

ANNUAL STUDY TOUR 1993
6th – 18th October 1993
Oregon, USA

Background to Study Tour

In 1992 the Society celebrated its fiftieth anniversary. To mark the event a special Annual Study Tour was organised. The destination was the State of Oregon in the Pacific Northwest of the US, home of many of the exotic species used in Irish forestry.

Preparation and planning for the tour started in early 1990 and a comprehensive programme was arranged. When the departure date finally arrived, the main group assembled at Dublin Airport while other participants joined the tour at Shannon.

Undaunted by the thought of spending approximately twelve hours in the air, the group was soon on its way across the Atlantic on a Delta Airlines flight to Atlanta and from there to Portland via Seattle. Despite the long journey, the group enjoyed a pleasant trip.

On arrival at Portland Airport we were met and welcomed by our hosts, Wilbur (Wil) and Catherine Heath, and Larry and Marian Christiansen of Western Forest Tours Inc., and soon we were heading to the Ramada Inn in Beaverton, situated in the suburbs of Portland and our abode for the week that followed.

Introduction

The Pacific Northwest States of Washington and Oregon comprise an area of enormous variation in physiography, geology and climate. Elevations range from sea level to 4,450 m. Annual precipitation is as low as 200 mm or less in eastern Oregon whereas in the Coast

Ranges, the Olympic Peninsula and the High Cascades it reaches over 3000 mm. The geology of the region is extremely complex. Much of the landscape has been shaped by volcanic activity, some of it very recent, but sedimentary and metamorphic rocks also abound, with some formations more than 400 million years old. Not surprisingly, the soils which are a product of these factors, as well as time and relief, also show considerable variation.

The climate of the region is broadly maritime and is characterized by:

1. mild temperatures with narrow diurnal fluctuation, frequent cloud cover;
2. wet, mild winters, relatively dry summers and a long frost-free period and
3. high precipitation, occurring mainly as rain, 75% to 85% of it in the October-March period.

The region has been divided by Franklin and Dyrness (1969), on whose work this introduction relies heavily, into 15 physiographic provinces. These are broad divisions within each of which, physiography, geology and soils are relatively homogeneous.

The principal field sites visited on the Study Tour fall into seven of these provinces. The principal features of each are described below.

Coast Ranges province:

The elevation of the main ridges in this province is between 450 m and

750 m although occasional peaks may be over 1,000 m. All rock formations are of the relatively recent, Tertiary period. In the area visited on the tour, both volcanic and sedimentary rocks occur. Siltstone and sandstone are found near Vernonia (October 8th). Eocene volcanic rocks, largely basalt, with some tuffs and breccias occur northeast of Tillamook (October 10th). Soils of the province are very variable. The most widespread soils vary from shallow lithosols and regosols to leached soils similar in morphology to brown podzolic soils.

The extreme coastal part of the province belongs to the *Picea sitchensis* Vegetation Zone. The natural habitat of Sitka spruce is only a few kilometres in width, except where it extends up river valleys. This zone has the mildest climate of any part of Oregon, characterized by annual rainfall in the range 2,000 to 3,000 mm, frequent fog and low cloud cover during the drier, summer months. The soils are amongst the best forest soils in the region, deep, relatively rich and fine textured. Under natural conditions, forest stands are dense and tall, dominated by western hemlock and western red cedar as well as Sitka spruce. Natural succession normally results in stands dominated by western hemlock, although on moist to wet sites, western red cedar and Sitka spruce will be present in the climax forest. Coastal lodgepole pine, known locally as "shore pine", occurs along the ocean.

Over most of the coast range, the principal forested region is the *Tsuga heterophylla* Vegetation Zone. This is the most extensive vegetation zone in Western Oregon and the most impor-

tant in terms of timber production. Douglas fir is the dominant sub-climax species of this zone, with western red cedar and western hemlock comprising the natural climax vegetation. However, Douglas fir is a dominant, often the sole dominant, over large parts of the zone even in stands more than 400 years old. In addition to Douglas fir and western hemlock, western red cedar, grand fir and Sitka spruce (near the coast) are major forest tree species in the zone.

Precipitation levels are high (1,500 to 3,000 mm), most of it falling in winter. Although winter temperatures are lower than in the *Picea sitchensis* Zone, summer temperatures are only slightly higher and temperature extremes are rare. The soils of the *Tsuga heterophylla* Zone are generally moderately deep, fairly fertile and well drained.

