Society of Irish Foresters Annual Study Tour Canada 11-23 September 2000

Introduction

The largest ever Society tour party – 55 members – assembled at Dublin Airport on Monday 11 September 2000 to set out on the annual study tour to Canada. This was the second tour to North America. The first was to the US Northwest in 1992; seventeen members of that party joined the tour to Canada. Our destination – via Heathrow Airport – was Calgary in west Alberta. From Calgary the tour would explore the forests and ice-fields of the Rockies on the Alberta and British Columbia (BC) sides. It would move on through dry forests of ponderosa pine and savannah grasslands, over the Coast Mountains, before finally reaching the more familiar forest surroundings of Vancouver Island, with its wet maritime climate and Sitka spruce forests.

When we arrived at Calgary we were met our guide Dr Gordon Weetman, Professor Emeritus of Forestry at the University of British Columbia. During the coach trip from the airport to our hotel, we became aware that this tour would compare favourably, or maybe even surpass, the 1992 trip to the US. Not just because the majestic Rockies beckoned in the west but also because we would have the erudite Professor Weetman for the duration of the tour. The number of companies and provincial agencies involved in resulted in an enormous amount of organisation. Gordon arranged all this in an unflappable manner. In doing so, he spent two weeks of his time leading us on what turned out to be a wonderful tour.

In the relatively short trip from the airport to the hotel he provided us with a snap shot of Canadian forestry, social issues of Alberta and a wry view of the affluent lifestyles of Calgarians, which whetted the appetite for more. Calgary, the largest city in the state (in recent times its population has surpassed that of the capital Edmonton), is situated in the flat plains of southern central Alberta. We learned of the warm Chinook winds that occasionally blow off the eastern slopes of the Rocky Mountains dramatically increasing Calgary's cold winter temperatures. They are capable of melting snow on the streets within hours.

The skyscrapers were a sign that Calgary's prosperity today results mainly from hi-tech industry and the oil boom of the 1960s. The 800,000 population no longer has the same dependence on cattle that it had in the past, although Calgary is still a major cattle centre of Canada.

John Mc Loughlin

Tuesday, September 12

We travelled west from Calgary to McClain Creek Forest leaving the flat plains and farmland behind. As we entered the foothills of the Rockies, we passed the ski jump outside Calgary where the 1988 Winter Olympics was held. This gave the city a much-needed boost following the near collapse of the oil market during the 1980s.

Our first stop was at the offices of the Bow area forest where we met Robyn Andries, Forester with Alberta Environment, Land and Forest Service. Fifty-three percent of the land in the Bow area was in public ownership. Here, as in the rest of Alberta's forests, a tenure system operates which provides licence holders with harvest rights. The company that operates the licence pays a stumpage tax on their portion of the annual allowable cut

(determined by the Environment, Land and Forest Service). The service issues licences and approved annual cuts in the following tenure types:

1. Forest Management Area based tenures (FMAs),
2. quota-based tenures and
3. small permits.

FMAs and quota-based tenures make up most of the licenses issued. An FMA is a long-term tenure that allows a company greater continuity in managing the leased area. Quota-based tenures last for ten years. The local Spray Lake Sawmills had a quota-based license, mainly in the Kananaskis foothills. They aspired to have an FMA-based tenure: the company has no asset value in the forest, only in the allowable harvest.

After discussing licensing arrangements, we met representatives of Spray Lake, including their forest planner Tjerk Huisman. It is a small family-run company that has timber quotas with an annual allowable cut of 300,000 m^3. The company employs 150 people directly with a further 75 in contract logging, hauling and reforestation operations. Lodgepole pine (*Pinus contorta*) comprises over 80% of the growing stock in the Spray Lake holdings. The remainder is made up of white spruce (*Picea glauca*), subalpine fir (*Abies lasiocarpa*) and interior Douglas fir (*Pseudotsuga menziesii*).

The company had been operating a licence in McLean Creek for four years. Because the area is close to Calgary there is pressure on them to manage the forests as multiple-use zones. Consultation is inherent in all planning to ensure that the public perception of Spray Lake's management plan is positive.

It was interesting to note that there are many differences between systems and approaches to forest management between provinces in Canada. For example the Alberta public and state seemed to trust companies like Spray Lake far more than similar companies in BC.

Most of the timber harvested in McLean Creek is exported to the US. Certification is an issue in Canada but buyers in the US are not overly concerned about it. There are a number of certifying and management systems used, including the Forest Stewardship Council (FSC), the Canadian Standards Association (CSA), and ISO. While Spray Lake was intensively involved in the consultation process at forest level, it did not have chain-of-custody certification at its sawmill which was based further north in Cochrane.

Continuous learning is part and parcel of a forester's education in Canada. Refresher courses are provided by the state at the Alberta Advanced Forest Management Institute. Registered foresters in BC (RPFs) enjoy extensive rights to both title and practices, while Alberta RPFs have only the right to title. The Forest Management Institute of BC offers University of BC Diplomas in Advanced Silviculture and Forest Engineering.

Foresters in Alberta understood public perceptions about forestry very well and the need for consultation and planning. This begins up to five years before harvesting. They conduct 'open houses' to determine key issues and concerns associated with harvesting. They deal with a multi-stakeholder advisory committee known as the McLean Creek Advisory Committee (MCAC) that advises and works with the company. There are three main goals of the consultation process:

1. to develop an ecologically sensitive timber harvest plan that takes into account the various resource values and uses in the area,
2. to develop objectives and operating guidelines that recognise the ecology specific to the area and

3. to provide a range of opportunities for stakeholder involvement.

The objectives reflect six main concerns of the stakeholders: environment, transportation, recreation, hydrology, forest operations and aesthetics. The MCAC represents a wide range of environmental, residential, recreational, governmental and other interest groups. It has a major attraction for Spray Lake, as all the concerned groups are represented on the MCAC so there is little danger of fragmentation in the consultation process. The MCAC is also central to the monitoring programme that is established after the consultation process. This ensures that sampling is carried out to determine how well operations are being carried out.

At a stop at a recently reforested clearfell on the Powderface Trail we saw the plan in action. Looking across to the nearby mountains we could see the way felling coupes are planned. While we had expected these to be very large, their size has in fact dramatically reduced in recent years. Depending on location and views, the sensitivity of water catchment area, and the susceptibility to wind damage, the coupes ranged in size from 1.7 to 130 ha. These emulate the historical disturbance pattern from fires and wind damage. Because of the vastness of the overall forest area, digital terrain modelling, combined with fieldwork, is used to plan clearfells. This takes account of landscape values, windthrow and fire risk.

Companies construct and pay for their own roads, which are planned in conjunction with the clearfells. Felling coupes are feathered to reduce harsh straight lines and create a better design. This issue was again discussed at the final stop, Jumpingpound Demonstration Forest.

On the way up the Powderface Trail the road cut through 150- to 200-year-old lodgepole pine and white spruce. The spruce was now beginning to dominate but the inevitable fire – the last major blaze was in 1936 – would change this, as pine will regenerate more freely and quickly after fire.

At Jumpingpound Demonstration Forest we met Jan Simonson, Forester with the Environmental Protection Land and Forest Services. Despite Canada having a rich wood culture foresters believe that they need to continuously provide the public with information about their forests, in particular how they manage them. Demonstration forests were ideal for school groups, and the general public, to discover and learn more, particularly about second growth forests.

The name Jumpingpound originates from the time when local tribes stampeded large herds of bison over the nearby cliff to their death. They used the meat, skin, bone and horns for their supplies over the winter. This practice was prevalent up until the 19th century; similar bison jumps occur throughout Alberta.

The forest has a clearly-laid-out 1.6 km trail – known as the Moose Creek loop – which demonstrates multipurpose forestry. As well as showing a wide range of silvicultural techniques, it is ideally situated, having a majestic view across to Moose Mountain. Ranging up the mountain are several forest types, from the foothills, though to sub-alpine forest between 1,600 and 2,100 m, with alpine forest beyond.

All aspects of the forest cycle and associated land use are present in the forest, such as the meadows that result from the combined effect of gravel being deposited from overflowing rivers and from tree removal for building sawmills and settlements. Other examples include the management of old spruce forest, forest succession, forest renewal and management of clearfelling or patch cutover. The latter practice is controversial throughout Canada and is of special concern to Calgarians who use the forest for walking,

biking, camping, fishing and hunting. The forest is close to the Trans-Canada Highway and has many visitors (including school groups) from southwest Alberta, especially from Calgary.

Demonstration forests effectively sold the idea of a working multi-purpose forest – albeit in a controlled environment – unlike nature trails and forest parks in Ireland.

Throughout the day foresters referred repeatedly to protecting water quality. The Bow River features strongly in their thinking as it is considered to be one of the best trout fishing rivers – brown and rainbow – in North America and the best dry fly fishing river in the world.

The visual impact of the forest, in particular its appearance after clearfelling is a key issue. Forest companies were conscious of the shape and visual appearance of clearfells. The word clearcut (clearfell) in Canada – and elsewhere – has become synonymous with exploitation. Canadian foresters have been at pains to counteract this negative perception. There are good aesthetic and environmental reasons for large clearfells but foresters had been unable to promote this view successfully. However, Gordon Weetman believed that the message was getting across and, while the public prefer small clearfells, many ecologists accept that there is a case for larger clearfells as they reduce the risk of catastrophic fire, encourage wildlife and emulate historic wildfire patterns.

Once harvesting and reforestation is complete adjacent areas cannot be felled for between ten and twenty years. The green up/adjacency constraint (GAS) is rigorously applied. However, while it does generally last for the specified period it also depends on the growth rate of the reforested crop. One forest area, which was harvested in 1987 and reforested in 1990, had a height of 3.5 m. The orientation of felled areas is planned to allow for natural regeneration. A combination of natural regeneration and manual planting of containerised plants is used in reforestation. In some of the less accessible areas re-seeding was carried by helicopter following scarifying.

After a long first day the tour made a brief stop at the Kananaskis Village Interpretative Centre. We overnighted in the Howard Johnson motel in Canmore where later that night the more health conscious enjoyed the glorious warmth of the Banff Upper Hot Springs.

