Chapter 6: Coastal Western Hemlock Zone

by

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LOCATION AND DISTRIBUTION

The Coastal Western Hemlock zone (CWH) occurs at low to middle elevations mostly west of the coastal mountains, along the entire British Columbia coast (Figure 18) and on into both Alaska and Washington/Oregon. The zone covers much of Vancouver Island, the Queen Charlotte Islands, and the Coast Mountains. It penetrates the coastal mountain barrier somewhat in major river valleys, especially along the Fraser and Skeena rivers. The CWH occupies elevations from sea level to 900 m on windward slopes in the south and mid-coast (1050 m on leeward slopes), and to 300 m in the north. The Mountain Hemlock zone is usually the subalpine zone above the CWH.

ECOLOGICAL CONDITIONS

The CWH is, on average, the rainiest biogeoclimatic zone in British Columbia (Table 4). The zone typically has a cool mesothermal climate: cool summers (although hot dry spells can be frequent) and, like the Coastal Douglas-fir zone (CDF), mild winters (Figure 19). Mean annual temperature is about 8°C and ranges from 5.2 to 10.5°C among the CWH subzones. The mean monthly temperature is above 10°C for 4-6 months of the year. The mean temperature of the coldest month is 0.2°C and ranges from -6.6 to 4.7°C among the subzones. Mean annual precipitation for the zone as a whole is 2228 mm, and ranges from 1000 to 4400 mm (and probably more in some areas). Less than 15% of total precipitation occurs as snowfall in the south, but as much as 40-50% in the northern parts of the zone.

Western hemlock is usually the most common species in the forest cover. It regenerates freely under the canopy of mature stands on zonal sites and elsewhere if sufficient acid raw humus or decaying wood has accumulated on the forest floor. Western redcedar occurs frequently throughout the zone south of 56°N latitude. Douglas-fir is widespread south from Dean Channel or roughly 53° (the species reaches its northern limit along the coast at Kemano), but is most abundant in drier parts of the zone. Amabilis fir and yellow-cedar are common only in wetter parts of the zone. Amabilis fir often dominates forests at upper elevations or more northerly latitudes of the zone, but does not range north much beyond the Nass River, and is absent from the Queen Charlotte Islands. Shore (lodgepole) pine is common on very dry or very wet (boggy) sites throughout the zone. Grand fir, western white pine, and bigleaf maple occur in warmer and drier, southern parts of the zone. Red alder is a widespread species on logged-over or otherwise disturbed sites; black cottonwood usually occurs only along large rivers with extensive floodplains. Sitka spruce is also a widespread species, but is largely restricted in the south to specialized habitats such as floodplains and exposed beaches. However, north of Vancouver Island it gains in importance, occurring over a wide variety of habitats and even forming a minor component of climatic climax ecosystems on the Queen Charlotte Islands and on the northern mainland.

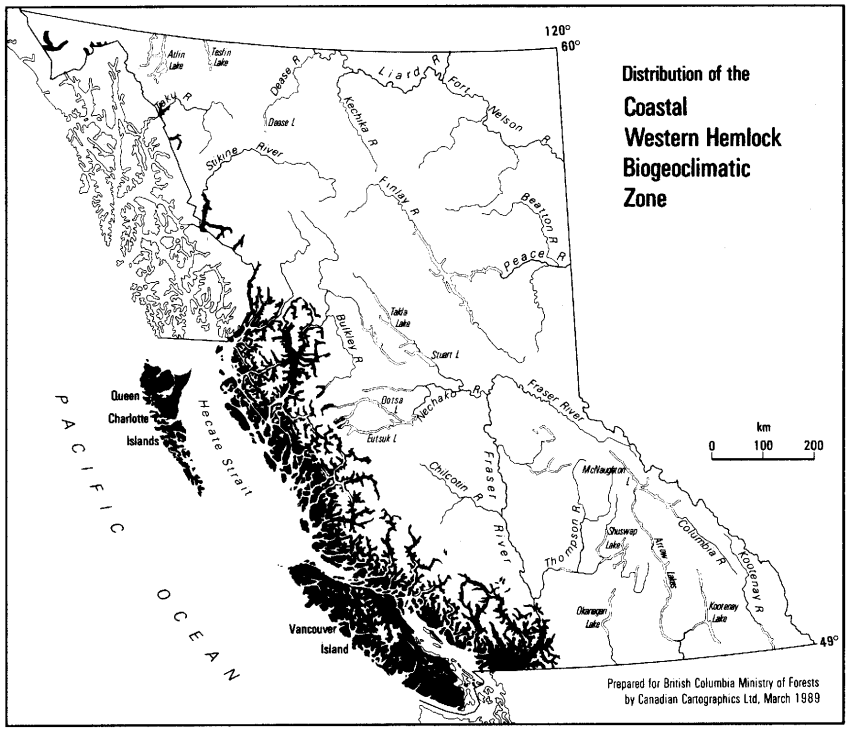

FIGURE 18. Coastal Western Hemlock zone.