Willamette Valley Province:

October 12, 13 and 16 were spent in the Willamette Valley. The valley is a broad, structural depression, oriented north-south and situated between the Coast Range and the Cascade Range. It is approximately 200 km long, from the Columbia River to Cottage Grove. It is characterized by broad alluvial flats, separated by groups of low hills. The valley is bordered on the west by a variety of sedimentary and volcanic rocks. Most of the valley floor is covered with thick, non-marine sedimentary deposits. Soils on the valley floor, derived from silty alluvial and lacustrine deposits, were formed under predominantly grassland vegetation. The climate of the valley is characterized by lower rainfall and higher temperatures than the Coast Range to the west.

Western Cascades and High Cascades Provinces:

The tour visited the Cascades on October 15 and 16. The Cascade Mountains in Oregon reach elevations of over 3,400 m (Mount Hood is 3,424 m). The rocks of these provinces are dominated by pyroclastic materials, some very young, and by basic igneous rocks. Glacial deposits are also widespread. Soils are very variable, but brown podzolics and regosols are among the most abundant. Soils derived from pyroclastic parent materials, such as tuff and breccias, are generally deep, fine textured and often imperfectly drained. Basalt and andesite give rise to poorly developed, often stony and well drained soils.

The Western Cascades fall within the *Tsuga heterophylla* Zone described above, to an elevation of about 550 m on the western slopes and to 1,125 m on the eastern slopes. Large areas of the province are in fact dominated by Douglas fir. At higher elevations, the sub-alpine forests consists first of *Abies amabilis*, western hemlock and noble fir. Above 1,700 m is the *Tsuga mertensiana* Zone which at first, is represented by continuous forest cover, then up to the tree line at a maximum of 2,000 m, as a mosaic of forest patches and shrubby or herbaceous sub-alpine communities.

The Cascade Range is a very effective barrier to the movement of both westerly maritime and north-easterly continental air masses. In the mountains, elevation has a dominating influence on local climate. With increasing elevation, precipitation increases, as does the proportion falling as snow. Temperature decreases markedly the higher one goes. On the western side,

precipitation rises to 2,000 mm, falling off rapidly east of the Pacific Crest.

Southern Washington Cascades Province:

According to Franklin and Dyrness (1969), Mount St Helen's last erupted "100 to 150 years ago". Events have overtaken them and in many respects, their description of this part at least, of the Southern Washington Cascades is irrelevant. At least 90% of the province is made up of andesite and basalt flows with their associated breccias and tuffs. In the immediate vicinity of Mount St Helen's, visited on October 9th, this has been overlain with volcanic ash and pumice deposits from the eruption of the 18th of May, 1980. Soils derived from glacial materials are not so common in the province. In the area of pumice deposits, podzols and brown podzolics soils are most common.

The Mount St Helen's eruption devastated an area of 60,000 ha. It blew out a crater 640 m deep and dropped the summit's elevation from 2,948 m to 2,549 m. To put this decrease in elevation of almost 400 m in context, the summit of Little Sugar Loaf in Wicklow is 341 m above sea level, and that of Great Sugar Loaf 501 m. While it has been estimated that the explosion produced about one cubic kilometre of ejecta (airborne ash and pumice), it ranks historically, as a relatively small eruption. Krakatoa produced 18 cubic kilometres of ejecta when it erupted in 1883 and Tambora, in Indonesia, produced 80 cubic kilometres in 1815.

High Lava Plains:

This province, to the East of the Cascades, provided a dramatic contrast to

the rest of the tour itinerary. We arrived there on the afternoon of October 14th and left it about 24 hours later.

The province has a base elevation of about 1,200 m and is characterised by young lava flows and alluvial and lacustrine sediments. The region is very dry. Annual precipitation may be less than 300 mm and temperature extremes are much greater than in the west. The area around Sisters is in the *Pinus ponderosa* Zone. *Pinus ponderosa* occupies drier sites than almost any other forest type in Oregon. Rooting is prolific on coarse textured soils utilising to the full the limited supplies of moisture in the soil. It is associated with a rich variety of species including inland lodgepole pine, seen on the tour, in pure stands in Deschutes National Forest.

Reference:

Franklin, Jerry F. and C. T. Dyrness 1969. Vegetation of Oregon and Washington. U.S.D.A. Forest Service Research Paper PNW-80, 216pp. Pacific Northwest Forest and Range Experimental Station, Portland, Oregon.

