *Agropyron spicatum* (bluebunch wheatgrass). In fact, the vegetation often consists of a mosaic of forest and grassland. Ponderosa pine is well adapted to fire, and fires have played an important role in the ecology of the zone. Douglas-fir is most common on moist and very moist sites associated with gullies, draws, and streams, but it also occurs as a minor component of drier sites in the northern part of the zone. Trembling aspen is a dominant component of the dense stands that occur on riparian or seepage sites throughout the zone. Water birch (*Betula occidentalis*) and paper birch are found locally in moisture-receiving sites. Black cottonwood occurs on floodplains.

The dominant soils throughout the zone are Dark Brown Chernozems and Orthic or Eluviated Eutric Brunisols. The "wettest" forested sites in the zone have imperfectly drained soils, but Gleysols are uncommon. There is local formation of saline, or alkaline, soils in depressions or basins with restricted drainage. Humus forms typically are Rhizomulls on zonal and drier sites, and Moders on zonal and wetter sites.

Grasslands occur throughout the PP. They are thought to have developed as a result of a combination of edaphic and topographic conditions, together with fire

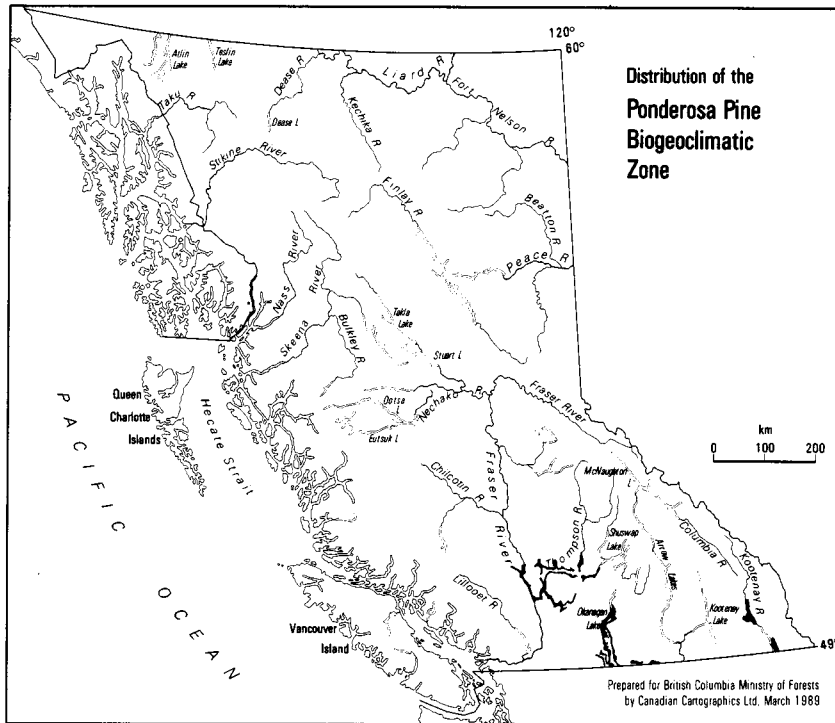


FIGURE 30. Ponderosa Pine zone.

