

Chapter 5: Coastal Douglas-fir Zone

by

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LOCATION AND DISTRIBUTION

The Coastal Douglas-fir zone (CDF) is limited to a small part of southeastern Vancouver Island, several islands in the Gulf of Georgia, and a narrow strip of the adjacent mainland (Figure 15). It is confined to elevations mostly below 150 m. Climate and plant communities similar to those of the CDF in British Columbia occur in Washington in the Puget Trough and on the San Juan Islands, and in Oregon in the Willamette Valley (Franklin and Dyrness 1973).

ECOLOGICAL CONDITIONS

The CDF lies in the rainshadow of the Vancouver Island and Olympic mountains. It has warm, dry summers and mild, wet winters. Based on long-term weather stations (Table 4), the mean annual temperature ranges from 9.2 to 10.5°C, and the absolute minimum temperature ranges from -21.1 to -11.7°C. The climate diagram for the representative weather station (Figure 16) shows that the monthly average of the daily minimum temperatures never falls below 0°C. Where mineral soil is exposed, the water near the soil surface can freeze periodically, causing frost heaving. However, soil frost is extremely unlikely if the soil surface is protected by a forest floor (humus layer) or a cover of vegetation.

Mean annual precipitation varies from 647 to 1263 mm; very little (5% or so) falls as snow from November to April. In most winters the snow melts within a week of falling. Dense young stands of trees in the pole stage are susceptible to damage by this snow, which is usually wet and heavy.

The majority of forests that are found today in the CDF have regenerated after logging that occurred at the turn of the century. Old growth remains in only a few areas, such as parks. The coastal variety of Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) is the most common tree species in upland forests. It can regenerate under the canopy of mature and partly open stands on most habitats. Western redcedar, grand fir, arbutus (the only evergreen broadleaf tree in British Columbia), Garry oak, and red alder frequently accompany Douglas-fir, depending on site moisture and nutrient regime. Less common trees in the CDF include shore pine, Sitka spruce (rare), western hemlock (rare), bitter cherry (*Prunus emarginata*), western flowering dogwood (*Cornus nuttallii*), bigleaf maple, black cottonwood, and trembling aspen (rare). The tree species composition of forest stands varies considerably as a result of widespread human disturbance.

The vegetation of the CDF includes about 50 rare species (Straley *et al.* 1985) restricted to the zone. Most of these are at the northern limit of their distribution and include species of seaside, aquatic, rock outcrop, and forested habitats. The CDF also contains a rare plant species endemic to British Columbia — *Limnanthes macounii* (Macoun's meadowfoam).