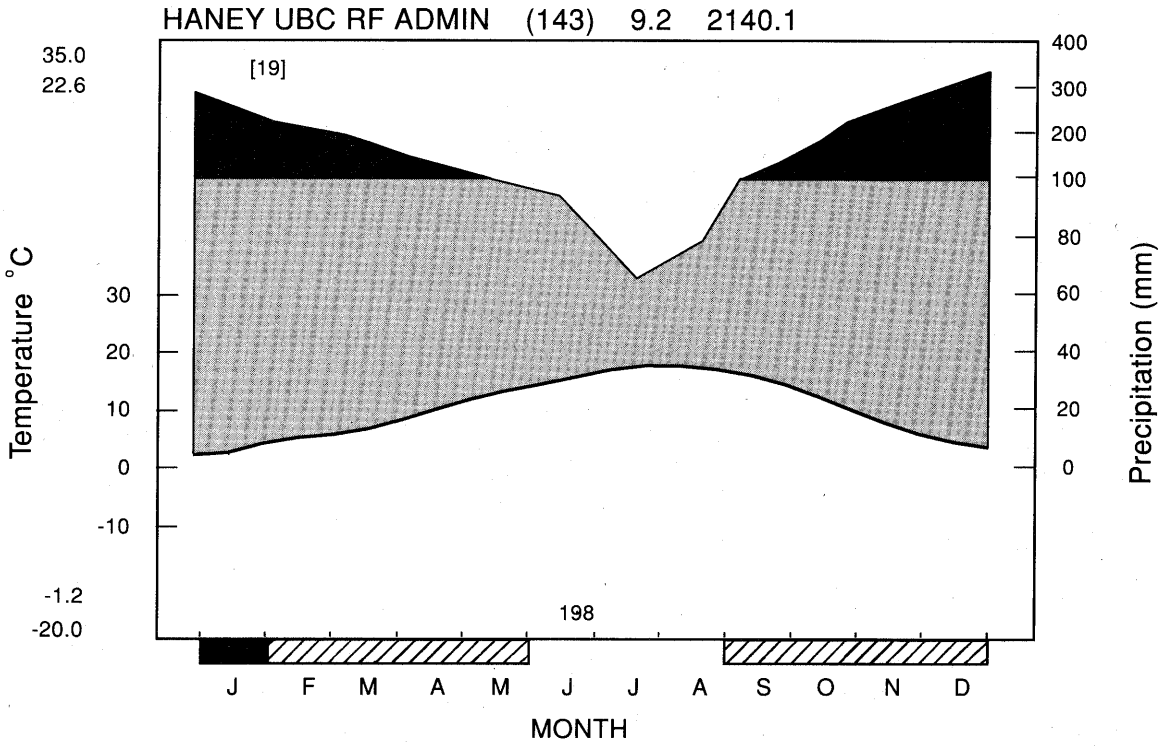

FIGURE 19. Representative climatic diagram for the Coastal Western Hemlock zone.

Characteristic floristic features of zonal ecosystems in the CWH are: (a) the prominence of western hemlock; (b) the sparse herb layer; (c) the predominance of several moss species (especially *Hylocomium splendens* [step moss] and *Rhytidiadelphus loreus* [lanky moss]).

Zonal hypermaritime forests are dominated by mixtures of western hemlock, western redcedar, Sitka spruce, and variable amounts of yellow-cedar. Amabilis fir is only locally abundant. Yellow-cedar, shore pine, and mountain hemlock increase in abundance in scrubby forests of the outer coast. Highly productive stands of western hemlock — Sitka spruce or western hemlock — amabilis fir occur on well-drained soils, often on steep slopes. Well-drained fluvial sites support excellent stands of Sitka spruce, western hemlock, western redcedar, red alder, and sometimes amabilis fir. Bogs are strikingly abundant over much of the hypermaritime landscape, especially on the coastal lowlands (e.g., Hecate Lowland, Nahwitti Lowland, Queen Charlotte Lowland). The extensive peatlands form a mosaic of blanket bog, bog woodland, and scrub forest on the subdued terrain.

Western hemlock, amabilis fir, western redcedar, Sitka spruce, and (especially with increasing elevation) yellow-cedar dominate the forests of the wetter maritime subzones, which cover the majority of the zone as a whole. Western hemlock and amabilis fir dominate the canopy of late seral stands. Windthrow plays an important role in the persistence of these species; relatively young and more or less even-aged stands are common as a result. Western redcedar stands typically occupy steep slopes or sites that regenerated following fire and/or have not been disturbed by windthrow for several centuries. Typical zonal stands are characterized by the Western hemlock — Amabilis fir — Alaskan blueberry association. This vegetation type features a well-developed shrub layer of ericaceous species (*Vaccinium alaskaense* [Alaskan blueberry], *V. parvifolium* [red huckleberry], *Gaultheria shallon* [salal]) and advance regeneration of western hemlock and amabilis fir, a poorly developed herb layer typified by *Blechnum spicant* (deer fern), and a well-developed moss layer dominated by *Rhytidiadelphus loreus*, *Hylocomium splendens*, and *Kindbergia oregana* (Oregon beaked moss).

Drier maritime forests typically have a substantial component of Douglas-fir along with western hemlock and western redcedar. *Gaultheria shallon*, *Mahonia nervosa* (dull Oregon-grape), and *Vaccinium parvifolium* typify the poorly to moderately developed shrub layer. *Kindbergia oregana*, *Hylocomium splendens*, *Rhytidiadelphus loreus*, and *Plagiothecium undulatum* (flat moss) dominate the well-developed moss layer.

Submaritime forests are characterized by the scarcity of typically coastal species such as *Gaultheria shallon* and yellow-cedar, and the presence of typically interior or continental species like *Pleurozium schreberi* (red-stemmed feathermoss) and *Clintonia uniflora* (queen's cup). Douglas-fir is an abundant species in zonal stands, along with western hemlock, redcedar, and variable amounts of amabilis fir. The shrub layer is characterized by *Vaccinium alaskaense*, *V. ovalifolium* (oval-leaved blueberry), and *Menziesia ferruginea* (false azalea). As well as *Clintonia uniflora*,

common herbs in the sparse herb layer are *Orthilia secunda* (one-sided wintergreen), *Cornus canadensis* (bunchberry), *Linnaea borealis* (twinflower), and *Goodyera oblongifolia* (rattlesnake-plantain). The well-developed moss layer contains *Pleurozium schreberi*, *Rhytidiadelphus loreus*, *R. triquetrus* (electrified cat's-tail moss), and *Rhytidiopsis robusta* (pipecleaner moss).