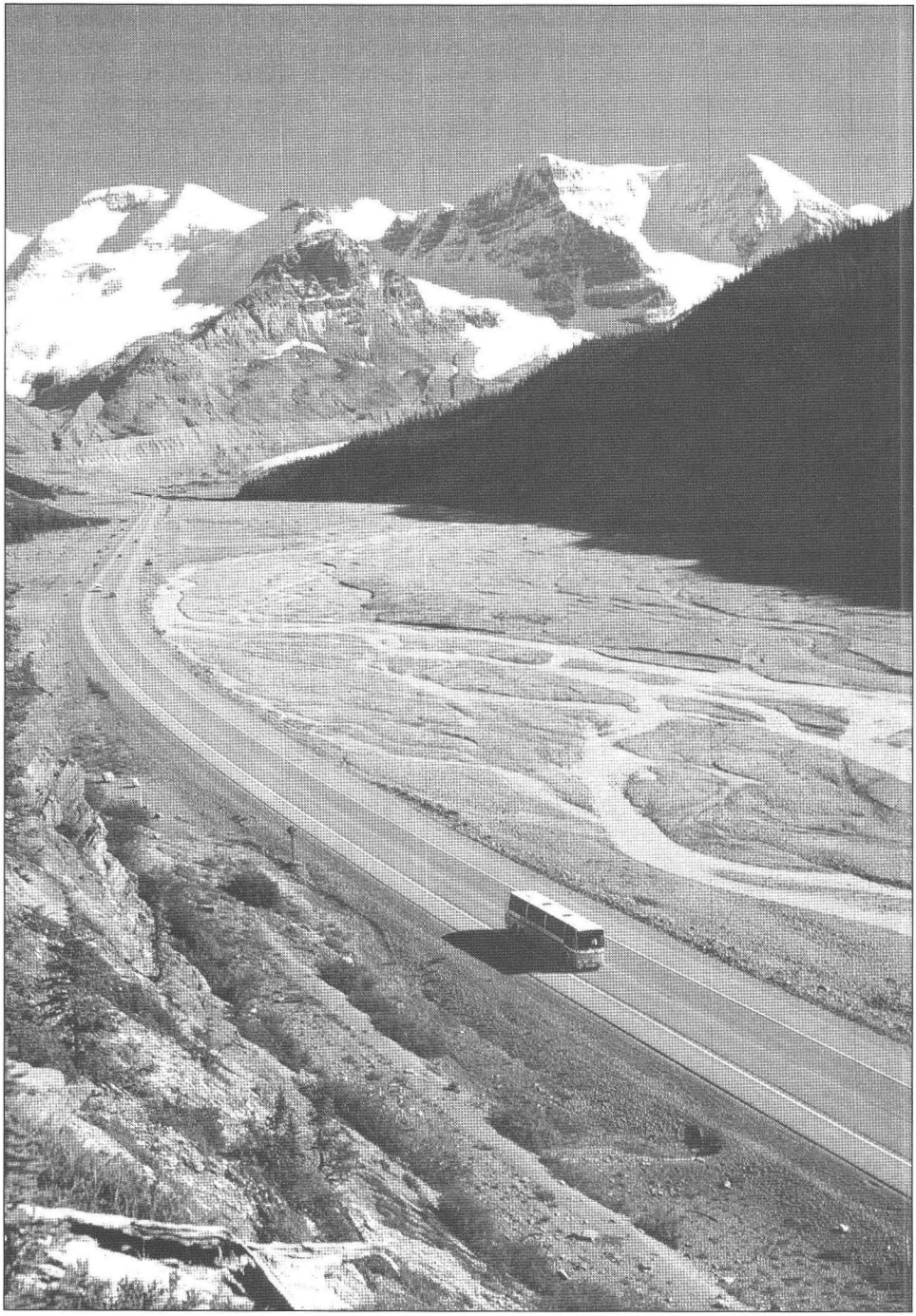
Donal Magner

Wednesday, September 13

A beautiful, crisp clear morning dawned under Three Sisters Mountains, just outside of Banff National Park. We set off on the Icefield Parkway, considered to be one of the most scenic highways in the world, which provided ever-changing view of waterfalls, emerald lakes, alpine meadows and snow-capped peaks. For 230 km from Lake Louise to Jasper townsite, the Parkway winds along the shoulder of the Great Divide and passes by the spectacular mountains of the Eastern Main Ranges of the Canadian Rockies.

Our first stop was the Columbia Icefield, located on the boundary of Banff and Jasper National parks. One of the largest accumulations of ice and snow south of the Arctic Circle, it covers an area of nearly 325 km^2. Accumulated snow feeds a number of glaciers which are visible from the Icefields Parkway. The icefield is a true 'continental divide', as its melt-waters feed streams and rivers that flow into three oceans – north to the Arctic, east to the Atlantic and west to the Pacific.

Across the highway from the Icefield Centre lies the Athabasca Glacier, a tongue of ice six kilometres long and one kilometre wide, descending almost to road level. We took Brewster's "Ice Age Adventure", a guided tour onto the icy slopes of the Athabasca



Looking south on the Icefields Parkway towards Mount Athabasca

glacier, and travelled in a specially designed 'snowcoach' to the middle of the glacier, a five kilometre round-trip.

After lunch in the open air we journeyed through the Rockies, passing through spectacular scenery. Gordon Weetman provided excellent forestry, historical and social narration as we passed through the different climatic zones. We headed through Golden and Rogers passes before finally reaching Revelstoke for the night.

Bob Clarke, a registered professional forester (RPF) and General Manager of Revelstoke Community Forest Corporation (RCFC) gave a presentation that evening on the history and management of their organisation and on the way they manage their forests.

Revelstoke Community Forest Corporation was formed in 1993 to manage and operate Tree Farm Licence (TFL) 56, which was purchased from Westar Timber Limited. The city of Revelstoke and three local forest industry partners own the corporation. The city holds 100% of the shares, while the industry partners purchase timber removal rights as a portion of the licence's allowance (*sic*) annual cut (AAC). The city's sawlog allocation (50% of the AAC) is sold through a log sort yard on a competitive bid basis. The industry partners' sawlog volumes are provided at cost (averaged annually) with species and grades representative of the profile harvested. Pulpwood is sold under separate contract with the proceeds being factored back into the cost of logs.

The Community Forest Project was initiated to:

1. revitalise downtown Revelstoke,
2. develop and diversify small business,
3. increase tourism and
4. increase the size of the forest industry (in 1986 only 4% of logs were processed locally, now it is 50%).

The aim of the RCFC is:

1. local control of local resources,
2. economic stability,
3. access to information,
4. forest enhancement/environment projects,
5. revenue generation and
6. to generate community pride.

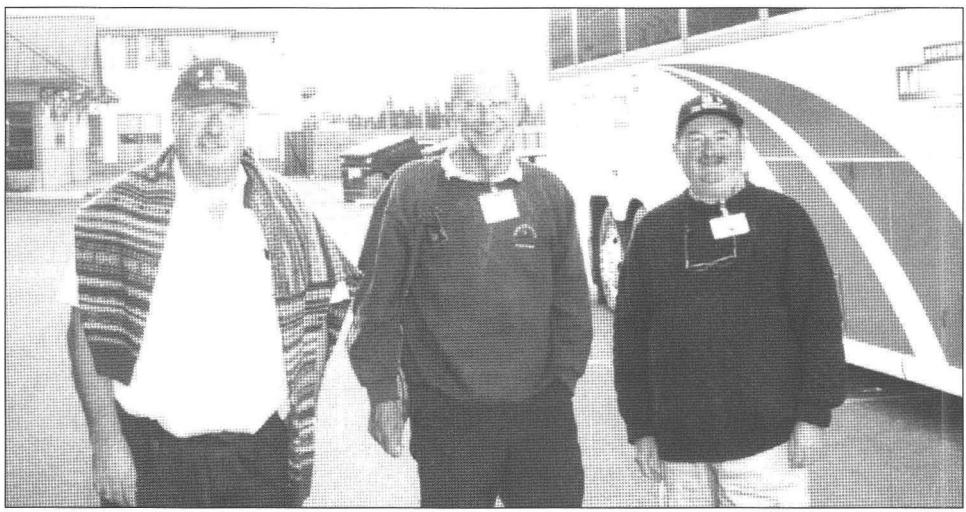
Tree Farm Licence 56 is located in the rugged Columbia Mountains, an hour north of the City of Revelstoke in the Downie Creek and Goldstream water catchments. It has a gross land area of 120,000 ha, but with a much smaller net operable land base of 21,000 ha (17.5%). The AAC is set at 100,000 m^3/year.

The climatic conditions where the forest is situated, the interior wet belt, are very favourable for tree growth with excellent stands of cedar, hemlock, spruce and subalpine fir along with small areas of Douglas fir and white pine. Wildlife is abundant in the forest and includes rare species such as mountain caribou, grizzly bear, wolverine and bats. It was also home to many common big-game species such as moose, deer, mountain goat, black bear and wolf, which are hunted by big game outfitters and residents. The mountainous terrain with its deep snow is well suited to heli-skiing, with two backcountry ski-lodges located adjacent to the TFL. Heli-hiking is also becoming a popular business enterprise. Local residents use the forest for outdoor recreation including nature study,

snowmobiling and mountain climbing. The wide variety of resources and resource-users requires a strong commitment from the corporation to manage the land base sensitively, taking into account all values.

A seven member Board of Directors, comprised of the Mayor, two City Councillors, the City Administrator and three appointees from the community, govern RCFC. Five employees manage the day-to-day business. The industry partners have their input through a management advisory committee. All forest management, construction, logging and silvicultural activities are contracted out. The goal is to maximise local employment and economic benefit to the community. The corporation is funded through the proceeds of log sales. A condition of the TFL agreement with the government is that 50% of the AAC must be sold on to the highest bidder. During the community referendum, which was held to ratify purchasing the TFL, a commitment was made that tax payers would not be called upon to fund the venture. In its first seven years of operation, the company has been profitable and has met the expectations of the majority of citizens.

An advisory committee to BC's Forest Minister was making efforts to arrive at an acceptable land use plan for the Revelstoke area but this had consumed much of the management's resources. Much time and effort were spent trying to resolve discrepancies in timber supply modelling approaches, and in the search for the best way to maximise environmental protection while minimising the impact on timber harvesting. From the study and related discussions, we learned a great deal about the community forest land base and its importance as caribou habitat, winter ungulate range and biodiversity corridors. After four years work, a plan had been developed which attempts to balance the many competing interests in the area. TFL 56 will see a substantial amount of forest retained in as old growth in important habitat areas at lower elevations, while less environmentally important upslope areas will be subject to more concentrated harvesting and development. As a result of these restrictions logging costs will increase as the upslope areas need specialised systems such as heli-logging and longline yarding.



Tour Convenor John McLoughlin, Professor Gordon Weetman and Society President Tony Mannion about to board the tour bus.

Last winter the RCFC started preparing their third management plan for TFL 56. The plan sets out the management and integrated timber harvesting taking into account the variety of resources and land uses that occur on the TFL land base. Part of the process involves analysing timber supply and recommending an appropriate harvest level to the Chief Forester of British Columbia, who has the final approval of all BC forest management plans. Preparation of the plan was a thirty-month process with opportunities for public input at a number of points. These are advertised in the local newspapers, but citizens can come in and discuss the plan at any time if they have questions or concerns.