Ted Farrell

WEDNESDAY 7th OCTOBER

World Forestry Centre

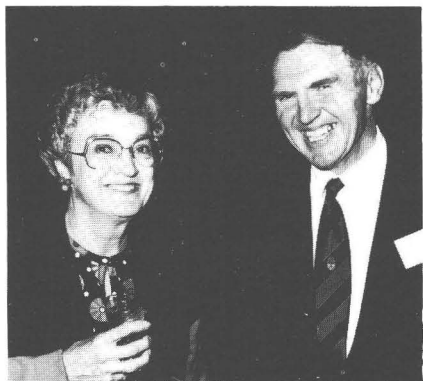
After a late breakfast, we assembled in the hotel car park where the coach was ready to take the group to downtown Portland, visiting on-route the business district and the waterfront region. From here it was on to Washington Park, a 134 ha urban forest, where we stopped for a delightful picnic lunch. After lunch, the group made an informal visit to the International Rose Garden and the Hoyt Arboretum. The arboretum, perched on a ridge top of

the Tuality Mountains in the western hills of Portland, has a collection of more than 700 species of trees and shrubs, including one of the nation's largest conifer collections.

The next stop was the World Forestry Centre, a centre for forestry education and a permanent collection of forestry exhibits. One of the highlights here, the Jesup Collection of Wood, has 505 full species represented. Morris K. Jesup (1830 - 1908), a banker, philanthropist and President of the American Museum of Natural History, developed and privately funded this elaborate collection. After a welcome rest at our hotel in Beaverton, we later returned to the Centre where, as guests of the Society of American Foresters



The Study Tour group at the World Forestry Centre, Portland, Oregon with our guides from Western Forestry tours.



The President, Dr. Ted Farrell and Mrs. Catherine Heath at the World Forestry Centre.

and the World Forestry Centre, we enjoyed cocktails and an elaborate banquet, honouring the first visit of the Society to the Pacific North West.

Overnight Beaverton.

John Fennessy

THURSDAY, 8th OCTOBER, DAY 1 Nyggard Logging Company

On the first day proper of the Study Tour we visited the chipping yard of the Nyggard Logging Company in Warrenton, Oregon. This firm, which operates the largest chipping facility in northern Oregon, specialises in chipping rough and "reject" timber in Warrenton, where it employs 60 people and has an annual intake of 350,000 U.S. tons of round timber.

The timber is first debarked (only 0.5% of bark is allowed in the finished chip) then chipped with rotary knives and finally screened to remove oversize chips which are rechipped to ensure a consistent size. The bark is

sold to Weyerhaeuser Corporation at £7.50/U.S ton for use as hog fuel. The mill produces three categories of clean chips:

1. Douglas fir.
2. Hardwood (alder, maple & cherry).
3. White (spruce, hemlock and fir).

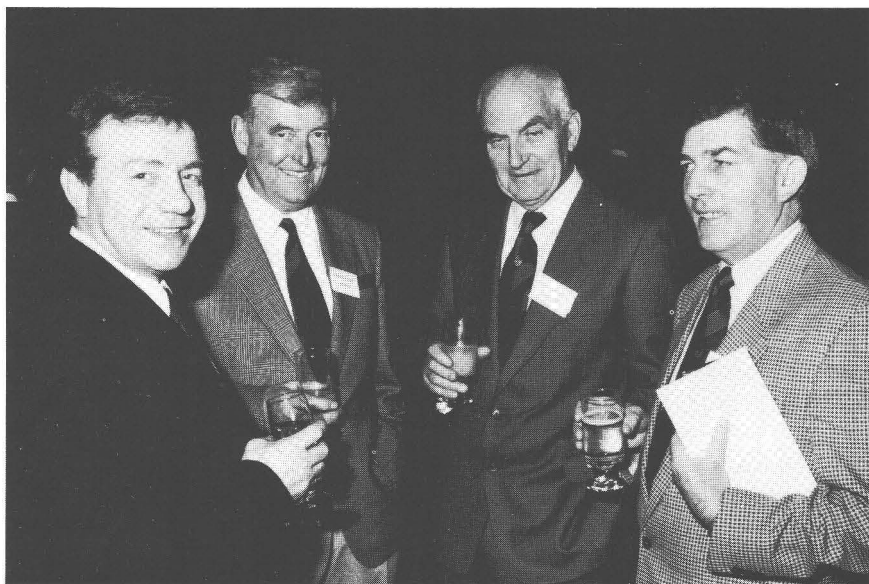
Nyggard purchases its round wood at £18/U.S ton for white (delivered) and £13/U.S. ton for hardwood (delivered). They purchase all sizes of material but as it has only a 30" chipper, any logs or butts over 28" diameter are split using an excavator mounted log splitter. Nyggard buys on a "green" ton basis and sells on a "bone dry" ton basis. On average one "green" ton produces a half "bone dry" ton. The current selling price of the chips is £53 per "bone dry" ton.