Characteristic soil processes include accumulation of acid organic matter on the forest floor (Mor formation), leaching, eluviation, illuviation, and gleying. The soils of zonal ecosystems are most often Humo-Ferric Podzols which, with increasing precipitation, grade into Ferro-Humic Podzols. Many Podzols in the CWH lack an eluvial (Ae) horizon, apparently because, in this part of the soil profile, the heavy leaching is offset by the rapid addition of organic colloids and weathering of iron and aluminum.

Soil-forming processes in the wettest portions of the zone are dominated by the gradual build-up of organic matter at the ground surface. In these areas, zonal soils are usually either folic phases of Podzols (if the organic layer is 15-40 cm thick) or Folisols (organic layer thicker than 40 cm or at least 10 cm thick if over bedrock or fragmental material; see Trowbridge *et al.* 1985).

Mors are the prevailing humus forms. In the wet climate of this zone, leaching of nutrients from the mineral soil is rapid. Furthermore, many soils derived from acidic parent materials such as granodiorites are low in clay minerals and poor in nutrients to begin with. Thus, the pool of nutrients contained in the vegetation and surface organic matter is extremely important in helping to maintain ecosystem productivity, especially on coarse-textured, nutritionally poor soils.

NOTES ON CLASSIFICATION

Analysis of floristic and climatic data suggested two major revisions to the zonal classification (see Klinka *et al.* 1990): (1) amalgamation of the former Wetter CDF (CDFb) subzone (Klinka *et al.* 1984) with the former Vancouver Island Drier Maritime CWH (CWHa1) variant to form the Very Dry Maritime CWH (CWHxm) subzone; and (2) designation of the former Coastal Cedars — Pine — Hemlock (CCPH) zone (Pojar 1983) as the Very Wet Hypermaritime CWH (CWHvh) subzone.

SUBZONES

Ten subzones are delineated in the CWH zone (Table 12). They can be separated along gradients of continentality (hypermaritime, maritime, and submaritime subzones) and precipitation (very dry, dry, moist, wet, and very wet) (Figure 20, Table 13). Species characteristic of the hypermaritime subzones include *Blechnum spicant*, *Coptis aspleniifolia* (fern-leaved goldthread), Sitka spruce, and *Scapania bolanderi*, and of the submaritime subzones *Clintonia uniflora*, *Orthilia secunda*, and *Pleurozium schreberi*. Species characteristic of the drier subzones include Douglas-fir, *Polystichum*

munitum (sword fern), and *Pteridium aquilinum* (bracken), and of the wetter subzones, amabilis fir, *Menziesia ferruginea*, *Vaccinium alaskaense*, and *V. ovalifolium*.

The hypermaritime subzones occur on the outer mainland coast, on the outer west coast of Vancouver Island, and on the Queen Charlotte Islands, while the submaritime subzones are restricted to the leeward side of the Coast Mountains. The drier subzones are found only in the central and southern portion of the zone — in the rain shadows of the Olympic Mountains, Vancouver Island Ranges, and Coast Mountains.

TABLE 12. Synopsis of subzones in the Coastal Western Hemlock zone (CWH)

Subzone	Code	Old code
Wet Hypermaritime CWH	CWHwh	(g/e/qc)
Very Wet Hypermaritime CWH	CWHvh	(d/CCPH)
Very Dry Maritime CWH	CWHxm	(a1/CDFb)
Dry Maritime CWH	CWHdm	(a2)
Moist Maritime CWH	CWHmm	(b3/b4)
Wet Maritime CWH	CWHwm	(j)
Very Wet Maritime CWH	CWHvm	(b1/b2/i1/i2)
Dry Submaritime CWH	CWHds	(c/h1/h2)
Moist Submaritime CWH	CWHms	(b5/b6/h3)
Wet Submaritime CWH	CWHws	(b7/i3/f1/f2)

SOME REPRESENTATIVE SITE ASSOCIATIONS

The site associations described below form a typical sequence in the CWHdm subzone (Figure 21).

Western hemlock — Flat moss

The Western hemlock — Flat moss association includes slightly dry to fresh and nutrient-very poor to -medium soils that occur on well to moderately well drained, middle slopes and gently sloping heights of land. The associated soils are sandy- to loamy-skeletal, moderately deep to deep, Orthic Humo-Ferric Podzols with Humimor humus forms. Relative to other sites, there are neither significant losses nor additions of moisture and nutrients; therefore, vegetation and soils of this association approximate the zonal ecosystem for the CWHdm subzone.

Mature stands are usually well stocked with Douglas-fir, western hemlock, and western redcedar (in the lower tree stratum). Both Douglas-fir and western hemlock can form pure stands in secondary succession.