Throughout the past year RCFC has continued to develop and expand its inventory of 'ready to log' areas. To be able to respond effectively to changes in market, it needs areas with different species and quality of wood. It also needs areas with a range of harvesting systems (e.g. skidding, cable, longline, helicopter) available over the seasons in order to respond to changes in costs and prices. It has approximately two year's timber supply that can receive approved cutting permits. The RCFC will be increasing that amount to two and a half to three years to provide more flexibility.

There has been a shift in harvesting methods since the early 1990s, shown in the table below. Cable extraction has become the dominant form of harvesting as it is cost competitive (cable technology has improved in recent years) and is environmentally friendly.

Harvest method	*1993*	*1999*	*Cost/m³*	
	% total harvest volume		*CAN$*	*€*
Skidding	33.3	24.1	20	16
Cable logging	34.3	55.3	27	21
Helicopter logging	13.8	7.4	70	55
Long line cable	18.6	13.2	48	38

Last year was RCFC's first year of its 5-year cut control period. The company harvested 85,786 m³ from TFL 56. In addition, 20 km of road and two bridges were constructed. Logging and haulage operations used local contractors to the greatest extent possible; road construction projects were tendered out to Revelstoke-based contractors only.

Over $4,200,000 (€3,400,000) worth of goods and services was purchased from Revelstoke businesses during 1998-99. Some 31,370 m³ of logs were sold through the RCFC log sort yard at an average price of $98.71/m³ (€77.44/m³). Pulpwood was sold to Celgar Pulp (17,942 m³) and Cache Creek Woodchips (11,847 m³). The log scale and sort yard on Highway 23 North continued as a facility for RCFC. Evans Forest Products and other local operators had begun to make use of it also, which helped to defray some of the operating expenses ($8-10/m³ – €6-8/m³). Logs from the sort yard are well accepted in the market place. RCFC maintains an extensive list of bidders throughout the southern interior who bid on the more than twenty varieties of logs that are produced.

Over the past decade there has been a decrease in the harvesting of western hemlock, spruce/balsam fir. On the other hand harvesting of yellow cedar has greatly increased (see below) due to strong demand and high prices for the species. Douglas fir also commands high prices but there are limited amounts in the RCFC area. The price of logs is high relative to the Irish market but this is due to the different species mix.

Species	*% volume sold*		*Current price/m³*	
	1993-1999	*1999*	*CAN$*	*€*
Yellow cedar	55.9	77.4	118	93
Western hemlock	20.8	10.2	45	35
Spruce/balsam fir	21.1	9.7	80	63
Douglas fir and other	2.2	2.7	100	78

Establishing a new forest once logging is completed and tending the new trees to maximise growth and wood quality, is a crucial part of RCFC's business. During the past seven years it has eliminated the backlog of not sufficiently restocked (NSR) areas on the TFL, tightened the reforestation delay to less than two years and implemented a programme of spacing and pruning to improve growth and wood quality. Local silvicultural contractors and workers are used as much as possible for doing this work. Local hiring clauses are used in all silvicultural contracts.

Other silvicultural initiatives include planting a component of rust-resistant white pine, experimenting with various methods of enhancing early growth to lessen competition from other vegetation and training local loggers to do spacing and pruning during the spring break-up period when the frost in the roads is melting and haulage is not possible. Almost $900,000 (€706,000) was spent on silvicultural projects in 1998-99. This represented 14% of revenue - for every cubic metre sold $10.40 (€8.16) was spent on silviculture.

The steep slopes and multitude of rivers and streams on the TFL require special care and consideration to minimise landslides and prevent erosion and siltation. These concerns are carefully considered in planning and carrying out forest operations such as logging, road building and silvicultural treatments. RCFC is implementing innovative harvesting approaches designed to protect and enhance wildlife values. To date they have designed partial cutting programmes on over 350 ha of sensitive deer, moose and caribou habitat, where less than 30% of the mature cover is removed. RCFC is also continuing to focus harvesting activities on previously inoperable forest types with lower environmental value, in order to take pressure off low elevation valley bottoms which are important wildlife habitat. In addition, they have increased the use of alternative logging systems like longline yarders and helicopters to reduce road access to important grizzly bear habitat. Utilising Province of BC funding, they have completed watershed rehabilitation projects to identify and correct potential problems caused by old roads and trails, as well as to enhance fish habitat. This and other subsidised work was an attempt by the BC government to enhance employment in the forest industry due to the loss of many traditional jobs through increased automation.

Herbicide use in brushing (woody vegetation control) and weeding has been minimised in favour of hiring local residents to conduct manual brushing and weeding of plantations. All of these activities are expensive and add to costs, but it is believed to be necessary to ensure that non-timber resources found on the TFL are protected.

Other projects and activities undertaken by the Corporation in 1998-99 included:

- sponsoring and participating in the Forest Communities Conference held in March 1999,

- overseeing the location, design and construction of the Mount Mackenzie ski hill road,
- supporting or sponsoring many local clubs and community activities,
- supporting, in conjunction with four other forest companies, the Forest Education Liaison teacher for the Revelstoke, Salmon Arm and Vernon Forest Districts,
- supplying start-up funding for the BC Interior Forest Museum Society,
- sponsoring and participating in the Revelstoke Forest Workers' Group,
- sponsoring and participating in the Columbia Mountain Institute.

Richard Lowe

Thursday, September 14

After an early breakfast we departed Revelstoke for our destination - the International Forestry Show – Demo 2000, near the town of Kelowna on the shores of Lake Okanagan. During the 3½-hour bus journey, west of the Trans-Canada highway, we saw spectacular old growth forest. Coniferous forest dominated the landscape, intermingled with small farm enterprises, from dairying to cereal growing, apple orchards to vineyards.

Leaving the Rocky Mountains and crossing the Columbia River, we left behind the interior cedar/hemlock zone, with its wet climate, for the dry southern interior zone, with dry forests and savannah grasslands. The dominant species was ponderosa pine, with Douglas fir covering the valley bottoms. On reaching the town of Kelowna we crossed Lake Okanagan on a mile-long floating bridge to its west shore. Travelling parallel to the shore we saw small log booms floating in the water ready for towing by boat to the log yard in Kelowna.

We had arrived in the West Bank First Nation Land Territory. Many of the First Nations are involved in legal proceedings with the government. Shortly before our arrival in Canada the Westbank First Nation and the Canadian government had signed an agreement that would increase Westbank's involvement in the forest industry in their Okanagan Traditional Territories, and create jobs for Westbank First Nation Band Members. Also, for the first time in a century, native tribes have access to their traditional forests based on their own right – Aboriginal Title.

Demo 2000 is North America's largest exhibition of wood harvesting and forest management systems designed by foresters for foresters. It takes place every fourth year and is sponsored by the Canadian Woodlands Forum. Over 100 exhibiting companies were distributed around a 6 km road system.

Woodland machines and systems of all types and sizes were demonstrated including:

- commercial thinning,
- final harvesting and chipping,
- cable-yarding and heli-logging,
- road and bridge construction,
- materials handling and transportation,
- site preparation, planting and spacing and
- GPS and GIS.

In all some 300 new woodland machines and systems valued at over $150 m (€118 m) were exhibited. All of the well-known North American and Scandinavian harvesting machines were on show, including Timberjack, Caterpillar, Lako, Valmet Daewoo, John Deere, Komatsu and Liebherr. Many contractors involved in harvesting favour the larger

clearfell harvesters, going for long life, low maintenance costs and those with consistent production. They felt that tightening rates and margins were starting to hamper innovation and erode working relationships and communication between contractors and the industry as a whole. A representative of the contractors' association stated they also realise that they can no longer work in isolation from each other. Globalisation is resulting in the realisation that your competitor is no longer the contractor harvesting the block adjacent to yours, but rather the contractor working on the other side of the world who is able to deliver wood at a lower cost. This was a salutary lesson for all competing in the market place.

Reforestation is a legal requirement in BC. Riverside's Kelowna Division plants 90% of its forests and it allows 10% to regenerate naturally. Forests must be tended until they are free-to-grow (standing above competing vegetation – taking about 12 years after harvest) before they are handed back to the owners. The establishment teams are under constant pressure from their companies to bring reforestation sites to free-to-grow stage as quickly as possible by faster establishment and tree breeding. Free-to-grow stage releases the adjoining timber locked up for harvesting due to the green-up/adjacency constraint, which must be complied with as part of sustainable forest management.

Continuing on the circuit we saw a Bräcke mounder/planter in operation. This machine makes mounds by overturning the humus layer and compacting it, while in the same operation it plants a seedling in the mound. The machine has different magazines for different seedling sizes; the 50 mm diameter tube has a magazine that holds 85 seedlings. The machine was mounted on a 12 tonne excavator and had a planting rate of 250-350 trees/hour.

One of the most impressive exhibitors was the Demo International corporate host, Riverside Forest Products Limited. Their stand gave an excellent insight into the company and its forest operations. Riverside employs 2,100 people and is Canada's leading producer of softwood, plywood and veneer. It is also a major manufacturer of stud and random length sawn timber. The company is located in the 2.2 million ha Okanagan Timber Supply Area (T.S.A.) that stretches from the US border in the south to the northern end of Shuswap Lake. Within the T.S.A. 1.4 million ha is classified as productive forest. The wood harvesting land base (working forest) is 1,022,000 ha. Like most of the forests in BC this T.S.A. is Crown land, managed on behalf of the province by the Ministry of Forests.

After extensive public review carried out by Riverside, the Ministry of Forests sets allowable harvest levels and issues cutting rights under different tenure arrangements. Major operators, such as Riverside, hold forest licences and Tree Farm Licences, issued for terms of 20 and 25 years respectively and renewable every five years. All plans are reviewed by government agencies, including the Ministry of Forests, and are planned to accommodate the integrated management of all resources including fish, wildlife, water, recreation and grazing.

Licensees like Riverside must also solicit public comment. The Ministry of Forestry approves the 5-year forest development plan only when it has met all legislative and regulatory requirements and demonstrates that public input has been considered in the planning process. Other forest users such as First Nations, ranchers, trappers, guides and camp operators are among the stakeholders consulted. Site-specific silvicultural prescriptions are written for each cut block detailing how the areas will be harvested and reforested. Finally, plans are signed and sealed by a registered professional forester. The entire planning process takes about five years.

Our visit to Demo 2000 had given us an opportunity to compare our work methods with what is done elsewhere and to see things in new ways. We left with an appreciation

and better understanding of the Canadian forest industry, particularly harvesting systems and most of all what it is possible to achieve through consultation and cooperation of all the stakeholders concerned, safeguarding the right to have an economic future. The party made its way to Vernon for our overnight stop.