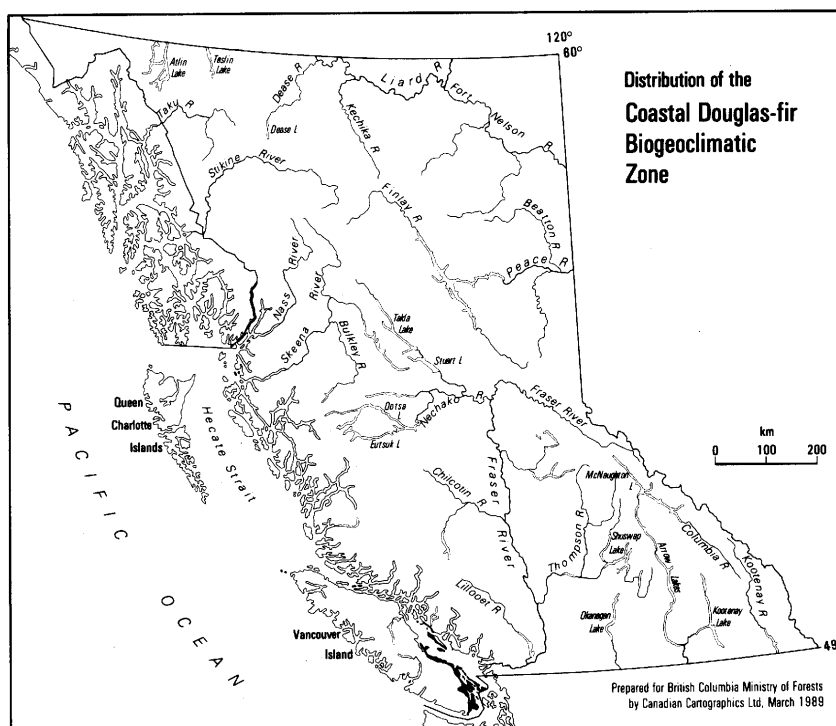


FIGURE 15. Coastal Douglas-fir zone.

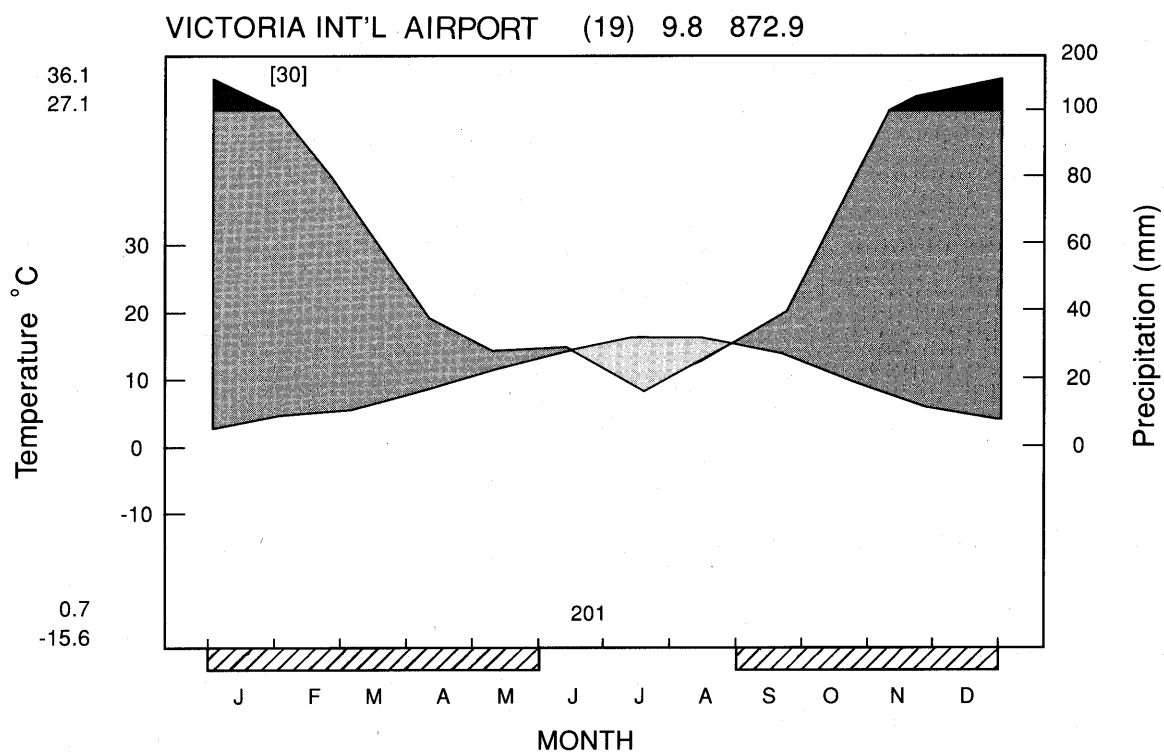


FIGURE 16. Representative climatic diagram for the Coastal Douglas-fir zone.

The Garry oak — rock outcrop and Garry oak savanna or parkland ecosystems contain many of these rare species, such as *Aster curtus* (white-topped aster), *Balsamorhiza deltoidea* (deltoid balsamroot), *Camassia leichtlinii* (great camas), and *Castilleja levisecta* (golden Indian paintbrush).