The shrub layer is usually poorly developed in fully stocked stands. There is always advance regeneration of western hemlock; occurrence of *Acer circinatum* (vine maple), *Gaultheria shallon*, *Mahonia nervosa*, and *Vaccinium parvifolium* depends on

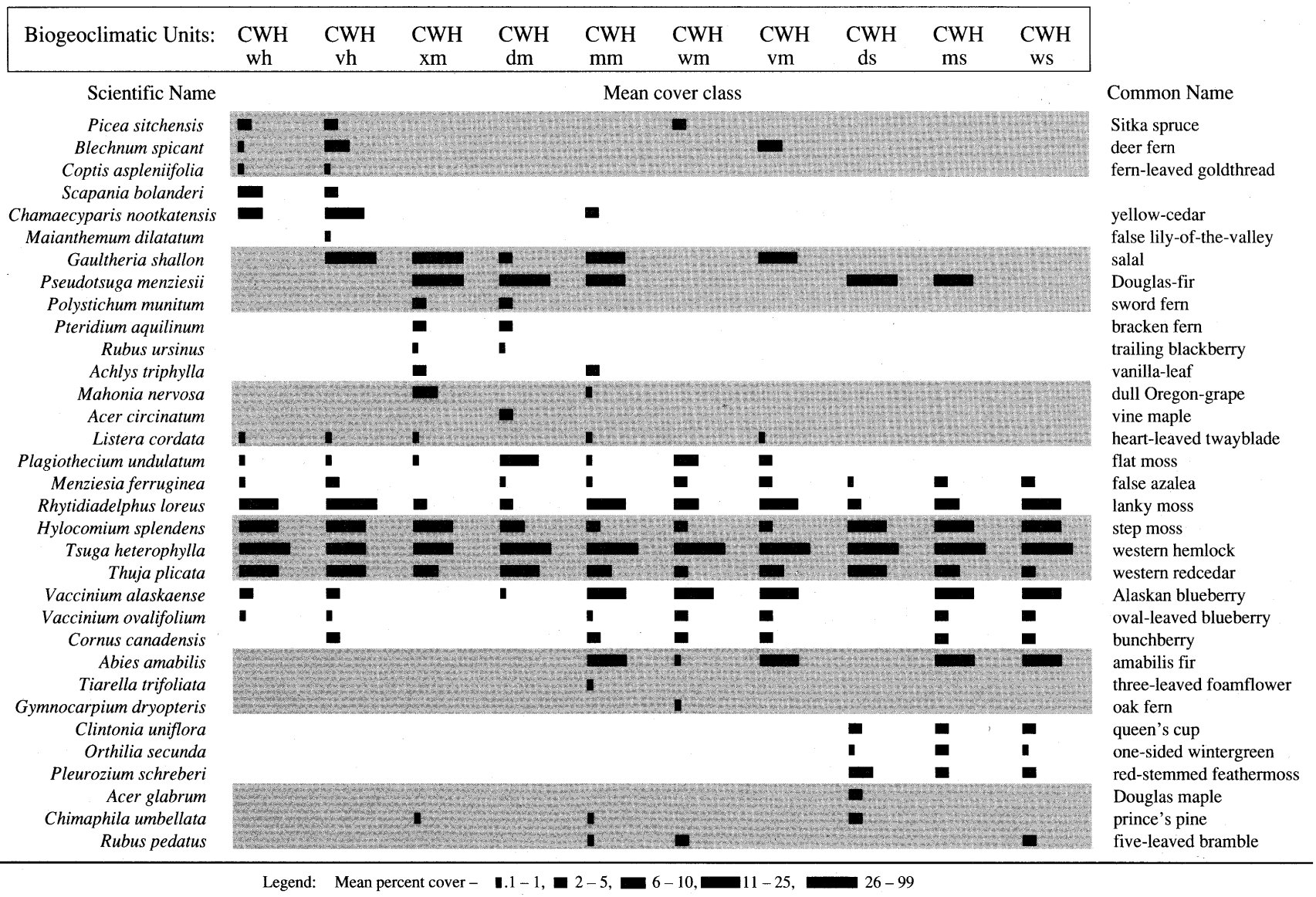

FIGURE 20. Zonal vegetation of subzones of the Coastal Western Hemlock zone.

TABLE 13. Means and standard deviations (in parentheses) of selected climatic characteristics for CWH subzones[a]

Climatic characteristics	CWHwh	CWHvh	CWHxm	CWHdm	CWHmm	CWHwm	CWHvm	CWHds	CWHms	CWHws
Number of stations for precipitation data	5	28	81	53	13	6	34	9	5	4
Mean annual precipitation (mm)	1349 (146)	2951 (657)	1505 (385)	1827 (326)	2349 (453)	2124 (342)	2787 (680)	1627 (367)	1683 (312)	1449 (410)
Mean precipitation April-Sept. (mm)	433 (61)	890 (193)	363 (96)	498 (89)	470 (50)	780 (242)	752 (200)	419 (109)	423 (90)	412 (148)
Mean ppt. of the driest summer month (mm)	54 (10)	96 (22)	39 (13)	53 (10)	45 (5)	86 (29)	75 (21)	45 (11)	40 (4)	45 (18)
Mean ppt. of the wettest winter month (mm)	204 (21)	431 (113)	251 (70)	292 (55)	400 (75)	362 (44)	436 (103)	259 (54)	262 (48)	244 (64)
Number of stations for temperature data	5	21	54	53	13	6	21	7	3	4
Mean annual temperature (°C)	7.6 (0.2)	8.2 (0.9)	9.3 (0.6)	9.8 (0.4)	5.7 (0.9)	5.5 (0.3)	8.2 (1.1)	7.8 (1.2)	5.9 (0.8)	5.5 (0.8)
Mean temperature of the warmest month (°C)	14.6 (0.3)	13.9 (0.8)	17.0 (0.8)	17.6 (0.5)	14.1 (1.0)	14.1 (0.8)	16.0 (1.1)	17.4 (1.4)	15.1 (0.8)	15.5 (1.0)
Mean temperature of the coldest month (°C)	1.3 (0.6)	3.0 (1.4)	1.8 (0.9)	1.9 (0.7)	-2.2 (1.1)	-4.2 (1.3)	0.3 (2.7)	-3.0 (2.3)	-4.2 (0.8)	-6.0 (0.6)
Number of months with mean temperature >10°C	4.0 (0.0)	4.4 (0.7)	5.4 (0.5)	5.7 (0.4)	3.9 (0.5)	3.8 (0.4)	4.9 (0.6)	5.0 (0.6)	4.3 (0.6)	4.2 (0.5)
Index of continentality[b]	6 (2)	3 (2)	14 (3)	15 (2)	16 (2)	17 (4)	14 (6)	24 (7)	23 (0)	24 (3)

[a] Symbols for CWH subzones are defined in Table 12.