Gerry Murphy (Limerick)

Friday, 15th September

The group had an early departure from our hotel in Vernon on a fine, bright morning. The Vernon area is one of low rainfall. It is situated in the Interior Douglas-Fir Zone, one of the fourteen such ecological zones, which have been designated to assist research in, and management of BC's diverse ecosystems. The zones are large geographic areas that share a similar climate. They are recognised and used across the province. The Interior Douglas-Fir Zone is comprised of extensive forests of the species, with a full range of age classes.

As we progressed towards the Kamloops region where the Thompson and Fraser Rivers merge we entered a dry area, where grassland and open ponderosa pine predominate. Another feature of the region is a unique wetland ecosystem which consists of saline meadows dominated by salt grasses.

Ecologists believe wildfires have played an important role in maintaining grasslands in the area. Without regular grassfires trees take root in open grassy areas and, over time, these become overgrown with trees. In recent years wildfires have been suppressed and there is evidence that forests are taking over areas once occupied by grasslands. Wildfires are classified as 'low intensity' or 'high intensity' depending on how they affect the forest. In this zone most forest fires are low intensity - they scorch the forest floor every 10 to 20 years and generally burn less than 50 ha. The thick bark of old Douglas fir enables them to survive low intensity fires, but many young trees and understorey plants are killed. Over time repeated low intensity fires create a Douglas fir forest with a wide range of age classes. High intensity fires occur on average every 150 to 250 years and burn more than 50 ha at a time. These are stand-destroying fires - they burn not only along the ground but also through the forest canopy, killing most young and old trees. Following a high intensity fire lodgepole pine is often the first tree to grow back. This pattern results in pure, even-aged pine stands.

As we passed through areas close to Lillooet we were informed of the importance of the area in the history of Canada. The area was noted for fur trading, which eventually led to the formation of the Hudson Bay Company. Nineteenth century prospecting and severe law enforcement policies also influenced the development of the area. First Nation lands are located in this region. In times past the population lived off the land and on salmon which they fished from the rivers and dried for winter food.

We crossed briefly into the high elevation interior Engelmann Spruce-Subalpine Fir Zone. It is predominately mountainous, though it includes some valley bottoms. In drier parts trees occur primarily in places where soils are deeper and where snow accumulates. This provides moisture for the growing season and protection from winter winds.

We headed southwest in the direction of Whistler and into the Mountain Hemlock Zone, which occupies sub-alpine elevations along the entire BC coast. It has short, cool summers and long, cool, wet winters. This is one of Canada's wettest ecological zones. It receives up to 5000 mm rainfall/year, up to 70% of which falls as snow. The area has a deep snow cover for many months of the year. The snow pack melts slowly, consequently the zone has a short growing season.

Vegetation within the Mountain Hemlock Zone is strongly influenced by elevation. Mountain hemlock (*Tsuga mertensiana*) and amabilis fir (*Abies amabilis*) are typical of lower elevation forests. At higher elevations temperatures are colder, the growing season is shorter and snows are deeper. These differences cause tree growth to lag behind tree growth at the lower elevations.

The deep snows attract many skiers to winter resorts located in the area. The deep snow pack also gives rise to avalanches, which are a common source of natural disturbance in the zone. Avalanches occur repeatedly at the same places and as a result they support different kinds of vegetation than adjacent forests.

In the afternoon the group was taken on a tour of the Whistler Interpretative Forest, which is a project of the BC Ministry of Forests, the Resort Municipality of Whistler and Western Forest Products Limited. Within its 3,000 ha area a wide variety of landscapes, forest types, geological formations, fish and wildlife habitats occurs - all accessible by an extensive road and trail network. The Forest Service manages the area to provide benefits for many people with diverse interests while still keeping the logging activities in operation.

We were introduced to Don MacLaurin, a forestry and wild land recreation consultant, who explained the background to the Whistler Interpretative Forest. He outlined the 'New Forestry' philosophy to maintain old growth characteristics by retaining portions of dying trees, decaying wood and understorey vegetation while logging. All forestry decisions in BC are based on ecological classification.

In 1991 the Municipality of Whistler, in cooperation with the Squamish Forest District and the University of BC began R&D trials with biosolids from the Municipality of Whistler. Biosolids (sewage sludge) are the nutrient-rich organic byproduct of wastewater treatment. Some treatment processes result in high concentrations of nitrogen, phosphorus, calcium and magnesium. The objective of the trials was to increase public awareness of the potential use of biosolids as a forest fertiliser and to provide site-specific information on application rates, season of application and the growth response of the trees to the addition of the organic matter. The results of the research have provided a site-specific refinement to the application rates and an estimate of the growth response to biosolids fertilisation. Based on this research, and research conducted in similar ecosystems, the Municipality of Whistler now operates a full-scale biosolids fertilisation programme.

The final stop of the day was to take a tour of the Craterview Loop Comparative Spacing and Alder Plots. We were accompanied by Brian Broznitsky of the BC Ministry of Forests who informed the party that the area was logged in 1971, broadcast burned in 1972 and planted with Douglas fir in 1973. In 1990, at age 17, the stocking of 3500 trees/ha was reduced in series of respacing treatments. There were seven treatments in all, resulting in a range of spacings from 400 to 1100 trees/ha. Within each spacing three further levels of management were applied: spacing only, spacing plus pruning (one lift) and spacing, pruning and fertilisation (standard 225 kg/ha of urea applied by hand). The 400 trees/ha treatment is now considered too low; a spacing of 750-800 trees/ha appears to be nearer the optimum to produce quality lumber.

After a long and absorbing day the party headed for the new town of Whistler and our overnight stop.

Frank Nugent

Saturday, September 16

After breakfast we ascended Whistler Mountain by cable car where we spent the morning hiking in the alpine zone. Whistler is the largest ski resort in Canada. Set among the spectacular Coast Mountains, 120 km north of Vancouver, Whistler and the nearby Blackcomb Mountains have the greatest vertical rises of any ski run in North America.

The area is situated in the Mountain Hemlock biogeoclimatic zone. (The biogeoclimatic ecosystem classification (BEC) incorporates climate, soil and vegetation data and was developed by ecologists to support silvicultural practices and now forms the basis for forest practice codes.) The slopes are completely snow-covered from October/November to April/May. During our hike in the alpine area, above the cable car terminal, Gordon Weetman outlined the natural regeneration process in these old growth forests. It relies on natural disturbance events (e.g. windthrow, disease) to provide gaps in the forest cover which allow trees to regenerate by seeding. Old growth forests at this elevation (1600 m), while having a high ecological value, also contain large volumes of wood (500 m^3/ha). Natural regeneration is a very slow process and can take up to 30-40 years. Having had lunch on the mountain we returned to Whistler and boarded the bus to continue our journey.

We travelled southwards to Vancouver through the Coastal Western Hemlock biogeoclimatic zone, which is dominated by western hemlock and western red cedar, with some Douglas fir. Shore pine (*Pinus contorta* var *latifolia*), which colonises basalt-derived soils also occurs. The zone contains few deciduous trees, though red alder (*Alnus rubra*) occurs extensively but it is a very invasive species. Further south, beyond the town of Squamish we moved into the Coastal Douglas-Fir zone. Again, these are predominantly old growth forests, with huge Douglas fir with dead crowns towering above the surrounding forest. These depend on fire to spread their seed. The frequency of fires can be as low as one every several hundred years. One of the talking points was how quickly the transition from one BEC zone to another takes place. Here also we had our first sighting of three significant elements of BC, the Pacific Ocean, log rafts and the hallowed Sitka spruce, albeit as individual trees along the coast. By now we were close to the city of Vancouver where we had one last stop at Lighthouse Park, West Vancouver. The park is 75 ha in extent, an area of unspoilt old growth forests with a wild, rocky coast overlooking the straits of Georgia with Vancouver Island in the distance. The area has escaped the logger's axe and features giant old growth Douglas fir and western red cedar, some 500 to 700 years old. Having boarded the bus we travelled into Vancouver over the Lion's Gate Suspension Bridge built by the Guinness brewing family. We overnighted in downtown Vancouver.

John Cleary

On Sunday September the 17th the group took the evening ferry to Vancouver Island.

Monday, September 18

The first session was in the classroom of the Cowichan Research Station of the Ministry of Forests in BC. The 1998/99 Annual Report were circulated (see www.for.gov.bc.ca/research). The objective of the session was to describe and demonstrate the growth and yield modelling systems developed and used by the ministry.

John Parminter began by stating that the Ministry of Forestry dated from 1912. Mensuration and volume yield research began in 1921. Jim Goudie told us that growth modelling[1] is now more complex, having to be more ecologically based. Variable retention forestry is in practice. There are no plot data to simulate current practice and the computer models must adapt to requirements.

The Tree and Stand Simulator (TASS) is a biologically orientated, spatially explicit individual tree model. It was designed to produce potential growth and yield tables for even-aged stands. It is calibrated for four coastal and four interior species in BC. TASS[2] was first developed in the 1960s and has been evolving ever since. Eichorn's assumption, that stands of a particular height have the same volume irrespective of their relative growth rate, is built into the algorithms. It also has a root rot simulator for Douglas fir, with yield implications. It is used to examine 'what if' scenarios for silvicultural planning and timber supply. However, the system does not cater for ecological zones or mixed stands. The output gives timber products from standing crops providing simulated assortments, grade and net discounted revenue. It can cater for no-thin to multiple thinning regimes on an individual tree basis. It does not provide spatial or topographical functionality.

Mario Di Lucca demonstrated TASS by simulating the Sayard Forest. The forest was burned in 1938 and planted with Douglas fir in 1944. Natural regeneration also occurred following the fire. Some 50% mortality occurred following planting in 1944/5. In 1974 a juvenile respacing was carried out to reduce the stocking to 800 stems/ha. In 1994 a commercial thinning was carried out, reducing stocking to 200 stems/ha and 53% crown cover. The forest will be ready for clearfelling in 2004.

While TASS provides information on volume, SYLVER assesses the impact of Silvicultural treatments on Yield, Lumber Value and Economic Return. It has three modules that provide quality, assortment and sawing outturns. SYLVER[3] predicts wood quality, product value and economic return in full for coastal Douglas fir and partially for coastal western hemlock, Sitka spruce and western red cedar. An interactive forestry management game and training tool has been produced, called Fred's Forest[4], to demonstrate the capabilities of SYLVER.