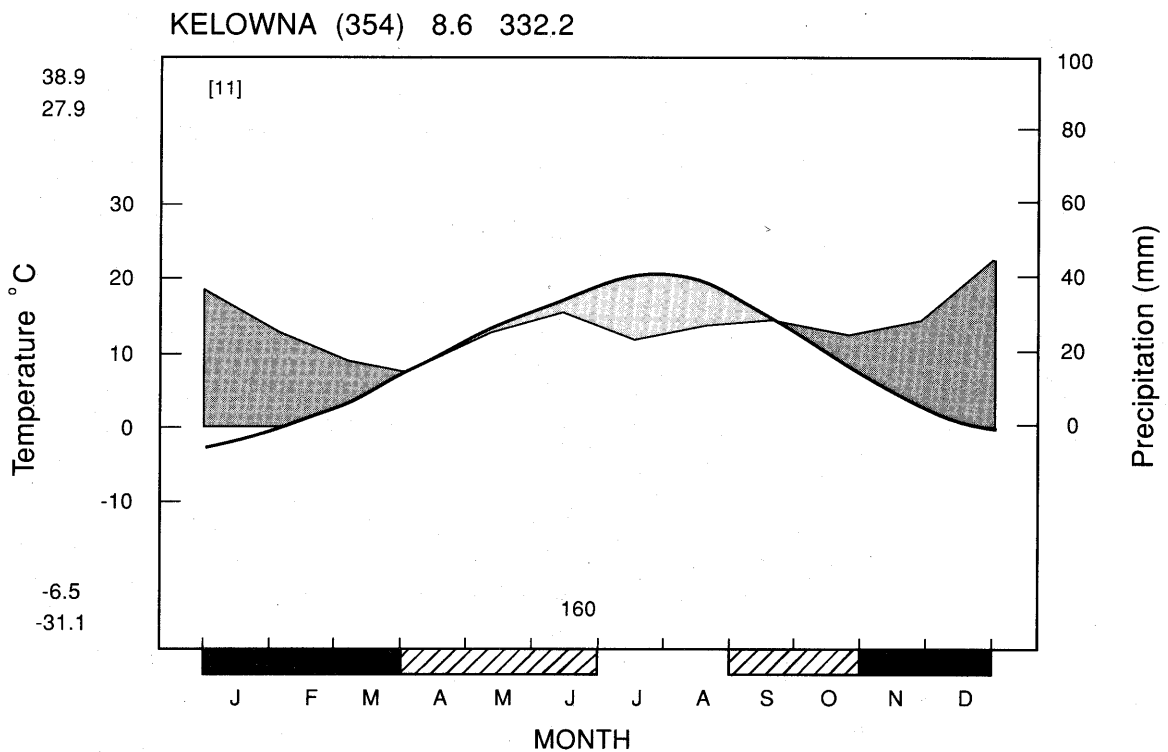


FIGURE 31. Representative climatic diagram for the Ponderosa Pine zone.

history. Dominant species in ecosystems in good range condition are *Agropyron spicatum* and *Artemisia tridentata* (big sagebrush), as well as *Festuca* spp. (fescues). Overgrazed sites in fair to poor range condition have less *Agropyron spicatum* and *Festuca* spp. and more *Artemisia tridentata* and *Poa sandbergii* (Sandberg's bluegrass), along with the invaders *Bromus tectorum* (cheatgrass) and *Centaurea* spp. (knapweeds). Many of the extensive grassland areas adjacent to the PP are included in the Bunchgrass zone.

Alkaline ponds can occur in depressions or basins with restricted drainage. These ponds dry out toward the end of summer and are fringed by wetlands which include several concentrically arranged plant communities. Common species in these communities include *Distichlis stricta* (alkali saltgrass), *Scirpus* spp. (bulrushes), and *Juncus* spp. (rushes).

## NOTES ON CLASSIFICATION

Krajina (1965, 1969) grouped the lower and middle grassland areas and the lower and middle elevation dry forests into the Ponderosa Pine — Bunchgrass zone (PPBG), a zone where either ponderosa pine or bluebunch wheatgrass, or both, dominated climatic climax ecosystems. Since then, Ministry of Forests ecologists have divided the PPBG, classifying it into separate BG and PP zones, although small azonal grassland ecosystems occur within the PP. Recently, an area of the East Kootenays classified as IDfg2, has been added to the PP.

## SUBZONES

Two subzones have been recognized in the PP (Table 19). Zonal vegetation in both subzones (Figure 32) is dominated by ponderosa pine and *Agropyron spicatum*. Other species in common are *Balsamorhiza sagittata* (arrow-leaved balsamroot), *Amelanchier alnifolia* (saskatoon), and *Achillea millefolium* (yarrow). The Very Dry Hot PP subzone (PPxh) is differentiated from the Dry Hot PP (PPdh) in having more *Festuca saximontana* (Rocky Mountain fescue), *Festuca idahoensis* (Idaho fescue), *Crepis atrabarba* (slender hawksbeard), and *Astragalus miser* (timber milk-vetch). The PPdh has *Lupinus sericeus* (silky lupine), *Arnica fulgens* (orange arnica), and greater abundance of *Antennaria microphylla* (rosy pussytoes), *Koeleria macrantha* (junegrass), and *Bromus tectorum* (cheatgrass).

The driest subzone (PPxh) occurs in valley bottoms from Lytton to north of Lillooet, and west along the Yalakom River and east along the Nicola River. It also occurs as an elevational band between the BG and IDF zones along the Thompson River from Lytton to east and north of Kamloops, and in the Okanagan valley from south of Vernon to the U.S. border.