In addition, many species of a broader southern distribution are restricted to these Garry oak ecosystems in the CDF. These include showy flowers such as *Camassia quamash* (common camas), *Dodecatheon hendersonii* (broad-leaved shootingstar), and *Sisyrinchium douglasii* (satin-flower), which contribute to the beautiful spring floral display of these “saanich” ecosystems. Encroaching urban development and invasion of the weedy *Cytisus scoparius* (Scotch broom) are threatening these important and unique ecosystems.

Alluvial forests and wetlands are rare in the CDF as a result of urbanization and agriculture.

Soils in the CDF are generally derived from morainal, colluvial, and marine deposits. The accumulation of organic materials in semi- to well-decomposed organic deposits is uncommon. Soils are usually Brunisols, grading with increased precipitation to Humo-Ferric Podzols. Zonal soils are mostly Dystric or Eutric Brunisols; the soils developing under Garry oak typically include a melanized (Ah) horizon and are Melanic Brunisols. Humus development is characterized by Moder to weak Mor formation.

NOTES ON CLASSIFICATION

Krajina (1965) initially recognized dry and wet subzones of this zone. The wet subzone is now classified in the Coastal Western Hemlock zone (Eastern Very Dry Maritime [CWHxm1] variant) as a result of a review of information and changes in the methods of classification. Thus, only one “maritime” subzone of the CDF is now recognized. Variants of this Moist Maritime CDF (CDFmm) subzone have not been identified. With increasing elevation, latitude, and distance inland from the coast, the CDFmm subzone is replaced by the CWHxm1 variant.

Most of the data for classification of site associations in the CDFmm were collected by Roemer (1972). Additional information and changes in classification concepts over the past 10 years have caused some changes to the classification of ecosystem units. An overview of the current status of some site associations follows.

SOME REPRESENTATIVE SITE ASSOCIATIONS

These four common site associations represent plant communities that occupy a gradient of soil moisture regimes ranging from very dry to wet and that have not been disturbed for a minimum of 50 years. Topographic position of the site is frequently correlated with this soil moisture regime, allowing site associations to be depicted as in Figure 17. The four site associations listed are not found in any other biogeoclimatic zone.