TIPSY[5] the Table Interpolation Program for Stand Yield is not a growth and yield model because it only provides electronic access to the managed stand yield tables generated by TASS and SYLVER. TIPSY retrieves and interpolates yield tables from its database, customises the information and displays summaries and graphics for a specific site, species and management regime. This is a public domain software package and can be used for Sitka spruce, Douglas fir, western hemlock and western red cedar. Stand Density Management Diagrams (SDMDs) have been constructed from TIPSY. SDMDs allow easy visual crop planning in the field.

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1 See Di Lucca, C.M. 1999 TASS/SYLVER/TIPSY: systems for predicting the impact of silvicultural practices on yield, lumber value, economic return and other benefits. In *Stand Density Management Conference: using the planning tools*. Ed. Bamsey, C.R., Conference Proceedings, Alta. Env. Prot., pp 7-16.

2 The TASS web page is: www.for.gov.bc.ca/research/gymodels/TASS.

3 A version modified for direct viewing is available at: www.for.gov.bc.ca/research/syldemo/syldemo.

4 Can be downloaded from www.for.gov.bc.ca/research/fredfor.

5 More information about TIPSY can be found at: www.for.gov.bc.ca/research/gymodels/TIPSY

Another modelling package – Prognosis – can project the development of mixed-species coniferous stands, regardless of the structure and stage of their development, provided a ground based inventory can define the existing structure.

With Jim Goudie as our leader we visited a thinning experiment which is quite famous in BC. The history of the crop dates from 1899 when the original Douglas fir forest was felled and the site was slash-burned soon after. It had become restocked by natural regeneration by 1910. The initial stocking was very high – 20,000 stems/ha – comprised of mixed coniferous and broadleaved species, of which about 8000/ha were Douglas fir. In 1929, the year when Cowichan Lake Research Station was established, J.R. Schenstrom laid out the experiment in the crop.

The objective was "to develop a yield table based upon a series of successive re-examinations and to compare the yield of several plots thinned by different methods to indicate the proper way of carrying out thinnings under different conditions". Two levels (light and heavy) of two types of thinning (low and crown) were established in four of the plots with a fifth left as a control. Seven major thinnings have been carried out in the treated plots. The plots have been measured 14 times, the last time in 1986 when the crop was 75 years old. The top height is now 50 m. There are very few such long-term research trials in BC.

All of the stands were of generally poor form with no clearwood because the trees were not pruned. An ecologist specialising in Douglas fir explained that the poor form was due to the wet site and lammas growth. To control lammas growth in Douglas fir it must be matched to the site.

There were still some of the original Douglas fir butts from 1899 present, still marked with the fellers' notches. Such was their size that it used to take about a day to fell each tree. There were also some large Douglas for logs left behind because of poor log quality. It was explained that if these logs were western red cedar they would probably have been salvaged by now due to the demand for cedar shakes and shingles.

We next visited a deadwood decomposition experiment with John Parminter. Since there was no salvage logging in this stand an experiment was started in 1929 to track the decomposition of coarse woody debris, i.e. felled logs that had not been extracted and standing dead trees. This is the only such experimental stand in North America. The objective was to determine how much deadwood to leave on harvesting sites in order to sustain the wildlife that are dependent on it. In practice the amount of logs left after harvest depends on the prevailing market conditions.

The rate of decomposition depends on the species, log size and environmental conditions. The location of each log and standing dead tree was mapped in 1929. Their state of decay has been tracked over time ever since. At each survey each log is classified according to five decay categories. The number of standing dead trees is reducing as they fall over due to decay. Some of the smaller logs have totally disintegrated.[6]

The next stop was at a spruce weevil control experiment in Sitka spruce (*Pissodes strobi*). Douglas fir and western red cedar were outgrowing the spruce due to repeated weevil damage to the leading shoot. Annual planting of Sitka spruce has declined from ten to one million seedlings because of the problem. Queen Charlotte Islands is the only location in BC where the weevil is not a problem. Damage occurs every second year. The experiment is testing the resistance of a range of Sitka spruce provenances to weevil attack.

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[6] See Stone, J.N., MacKinnon, A., Parminter J.V. and Lertzman, K.P. 1998. Coarse woody debris decomposition documented over 65 years on southern Vancouver Island. Can. J. For. Res. 28 (5): 788-793.

Some provenances were found to be resistant to attack, particularly those from Campbell River Falcon and Vancouver. Those from the warmer, dryer eastern provenances on the east cost of Vancouver Island were more susceptible.

We moved to a Douglas fir genetic gain trial. The objective is to determine if the predicted 10-20% growth gain from genetic improvement would result in an equivalent volume production increase. It is one of six experiment sites and was established in 1996.

There were three types of progeny test:
- top cross mix
- mid cross mix
- wild stand mix,

at four spacings:
- 4.0 x 4.0 m
- 2.9 x 2.9 m
- 2.3 x 2.3 m
- 1.6 x 1.6 m.

The top cross trees are showing a 19% increase in height growth, but it is too early to measure volume growth. However, there was concern that the faster growth could leave trees prone to early and late frost damage.

Keeping with the tree improvement theme we moved to a grand fir (*Abies grandis*) provenance trial, planted in 1978. The species is of minor importance in BC – only four out of the 155 provenance trials in BC are devoted to it. The objective of the trial is to investigate the survival, growth, form and disease susceptibility of 23 seed sources. When the plots were measured in 1999 there was an 88% survival rate, with a top height of 13.5 m. Variation in height was highly significant among provenances. The local provenance ranked 18th while the Parksville provenance was best for volume production. Grand fir is very site specific.[7]

At our next stop in the Robertson Valley we saw the only combined spacing and provenance trial in lodgepole pine in BC. The objective of the trial is to investigate the effect of spacing and provenance on survival, growth, stem defects, disease and insect damage. The plots were planted in 1973 with six different seed sources. There are 12 replications at 1.52 m (5 feet) and 3.65 m (12 feet) spacing in a circular layout. When the trees were measured in 1992 survival was high (97.7%), and not significantly influenced by spacing. However, the effect of spacing on other traits was significant. Increased planting density reduced the proportion of stem defects and disease, and of insect-damaged trees, slowed diameter and stem volume growth of individuals and stimulated height growth. Height growth responded to planting density earlier than diameter growth, but diameter growth was more affected by treatment as the trees grew. The total volume per hectare increased with planting density, but the rate of increase declined as the trees grew older. The local provenance proved to be the best[8]. All trees had suffered from needle cast (*Lophodermella concolor*).

John Russell, a geneticist specialising in gene conservation, in particular western red cedar (*Thuja plicata*) and yellow cedar (*Chamaecyparis nootkatensis*) made the next

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[7] See Xie, C.Y. and Ying, C.C. 1993. Geographic variation of grand fir (*Abies grandis*) in the Pacific coast region: 10-year results from a provenance trial. Can. J. For. Res. 23 (6): 1065-1072.

[8] See Xie, C.Y. and Johnstone, W.D. 1995. Spacing and provenance effects on the performance of shore pine (*Pinus contorta var. contorta*): 20-year test results. Can. J. For. Res. 25 (4): 567-576.

presentation. The research station is involved in gene conservation for resource management, seed transfer and tree breeding. There are some twenty-five coniferous species being tested, ranging from minor to major commercial species, including Douglas fir, western red cedar, yellow cedar, Sitka spruce, western hemlock (*Tsuga heterophylla*) and western white pine (*Pinus monticola*).

Most genetic work in Douglas fir was started in the 1950s; the work is now in the second generation selection phase and is moving to the third generation. The seed orchards are second generation. These have captured a 10-20% volume improvement, but Douglas fir selection and improvement is for both volume and density.

A 30-year-old Douglas fir trial showed severe effects on stem form after two generations of selfing. There was also a trial demonstrating the variation in provenances from the Pacific Northwest.

There are active gene management programmes for coniferous and broadleaved species, with ecological reserves for some twenty-seven species. Altogether there are fourteen species on the site with 10,000 clones; 2.5 million trees in all in progeny trials. The objective is to preserve the genetic variation from the seed bank.

The centre needs full time guards to protect the clonal stock from eco terrorists.

We moved to a tunnel with western red cedar progeny testing. The objective of the cedar trials is to improve wood durability. Yellow cedar is propagated using cuttings, using a technique which dates from the 1970s. We were shown hedge orchards of yellow cedar in pots. Some clones of cedar lack taste and scent and are susceptible to deer browsing damage. An 11-year-old clonal trial was seen showing growth and form variation. Many of the clones had multiple leaders.

Second generation western red cedar is obtained using controlled pollination, using hormones to stimulate early flowering, achieving seed to seed in two years. The work has shown there is not the same amount of genetic variation in western red cedar as there is in Douglas fir; selfing occurs at a high frequency and inbreeding depression appears after ten years. To promote hybrid vigour outcrossing has been used and has improved growth rate.

There is an annual demand for some 1-2 million yellow cedar cuttings. Clonal variation results in differences in root formation and growth. The western red cedar trials show that outcrosses have 10% more growth than selfed material. However, half of the seed produced was selfed.

Western hemlock has the highest genetic variability. Natural regeneration occurs frequently. The team was co-operating with Washington State University in research into the species. The local provenance performed best in a trial of western hemlock elites.

Research to find resistance to blister rust (*Cronartium ribicola*) on white pine is also taking place. The trials are located in Oregon and Victoria.

Improved resistance in spruce to weevil attack was being achieved by using white/Sitka spruce hybrids from the Nass and Skeena rivers hybrid swarms. There are three mechanisms involved in resistance to weevil. Two of which are: variation in resin canal distribution and an apparent chemical compound that causes egg abortion in weevils.

Golden spruce, a chlorophyll-lacking variety of Sitka spruce has been propagated; it is from Yakoon River area on Queen Charlotte Islands. The tree, which was revered by first nation people, was cut down by vandals.

The potential for test tube propagation (somatic embryogensis) of trees was discussed. It works for spruce but further tests were felt to be necessary to determine the full impact on planting stock.

Kevin Collins

Tuesday, September 19

The tour visited the offices of TimberWest near Mesachie Lake, BC where a number of employees gave presentations on the operation and management of the company.

Steve Lackey, Land Use Forester, informed us that TimberWest is one of Canada's largest businesses, operating exclusively in the solid wood segment of the forest industry. It operated entirely in the coastal region of BC, and is engaged in the harvesting and sale of logs and the processing and sale of softwood lumber. TimberWest owns about 334,000 ha of private land with an annual sustainable harvest of 2.4 million cubic metres with a further annual harvest from crown lands of 1.3 million cubic metres.

The company has a variable retention (VR) harvesting system in operation, which tries to retain a natural range of stand and forest structures and forest functions. By preserving more trees in the form of snags, large woody debris and live trees of various sizes, variable retention harvesting provides habitat for a wide range of species. TimberWest has introduced VR harvesting in response to public concern over large-scale clearfelling. The shape and size of each cut block is designed to reduce the impact visually of harvesting in the landscape.