The dry, hot subzone (PPdh) occurs in the southern Kettle River valley around both Midway and Grand Forks. Further east, the PPdh occupies the bottom of the Rocky Mountain Trench, both north of Cranbrook and on the southeast side of Koochanusa Reservoir.

TABLE 19. Synopsis of subzones in the Ponderosa Pine zone (PP)

Subzone	Code	Old code
Very Dry Hot PP	PPxh	(PPd/PPBGd)
Dry Hot PP	PPdh	(PPc/PPBGc/IDFg2)

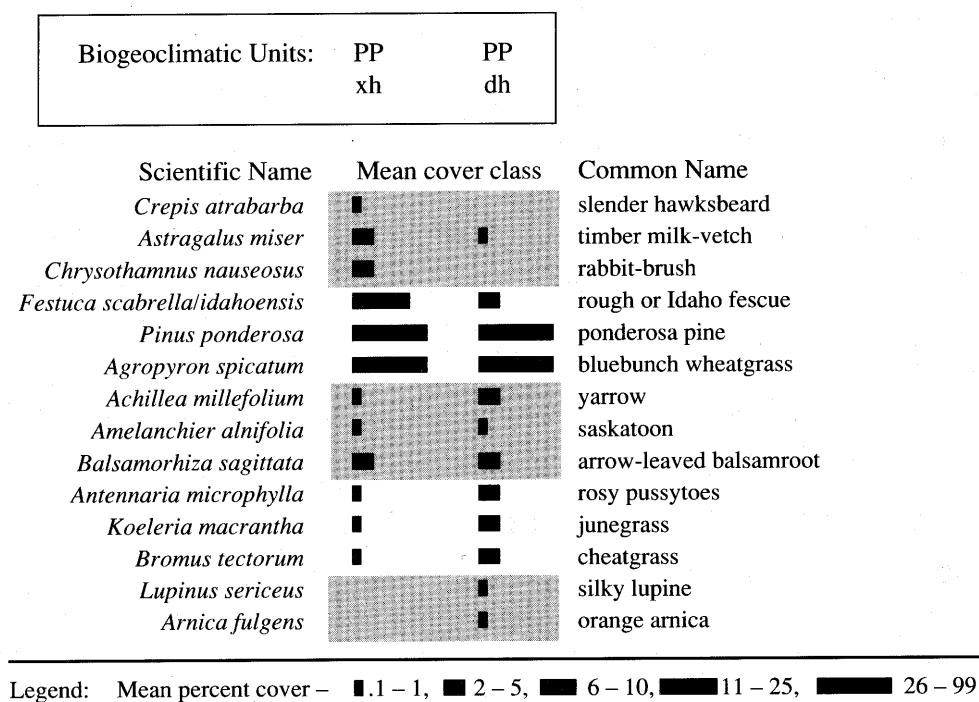


FIGURE 32. Zonal vegetation of subzones of the Ponderosa Pine zone.

## **SOME REPRESENTATIVE SITE ASSOCIATIONS**

The following site associations occur commonly in the PP. They form a typical sequence of ecosystems in the PPxh in the Okanagan Valley (Figure 33).

### **Ponderosa pine — Bluebunch wheatgrass — Fescue**

This is the zonal association in the PPxh subzone, and it is commonly found on loamy, moderately well-drained soils developed from morainal and glaciofluvial deposits. Soils are Orthic Eutric Brunisols and Brown Chernozems. Humus forms include Mullmoders and Rhizomulls.

Mature forest stands have very open canopies of ponderosa pine, with some Douglas-fir in the north of the subzone. Regeneration in the understory is uncommon.

*Agropyron spicatum* (bluebunch wheatgrass) and *Festuca* spp. (*F. idahoensis* in the south, *F. scabrella* in the north) dominate the understory. There are lesser amounts of *Achillea millefolium*, *Astragalus miser*, and *Balsamorhiza sagittata*. The zonal association in the dry subzone is similar, but lacks fescues (*Festuca* spp.).

The shrub layer is open or absent. *Chrysothamnus nauseosus* (rabbit-brush) can occur in northern areas. The moss layer is generally absent.