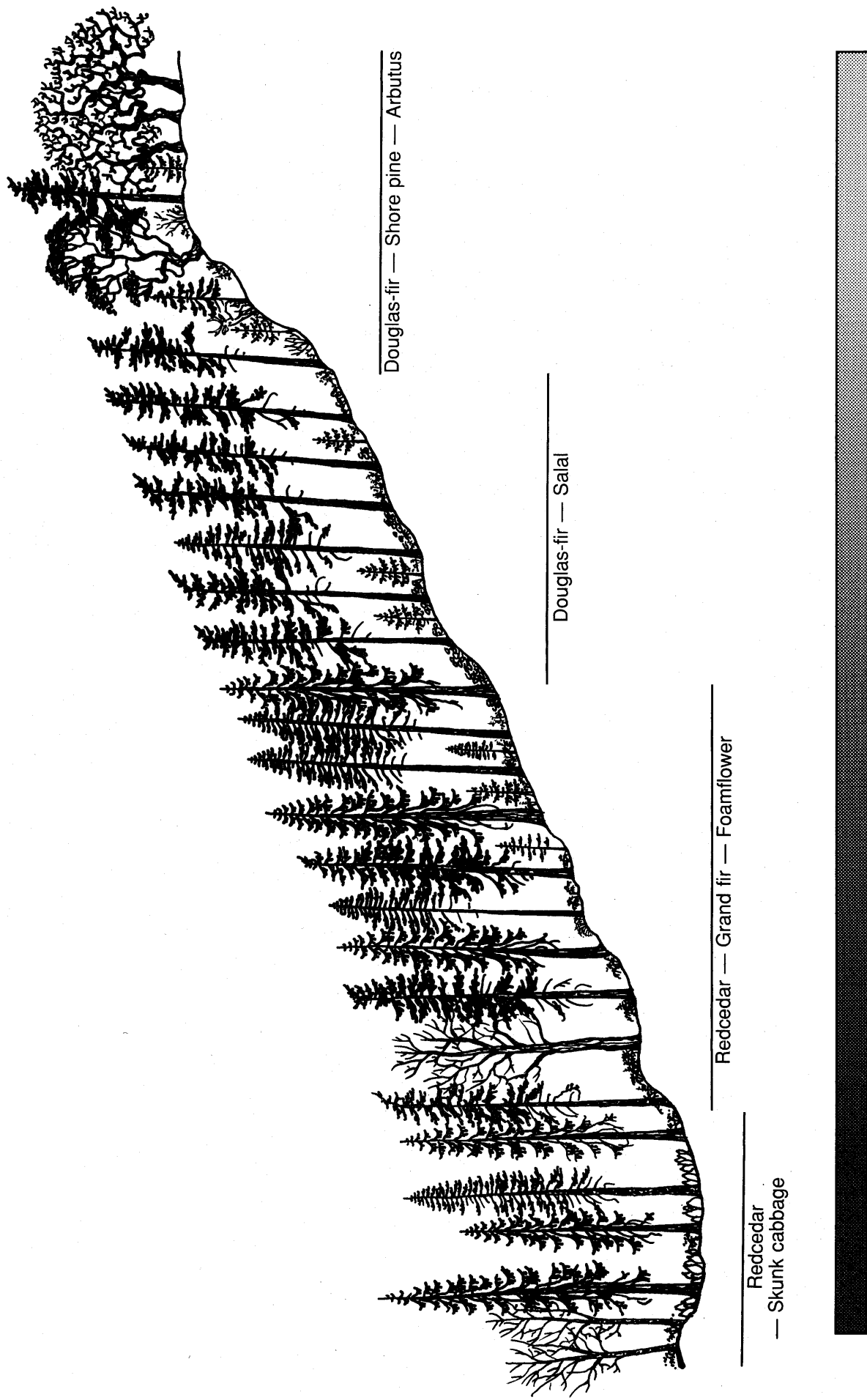


FIGURE 17. Simplified schematic diagram of topographic relationships among four common site associations of the Coastal Douglas-fir zone.

Douglas-fir — Salal

This is the zonal site association; it has a moderately dry soil moisture regime and a very poor to medium soil nutrient regime. Mature stands have a canopy cover that is continuous except for openings caused by rock outcrops or shallow soil. The tree layer is dominated by Douglas-fir, usually with a component of grand fir and western redcedar. Western flowering dogwood is often present. In this site association, Douglas-fir can regenerate beneath the small canopy gaps that result from the death of trees.

The shrub layer in mature stands is well developed, containing mainly *Gaultheria shallon* (salal) and *Mahonia nervosa* (dull Oregon-grape) with lesser amounts of *Vaccinium parvifolium* (red huckleberry) and *Rosa gymnocarpa* (baldhip rose).

The herb layer, though less well developed than the shrub layer, is still prominent. It is dominated by *Pteridium aquilinum* (bracken), *Rubus ursinus* (trailing blackberry), and frequently *Symphoricarpos mollis* (trailing snowberry). Additionally, species such as *Festuca subulata* (bearded fescue) and *Lonicera ciliosa* (western trumpet honeysuckle) are often found.

Kindbergia oregana (Oregon beaked moss) is the predominant moss of the well-developed moss layer. Other species that often have high cover are *Hylocomium splendens* (step moss) and *Rhytidiadelphus triquetrus* (electrified cat's-tail moss).

The soils of zonal sites usually belong to the Dystric Brunisol soil great group, but Sombric Brunisols and Humo-Ferric Podzols are occasionally present, too. The humus forms are usually Moders, but Mormoders also occur.

Douglas-fir — Shore pine — Arbutus

This site association has a very dry soil moisture regime and a very poor to medium soil nutrient regime. The tree canopy is often interrupted because of the rock outcrops and pockets of shallow soil. A characteristic floristic feature of this site association is the presence of Douglas-fir regeneration in the understory of the tree canopy. Mature stands are dominated by Douglas-fir and arbutus. Garry oak is often present as a minor tree species.