The mill's main customers are James River and the Weyerhaeuser plant at Lakeview, just across the Columbia river in the State of Washington. The chips are loaded directly on barges for export to Washington. They are used to produce newsprint at the Weyerhaeuser plant and computer paper and tissues at the James River plant which purchases a higher grade mix of chip i.e. 80% white, 15% hardwood and only 5% Douglas fir.

Weyerhaeuser Log-Export yard at Lakeview, Washington

In this 65 ha complex, the Weyerhaeuser Company operates a newsprint mill, two fibre board mills and a log export yard. A total of 4,000 are employed at the complex.

Our visit concentrated on the log export yard which has an annual throughput of 1.2 million U.S. tons of logs. Sixty five per cent of these logs are supplied from Weyerhaeuser's own forests in Oregon and Washington – mainly second



Pat O'Brien, Tom Purcell, Paddy Glennon and John Fennessy (Study Tour Convenor), at the World Forestry Centre.

growth forests or "tree farms" worked on a 55 to 60 year rotation.

On arrival at the yard (approx. 200 truck loads per day) the logs are debarked, measured (manually) and sorted into upwards of seventy different size categories using U.S. Forest Service log grades at a cost of 1.5 pence per log. The main reason why the timber is not sawn before export appears to be the very high price being paid by South-East Asian customers, e.g. quality logs of two cubic metres can command a price of £133 on the quayside at Lakeview.

The logs are exported to Japan, Taiwan, Korea and China, although Japan is by far the most important customer. The logs are mainly Douglas fir (70%) and hemlock (10%) with the balance comprising cedar, alder and spruce. Approx. 60% of their customers

require the logs to be debarked prior to export. Highly mechanised systems enable large ships to be loaded quickly – one modern log transporter with a capacity of 155,000m³ can be loaded in two days. The average sailing time to Japan is fourteen days.

During the past ten years the price trend for export logs had been upwards, with prices increasing significantly in the past eight months due to scarcity of export quality logs. In fact the log export yard is now operating at only one third capacity. The difficulty in obtaining suitable quality logs is due to federal restrictions on exports, environmental legislation which severely restricts harvesting and the small size of timber from second growth forests. The Weyerhaeuser Company fears this lucrative export trade may decline even

further when Russia begins exporting from the vast forests of Siberia.

Overnight Beaverton (Portland).

Pat O'Sullivan

FRIDAY, 9th OCTOBER, DAY 2

Mount St. Helens Tree Farm

We had a 0700 hours departure from our hotel in Beaverton on a fine, bright and clear morning. We set off east-bound towards Portland ; in the distance stood Mount Hood, at 3424 m (11,235 feet) it dominates the skyline east of the city. After crossing the Willamette river we headed for the Columbia river which forms the boundary between the states of Oregon and Washington. We continued north on Interstate 5 through a countryside of mixed agriculture and forests. Among the fields were Douglas fir Christmas tree farms. Common too were plantations of cottonwood (poplar), grown to produce wood chips.

Travelling parallel with the Columbia we could see large log booms heading down-stream to log yards. At Kelso we had a welcome stop and an opportunity to purchase some film for the spectacular day that lay ahead. We were introduced to our guide for the day, Dick Bohlig, recently retired from the Weyerhaeuser Corporation. Having spent many years on the ground he had much valued practical experience to relate to us.

Off we set, and ten miles or so north of Kelso we left the freeway and climbed eastwards up through forests of mature Douglas fir. We passed areas of clear cut (clearfell) with slash (lop and top) piled and partially covered with sheets of plastic. This keeps the rain off so they can be burned during winter months.

Reforestation generally takes place a year following clear cutting. Burning of slash is a controversial issue as locals complain about smoke pollution.

Continuing our journey we passed on through forests of Douglas fir interspersed with western red cedar, maple and red alder. The two commonest species of maple – big leaf and vine maple provided a colourful scene among the deep greens of the forest. Red alder grows very well naturally but is difficult to establish artificially. When it does establish itself, it forms a valuable source of wood chips.