### **Ponderosa pine — Red three-awn**

This is the driest site association in the PPxh. It is found on south-facing rock outcrops and steep glaciofluvial escarpments. Soils are Brown Chernozems and humus forms are loose, dry Xerorhizomulls.

The open tree canopy is dominated by ponderosa pine, with some Douglas-fir occurring in the north.

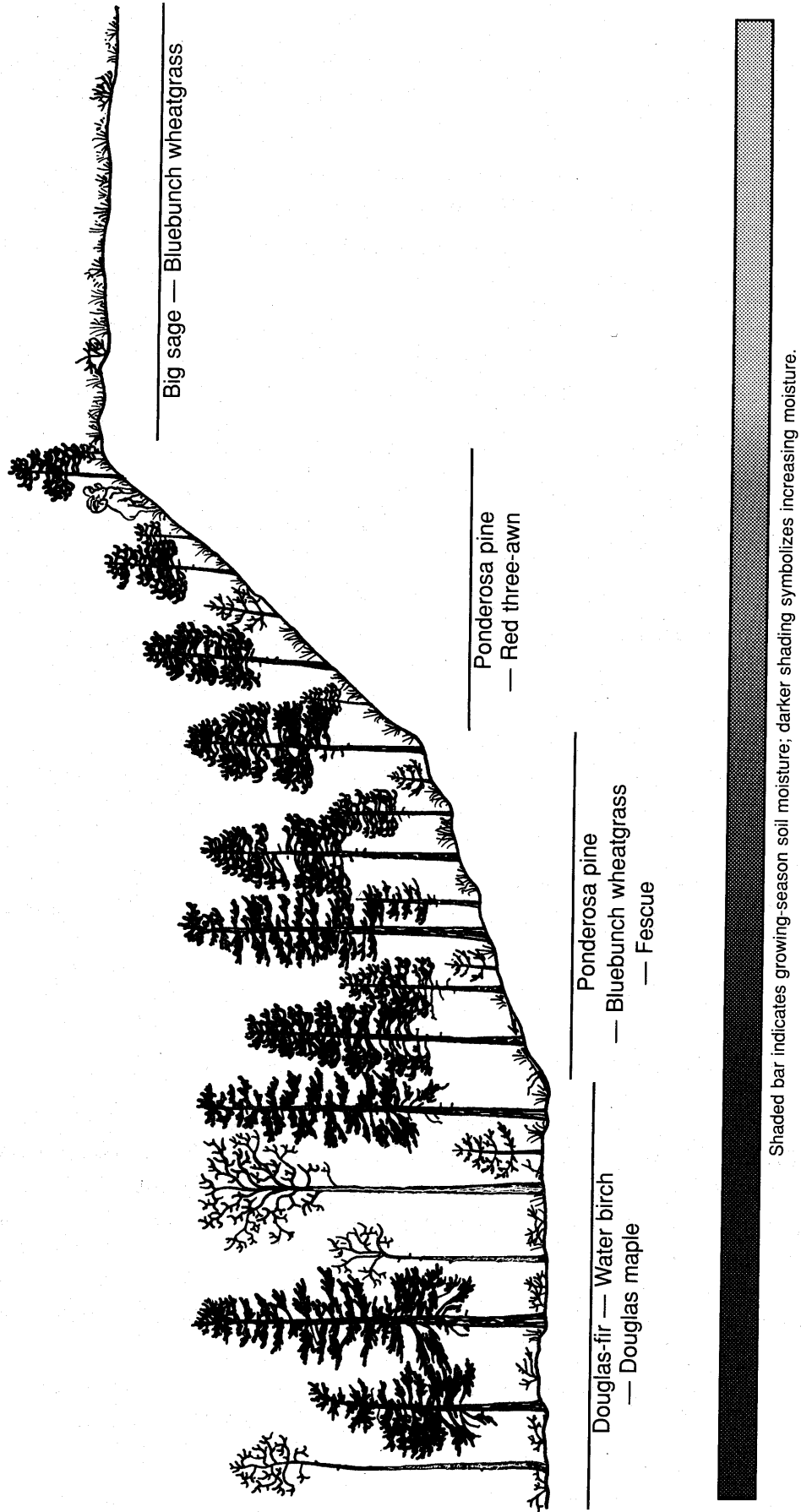
The shrub layer, if present, is poorly developed. Tree regeneration is uncommon.

