

A glimpse of forestry in British Columbia

Karen Bothwell¹

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Introduction

British Columbia (BC) has been described as a “sea of mountains” unsuitable for growing almost everything except trees (Barber 1995). Native Americans were the first loggers harvesting trees for shelter, transportation and for ceremonial purposes. When settlers came from Europe in the mid-1800s they brought with them their Old-world preference for open fields, food crops and livestock. Forests were viewed as an obstacle to be cleared away, but their removal was a losing struggle against stubborn stumps, relentless undergrowth and thin soils. Eventually, the people realised that lumber was the most valuable crop and harvesting began in earnest in the late 1860s. By 1900 forest harvesting was the leading industry in the province and it has never relinquished that position (Barber 1995).

The sheer scale of the forests dominated my first impressions of BC, the vast forest industry, vitally important to every community. Nearly everyone I met had some connection with forestry. Almost every town has a sawmill or pulp mill, many of the roads warn of logging trucks, rivers are full of logs waiting to be pulled up to the sawmills. Even the houses in Vancouver have huge Douglas fir (*Pseudotsuga menziesii*) spruce trees in their gardens; the streets downtown are lined with trees. Most of the building construction is with wood. Forests, trees and wood are an intimate part of the culture, life-style and community of BC.

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The diversity of BC forests

Most of Canada is covered in boreal forest comprised of jack pine (*Pinus banksiana*), black and white spruce (*Picea mariana* and *P. glauca*), balsam fir (*Abies balsamea*) and aspen (*Populus tremuloides*). While BC has only 17% of Canada’s total forest, it grows 40% of the nation’s merchantable timber (Bartlett 1996). BC is a large, diverse province, more variable physically and biologically than any other comparable region of Canada. It covers 95 million ha of which 61 million ha is forest. The province spans 11 degrees of latitude and 25 degrees of longitude. Mountains feature prominently - three quarters of the land mass is higher than 1000 m. The coast is deeply indented and is fringed with islands throughout its length.

Broadly speaking BC has a cool moist climate. However, there are areas with Mediterranean, semi-arid, alpine and subarctic climates. As a result of these and other factors the

¹ 42 Offington Drive, Sutton, Dublin 13, (bothwell@esatclear.ie). Karen Bothwell was studying for an M.Sc. in forest sciences at the University of British Columbia when this paper was written. Many of the issues highlighted in the paper are still current in BC – Ed.

province has tremendous ecological diversity with a wide range of ecosystems. Soil parent materials range from glacial outflows, to volcanic, sedimentary and intrusive igneous rocks.

BC can be divided into five physiographic regions:

1. the Coast mountains and islands,
2. the Interior Plateau with its flat to gently rolling uplands, (the southern part is more rugged),
3. the Columbia mountains and the Southern Rockies,
4. the Northern and Central Plateau and mountains, and
5. the Great Plains of north-eastern BC.

Biogeoclimatic ecosystem classification

As one can imagine the great range of site types caused some problems in devising appropriate land management strategies. In the 1960's and 70's Krajina and his postgraduates at the University of British Columbia developed a biogeoclimatic classification system (Krajina 1965) which integrates climatic, edaphic and vegetation factors. With the goal of improving forest management, the BC Ministry of Forests began developing in 1975 an ecosystem classification of forests and rangeland, based on Krajina's work.

Biogeoclimatic ecosystem classification (BEC) is an hierarchical classification system with different levels of integration and classification². There are 14 zones - areas with the same regional climate. Each is named after its climax plant association. Within each zone there are considerable variations in climate, resulting in different vegetation, soils and primary productivity; these are classified as subzones and variants. For example, a typical subzone where one might find Sitka spruce (*Picea sitchensis*) on the coast is the CWHvm1 – the coastal western hemlock (*Tsuga heterophylla*), very wet, maritime submontane - variant. Here the mean annual rainfall is 3000 mm, occurring throughout the growing season, with a minimum mean monthly temperature of 4.6 °C (Peterson *et al.* 1997). A further example is IDFxh – the Interior Douglas-fir very dry, hot - subzone. (The first three upper case letters denote the zone, the first lower case letter denotes the precipitation regime, the second is for the temperature regime in the interior.)

