Structure, Processes, and Diversity in Successional Forests of Coastal British Columbia

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British Columbia's Coastal Temperate Rainforests

The forests of coastal British Columbia (BC) are part of a biome extending from northern California to southeastern Alaska (Schoonmaker et al. 1997). At low elevations (<900-1050 m in southern BC, <300 m in northern BC) coastal forests have been called coastal temperate rainforest (e.g. Alaback 1995) or the Coastal Western Hemlock biogeoclimatic zone (Pojar et al. 1991a). Above these rainforests are the subalpine forests and parkland of the Mountain Hemlock (MH) biogeoclimatic zone (Pojar et al. 1991b)—which extend to 1800 m in southern BC and to 1000 m elevation in northern BC—with non-forested alpine above that. Within the CWH and MH biogeoclimatic zones several subzones are recognized, as related to precipitation and degree of continentality (Pojar et al. 1991a, 1991b). Though 11% of the CWH and 59% of the MH zones are naturally non-forested (largely wetlands and meadows, respectively) (MacKinnon and Eng 1995), the papers in this special issue report only on the forested areas of these zones.

Only rough correspondences can be made between the CWH and MH biogeoclimatic zones and the four forest Zones recognized in western Washington and Oregon (Franklin and Dyrness 1988), i.e. the *Picea sitchensis, Tsuga heterophylla, Abies amabilis,* and *Tsuga mertensiana* Zones. The *Picea sitchensis* Zone found on the outer coast corresponds roughly with the very wet and wet hypermaritime CWH biogeoclimatic subzones. The *Tsuga heterophylla* Zone covers a broader range of conditions and corresponds roughly with the very wet, wet, dry, and very dry maritime and dry submaritime CWH biogeoclimatic subzones. The *Abies amabilis* Zone is found at higher elevations with winter snowpack and corresponds roughly with the moist maritime and moist and wet submaritime CWH biogeoclimatic subzones. The high elevation *Tsuga mertensiana* Zone corresponds roughly with the MH biogeoclimatic zone.

Compared to forests in other temperate ecosystems, forests in BC's CWH and MH biogeoclimatic zones are structurally and biologically complex (e.g. Bunnell and Chan-McLeod 1997). As fire-return intervals for much of coastal BC can span hundreds (or even thousands) of years, natural disturbance regimes tend to be dominated by small-scale events such as gap dynamics (Lertzman et al. 1996). The resulting forests are usually old; for example, in three undeveloped watersheds in Clayoquot Sound on western Vancouver Island, over 98% of the forest stands were in age classes greater than 141 years (Clayoquot Sound Scientific Panel 1995, p. 24).

Coastal temperate rainforests make up only a small portion (2-3%) of the area of the world's temperate forests (Ecotrust et al. 1995), and the subalpine forests above them are similarly scarce. Approximately half of the world's coastal temperate rainforest is located on the northwestern maritime margin of North America, and almost half of the North American coastal temperate rainforests are in BC (Ecotrust et al. 1995).

Prior to European contact, First Nations in the region managed the land and cut the trees, but there was no deliberate, large-scale, anthropogenic forest conversion. Since the arrival of the first European settlers, BC's coastal forests have been logged. Early logging was primarily to clear land for settlement. By 1900, however, as timber was depleted in other regions of North America, BC became the new frontier of industrial forestry. Forestry remains the single largest industry in the province today.

Workshop Themes and Needs

This special issue of *Northwest Science* contains the proceedings of a workshop titled "Structure, Processes, and Diversity in Successional Forests of Coastal British Columbia" held in Victoria, BC, February 17-20, 1998. The workshop was jointly sponsored by the Canadian Forest Service and the BC Ministry of Forests, and was chaired by the two of us. Topics covered in 34 oral presentations, 23 posters, and 4 keynote addresses included: changes in stand structure and composition; site carbon and nutrient balance; and species diversity, focusing especially on those species with low dispersal capabilities.

Why "Structure, Processes, and Diversity in Successional Forests of Coastal British Columbia"? The main impetus for the workshop was to share information from research and operational trials about differences between old-growth forests and (largely anthropogenic) second-growth forests in coastal BC. To date, in coastal BC, we've logged approximately 3.4 million ha (24% of the total coastal area). Of this, 420 000 ha (3% of the total coastal area) has been logged and developed (MacKinnon and Eng 1995). That leaves approximately 3 million ha on the coast where old-growth forests have been converted to second-growth forests. In some areas (e.g. southeastern Vancouver Island), very little old-growth forest remains.