The shrub layer contains *Holodiscus discolor* (ocean-spray), *Mahonia nervosa*, and *Rosa gymnocarpa*. *Mahonia aquifolium* (tall Oregon-grape) and *Amelanchier alnifolia* (saskatoon) are also present in minor amounts. The herb layer usually includes *Bromus vulgaris* (Columbia brome), *Lathyrus nevadensis* (purple peavine), *Lonicera ciliosa*, *Melica subulata* (Alaska oniongrass), *Trientalis latifolia* (broad-leaved starflower), *Erythronium oreganum* (white fawn lily), *Sanicula crassicaulis* (Pacific sanicle), and *Rubus ursinus*; and often contains *Festuca occidentalis* (western fescue), *F. subulata*, and *Galium aparine* (cleavers).

Kindbergia oregana and *Rhytidiadelphus triquetrus* are the predominant mosses. Another species that often has a high cover is *Hylocomium splendens*.

The shrub, herb, and moss layers of the Douglas-fir — Shore pine — Arbutus site association are all well developed. Douglas-fir regenerates on these sites.

The soils usually belong to the Dystric Brunisol soil great group. Humus forms are usually classified as Xeromors or Moders.

Redcedar — Grand fir — Foamflower

This site association has a slightly dry to fresh soil moisture regime and a rich to very rich soil nutrient regime. Such sites are often used for agriculture rather than forestry.

Where the site association is forested, the tree stratum consists of Douglas-fir, grand fir, western redcedar, bigleaf maple, and western flowering dogwood. Western redcedar occurs in the understory. However, its growth rate is slow until an opening occurs in the canopy above. Douglas-fir is not able to grow below an intact tree canopy in this site association.

Gaultheria shallon and *Mahonia nervosa*, and *Taxus brevifolia* (western yew) are present in the shrub layer.

In the herb layer, *Achlys triphylla* (vanilla-leaf), *Galium triflorum* (sweet-scented bedstraw), *Polystichum munitum* (sword fern), *Rubus ursinus*, *Tiarella trifoliata* (three-leaved foamflower), *Trientalis latifolia*, and *Trillium ovatum* (western trillium) usually occur. With the exception of sword fern, the herb layer generally has low cover.

Kindbergia oregana and *Leucolepis menziesii* (palm tree moss) are frequently found in the moss layer. This layer is not well developed.

The soils are usually Sombric Brunisols, although Dystric Brunisols are also found. Incipient gleying may be present in both soil types. The humus forms are usually classified as Mulls, but Moders are also present.

Redcedar — Skunk cabbage

This site association is found where the soil moisture regime is wet and the soil nutrient regime is rich to very rich. In many cases, these sites have been drained and are used for agriculture.

Where natural vegetation remains, trees tend to be restricted to elevated microsites, largely because of the increased availability of oxygen for root respiration there. Thus, the tree canopy is not continuous on this site association. Western redcedar and red alder are the major tree species; occasionally, bigleaf maple and western hemlock are also present. Douglas-fir is not adapted to growing on these sites. Tree regeneration occurs on the elevated microsites but does not grow well until the older trees occupying the microsites die.

The moderately well-developed shrub layer is dominated by *Rubus spectabilis* (salmonberry). It also contains *Oemleria cerasiformis* (Indian-plum) and *Sambucus racemosa* (red elderberry) as major species.

The herb layer is well developed. Herbs that predominate include *Athyrium filix-femina* (lady fern), *Dryopteris expansa* (spiny wood fern), *Equisetum telmateia* (giant

horsetail), *Lysichiton americanum* (skunk cabbage), *Maianthemum dilatatum* (false lily-of-the-valley), *Polystichum munitum*, *Stachys cooley* (Cooley's hedge-nettle), and *Tiarella trifoliata*.

The moderately well-developed moss layer contains *Kindbergia praelonga*, *Leucolepis menziesii*, and *Plagiomnium insigne*.