[b] Index of continentality = $[1.7(\text{mean } T_{JULY} - \text{mean } T_{JAN})/\sin_{\text{DEGREES LATITUDE}}]-20.4$, where T - temperature (°C) (after Rose and Grant 1976).

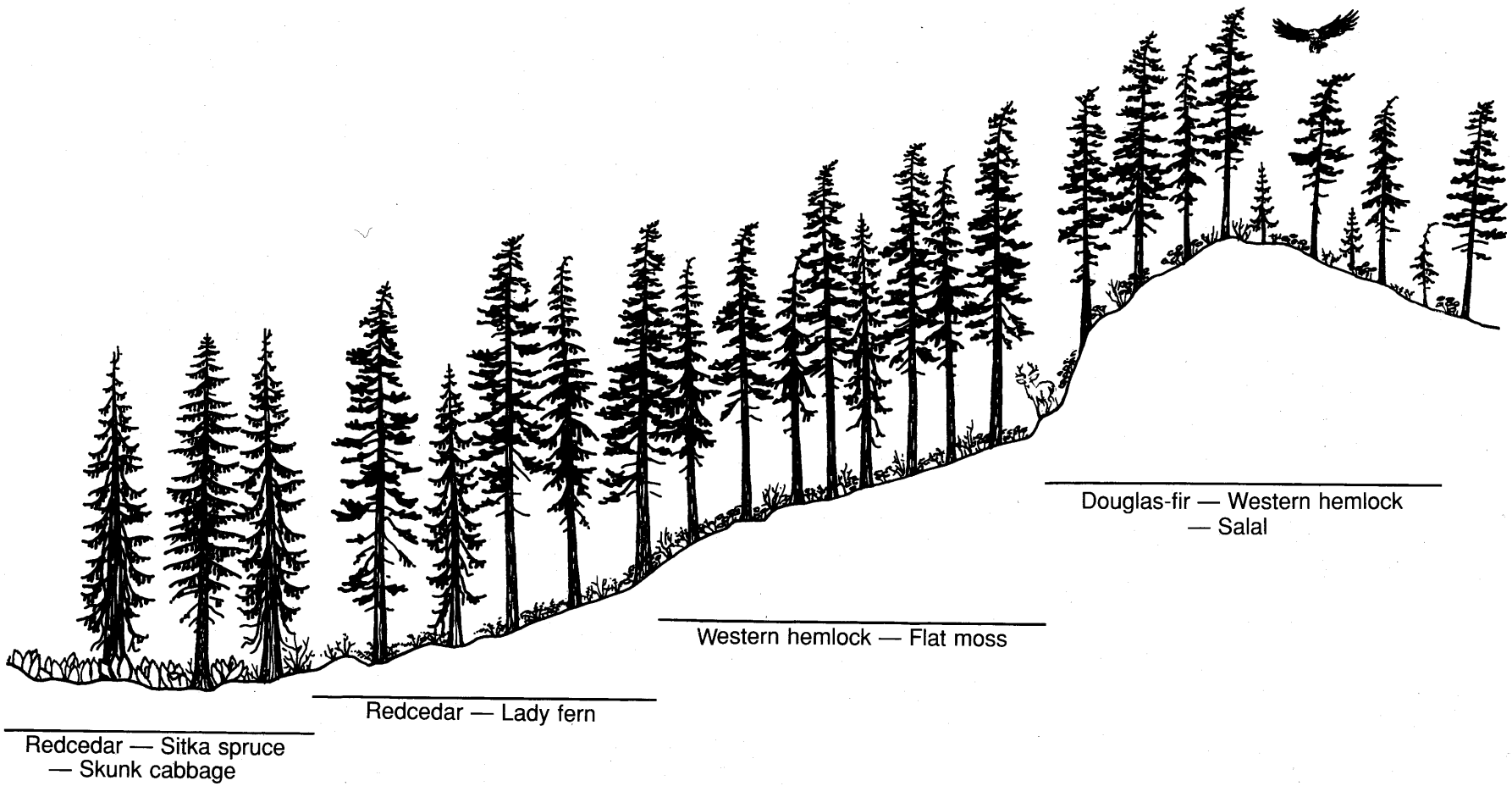

FIGURE 21. Simplified schematic diagram of topographic relationships among four common site associations in a dry, maritime subzone of the Coastal Western Hemlock zone.

light in the understory and surface materials. Similarly, the herb layer is very poorly developed with infrequent *Linnaea borealis*, *Polystichum munitum*, *Rubus ursinus* (trailing blackberry), and *Trientalis latifolia* (broad-leaved starflower). The moss layer is well developed, featuring *Kindbergia oregana* in early successional stages, and *Hylocomium splendens*, *Rhytidiadelphus loreus*, and *Plagiothecium undulatum* (flat moss) in late successional stages.

Douglas-fir — Western hemlock — Salal

This association includes moderately dry and nutrient-very poor to -medium, water-shedding sites that occur on rapidly drained, coarse-skeletal soil materials on upper slopes or valley bottoms in the CWHxm, CWHmm, and CWHdm. Soils are moderately deep Orthic Humo-Ferric Podzols with Hemimor humus forms. A growing-season water deficit and severe nitrogen deficiency are the main constraints to better forest growth.