The herb layer is well developed and contains *Selaginella densa* (compact selaginella), *Agropyron spicatum*, *Achillea millefolium*, and *Aristida longiseta* (red three-awn).

The moss layer is generally poorly developed, and exposed mineral soil is common. Some lichens are usually present.

### **Big sage — Bluebunch wheatgrass**

This shrub-steppe association occurs on gently sloping, extremely dry sites throughout the PP. The Big sage — Bluebunch wheatgrass association is very similar to the zonal association of the driest BG subzone. In the PP, these sites are considered to represent disclimaxes or topoedaphic climaxes. Parent materials are generally medium- to fine-textured morainal blankets. Soils are typically Orthic Dark Brown and Brown Chernozems. Rhizomulls are the most common humus form.



**FIGURE 33.** Simplified schematic diagram of topographic relationships among four common site associations of a very dry, hot subzone of the Ponderosa Pine zone.

In undisturbed stands, the shrub layer is dominated by well-spaced *Artemisia tridentata* (big sagebrush). There can be a low cover of *Artemisia frigida* (pasture sage).

The herb layer is dominated by *Agropyron spicatum* (bluebunch wheatgrass), with lesser amounts of *Poa sandbergii* and *Achillea millefolium*.

The very sparse moss layer consists mainly of *Cladonia* and *Peltigera* lichens and the moss *Tortula ruralis*.

Increased grazing of these sites results in increased cover of *Artemisia tridentata*, *Chrysothamnus nauseosus*, *Poa* spp. (bluegrasses), and *Antennaria* spp. (pussytoes). *Bromus tectorum* invades or increases in severely overgrazed ecosystems.

### **Douglas-fir — Water birch — Douglas maple**

This association occurs on very moist to wet, nutrient-medium to very rich sites throughout the PP. Such sites are often on floodplains and along streams. Soils are medium- and fine-textured Melanic or Eutric Brunisols, or occasionally Regosols. The soils can be gleyed. Humus forms include Leptomoders, Mormoders, and Vermimulls.

Mature seral or young climax stands are very dense; they contain Douglas-fir and trembling aspen or black cottonwood. Ponderosa pine and paper birch are minor components in some stands.

The shrubby understory contains *Betula occidentalis* (water birch), *Symphoricarpos albus* (common snowberry), *Rosa* spp. (roses), *Cornus stolonifera* (red-osier dogwood), *Acer glabrum* (Douglas maple), and *Mahonia aquifolium* (tall Oregon-grape).

The well-developed herb layer is dominated by *Poa* spp., but also contains *Smilacina stellata* (star-flowered false Solomon's-seal) and *Viola canadensis* (Canada violet).

The moss layer is poorly developed.

### **WILDLIFE HABITATS**

The three factors that most influence the assemblage of wildlife species in this zone (Table 20) are short winters with low snowfall, a strategic location between the Great Basin to the south and the boreal forests to the north, and a great diversity of vegetation types. The short, largely snow-free winters attract many animals during the winter months. Mule Deer, White-tailed Deer, Bighorn Sheep, and Rocky Mountain Elk can migrate long distances (up to 80 km) to winter in this zone. Flocks of passerine birds that have descended from higher elevations are also found during the winter months.

The strategic location between the boreal forests and western Great Basin contributes to the high diversity of wildlife species. Some northern species (e.g., Snowy

Owl and Gyrfalcon) are near the southern limit of their range, and some southern species (e.g., Canyon Wren and Spotted Bat) are near the northern limit of their range. Wildlife habitats in this zone are also diverse. A rich and varied collection of habitat niches results from the mosaic of grasslands and dry forest, the juxtaposition of wetlands and dry shrub-steppe, and the abundance of rugged cliffs and broken rock.

Ponderosa pine parklands provide habitat for species that forage on large conifer seeds (e.g., Clark's Nutcracker, Pygmy Nuthatch, and Yellow-pine Chipmunk), bark insects (e.g., Northern Flicker and White-headed Woodpecker), or flying insects (e.g., Common Poorwill). The open forest canopy passes sufficient light for the production of shrubs (e.g., *Ceanothus* spp. and *Amelanchier alnifolia*) palatable to wintering ungulates. Denser stands of Douglas-fir and ponderosa pine provide thermal cover for wintering ungulates and an abundant seed and insect source for a variety of birds and small mammals.