The soils usually belong to the Gleysol or Organic soil order. The humus forms are usually classified as Hydromulls.

WILDLIFE HABITATS

The factors that most influence the assemblage of animal species in this zone (Table 11) are the mild, moist winters and the warm, dry summers. The CDF receives the least snowfall, both in terms of amount and duration, of any zone in British Columbia. Another factor that influences wildlife is the location of this zone leeward of the Vancouver Island Mountains, on coastal plains and small islands in the Strait of Georgia. Indeed, the island nature of most CDF habitat, on both Vancouver Island and the smaller Gulf Islands, means that it will have fewer wildlife species than had it occurred on the mainland. Black-tailed Deer are the most abundant large ungulate, although Roosevelt Elk were present before the conversion of the coastal plain into agricultural fields and small communities. Both Black Bear and Cougar are common throughout, but are usually eliminated when they enter rural and urban areas. Their numbers are therefore not as high as they could be. Recently, the Gray Wolf has invaded Vancouver Island, too; and while they are more abundant in the Coastal Western Hemlock zone to the north and west, they occasionally enter the CDF in search of deer.

Many species of waterbirds spend the winter months on the estuaries and sheltered waters within this zone. Typical waterfowl include species such as Mallard, American Wigeon, Lesser Scaup, Harlequin Duck, Trumpeter Swan, Bufflehead, Hooded Merganser, Western Gull, Glaucous-winged Gull, and California Gull. Only a few species breed here, such as the colony-nesting Great Blue Heron, Mallard, and the re-introduced, non-migratory Canada Goose.

Mature and old-growth coniferous forests are important for birds that eat conifer seeds, or wood-boring and bark insects. Species that breed in these forest habitats are: Pileated Woodpecker, Yellow-bellied Sapsucker, Hairy Woodpecker, Downy Woodpecker, Steller's Jay, Raven, Chestnut-backed Chickadee, Brown Creeper, Winter Wren, and Varied Thrush. Some species are highly specialized such as the Western Flycatcher, which only inhabits thickets in depressions, ravines, or along waterways.

Deciduous thickets and shrubbery offer a variety of flying insects and seeds for breeding populations of House Wren, Hutton's Vireo, Black-headed Grosbeak, and White-crowned Sparrow.

The many small islets offshore Vancouver Island provide nesting security for colony-nesting birds such as the Glaucous-winged Gull, Brandt's Cormorant, and Double-crested Cormorant.

TABLE 11. Selected wildlife habitats and species in the Coastal Douglas-fir zone
(adapted from Wildlife Branch 1989)

Habitat	Habitat distribution	Representative wildlife species	Wildlife species at risk ^a
Old-growth coniferous forests	Limited areal extent, dwindling	Black-tailed Deer, Black Bear, Cougar, Gray Wolf, Marten, California Myotis, Red Squirrel, Deer Mouse Great Horned Owl, Saw-whet Owl, Barred Owl, Blue Grouse, Ruffed Grouse, Band-tailed Pigeon, Pileated Woodpecker, Yellow-bellied Sapsucker, Downy Woodpecker, Hairy Woodpecker, Common Raven, Steller's Jay, Western Flycatcher, Brown Creeper, Chestnut-backed Chickadee, Red-breasted Nuthatch, Winter Wren, Varied Thrush, Anna's Hummingbird Western Toad, Pacific Treefrog, Western Red-backed Salamander, Ensatina Salamander, Northwestern Salamander	▽ Keen's Long-eared Myotis, Townsend's Big-eared Bat, Marbled Murrelet, Sharp-tailed Snake ◆ Bald Eagle, Clouded Salamander
Young seral and managed second-growth forests	Extensive	Black-tailed Deer, Black Bear, Cougar, Gray Wolf, Marten, Deer Mouse Great Horned Owl, Barred Owl, Blue Grouse, Ruffed Grouse, Band-tailed Pigeon, Northern Flicker, Hairy Woodpecker, Common Raven, Gray Jay, Steller's Jay, Chestnut-backed Chickadee, Red-breasted Nuthatch, Winter Wren Western Toad, Pacific Treefrog, Western Red-backed Salamander, Ensatina Salamander, Northwestern Salamander	▽ Townsend's Big-eared Bat
Mixed coniferous and deciduous forests	Common, not extensive	Black-tailed Deer, Black Bear, Gray Wolf, Marten, Raccoon, California Myotis, Red Squirrel, Deer Mouse Red-tailed Hawk, Northern Saw-whet Owl, Blue Grouse, Ruffed Grouse, Common Merganser, Steller's Jay, Hairy Woodpecker, House Wren, Hutton's Vireo, Black-headed Grosbeak, White-crowned Sparrow, Townsend's Warbler Northern Alligator Lizard, Pacific Treefrog, Ensatina Salamander, Northwestern Salamander	▽ Marbled Murrelet