As far as the species composition in the different biogeoclimatic zones in BC is concerned, western hemlock and western red cedar (*Thuja plicata*) (CWH zone) dominate the majority of the coastal forests at low to medium elevations; Douglas fir is abundant in the south, amabilis fir and Sitka spruce likewise in the north. These are primarily mature rainforests, with dense undergrowth. The coastal Douglas-fir zone (CDF zone) includes a narrow band along eastern Vancouver Island and the Gulf Islands, an area that is much warmer and drier than much of the coast. Arbutus (*Arbutus menziesii*) and Garry oak (*Quercus garryana*) are common associates in this area. Mountain hemlock (*Tsuga mertensiana*), amabilis fir (*Abies amabilis*) and to a lesser extent yellow cedar (*Chamaecyparis nootkatensis*) predominate in the coastal subalpine forest (MH zone).

As one moves over the Coast Mountains into the southern Interior, the valleys are covered by dry forests and savannah grasslands, the dominant species being ponderosa pine

² The BEC map is available at <http://www.for.gov.bc.ca/research/becmaps/BECMAPS.htm>

(*Pinus ponderosa*) (and Douglas fir (PP zone). As one moves up in elevation lodgepole pine (*Pinus contorta*) and Douglas fir form extensive stands (IDF zone), providing good winter range habitat for wildlife. Western larch (*Larix occidentalis*) is a common associate in the south-eastern BC.

Again with increasing elevation, one moves into the Montane spruce zone (MS zone). The upper elevation forest and parkland of the southern two thirds of the BC interior consist of mixtures of Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*) and lodgepole pine (ESSF zone). The low and middle elevation forests of northern BC is boreal in character – white spruce, subalpine fir and lodgepole pine are the dominant species. The northern subalpine forest consists of lodgepole pine, white and black spruce. The outer northern coast is covered with muskegs, where scrub of shore pine, yellow cedar and red cedar, and hemlocks, along with some shrubs, grows.

Coniferous forests dominate the landscape (Figure 1), but there are some broadleaves, some of which are gaining in importance, for example aspen for OSB (oriented strand board) production. Aspen is common throughout the interior plateau and the boreal forest region. Paper birch is also found in mixture. Red alder, big leaf maple and black cottonwood are common on the coast.

This is all on the regional scale, but at the more local level the BEC system becomes useful for classifying sites, developing future harvesting plans, and site preparation and silvicultural prescriptions.

At the site level, there can be differences in plant communities due to topography, effects of slope on moisture availability, soil depth, and drainage. These lead to different soil moisture (SMR) and soil nutrient regimes (SNR). Associated with the SMR and SNR regimes are different site series, where a group of plant communities is distinguished by the presence of a unique combination of species. Very wet, nutrient-poor sites are typical of shore pine, Sphagnum bogs, but when there is an increase in nutrient availability, the vegetation changes to being dominated by western red cedar, Sitka spruce and skunk cabbage (*Symplocarpus foetidus*).