Billy Robertson from the Private Forest Landowners Association (PFLA) showed a short video about his forest. The majority of PFLA members own forests of less than 250 ha. About two million ha, 2% of BC, is privately owned, nearly half which is managed forest. The PFLA represents owners of private managed forests who have made a legal commitment to manage their lands for timber.

Dr Bob Willington, hydrologist, made a presentation on watershed management. All TimberWest's harvesting plans for watersheds that provide licensed domestic water have an input from a hydrologist who helps to ensure that water quality and sensitive fisheries habitats are maintained. A list of Standard Operation Procedures has been developed by the company, covering procedures that range from road construction to water management.

TimberWest's environmental management system was outlined by John Mitchell, Operations Planner. The company uses ISO 14001 which requires companies to proactively assess their operations, identify potential environmental risks, set goals and objectives for managing those risks, and to continually improve their environmental performance. TimberWest was awarded ISO 14001 in 1999.

Dave Kral, Operations Superintendent discussed the wide range of timber assortments and markets for its timber. There was a very high demand for quality logs, straight and tight grained, in Japan and the US. About 40% of logs were exported off lands owned privately by TimberWest. Prices quoted for quality premium logs were in the region of $\$500/m^3$ ($€392/m^3$). Pulp prices were as low as $\$10/m^3$ ($€8/m^3$).

After refreshments TimberWest took us to a number of stops to look at forest management. At the first stop Variable Retention (VR) harvesting systems were being used. Forest design planning uses the most up-to-date software and GIS systems with 3-D visualisation modelling. The minimum retention area on clearfell sites is about 10%.

The second stop was at a forest harvesting operation in a riparian zone. Bob Willington discussed standard operating procedures. Streams can only be crossed at points approved in the harvesting plan. The use of temporary metal bridges proved useful in providing access to harvesting areas. Stream gravel beds are left undisturbed. Trees are felled away from riparian zones. Some logging debris is left on the site. Last year TimberWest made over 1400 river crossing notifications.

Helicopter pruning (using a heavy horizontal blade on a cable to remove the upper branches) is used to reduce windthrow risk.

We moved to a well-established Douglas fir crop, planted after the previous crop had been clearfelled in 1995. All clearfell sites must have a silvicultural prescription written by a registered professional forester. Trees are planted at a stocking of 1000 stems/ha with some infill of natural regeneration. Very little soil cultivation takes place. There was no evidence of deer damage, even though there were deer present in the area. However, a resident wolf population may have been keeping numbers under control. Fertiliser was applied using a 'tea bag' of 16:8:6 (N:P:K). Stocking was checked at year 1 and again at year 10 or 15 for inventory purposes. Hydrological recovery takes place when the forest crop is about 3 m high.

A Douglas fir harvesting site was visited next. Steep slopes dictate the use of cable crane extraction in some parts of BC. Mark Carter described the cable crane, a multispan yarding system, with had a range of one mile. Logs down to 10-inch (25 cm) top diameter were being extracted. Helicopter logging is also used by TimberWest. After a very interesting day we overnighted at Cowichan Lake Research Station.

Fergus Moore

Wednesday, September 20

Before leaving Cowichan Lake Research Station, convenor John Mc Loughlin thanked the catering staff for the excellent cuisine.

The tour departed the research station and drove across Vancouver Island to Port Renfrew on the southwest coast. Our journey was to visit Western Forest Products Limited, a private company that manages both private and public forest lands in coastal BC. On the journey Gordon Weetman outlined the background to forestry on this part of the island. A company called Alaska Pine and Cellulose was set up in the late 1930s and was the first to market western hemlock as Alaska pine.

Silvicultural practices have had to change over the years as new second growth forest has come-on-stream. Thinning and yield forecasting are relatively new. It has proven to be extremely difficult to make thinning operations pay.

Old growth forests in the region carry an average volume of between 500 and 700 m^3/ha of commercial wood. Second growth forests are capable of yielding well over 1000 m^3/ha, depending on stocking. The area is located in the fog belt - Sitka spruce is the main species near the coast, with some fine stands. The fog belt is free from spruce weevil (*Pissodes strobi*), which prohibits the planting of Sitka spruce in other parts of BC.

We passed through Port Renfrew from where logs are transported down to the mainland on giant rafts to be stored in fresh water. Twenty million cubic metres are transported annually in this way on the coast of BC. The area is the location of one the most popular hiking trails in the world and caters for 10,000 walkers every year. It is located in a First Nation reservation.

The area is classified as temperate rain forest with little or no threat of fire damage. The old growth forest is spectacular, comprised as it is of towering, giant trees. Sitka spruce, Douglas fir, western hemlock, western red cedar and yellow cedar are the main species. The yellow cedar is highly valuable, making \$600-700/m^3 (€470-550/m^3) when it is exported to Japan.

Our first stop was at a 200-year-old Sitka spruce old growth forest. Huge, windthrown trees lay decaying on the forest floor. The undergrowth consisted of salal (*Gaultheria shallon*) with some blueberry (*Vaccinium myrtillus*) and huckleberry (*Vaccinium ovatum*). Salal is a major problem in establishing second growth forests.

As we moved south towards Jordan River we passed into areas of second growth Douglas fir and western hemlock that had not been thinned. Heavy logging had taken place in the past when private companies had liquidated the growing stock for cash before controls were introduced. Where no regeneration had taken place the sites were colonised by red alder. The area is practically uninhabited due to heavy rainfall.

We moved on to the Western Forest Products office in Jordan River where we were introduced to Doug Stables, operations forester. Doug, who was to be our host for the day, gave an outline of the company. Western Forest Products is one of BC's oldest forest companies – it is already managing third growth forests. It has a large forest research and tree improvement programme especially for western hemlock, along with a nursery that produces four million seedlings per annum. The company was bought out in 1989 by the Doman Group. Prior to that it had passed through various ownerships dating back to 1854. All of the 885,000 ha the company manages are located in the coastal zone. It manages both Crown and private lands. These stretch from the Jordan River in the south to the Queen Charlotte Islands in the north. The annual wood harvest is 4.2 million cubic metres. Logging operations are conducted primarily on Crown owned lands and consist of three Tree Farm Licences and numerous timber licences. The next area we visited was a small Tree Farm Licence on the Pacific coast, close to Victoria which was extensively used for forestry studies.

The company is governed by the Forest Practices Code that determines the certain standards that must be observed. The principal management tools are:

- a five-year forest management plan for all areas under the Tree Farm Licence,
- a forest development plan identifying cut blocks and wildlife areas,
- a silvicultural prescription agreement that must be signed off by the company and the Forest Service for each cut block.

Consultation with the local community is ongoing and notifications of all new developments are put in the local newspapers. The maximum cut size is 40 ha. Wildlife areas, comprising at least 9% of the site must be left unfelled. No cut is permitted within 500 m of a previous cut areas unless the successor crop is at green-up stage (at least 3 m tall).

Some of the area had been harvested for the third time, had been slash-burned and left to regenerate naturally. The regenerated areas near the coast range in age from 25 to 80 years, at elevations up to 250 m. Our first stop was at 650 m elevation. The rotation at the lower elevations is about 80 years, at the higher elevations (600 to 1000 m) it ranges from 150 to 200 years depending on the site. There is about 3 to 4 m of snow every year at the higher elevations.

The company plants four million seedlings annually, using nine different species. The principal species are Douglas fir, western hemlock, yellow cedar, western red cedar, Sitka spruce and amabilis fir.

Next we visited an old growth forest, over 450 years old, on an extremely wet site (the rainfall was 1500 mm/annum) at an elevation of 610 m. The stocking was 450 stems/ha, comprising western and mountain hemlock, western red cedar, yellow cedar, balsam fir, western white pine and Douglas fir. The standing volume was 650-900 m^3/ha but only 65% was commercially harvestable due to butt rot and stem breakage. The stand had a high conservation and recreational value and may never be felled. If it were to be felled it would be restocked with the same species. The normal restocking procedure was to plant 1200 trees/ha with 75% improved seed planting. Site preparation was slash-burn followed

by direct planting and salal control. There was a 95% survival rate in second growth. The expected second rotation length was 75 years.

The next site was a 28 ha clearfelled block, harvested in 1992. After harvest the area had been slash-burned and reforested at a stocking of 1000 trees/ha. Survival was 92%. The stocking is surveyed regularly until the crop will reach the green-up stage at around 15 years. Following harvesting on Crown lands the maximum volume of harvesting residues that is allowed on old growth sites is 30 m^3/ha, with 10 m^3/ha on second growth. This includes decayed butts etc. Residue is defined as logs with a minimum length of 3 m with a minimum top diameter of 15 cm. Residual volume exceeding 30 m^3/ha was charged for at stumpage price. Random surveys were done after harvesting by the Forest Service to assess the residue volumes. On the other hand conservationists were demanding that more residues be left on site.

All debris on roadsides is burned in piles. Slash burning is not now allowed on these sites, unlike in the past. The cost of planting was $1/plant (€0.78/plant), including the cost of the plant. NPK (8:20:30) fertiliser was applied at planting to each plant as a 'tea bag'. After 40-50 years a further application of 435 kg of nitrogen fertiliser/ha may be applied by helicopter.

We travelled through the forest up to 400 m elevation to a 35-year-old stand of second growth Douglas fir. The site index was SI_{50} 32 i.e. the dominant trees were 32 m tall at 50 years of age at breast height[9]. Site index is used as yield classes are not available. The crop had been clearfelled, slash-burned and planted with 1000 trees/ha. A pre-commercial thinning had been carried out at 15 years which reduced the stocking to 735/ha. The cost of thinning was $1500/ha (€1200/ha). Pruning was carried out on 700 stems/ha starting at 15 cm diameter in two operations:

stage 1 to 2.5 m at $2100/ha (€1650/ha) and
stage 2 to 5 m at $4200/ha (€3300/ha).

Grants for pruning and pre-commercial thinning are available only on Crown lands. The issue here was how cost effective it was to thin and prune. It was very doubtful if the investment would prove worthwhile, as BC will be harvesting high quality natural stands for many more decades. One of the reasons for grant-aiding pruning and thinning was to provide work for union workers.

Many of the secondary harvesting roads were decommissioned (culverts and bridges removed) after harvesting as part of the conservation plan.

We descended to 100 m to a stand of second growth western hemlock with 15% Douglas fir and a 10% Sitka spruce and western red cedar component. The area had been excessively logged by the railroad company from 1880 to 1920. The site was originally slash-burned and naturally regenerated. After 80 years the crop was beginning to take on some of the characteristics of old growth forest. It was site index SI_{50} 36. The standing volume was 802m^3/ha on 976 stems/ha, with a top height of 40 m.