TABLE 11. Continued

Habitat	Habitat distribution	Representative wildlife species	Wildlife species at risk ^a
Garry oak — arbutus forests	Limited areal extent, dwindling	Black-tailed Deer, Yuma Myotis, Deer Mouse Coopers' Hawk, Merlin, Western Screech-Owl, Great Horned Owl, Turkey Vulture, Pileated Woodpecker, Downy Woodpecker, Northern Flicker, Common Raven, Northwestern Crow, American Robin, Varied Thrush, Band-tailed Pigeon, Dark-eyed Junco, Rufous-sided Towhee, Fox Sparrow, Song Sparrow, Hutton's Vireo, Chestnut-backed Chickadee, Bushtit, Bewick's Wren, Brown Creeper, Rufous Hummingbird Western Garter Snake, Northwestern Garter Snake, Northern Alligator Lizard	▽ Lewis' Woodpecker
Clearcuts, burns, seepage sites	Limited areal extent	Black-tailed Deer, Black Bear Turkey Vulture, Blue Grouse, Lewis' Woodpecker, Band-tailed Pigeon, Willow Flycatcher, American Robin, Swainson's Thrush, Cedar Waxwing, Purple Finch Red-legged Frog	
Agricultural areas	Common	Raccoon, Spotted Skunk Cooper's Hawk, Red-tailed Hawk, Rough-legged Hawk, Northern Harrier, Short-eared Owl, Mew Gull, Glaucous-winged Gull, Northwestern Crow, Brewer's Blackbird	◆ Common Barn-Owl, Purple Martin
Riparian areas, wetlands, meadows, floodplains, lakes, and streams	Limited areal extent	Black-tailed Deer, Black Bear, Gray Wolf, Raccoon, River Otter, Mink, Deer Mouse, Wandering Shrew, Vagrant Shrew Osprey, Short-eared Owl, Blue Grouse, Ruffed Grouse, Trumpeter Swan, Canada Goose, Ring-necked Duck, Redhead, Harlequin Duck, Wood Duck, Red-throated Loon, Common Merganser, Wilson's Phalarope, Black Tern, Mew Gull, American Dipper Western Garter Snake, Northwestern Garter Snake, Painted Turtle, Western Toad, Bullfrog, Red-legged Frog, Northwestern Salamander, Long-toed Salamander, Rough-skinned Newt	▽ Sharp-tailed Snake ◆ Bald Eagle, Great Blue Heron, Green-backed Heron, Yellow-headed Blackbird, Purple Martin
Marine cliffs and rocky islets	Common	Northern Sea Lion, Harbor Seal Black Oystercatcher, Double-crested Cormorant, Pelagic Cormorant, Pigeon Guillemot, Rock Sandpiper, Glaucous-winged Gull, Surfbird	▽ Keen's Long-eared Myotis, Anatum Peregrine Falcon ◆ Bald Eagle, Brandt's Cormorant