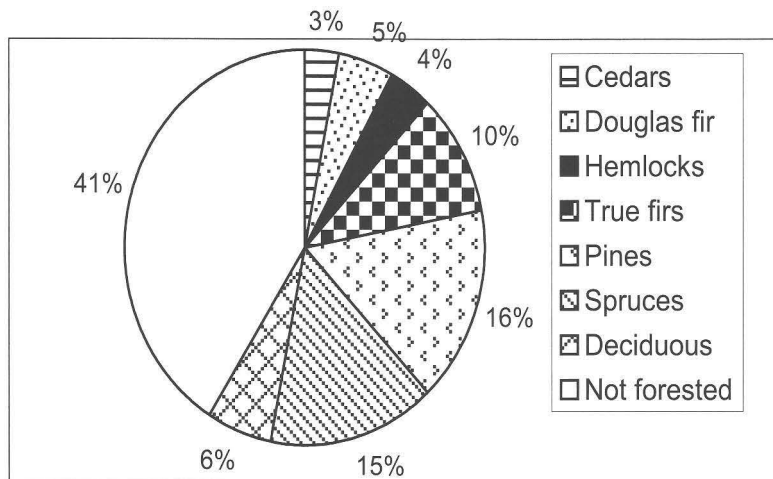


Figure 1. Principal tree species of BC based on land area (Bartlett 1996). (Not forested includes all areas with no tree species, for example rock outcrop, alpine, meadow, grasslands, wetlands, transportation routes, urban and industrial areas.)

Forest tenure in BC

The province of BC owns 92% of the land area (known as Crown land) and forests while private industry owns the logging equipment and manufacturing facilities. The provincial government issues tenures which are usually valid for a period of 25 years. These are renewable. Most tenure agreements grant the licensee the right to harvest a specific area and/or volume of Crown wood in exchange for a set stumpage price, payable at time of harvest. The licensee must harvest in accordance with the Forest Practices Code (FPC) and comply with other legislative requirements. The Chief Forester of BC determines the allowable annual cut (AAC) for the province.

There are four primary tenure types:

1. *Forest Licence (FL)* – is a volume based tenure that grants licensees the right to harvest a specified AAC within a given Timber Supply Area (TSA). Actual areas are negotiated between the government and the other FL holders in the TSA. The AAC is redetermined every five years.
2. *Tree Farm Licence (TFL)* – an area based tenure that grants licensees the exclusive right to harvest timber in a specified area. The AAC is redetermined every five years.
3. *Timber Sales (TS)* – the bulk of these are issued through the Small Business Forest Enterprise Program (SBFEP). Timber sales are granted on the basis of ‘competitive bids’ and ‘bid proposals’, the number of jobs that will be created and the amount of value added. Woodlot licenses are also included here.
4. *Private land* represents 5% of BC and is primarily on the coast. Private land outside of a TFL does not have to be managed in accordance with the FPC.

Land tenure and ownership are areas of big debate and controversy in BC, especially regarding First Nations. When Europeans first came to BC treaties were not signed with the First Nations; instead they were made wards of the state and put in small reserves around the province. Now there is a lengthy process in progress trying to settle land claims and sign fair treaties with the First Nations. In other parts of Canada the Supreme Court has ruled that First Nations have an aboriginal right to harvest wood and fish for salmon on their native lands for subsistence purposes.

Wood production

In 1997/8, BC had a total annual harvest of 64.8 million m³. In the Interior, pine (primarily lodgepole pine) and spruce (white spruce and its hybrids) are important, while hemlock, true fir, cedar and Douglas fir are important on the coast. Until the 1960s, interior lodgepole pine was considered a weed species and was not harvested; now it is an extremely valuable species. Coastal lodgepole pine is not a commercial species in BC due to its limited location on very wet coastal bogs, where its poor form lives up to its specific and varietal name *Pinus contorta* var. *contorta*. Sitka spruce is of minor importance. This is primarily because of the risk of white pine weevil (*Pissodes strobi*) attack. So great is the risk in coastal BC (apart from the Queen Charlotte Islands and the coastal areas further north) that Sitka spruce has been excluded from use in most reforestation programmes (Peterson *et al.* 1997). The weevil repeatedly destroys the terminal leader of Sitka spruce trees, causing reduced height growth and deformed stems. Serious damage is most common on Vancouver Island.

Forest management in BC

My impression of forestry in BC is that it is mainly concerned with logging, coupled with a huge processing industry including sawmilling, pulp and paper production, OSB and plywood production. Forest management is extensive rather than intensive. Silviculture has not impacted on most of the forest, primarily because there is a considerable area of unmanaged forest, 60% of which is still intact. Also, as stated, forests play an important role in BC life; people are protective of their wilderness areas (12% of BC is in parks). Wood production is no longer the sole objective of the forest: watershed protection, wildlife management, and recreation are now of considerable importance.