TABLE 20. Selected wildlife habitats and species in the Ponderosa Pine zone (adapted from Wildlife Branch 1989)

Habitat	Habitat distribution	Representative wildlife species	Wildlife species at risk <sup>a</sup>
Ponderosa pine parkland	Extensive	Rocky Mountain Elk, Mule Deer, White-tailed Deer, Coyote, Badger, Big Brown Bat, Hoary Bat, Yuma Myotis, Little Brown Myotis, 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, Great Basin Spadefoot Toad	∇ Townsend's Big-eared Bat, Spotted Bat, Fringed Myotis, Western Small-footed Myotis, Flammulated Owl, Common Poorwill  ◆ Lewis' Woodpecker, White-headed Woodpecker, Gray Flycatcher, Western Rattlesnake, Gopher Snake
Shrub-steppe	Common	Mule Deer, Coyote, Badger  American Kestrel, Western Meadowlark, Horned Lark, Vesper Sparrow  Western Yellow-bellied Racer	∇ White-tailed Jackrabbit, Pallid Bat, Burrowing Owl, Short-horned Lizard, Tiger Salamander  ◆ California Bighorn Sheep, Nuttall's Cottontail, Great Basin Pocket Mouse, Lewis' Woodpecker, Sage Thrasher, Western Bluebird, Brewer's Sparrow, Western Rattlesnake, Gopher Snake
Rocky cliffs and talus	Limited areal extent	Yellow-bellied Marmot  Golden Eagle, Common Raven, Rock Wren, Cliff Swallow	∇ Spotted Bat, Pallid Bat, Fringed Myotis, Western Small-footed Myotis, Anatum Peregrine Falcon, Canyon Wren, White-throated Swift  ◆ California Bighorn Sheep, Western Rattlesnake, Night Snake, Gopher Snake

TABLE 20. Continued

Habitat	Habitat distribution	Representative wildlife species	Wildlife species at risk <sup>a</sup>
Ponderosa pine and Douglas-fir forests	Extensive	Rocky Mountain Elk, Mule Deer, White-tailed Deer, Cougar, Coyote, Black Bear, Big Brown Bat, Little Brown Myotis, California Myotis, Red Squirrel, Northwestern Chipmunk, Long-tailed Vole  Great Horned Owl, Northern Pygmy Owl, Northern Saw-whet Owl, Pileated Woodpecker, Hairy Woodpecker, Northern Flicker, Clark's Nutcracker, Hammond's Flycatcher, Dusky Flycatcher, Steller's Jay, Mountain Chickadee, Red-breasted Nuthatch, Townsend's Solitaire, Swainson's Thrush, Solitary Vireo, Yellow-rumped Warbler, Western Tanager, Chipping Sparrow, Cassin's Finch, Red Crossbill  Western Yellow-bellied Racer	∇ Flammulated Owl  ◆ California Bighorn Sheep, Lewis' Woodpecker, Western Rattlesnake, Gopher Snake
Agricultural areas	Common	Rocky Mountain Elk, 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	◆ Western Rattlesnake, Gopher Snake
Riparian areas, wetlands, meadows, and floodplains	Limited areal extent	Mule Deer, White-tailed Deer, Long-tailed Weasel, Big Brown Bat, Little Brown Myotis, Western Jumping Mouse, Water Shrew  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 Yellow-throat, Gray Catbird, Veery  Common Garter Snake, Rubber Boa, Northern Leopard Frog	∇ Spotted Bat, Fringed Myotis, Western Small-footed Myotis, Western Long-eared Myotis, Tiger Salamander  ◆ Southern Red Bat, Western Harvest Mouse, Bald Eagle, Great Blue Heron, Yellow-breasted Chat, Yellow-headed Blackbird, Western Bluebird, Western Rattlesnake
Lakes and streams	Common	Yuma Myotis, Little Brown Myotis, Muskrat, Beaver  Canada Goose, Mallard, American Wigeon, Northern Shoveller, Redhead, American Coot, American Dipper  Painted Turtle, Great Basin Spadefoot Toad	∇ Tiger Salamander  ◆ Western Grebe, Black-crowned Night Heron, Great Blue Heron

<sup>a</sup> 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.

Rugged cliffs and talus are relatively common in this zone. They provide breeding habitat for several rare bat species (e.g., Spotted Bat, Pallid Bat) as well as some of the less abundant bird and reptile species such as the Canyon Wren and Western Rattlesnake. When adjacent grassy forage areas are present, Bighorn Sheep will use these low elevation cliff habitats as lambing grounds.