The question of yields from different species and mixtures arose. The potential volume growth for the main species was as follows.

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[9] Breast-height-age is the age at breast height as determined by coring. This is more reflective of height/age relationships as some trees spend as long as 100 years barely growing in heavy shade before a gap opens that allows them to grow according to the site potential.

Species	*Site Index$_{50}$ range m*	*Mean annual increment m³/ha/yr*	*Standing volume[1] m³/ha*
Sitka spruce	16-33	8-17	1214
Douglas fir	22-36	5-12	940
Western hemlock	15-33	4-14	997
Yellow cedar	12-26	2-10	1398

[1]All volumes are net merchantable, not gross total as in UK yield tables.

We crossed the road to an adjacent thinning trial in second growth Douglas fir. On the coast of BC commercial thinnings must be delayed until a profit can be made. Thinned trees must compete in price with trees from mature old growth forests. In fact thinning is only economically feasible at times of high log prices. This stand was thinned at about age 55. Thirty five percent of the basal area was removed from trees in the 30 cm and below diameter classes. Basal area had been reduced to 47 m²/ha from about 75 m²/ha, down to 465 stems/ha leaving a standing volume of 702 m³/ha. The material had been removed by mini-tower cable.

There was an allowable waste of 10 m³/ha of non-utilisable material; the outturn was 2.5 m³/ha. Sixty percent of the harvest was sawlog, the remainder pulp. The thinning operation resulted in a net loss of $5/m³ (€3.9/m³).

We travelled on to an old growth western hemlock, Sitka spruce and Douglas fir stand adjoining a beautiful beach on the shores of the Pacific Ocean. Mistletoe (*Viscum album*) was growing on the trees and was a problem where areas were being managed commercially. This area was however, designated for recreation. We walked down a path through the old growth and passed through an area of alder before reaching the beach. It was a gloriously sunny day. The Society publication Father Browne's Forests, a Society cap and badge were presented to Doug Stables as a token of our thanks to him and Western Forest Products for being our hosts for the day. We returned to our coach and made our way back to Victoria.

Michael Doyle

Thursday, September 21

The day began on an auspicious note when the tour was photographed on the steps of Victoria's Parliament Buildings with Mr Jim Doyle, Minister for Forests, BC. A native of Co Down, he had joined us on the Wednesday evening for dinner.

Mr Doyle graciously invited us on a tour of the parliament buildings which were completed in 1893. There is a wealth of interesting architecture and history associated with the buildings, which are the home to the Legislative Assembly and Executive Council of BC, Canada's third largest province.

Directly opposite the parliament is the Royal British Columbia Museum, with its Natural History Gallery, First Peoples' Gallery and Modern History Gallery. The remarkable and life-like re-creation of coastal forestry was of a special interest to the party.

Saanich Forestry Centre was our next stop. Located on the Saanich Peninsula on Southern Vancouver Island, and operated by Western Forest Products Limited, the centre is one of several seed orchard facilities that supply tree seed for reforestation programmes in BC.

Seed orchards are of critical importance because they have the capacity to produce large quantities of tree seed regularly, and because the seed comes from parent trees that have been carefully selected for valuable characteristics such as fast growth, good conformation or resistance to insects and disease.

A modern centre for genetic research, Saanich Forestry Centre was founded in 1964, and is located on a 26 ha site. As well as a seed orchard covering 12 ha and growing six coastal species, it also incorporates a tree seedling nursery and modern laboratory.

The nursery produces between three and four million seedlings per year comprised of 40% western red cedar, 40% western hemlock and 20% Douglas fir. The seedlings are grown in styro-block containers. A peat-based growing medium with a grit covering is used. The containers are grown under glass or plastic-covered header houses known as I.B.G. and Hoop houses (these, unlike I.B.G. are not fully computer-controlled). Two to five seeds are sown per cavity; surplus seedlings are manually removed. The houses are heat-controlled, using natural gas. Growth rates are monitored closely and fertiliser rates can be varied using an overhead injection system. A black out system is used to control height growth and root formation. A mobile overhead boom is used for watering – the nursery uses up to two million gallons of water per year.

To encourage hardening-off and frost-hardiness, the majority of the seedlings are stored for a period in refrigerated containers and thawed-out before dispatch to the planting site. Seedlings are generally dispatched in wax-lined paper bags, beginning in September/ October, to facilitate planting before snowfall.

The seedlings, which are planted out in the forest as one-year-olds, are easy to transport and plant, as compared to the large two- or three-year-old plants that were commonly used in the 1960s and 1970s. Nowadays bare-root seedlings are only planted where high brush (woody vegetation) competition is expected.

Saanich Forestry Centre maintains three coastal Douglas fir orchards, two western hemlock orchards, one western red cedar orchard, one yellow cedar orchard, one Sitka spruce orchard and one western white pine orchard. A cuttings production area and a 'B' class[10] yellow cedar seed production area are also maintained.

Lost Lake Seed Orchard contains eight western red cedar, Sitka spruce, and western hemlock orchards, a yellow cedar cutting orchard and a hybrid poplar stoolbed.

British Columbia has a wealth of native tree species, with tremendous levels of genetic diversity, growing across a wide variety of environments. This presents a great opportunity for increasing wood production, through the sound application of plant breeding principles, as well as effective gene resource management.

Tree-breeding involves the identification of parent trees that are of good form, pest resistant and naturally fast growing, then testing the performance of their offspring in scientifically designed field progeny trials. The parent trees with the fastest growing progeny are selected and used in seed orchards. Their seeds, or vegetative cuttings from selected parents, are then used for reforestation. Genetic gains can be estimated and forecast for various rotation ages.

Seed production planning in BC is based on seed planning zones. Zonal boundaries are based on ecological and adaptability information. Long-term seed requirements are determined for each species in each zone so as to deliver sufficient seed.

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[10] B class seed is untested wild stand seed.

At Saanich, the typical procedure is that seed or cuttings are collected from a number of good parent trees, in wild stands and then grown and tested for desirable characteristics. The best trees are used in seed orchards, where they are carefully tended so they can produce large volumes of high quality seed. Over 200 million trees are planted in BC every year. The target is that by 2007, 75% of all seed sown will come from seed orchards. The Saanich Centre also features a well-equipped laboratory with highly qualified staff that provides technical support in forest productivity and forest health for the 850,000 ha of forestlands that Western Forest Products manage in BC.

Trials at Saanich show volume gains ranging from 2% in untested 1st generation orchards to 15% for progeny from 2nd generation orchards. Gains greater than 15% are realised in Washington and Oregon, as those jurisdictions impose fewer restrictions on issues related to genetic diversity, as compared to BC. The volume gain from seed tested in seed orchards is important as BC's active forestry land base is being reduced due to environmental pressure groups, green-up/adjacency constraints and other factors including reduced annual allowable cuts.

Hedge orchards are used at Saanich to propagate yellow cedar, which has a low germination rate from seed. Up to 100 cuttings are taken from each tree. The hedges are under 1 m tall and produce the best cuttings when aged between 3-7 years. John Halluciac, the nursery manager, stated that there was no difference on planted-out sites between plants raised as seedlings or cuttings.

Although no genetic modification takes place at Saanich, a group of people opposed to it had invaded the seed orchard and had destroyed many important seed trees. The cost of the damage was estimated at $300,000 (240,000), with losses in anticipated volume gains in future years running into millions of dollars.

Following our visit to Saanich, we travelled to the ferry terminal, where we boarded the Tsawwassen car ferry and travelled back to Vancouver. Our hotel was located in the Richmond area, where that evening we had a delightful meal at an elegant Chinese restaurant.

Patrick F. Berkery

Friday, September 22

The Home Depot chain of merchant stores is located throughout Canada and the US. They sell a large selection of products for the DIY market and provide expert advice on materials, building systems, machines, tools and gadgets for the DIY enthusiast. The range of timber products consists of graded lumber, sheet materials such as plywood, MDF, OSB and laminated boards, flooring boards, and flat-packed kitchen and bath units ready for assembly.

Home Depot's timber marketing policy is that it will not sell lumber derived from old age growth forests (Canada or US), nor will it sell tropical hardwood imports. From the consumer and environmental perspective, such policies are imperative, as the Canadian consumer is committed to purchasing lumber derived from forests which are managed on a sustained yield basis.

Following a brief introduction to the sales and marketing systems, we saw the quality and standard of stock materials available for off-the-shelf purchase. For the DIY enthusiast, these stores provide 'box-store shopping' at its best. No matter what the job is, the purchaser can pick every item he/she requires off-the-shelf, and get expect advice on

materials, tooling and the fixings required. In providing such a range of services, Home Depot claims to have 10% of the lumber market in Canada.

On leaving Richmond, we crossed the Fraser River, with views of log rafts being hauled by tugs downstream to lumber mills for processing. We entered forested lands, an area called the Pacific Spirit Park, next to the University of BC campus. The forest consists of 800 ha of predominately second growth Douglas fir/western hemlock and red alder. The original old growth Douglas fir forest was logged in the early 1900s, leaving many trees.

The forest area is interspersed with walking trails. The adjacent campus is very extensive with some elegant market housing. Trails and parks are open to the general public.

We stopped at the Simon Fraser Lookout Point to view the extensive booming grounds in the Fraser River. Transport of logs by booms to the freshwater in the Fraser River is still the most economical means of transportation in BC. (Logs left in salt water are attacked by toredo worms.) Log bundles are sorted by species and diameter at the mouth of the river and are built into rafts. Rafts are of a standard length and are held together by boom sticks. The rafts are pulled by tugs along the river to the processing mills located at the mouth of the river basin. In addition to logs, chipped waste is transported by tugs and barges to paper and pulp mills, which also operate along the river basin.

The Museum of Anthropology is Canada's largest teaching museum and one of UBC's most popular public museums on campus, attracting 170,000 visitors annually. In addition to its First Nations' collections – including totem poles, Haida houses, feast dishes, masks, jewellery, and contemporary works in a variety of media, the museum also features displays of European ceramics, collections of Inuit sculpture, Greek and Roman antiquities, and Asian arts. Housed in a spectacular building overlooking mountains and sea, the museum enjoys an international reputation for excellence in research, teaching, collections' management, exhibitions and programming.

The Northwest Coast Peoples' collection of indoor and outdoor sculptures were most impressive. The sheer scale of the sculptures, their superb skills and technologies employed in woodworking, and the highly decorative artistry in their basketry, weaving and clothing artefacts left a lasting impression.