Forest management in BC has come under criticism within the province and internationally. Large scale clearfells such as at Mount Paxton on northern Vancouver Island, which featured in National Geographic, and the sprawling clearcut of the Bowron watershed (52,500 ha), due to beetle kill salvage, has put BC at the centre of controversy and caused widespread anger and distrust of the forest industry. Clearfelling is still the primary method of forest harvesting, although the use of alternative silvicultural systems, leaving wildlife patches and riparian zones has been happening to some degree, and for some now in the Interior area. The average clearfell size in 1995 was 31.1 ha, but this varied according to region.

Due to environmental pressure and loss of market share, MacMillan Bloedel (one of the largest BC forest companies, which has recently been purchased by Weyerhaeuser) decided to phase out clearfelling in coastal forests, and adopt variable retention systems – irregular shelterwood, group retention and strip shelterwood. However, clearfelling is often the best option silviculturally and for safety reasons, therefore a combination of different silvicultural systems should be implemented on a landscape level.

Silviculture and forest harvesting have been evolving over time, and attempt to emulate natural events – characterised by their type, intensity, scale, frequency and distribution over time. The province is now classified by Natural Disturbance Types (NDTs). On the coast, there are usually small-scale disturbances due to windthrow or rot, while in the Interior there are larger scale disturbance patterns due to fire. Adjacency constraints ensure that regenerated forests must achieve ‘green up’ (greater than 3 m height) before a company can harvest an adjacent block. Management is on a landscape level, taking careful consideration of spatial patterns, connectivity of forests, protection of riparian areas and biodiversity, and preserving the interior habitat of remaining patches.

A forest practices code was introduced in 1995 to provide a regulatory framework that tries to achieve environmental, economic and social objectives for the province’s resources. Regulations and standards to deal with forest practices were introduced. Much of the emphasis has been on the operational planning process, which leads to lots of paperwork and administrative processes, rather than being a results-based code. There has been much criticism of the code because of the large number of conflicting regulations, the resulting increase in logging costs when trying to achieve the standards set out, the lack of operational flexibility and freedom for companies to carry out their business.

Intensive plantation management as we practise it in Ireland is virtually unknown in BC. Forest companies, in accordance with their licensing agreement, must regenerate the forest and manage it, at their own expense until it has reached free to grow stage. About 65% of harvested sites are now regenerated by planting, with an average of two to three species being planted; natural seeding frequently supplements this. Since 1994, 96% of the planting stock is containerised (1981 – 55% bareroot). Seedling survival two years after planting has now reached over 85% (Bartlett 1996). Site preparation techniques are often

used, primarily mechanical methods, but also some burning. Brushing is being used on some sites to try and accelerate early growth rates. Once a stand is free to grow, a company is no longer obligated to do any management on Forest Licences. Forest Renewal British Columbia (FRBC) (a government organisation) provides contracts for companies to conduct incremental silvicultural practices such as juvenile spacing, pruning and fertilisation. Often these have the goal of creating jobs, rather than being good silvicultural and economic options for management. Fertilisation has been shown to be the only economic silvicultural activity in BC.

Commercial thinning is rarely practised in BC, for three main reasons:

1. there has been no need to thin because of the abundance of fibre,
2. the low volume in small thinnings is not usually economic at present log values (in a market dominated by large mature trees from unmanaged forests),
3. by the time dense stands have self-thinned to a tree size that is economical, most mortality has occurred and salvage thinnings are not possible.

In 1996 just over 1 million ha were harvested in Canada, of this only 14,000 ha were commercially thinned. But this figure will be increasing in the future because in large forest management areas with so much mature wood there is often a large class gap. This creates a need to accelerate second growth stand operability by pre-commercial thinning, and to fill the gap in wood supply by commercial thinning in second growth stands (Weetman 1998).