Mature stands are usually well stocked with Douglas-fir (in the upper tree stratum), western hemlock, and western redcedar (in the lower tree stratum).

The shrub layer is very well developed with *Gaultheria shallon* (salal) dominant and *Mahonia nervosa* and *Vaccinium parvifolium* scattered. Advance regeneration of western hemlock and western redcedar is common in late-seral stands. The herb layer is very poorly developed, with *Pteridium aquilinum* as the only constant species. The moderately developed moss layer includes primarily *Kindbergia oregana* and *Hylocomium splendens*; lichens and xerophytic mosses are infrequent.

Redcedar — Lady fern

This association includes moist to very moist and nutrient-rich to -very rich, water-receiving sites that occur on imperfectly drained lower slopes in the CWHxm and CWHdm subzones. The associated soils are sandy- to loamy-skeletal, moderately deep to deep Sombric Humo-Ferric Podzols with Moder or Mull humus forms. Relative to other sites, the soils are either inherently nutrient-rich or enriched by seepage. Under these climatic and edaphic conditions, Douglas-fir and western redcedar attain their best growth.

Second-growth stands usually feature Douglas-fir; however, the presence of western redcedar stumps suggests that the final stage of secondary succession will be dominated by the latter, shade-tolerant species.

Acer circinatum and *Rubus spectabilis* (salmonberry) dominate the well-developed shrub layer. In the floristically rich herb layer, the constant species are *Athyrium*
filix-femina (lady fern), *Galium triflorum* (sweet-scented bedstraw), *Polystichum munitum*, and *Tiarella trifoliata* (three-leaved foamflower). In the less well-developed moss layer, *Leucolepis menziesii* (palm tree moss) and *Plagiomnium insigne* indicate friable forest floors.

Redcedar — Sitka spruce — Skunk cabbage

Wet and nutrient-medium to -very rich sites throughout lower elevations of the CWH are represented by the Redcedar — Sitka spruce — Skunk cabbage association. These water-collecting sites occur on lower slopes below the Redcedar — Lady fern site association or in depressions. The associated soils are poorly drained Gleysols or Humisols affected by slowly moving seepage.

Western redcedar and western hemlock dominate the open canopy, reflecting the pattern of relatively drier (usually raised organic mounds) and depressional microsites.

Gaultheria shallon, *Vaccinium parvifolium* (on acid organic mounds), and *Rubus spectabilis* (in depressions) dominate the moderately well-developed shrub layer. Herbs are largely confined to depressions and include *Athyrium filix-femina*, *Lysichiton americanum* (skunk cabbage), *Streptopus amplexifolius* (clasping-leaved twistedstalk), and *Tiarella trifoliata*. The moderately well-developed moss layer is dominated by *Hylocomium splendens*, *Rhytidiadelphus loreus*, and *Plagiothecium undulatum* on acid organic mounds, and by *Conocephalum conicum*, *Kindbergia praelonga*, *Pellia epiphylla*, and *Rhizomnium magnifolium* in depressions.

WILDLIFE HABITATS

The factors that most influence the assemblage of wildlife species in this zone (Table 14) are: its location and distribution — sea level to 1050 m on windward slopes and from southern Vancouver Island and the Fraser Lowland north to Alaska; the landforms that range among small coastal islands, coastal plains, estuaries, bedrock-controlled, rolling uplands and steep, rugged mountain slopes, often with exposed bedrock; the cool, mild, maritime climate; and the usually dense coniferous forests. In addition, this zone probably has a greater diversity and abundance of habitat elements than any other zone in the province. The greatest diversity of birds, amphibians, and reptiles in British Columbia is found within the Fraser Lowland portion of this zone, and almost all of the coastal, colony-nesting bird habitats are found in the CWH.

Black-tailed Deer, Black Bear, Grizzly Bear, and Gray Wolf are the most common large mammals. Black Bear occur throughout, as do Black-tailed Deer (since they were introduced to the Queen Charlotte Islands). Gray Wolf are only absent from the Queen Charlotte Islands, and Grizzly Bear and Mountain Goat occur only on the mainland. The marine environment, including the small, rocky coastal islands, provides good protection from predators and nesting habitat for many species of colony-nesting marine birds. Low, near-tidal islets are important haul-out areas for California and Steller's Sea-lion, Harbor Seal, Northern Fur Seal, and Northern Elephant Seal. Mountain Goat occupy rugged southerly aspects with exposed bedrock, often descending to forested cliffs near sea level in the winter.

TABLE 14. Selected wildlife habitats and species in the Coastal Western Hemlock 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	Mountain Goat, Black-tailed Deer, Black Bear, Cougar, Gray Wolf, Marten, California Myotis, Douglas Squirrel, Columbian Mouse, Southern Red-backed Vole, Deer Mouse Great Horned Owl, Saw-whet Owl, Barred Owl, Blue Grouse, Ruffed Grouse, Band-tailed Pigeon, Pileated Woodpecker, Northern Flicker, Hairy Woodpecker, Common Raven, Gray Jay, Steller's Jay, Varied Thrush, Chestnut-backed Chickadee, Red-breasted Nuthatch, Winter Wren, Vaux's Swift Western Toad, Pacific Treefrog, Western Red-backed Salamander, Ensatina Salamander, Northwestern Salamander	∇ Keen's Long-eared Myotis, Spotted Owl, Marbled Murrelet ♦ Roosevelt Elk, Grizzly Bear, Mountain Beaver, Townsend's Chipmunk, Sitka Mouse, Shrew-mole, Trowbridge's Shrew, Bald Eagle, Tailed Frog, Pacific Giant Salamander, Clouded Salamander
Young seral and managed second-growth forests	Extensive	Black-tailed Deer, Black Bear, Cougar, Gray Wolf, Marten, Columbian Mouse, 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, Varied Thrush Western Toad, Pacific Treefrog, Western Red-backed Salamander, Ensatina Salamander, Northwestern Salamander	♦ Roosevelt Elk, Grizzly Bear
Mixed coniferous and deciduous forests	Common	Black-tailed Deer, Black Bear, Gray Wolf, Marten, California Myotis, Douglas Squirrel, Columbian Mouse, Deer Mouse Red-tailed Hawk, Northern Saw-whet Owl, Blue Grouse, Common Merganser, Steller's Jay, Hairy Woodpecker, Pine Grosbeak, Townsend's Warbler Northern Alligator Lizard, Pacific Treefrog, Ensatina Salamander, Northwestern Salamander	∇ Marbled Murrelet ♦ Roosevelt Elk
Rocky cliffs, talus, and sparsely vegetated rocks	Extensive	Mountain Goat, Little Brown Myotis, Common Pika, Northwestern Chipmunk, Bushy-tailed Woodrat Common Raven, Black Swift, Cliff Swallow	∇ Keen's Long-eared Myotis