Research on the forests of coastal BC began in earnest early this century. Soon after the establishment of the provincial forest service in 1912 and the execution of the first inventory of BC's forests by the federal Forestry Branch (1914-1916), the provincial Chief Forester H.R. MacMillan in 1915 directed the establishment of growth and yield studies "on our difficult sites . . . in order that some opinion may be formed as to the length of time necessary to grow a second crop in logged and burned districts". Some early research plots, such as those at the Cowichan Lake Research Station, have now been monitored for more that 65 years.

In the past, much of the research on BC's coastal forests focused on the growth, silviculture, and genetics of commercial tree species, and issues related to protection of forests, i.e. fire, insect pests, and diseases. Today though, studies of tree growth are accompanied by studies of lichen populations and wildlife habitat. Growth-and-yield modellers are now turning their hands to modelling tree mortality. Landscape-level studies are being established.

People inside and outside the research community are beginning to ask some difficult questions about our 3-million-ha experiment on the coast. How do old-growth and second-growth forests compare in terms of ecosystem structure, function, and biodiversity? And what do these differences mean for forests and landowners? One intent of this workshop is to begin to answer some of these questions.

Almost half of the papers presented here are from the Canadian Forestry Service's multidisciplinary Coastal Forest Chronosequence project which is introduced in the paper by Trofymow and Porter (this issue). Other papers are from studies conducted in other successional forest stands elsewhere in coastal BC. Laurie Kremsater and Fred Bunnell's keynote address "Changing Forests, Shifting Values, and Chronosequence Research" examines how forest research in general, and research on successional forests in particular, can help address forest management regimes as they change to meet societal goals. Tom Spies, Bernard Bormann, and Andy Carey present overviews of research results from similar forest types in the US coastal Northwest and Alaska. And, Jerry Franklin adds some thoughtful comments on "The Natural, the Clearcut, and the Future"—a talk that was presented as a public lecture during the workshop.

Papers in this special issue are organized into three sections following the workshop themes—structure, processes, and biodiversity. Papers from this special issue are also available on the World Wide Web at http://www.pfc.cfs.nrcan.gc.ca/.

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Literature Cited

Alaback, P.B. 1995. Biodiversity patterns in relation to climate and a genetic base for the rainforests of the west coast of North America. *In* R. Lawford, P.B. Alaback, and E.R. Fuentes (eds.). High Latitude Rain Forests of the West Coast of the Americas: Climate, Hydrology, Ecology and Conservation. Springer-Verlag, Berlin. Pp. 105-133.

Bunnell, F.L. and A.C. Chan-Mcleod. 1997. Terrestrial vertebrates. *In* P.K. Schoonmaker, B. von Hagen, and E.C. Wolf (eds.). 1997. The Rain Forests of Home: Profile of a North American Bioregion. Island Press, Washington, DC and Covelo, California. Pp. 103-130.

Clayoquot Sound Scientific Panel. 1995. Report 4, Sustainable Ecosystem Management in Clayoquot Sound: Planning and Practices. Cortex Consultants, Victoria, BC.

Ecotrust, Pacific GIS, and Conservation International. 1995. The Rain Forests of Home: An Atlas of People and Places—Part 1: Natural Forests and Native Languages of the Coastal Temperate Rain Forest. Portland, Oregon.

Franklin, J. and C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press. 452 p.

Lertzman, K.P., G. Sutherland, A. Inselberg, and S. Saunders. 1996. Canopy gaps and landscape mosaic in a temperate rain forest. Ecology 77:1254-1270.

MacKinnon, A. and M. Eng. 1995. Old forests inventory for coastal British Columbia. Cordillera 2(1):20-33.

Pojar, J., K. Klinka, and D.A. Demarchi. 1991a. Coastal Western Hemlock zone. *In* D. Meidinger and J. Pojar (eds.). Ecosystems of British Columbia, Special Rep. Series No. 6., BCMOF, Victoria, BC. Pp. 95-112.

———. 1991b. Mountain Hemlock zone. *In* D. Meidinger and J. Pojar (eds.). Ecosystems of British Columbia. Special Rep. Series No. 6, BCMOF, Victoria, BC. Pp. 113-125.

Schoonmaker, P.K., B. von Hagen, and E.C. Wolf (eds.). 1997. The Rain Forests of Home: Profile of a North American Bioregion. Island Press, Washington, DC and Covelo, California.