TABLE 11. Continued

Habitat	Habitat distribution	Representative wildlife species	Wildlife species at risk ^a
Estuaries, shallow bays, intertidal and sub-tidal marine	Limited areal extent	Black-tailed Deer, Black Bear, Gray Wolf, Raccoon, Mink, River Otter, Northern Sea Lion, Harbour Seal, Killer Whale, Harbor Porpoise Northern Pygmy-owl, Sharp-shinned Hawk, Turkey Vulture, Red-throated Loon, Yellow-throated Loon, Trumpeter Swan, Canada Goose, Brant, Barrow's Goldeneye, Black Scoter, Surf Scoter, White-winged Scoter, Mallard, Northern Shoveller, American Wigeon, Lesser Scaup, Green-winged Teal, Pigeon Guillemot, Glaucous-winged Gull, California Gull, Northwestern Crow	♦ Bald Eagle, Great Blue 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.

Wildlife abundance and diversity in an urban setting are related to the density of development. Areas that are interspersed with parks, landscaped gardens, and native forests have more of the habitat requirements for more species than areas dominated by buildings and pavement. Non-native species such as the Rock Dove, House Sparrow, European Starling, Roof Rat, Norway Rat, and House Mouse do well in developed urban areas. Some native species have also adapted to city life, for example, the Herring Gull, Common Nighthawk, Barn Swallow, Raccoon, and Little Brown Myotis often use buildings for nests and burrows.

Several animal species have been introduced to this zone. The Ring-necked Pheasant and California Quail have become established in agricultural areas and in upland habitats dominated by *Cytisus scoparius*. The Eurasian Skylark occurs in similar habitat on the Saanich Peninsula. The Eastern Cottontail and Striped Skunk have been released on southern Vancouver Island and are spreading northward along the Nanaimo Lowlands. Fallow Deer were released on Sidney and James Islands where they have proliferated and severely overbrowsed the vegetation. Painted Turtles, the result of accidental releases, occur in only a few ponds on the Nanaimo Lowland, while the Bullfrog was deliberately released into wetlands on the Nanaimo Lowland and the Gulf Islands in order to develop a frog-leg industry.

RESOURCE VALUES

The major portion of the land base in the CDF is not dedicated to forestry. However, many sites in the CDF have a high capability to produce timber and many fee-simple (so-called "private") properties are managed for forestry. Low summer precipitation resulting in a soil moisture deficit is the major factor limiting growth on sites that are likely to be managed for forestry. Thus, soil water conservation should be a major management consideration in timber production.

A large part of the CDF is used for residential and industrial purposes. Industry is concentrated in the urban centers of Duncan, Nanaimo, Powell River, and Victoria. Residential use is greatest in urban centers but is also a major land use elsewhere, as on the Gulf Islands. The CDF includes many small parks that are popular hiking, camping, and boating destinations.

Intensive agriculture is usually associated with flat-lying glaciomarine or gently sloping, water-reworked morainal materials. Where medium- to fine-textured, coarse-fragment free soils occur, they are well suited to agriculture. Agricultural production includes: field crops (primarily hay and other fodder crops for livestock), field vegetables (primarily sweet corn, cauliflower, and carrots), small fruit (berries and apples), nursery/floriculture, livestock, and dairy products (B.C. Ministry of Agriculture and Food 1984).

LITERATURE CITED

- B.C. Ministry of Agriculture and Food. 1984. Agriculture profile, Courtenay District. Victoria, B.C. 35 p.
- 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. 1965. Biogeoclimatic zones and classification of British Columbia. *Ecol. West. N. Amer.* 1:1-17.
- Roemer, H.L. 1972. Forest vegetation and environments on the Saanich Peninsula, Vancouver Island. Ph.D. thesis, Univ. Vict., Victoria, B.C.
- Straley, G.B., R.L. Taylor, and G.W. Douglas. 1985. The rare vascular plants of British Columbia. *Nat. Museum Canada, Syllogeus* No. 59. Ottawa, Ont.
- Wildlife Branch. 1989. Regional wildlife habitat maps. B.C. Min. Environ., Victoria, B.C. 15 maps, 1:500 000.