TABLE 14. Continued

Habitat	Habitat distribution	Representative wildlife species	Wildlife species at risk[a]
Avalanche tracks and seepage sites	Common	Black-tailed Deer, Black Bear	∇ Vancouver Island Marmot
		Blue Grouse, Lewis' Woodpecker, Band-tailed Pigeon, Willow Flycatcher, Swainson's Thrush, Cedar Waxwing, Purple Finch	♦ Grizzly Bear, Mountain Beaver
		Red-legged Frog	
Upland grassy areas	Rare	Northern Saw-whet Owl, Lincoln Sparrow	♦ Least Sandpiper, Purple Martin
Agricultural areas	Extensive in lowland areas	Coyote, Spotted Skunk, Coast Mole	♦ Mountain Beaver, Shrew-Mole, Townsend's Mole, Common Barn-Owl, Purple Martin
		Cooper's Hawk, Red-tailed Hawk, Rough-legged Hawk, Northern Harrier, Short-eared Owl, Mew Gull, Glaucous-winged Gull, Northwestern Crow, Brewer's Blackbird	
Riparian areas, wetlands, meadows, floodplains, lakes, and streams	Common	Black-tailed Deer, Black Bear, Gray Wolf, River Otter, Mink, Deer Mouse, Wandering Shrew	♦ Roosevelt Elk, Grizzly Bear, Mountain Beaver, Townsend's Chipmunk, Pacific Jumping Mouse, Pacific Water Shrew, Bald Eagle, Great Blue Heron, Green-backed Heron, Yellow-headed Blackbird, Purple Martin, Tailed Frog, Pacific Giant Salamander
		Osprey, Short-eared Owl, Snowy Owl, Ruffed Grouse, Trumpeter Swan, Sandhill Crane, Ring-necked Duck, Redhead, Harlequin Duck, Wood Duck, Red-throated Loon, Common Merganser, Wilson's Phalarope, Black Tern, Mew Gull, American Dipper	
		Common Garter Snake, Western Garter Snake, Northwestern Garter Snake, Painted Turtle, Western Toad, Bullfrog, Red-legged Frog, Northwestern Salamander, Long-toed Salamander, Rough-skinned Newt	
Offshore forested islands	Common		♦ Bald Eagle, Peale's Peregrine Falcon, Ancient Murrelet, Rhinocerous Auklet, Cassin's Auklet, Parakeet Auklet, Fork-tailed Storm-Petrel, Leach's Storm-Petrel
Offshore grassy and shrubby islands	Limited areal extent		♦ Peale's Peregrine Falcon, Rhinocerous Auklet, Fork-tailed Storm-Petrel, Leach's Storm Petrel, Tufted Puffin, Cassin's Auklet
Marine cliffs and rocky islets	Common	Northern Sea Lion, Northern Fur Seal, Northern Elephant Seal, Harbor Seal	∇ Keen's Long-eared Myotis, Horned Puffin, Thick-billed Murre
		Black-legged Kittiwake, Black Oystercatcher, Double-crested Cormorant, Pelagic Cormorant, Pigeon Guillemot, Glaucous-winged Gull, Black Swift	♦ Bald Eagle, Peale's Peregrine Falcon, Brandt's Cormorant, Common Murre

TABLE 14. 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, Harbor Seal, Killer Whale, Harbor Porpoise Northern Pygmy-owl, Sharp-shinned Hawk, 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, Green-winged Teal, Pigeon Guillemot, Northwestern Crow	∇ Sea Otter, Marbled Murrelet ♦ Roosevelt Elk, Grizzly Bear, Bald Eagle, Great Blue Heron, Common Murre, Ancient Murrelet, Rhinoceros Auklet, Cassin's Auklet, Parakeet Auklet

[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.

Climax or old-growth forests provide both food and nesting habitat for a large variety of birds. The deep, dense canopy is an excellent interceptor of snow, while litterfall of arboreal lichens and needles provides winter forage for Black-tailed Deer. After clearcutting, the succulent regrowth provides an abundance of forage for Black-tailed Deer, Black Bear, Grizzly Bear, and Roosevelt Elk (on Vancouver Island), as well as habitat for Blue Grouse, Band-tailed Pigeon, Lewis' Woodpecker, Traill's Flycatcher, American Robin, Swainson's Thrush, Cedar Waxwing, and Purple Finch. Forest regeneration is usually rapid and forest openings can quickly develop a dense canopy of young trees with sparse understory vegetation. Many species of birds, such as Spotted Owl, Great Horned Owl, Saw-whet Owl, Northern Flicker, Pileated Woodpecker, Hairy Woodpecker, Hammond's Flycatcher, Gray Jay, Steller's Jay, Common Raven, Chestnut-backed Chickadee, Red-breasted Nuthatch, Winter Wren, and Varied Thrush, use the conifer forests because of the presence of other birds and rodents, bark and wood-boring insects, and conifer seeds. Many species of amphibians occur because of the damp litter on the floor of mature forests, including Northwestern Salamander, Western Red-backed Salamander, Ensatina Salamander, Clouded Salamander, and Western Toad. The Pacific Giant Salamander and Tailed Frog both require steep cold mountain streams in old-growth forests as breeding habitat, and damp litter on the forest floor to survive as metamorphosed adults.