Stand yields are reported as net merchantable yield $\text{m}^3 \text{ha}^{-1}$ and not as gross total yield as in Europe. Yield classes are not used in Canada because "gross total yield for a height curve (like GB yield tables) has no data to support it". Also net merchantable yields must be used if mortality cannot be salvaged.

Forest health is a big issue for BC foresters. In 1996/7 timber losses due to pests were in the region of 6.2 million m^3 (0.33 million m^3 lost to wildfire). There is currently a beetle epidemic in BC. Much of the logging in the Interior is a race against time - trying to get trees harvested before beetle attack or salvaging timber already attacked. Fire suppression over the past five decades has led to large areas of over-mature forest, which are prone to bark beetle attacks.

Crisis in the forest industry

BC is quite unique in that it still has a natural unmanaged forest, with high quality timber that cost them nothing to grow. Yet it is still difficult for companies to generate good profits. The industry typically follows a cycle of highs and lows, and over the last two years it has been in a big slump. There have been daily reports in the newspapers of mills closing, job losses, and logging activities being halted because it was not economic to log or process the timber.

The problems facing the BC forest industry result from a number of historical and current issues including, land ownership problems, government and forest policies, industry strategy and the global market position. There are increasing arguments for tenure reform and privatisation of the forest resource. As a result of the mountainous terrain and remote location of wood for harvest, BC has very high logging costs and long truck hauling distances. The government has pushed wood harvesting in BC to the high end of the global cost curve by the introduction of super stumpage rates, and the increased costs and restric-

tions associated with the FPC. The manufacturing industry in BC is highly unionised, with high labour costs. In 1987 BC was a low cost producer, but by 1997 BC logging costs were among the highest in the world. The Asian Crisis accentuated problems especially for coastal companies, which are highly dependent on this market. Due to the US softwood lumber agreement that puts a quota on the amount of wood and certain wood products entering the US market (quota based on historical shipments), companies could not access this market when the Asian market crashed.

Currently there is an oversupply of low cost wood on the market from countries such as Chile, New Zealand, Brazil, Scandinavia, and BC cannot compete in its current situation. The forest industry is also rapidly changing with many new products such as composites OSB, MDF, engineered wood products (I-beams), etc. Many of these new products do not require high quality wood and utilise smaller dimensions, thereby replacing large size logs – the prime attribute of BC coastal timber. The BC forest industry has been highly dependent on commodity based products but now they must reduce this, and increase the importance of manufactured and value added products.

Due to environmental and marketplace pressure, many companies are currently seeking certification, to confirm the industry's commitment to environmentally responsible and sustainable forest management. Certification is becoming an important tool for the marketing and sale of forest products in the global marketplace. The three main certification systems available to BC forest companies are (Jepsen 1998):

1. Canadian Standards Association (CSA),
2. Forest Stewardship Council (FSC) and
3. International Standardisation Organisation (ISO 14001).

CSA and FSC provide certification of a company's sustainable forest management while ISO 14001 is a certification of a company's environmental management system.

However the economic situation is beginning to improve and companies are starting to generate small profits. But the industry cannot succeed on its own, it needs good leadership from the government, a government which currently appears to be suppressing the industry, forming an interesting contrast to the support and encouragement shown by the Irish government to help establish Ireland's forest industry.

Conclusion

BC is wonderful diverse province to live and work in. The scale of the forests and the industry is overwhelming. It is exciting to have an opportunity to study and work with many of the species so familiar to Irish forestry in their natural habitat. Even the managed forests of BC appear so natural, diverse in both species and stand structure, which is something we need to develop and encourage in Irish forests. An important lesson which I have learnt, is that foresters must have a thorough knowledge and understanding of the 'science of forestry' and always promote this; but in addition foresters of today must understand the 'business of forestry' and be good communicators.

Society of Irish Foresters, enjoy the tour next year!

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