Shrub-steppe habitats contain the same wildlife species as do similar habitats in the Bunchgrass zone. These areas provide winter and spring grass forage for California Bighorn Sheep and Rocky Mountain Elk, shrub forage for Mule and White-tailed deer, and breeding habitat for big sagebrush-adapted birds such as the Sage Thrasher and Brewer's Sparrow.

Wetland meadows and moist, shady draws harbour reptiles and amphibians such as the Common Garter Snake, Tiger Salamander, and Northern Leopard Frog — species that are poorly adapted to the dry forests that dominate this zone. Lakes and potholes are breeding grounds for the Canada Goose and various dabbling and diving ducks, and provide year-round habitat for the Painted Turtle and Tiger Salamander.

Agriculture is restricted to lower elevation valleys and riparian areas, habitats historically used by ungulates as winter range. Species such as Coyote, Rocky Mountain Elk, Mule Deer, and White-tailed Deer are now often considered pests because of crop depredations. Some species of wildlife benefit from the change in vegetation associated with agriculture, for example, the Coyote, American Kestrel, Mountain Bluebird, and Lewis' Woodpecker.

The PP contains several non-native bird species. The California Quail, Ring-necked Pheasant, Chukar, Gray Partridge, Rock Dove, European Starling, and House Sparrow all occur in this zone as a result of direct or indirect introductions from elsewhere.

Sage Grouse once occurred in this zone, but are now considered extirpated in British Columbia. The White-tailed Jackrabbit, Nuttall's Cottontail, and Short-horned Lizard could also belong in this category.

## **RESOURCE VALUES**

The Ponderosa Pine zone is of limited commercial value for forestry. Productivity of ponderosa pine and Douglas-fir is low to poor on all sites except the relatively uncommon moist and very moist sites.

The primary agricultural use of the PP is for cattle grazing. The zone provides important early spring and late fall forage for domestic livestock. Grassland areas, although chronically overgrazed in the past, are now better managed and provide valuable grazing. Flat areas, especially on fluvial or lacustrine terraces, are irrigated for hay production.

On range in excellent condition, *Agropyron spicatum* is the primary forage species, although *Festuca scabrella* and *F. idahoensis* are also important. Other forage plants can include *Stipa comata* (needle-and-thread grass), *Koeleria macrantha*, *Balsamorhiza sagittata*, and numerous other forbs. *Poa pratensis* (Kentucky bluegrass) can be an important forage for livestock on wetter sites and on sites below climax condition. Some browse species, such as *Amelanchier alnifolia*, *Prunus virginiana* (choke cherry), *Symphoricarpos albus*, and *Rosa* spp. are often available to livestock, but are usually limited in their distribution (McLean and Marchand 1968).

In the Okanagan Valley, favourable soil types (fluvial and lacustrine deposits) are used, when irrigated, for orchards and vineyards.

Recreational use of the PP includes some spring, fall, and winter hiking and cycling, horseback riding, nature study, and some hunting, fishing, and motorcycle (dirt bike) riding. Major tourist use occurs along the beaches of some of the main lakes.

The zone itself makes a very small contribution to early spring run-off and sustained yield watershed flows. However, significant municipal, domestic, and agricultural water consumption occurs in the zone.

Major land use conflicts are common in the Ponderosa Pine zone as a result of the demands made on the available land base for agricultural use, for major transportation corridors, for urban, rural, and industrial developments, for recreational uses, and for wildlife wintering areas. Consequently, these areas represent a challenge in integrated land use planning and important gains have been made through this approach.

## **LITERATURE CITED**

Krajina, V.J. 1965. Biogeoclimatic zones and biogeocoenoses of British Columbia. *Ecol. West. N. Amer.* 1:1-17.

\_\_\_\_\_. 1969. Ecology of forest trees in British Columbia. *Ecol. West. N. Amer.* 2:1-146.

McLean, A. and L. Marchand. 1968. Grassland ranges in the southern interior of British Columbia. *Can. Dep. Agric., Publ. No. 1037.* Ottawa, Ont.

Wildlife Branch. 1989. Regional wildlife habitat maps. *B.C. Min. Environ., Victoria, B.C.* 15 maps, 1:500000.