Many large and small rivers cross this zone, with large and small riparian areas. Nearly all the rivers and streams are used for spawning by salmon, and most of their young spend some time in these streams. These fish, in addition to the lush vegetation and berries, provide ample food for Grizzly Bear and Black Bear. These riparian areas support some of the densest populations of Grizzly Bear and Black Bear in the province. Other species that depend on the anadromous fish are River Otter, Mink, Common Merganser, Common Goldeneye, Bald Eagle, and many species of gulls. The annual Eulichan (candlefish) run also provides a spring feast for seals, sea lions, gulls, and Bald Eagle on the lower reaches of many coastal rivers. Many species of reptiles and amphibians use riparian areas and wetlands within the forest, including the Common Garter Snake, Western Terrestrial Garter Snake, and Red-legged Frog, although the Queen Charlotte Islands have no reptiles and only one amphibian — the Northern Toad.

As these rivers and streams enter the marine environment they form estuaries, which, like the rivers behind them, range from small to very large (e.g., the Fraser River estuary). The nutrient-rich, protected waters of these estuaries provide shelter for over-wintering waterbirds, such as diving and dabbling ducks, Trumpeter Swan, grebes, scoters, and gulls. Most of the province's estuaries occur in this zone.

Steep, rocky islets are used by colony nesting seabirds such as the Pelagic and Double-crested Cormorants, Ancient Murrelet, Forked-tailed Storm-Petrel, Leach's Storm-Petrel, Cassin's Auklet, Rhinocerous Auklet, Pigeon Guillemot, Tufted Puffin, and Common Murre. Peale's Peregrine Falcon nest on rocky ledges near colonies of Ancient Murrelets on the Queen Charlotte Islands, and Bald Eagle perch on large conifers along major rivers and on the forested islets and headlands.

Extensive areas of sparsely vegetated, steep rock occur in many of the fjords in this zone. The massive rock walls are poor habitat for most wildlife species, except Mountain Goat which sometimes use these areas as escape terrain.

Extensive urban and agriculture developments have taken place in the Fraser Lowland, displacing large mammals such as Roosevelt Elk, Grizzly Bear, and Gray Wolf. While Black-tailed Deer, Cougar, and Black Bear survive here, their numbers are greatly reduced. Draining of wetlands, especially Sumas Lake, and diking of the Fraser River, which has subsequently stopped the development of back-channels and sloughs, has reduced the number of over-wintering waterbirds. There has been minor compensation when forest has been turned into agricultural land, enabling these birds to feed on exposed crops and insects.

The extensive urban areas in the Lower Mainland portion of this zone support a variety of native and introduced wildlife species whose abundance and diversity are related to the density of development. Non-native species include the Rock Dove, House Sparrow, European Starling, Crested Myna, Gray Squirrel, Roof Rat, Norway Rat, and House Mouse. Native species that have adapted to urban habitats include the Black-tailed Deer, Coyote, Striped Skunk, Raccoon, Little Brown Myotis, Herring

Gull, Common Nighthawk, Barn Owl, and Barn Swallow. Even these urban species are more abundant in areas that are interspersed with parks, gardens, and native forest.

Several animal species have been introduced to certain parts of the CWH. On the Queen Charlotte Islands, Rocky Mountain Elk, Black-tailed Deer, Raccoon, Beaver, and Pacific Treefrog have all been directly introduced. Roosevelt Elk were directly introduced to the Sechelt Peninsula, and Gray Squirrel to the Lower Mainland. The Spotted Skunk and North American Opossum were introduced to Washington State and have since expanded their range into the Lower Mainland. The Crested Myna maintains a small population near urban areas centred around Greater Vancouver, but it has not expanded its range much since being introduced in the 1890's. In contrast, the European Starling extended its range during a similar time period from the Eastern United States to the west coast of North America, including the Coastal Western Hemlock zone.

The only subspecies to have recently become extinct in this zone is the Dawson Caribou, from the Queen Charlotte Islands.

RESOURCE VALUES

The CWH is the most productive forest region in Canada. In the drier portion of the zone, Douglas-fir, grand fir, western white pine, and western redcedar, and in the wetter portion, amabilis fir, Sitka spruce, western hemlock, and yellow-cedar, exhibit their best growth. Thus, a majority of CWH ecosystems are used primarily for forestry, a management strategy that warrants the application of intensified silvicultural practices. As a result of mountainous relief and high precipitation, soil conservation appears to be the primary management concern in sustaining the productive potential of forest ecosystems.

Medium- to fine-textured, coarse fragment-free soils in the driest portion of the zone are suitable for agriculture. However, the combination of unfavourable topography and humid climate renders most of the zone unsuitable for agricultural use.

Recreational pursuits in the CWH include hiking, hunting, fishing, and wildlife viewing. Marine-based sports such as sea-kayaking, boating, and sailing are very pleasant along the scenic coastline of much of the zone. “Big trees” are common in this zone and are a very popular recreational destination.

Although there is an abundance of furbearers in this zone, fur harvest is generally low.

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