Western red cedar has been described as the "cornerstone of the Northwest Coast aboriginal culture" and has great spiritual significance. Coastal people used all parts of the tree. The wood was used for dugout canoes, house planks, bentwood boxes, clothing and masks, and for many tools such as arrow shafts and paddles. The inner bark was used to make rope, clothing and baskets. Branches were twisted into rope and baskets. In addition, many medicines and herbal remedies were extracted from the tree.

Acting Dean, Professor John McLean welcomed the Society to the new Forest Science Centre, which was recently constructed on the campus at a cost of $47 m (37 m) to accommodate the Faculty of Forestry. The Faculty of Forestry offers four-year undergraduate degree programmes in five areas:

- Forest Resources Management - B.S.F.,
- Forest Operations - B.S.F.,
- Forest Science - B.Sc. (Forestry),
- Wood Products Processing - B.Sc. (Forestry),
- Natural Resources Conservation - B.Sc. (Natural Resources Conservation).

The Canadian Forestry Accreditation Board (CFAB) sets academic standards for the 4-year B.S.F. programme.

For the first time in the past decade, total undergraduate enrolment has decreased. In 1999/00, total enrolment fell to 553 students and new enrolment to 164. The largest number of undergraduate students were enrolled in the Forest Resources Management (B.S.F.) programme. In 1999/00 women comprised 33% of the overall enrolment and almost 50% of the students in the Natural Resources and Forest Science programmes.

First Nations students totalled 21, representing 14 nations, which is an increase over previous years. The Faculty is committed to increasing the participation of First Nations' students by providing direct support services and by creating awareness within the University and the wider community about First Nations' perspectives and issues in forestry.

Undergraduates are required to complete two 13-week terms and to take exams at the end of each term. In addition to the undergraduate programmes, the Faculty of Forestry offers four graduate degrees:

- Doctor of Philosophy – Ph.D.,
- Master of Forestry – M.F.,
- Master of Science – M.Sc.,
- Master of Applied Science – M.A.Sc.

Enrolment in the forestry graduate programme has grown by almost 80% over the past decade. Today there are 217 graduate students in the faculty. The greatest growth has been in the number of masters students – today there are 134. In the same period the number of doctoral students has risen from 51 to 83. The proportion of graduate students from outside Canada has increased and presently stands at 58% of doctoral and 28% of masters students. Twenty-six countries are represented in the graduate student body.

The Faculty of Forestry comprises three Departments:

- Wood Science,
- Forest Science,
- Forest Resources Management.

The faculty also operates two research forests: the Malcolm Knapp research forest near Maple Ridge on the coast, and the Alex Fraser research forest near Williams Lake in the central interior of Canada. The purpose of the research forests is to support teaching and research in the faculty. Their location, covering five biogeoclimatic zones and three tenure systems offers a wide variety of research and educational opportunities. They host three field courses each year, in which third and fourth year students receive practical training in forest management and conservation.

Allied to the three departments are two centres. The Centre for Applied Conservation Biology provides a combination of graduate level instruction and public lectures on important conservation issues. The Centre For Advanced Wood Processing provides student placements in industry, cooperative education programmes, workshops, conferences and other continuing education programmes for personnel operating in the wood products industry across Canada; and wood product development and testing laboratories for industry-led applied research projects.

In addition to undergraduate and graduate programmes, the faculty provides continuing education programmes for both registered professional foresters (RPFs) and operational forest resource practitioners who wish to attain RPF standard so they can professionally practise in BC. The continuing education programmes for professional foresters are run by the Silviculture and Forest Engineering Institute of British Columbia (SFEIBC). Many

of the instructors are from UBC Faculty of Forestry staff who donate volunteer time to the Institute.

The Faculty's International Forestry programme facilitates international linkages at the faculty, graduate and undergraduate levels. The purpose of the programme is to improve research and to promote international forestry issues. In 1999/00, the Faculty hosted 40 students from partner universities located in US, UK, EU member states, Scandinavia, Australia and New Zealand.

In concluding his introduction to the Faculty of Forestry, the Dean stated "there was a time in BC when forests were viewed primarily as sources of timber and forestry was based on the economics of harvesting. Today however, the management of our forests encompasses economic, environmental, social and cultural considerations. Forest conservation, forest management and wood processing require specialised areas of knowledge and at no time has there been a greater need to learn more about our forests. Continued financial support from federal, provincial, corporate and individuals helps us to find innovative and effective solutions to forest issues and to prepare our students for careers in forestry and forestry related professions. Extramural funding, endowments and sponsored research raised in excess of $8 m [€6 m] in 1999/00, down 8.5% from the previous year. Net operating budget for the same period is estimated to be circa $5 m [€4 m]."

Finally, the Dean introduced two staff members: Dr Greg Smith and Dr Steve Mitchell. Dr Smith is an assistant professor at the Department of Wood Science with specialist expertise in metals and materials engineering specialist. His teaching specialisations include the polymer science of adhesives and coatings, the fundamentals of composite wood properties and the processing of reconstituted wood composites. To date his research has concentrated on the processing and structural property relationships of Sitka spruce wood composites. Sitka spruce is only a minor species in BC, occupying a niche biogeoclimatic zone, normally associated with high rainfall/fog pockets located on the northwestern coastline.

Timber originating from old growth forests does not present a problem. However, current research indicates that in second and third growth [rotation] Sitka spruce forests, the presence of a high proportion of juvenile wood reduces the end-use value of the lumber. This degrade in timber quality presents problems in both the manufacture and end-use applications of wood composites such as OSB, Parallam and LVL. Laboratory tests have revealed that when laminates were subject to high moisture and that warping and peeling occurs. As a result Sitka spruce laminates are not recommended for exterior end-uses/finishes.

Dr Mitchell, an assistant professor of silviculture, has been engaged in windthrow risk assessment and management in coastal BC. His research has concentrated on establishing a diagnostic system which will enable foresters to predict windthrow risk for a range of soil, topographical and stand characteristics, geoclimatic classes and site types. Windthrow is a new phenomenon in BC forests. It is particularly associated with groups or stands which are retained for reasons of landscape and/or the feathering of edges in riparian zones within clearfell blocks - Variable Retention (VR) areas. Sitka spruce stands are prone to windthrow because of their coastal location and the wet, peaty, shallow-rooting soils on which they occur. Windthrow mainly occurs around the fringes and edges of clearcut [clearfell] zones, and creeps through the retained trees/groups/blocks over a period of time. Research indicates that windthrow salvage felling now accounts for 12% of the annual cut, about 3 million cubic metres/year.

He outlined a number of methods to reduce windthrow:

1. Crown modification, which involves reducing the sail area of the tree crown. This operation involves the pruning and reshaping of the tree crown using helicopters with suspended cutting devices (helicopter pruning). It is an expensive operation at $1000/100 linear metres (€790/100 linear metres).
2. Reduction in stocking density which decreases the percentage of segment damage.
3. Increasing the area of the tree group or block retained – the bigger the area retained the less the likelihood of windthrow and wind damage.
4. Removal of felled trees only, leaving leaning trees at edges, leaving feathered edges.
5. Avoiding cleaning edges to present square faces/edges.
6. Clearcut [clearfell] strips kept to less than five times tree length.

Following a lively question and answer session, Dr Smith took the party on a tour of the lecture and laboratory facilities to view this state-of-the-art building. Enormous vertical (Parallam) and horizontal beams (glulam), which were manufactured from reconstituted wood, served to remind the visitor of the spiritual power and majesty of the old growth forest. Lecture theatres and common areas, which doubled as student study facilities, were large and relaxing in tone and character. They were enhanced using coloured and textured wall panelling. A choice of veneers of cedar, cherry, pine and fir was used most effectively to achieve soft tonal contrasts.

After visiting the facilities in the Forest Science Centre, the tour moved to the well-equipped Centre for Advanced Wood Processing. This Centre, which provides students with a broad knowledge of the wood products industry, including wood manufacturing, business management, and marketing, is also engaged in industry-driven product R&D and laboratory testing. State-of-the-art wood processing equipment is used for laboratory exercises, which enables students to develop skills in technical processes and operations carried out in industry situations.

In his wrap-up remarks, Dr Smith commented on the very low level of funding for timber and wood product R&D. Only 2% of the total turnover of the entire forest industry in BC is put back into research. The main reason given for this is the lack of land tenure – milling companies do not own the land on which they operate and manage, the lands are leased under licence from the Crown, licences are renewable every five years – the maximum licence is for 25 years. The mills feel that in the absence of a security of tenure, there is little advantage in investing in long-term research.

The party enjoyed a most informative visit to UBC and its Faculty of Forestry. We were appreciative to all of the staff who gave of their time and depth of knowledge in coping with such a large group. Following a show of appreciation and presentation of gifts to the staff, the Society bid farewell to UBC and we made our way through downtown rush hour traffic, over the river Fraser, bound for the airport at Squamash Point to begin our return journey to Dublin via London.

Finally and by no means least, special tribute was paid to Steve, our driver, for the courteous, helpful and agreeable manner in which we had reached our destinations, often over difficult and, on some occasions, dangerous roads – this he managed in his stride, and always with a smile.

What impressed most people on this Canadian tour was the sheer vastness and scale of the forests in BC and Alberta, the size of the logs and the harvesting machinery employed, the number of mills and staffs involved in the industry, the array of cultures and peoples

involved and their very strong commitment to forest environmental issues. When all these impressions are combined, the tour can certainly be rated as one of the 'Classics'.

Eamon Larkin

The Study Tour party on the steps of the parliament Building in Victoria.

Participants

Pat Berkery, PJ Bruton, Richard Clear, John Cleary, Kevin Collins, Tadhg Collins, John Connelly, Jim Crowley, Jim Dooley, Joe Doyle, Michael Doyle, Frank Drea, Jack Durand, Ken Ellis, Charlie Farmer, Gerry Fleming, Brigid Flynn, Gerhardt Gallagher, Tony Gallinagh, John Gault, Christy Hanley, George Hipwell, Liam Howe, Tom Hunt, Seamus Kennedy, Joe Kilbride, Eamon Larkin, Richard Lowe, Eddie Lynagh, Liam McCluskey, Kevin McDonald, PJ McElroy, John Mc Loughlin (Convenor), Donal Magner, Susan Manahan, Tony Mannion (President), Brian Monaghan, Fergus Moore, Ned Morrissey, Gerry Murphy, Liam Murphy, Jim Neilan, Frank Nugent, Michael O'Brien, Pat O'Callaghan, Christy O'Donovan, Liam O'Flanagan, Derry O'Hegarty, Martin O Neachtain, Tim O'Regan, Denis O'Sullivan, Michael O'Sullivan, Tom Purcell, Joe Treacy, Trevor Wilson.

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