We made a brief stop to see an aerial fertilising operation. Over 6000 ha (15,000 acres) were being treated with urea at 450 kg/ha (400 lbs/acre). The fertiliser had been railed to a landing in the forest using Weyerhaeuser's own rail line. It is filled into bags which hold 1.36 tonnes (3000 lbs) by a special attachment on the side of the wagon. The fertiliser is in pellet form for ease of spread. Application is on average once every eight years depending on foliar nitrogen levels. Research results indicate that a growth response of up to one third can be achieved using fertilisers.

Close-by at an elevation of 365 metres (1,200 feet) we saw a reforestation crop of Douglas fir planted in 1988 at 1000-1100 plants/ha (400-450/acre). The seed and planting stock (2+1 transplants) came from Weyerhaeuser's own seed orchard and nursery. Ground preparation on these sites involves burning slash, if heavy. If it is light and there is no need for burning a machine comes in and "kicks the slash about" to make direct planting easier. Apart from that no mechanical ground preparation is used. Planting begins around the

end of January and goes on to early June. Contractors, paid by the thousand plants, are carefully supervised. Control of competing naturally regenerated red alder was done by spraying 2,4-D by helicopter. This operation is carried out during the dormant season. A feature of the plantation was the very high survival rate and low initial stocking used in comparison to Irish experience and practice. Natural regeneration is not widely practised as stocking levels tend to uneven compared with planted crops.

Inventory is done from the air, with stocking plots laid out on the ground. Productivity averages about 20 cubic metres/ha/year.

Further on we stopped at an 18 year old stand of Douglas fir. Four years ago a pre-commercial thinning was carried out. It reduced stocking down to 680 stems/ha (275 trees/acre). This operation is carried out by trained contractors who are paid by the acre. Cut stems are left on the ground. Various stages of pruning are carried out to a final height of 5.5 metres (18 feet). Again this is carried out using trained contractors.

Our final stop before lunch was in a 140-180 metre wide strip of 65 years old Douglas fir adjacent to the forest road. This crop was second growth, typical of what is being clearfelled at present. Beyond the strip the crop had been clearfelled and the area reforested. Regulations now stipulate that such strips of mature forest be left along certain scenic roads at clear cutting. Once the reforested crop reaches 4 years of age then this buffer zone will be cleared. Risk of windthrow is low as the soils are generally deep and free draining and provide a good rooting medium for Douglas fir. Throughout

the forest area the roads are open to the public for recreational activity.

A welcome stop for lunch was made at Hemlock Creek. The day was glorious with clear views for miles over forests shaped by man by clear cutting and reforestation. Down in the valley below us a cable logging operation was in progress with a steady stream of trucks drawing away the extracted logs.

Mount St. Helens Eruption Area

After lunch we left for Mount St. Helens, travelling mile upon mile of forest road. The wide flowing Green river provided a change of scene. This is a popular fishing waterway having good salmon and steelhead (sea trout). Further on a monument by the roadside, overlooking the Green river, marks the extent of the blast area – 18 miles from the epicentre. It was on May 18th, 1980 that Mount St. Helens erupted violently. A severe earthquake triggered off one of the world's largest recorded landslide. During this avalanche more than 410 metres (1,300) feet of the mountain top cascaded into the river valley below. The Weyerhaeuser company lost 27,500 ha (68,000 acres) of forest in the devastation.

After things had settled a major salvage operation began. Much valuable timber was saved. Vegetation began to appear again within a month of the operation. Research plots were established to determine the effects of planting on areas with volcanic ash deposits. It was found that normal growth could be expected for conifer seedlings as long as the ash was scraped away so that the seedlings roots could be

placed directly in the underlying mineral soil. Over a seven year period following the eruption Weyerhaeuser reforested of the damaged areas. Over eighteen million trees were planted on 18,000 ha (45,000 acres). The species planted were those that had grown in the area prior to the eruption, Douglas fir and noble fir with some lodgepole pine and black cottonwood. The reforestation has been very successful with high survival and growth rates.

After travelling for many miles on forest roads to reach the viewing point over the eruption area we reached an impasse – the bus could go no further on the rough forest roads. After much deliberation among our hosts we were about to turn back until our President showed his true leadership qualities in leading a charge up the mountain. In glorious sunshine we walked, crawled and jeeped a good Irish mile to the viewing point. Several miles away to the south lay Mount St. Helens, with smoke still rising from where the blast occurred twelve years ago. One was struck with awe at the sheer magnitude of the devastation, and the huge expanse of country. As far as one could see was hill upon hill of forest. The very successful reforestation of the eruption zone is bringing a new greenness and life to an area that was formerly devastated. It was with reluctance that we had to return to the bus, then head back to Kelso via the River Toulte and picturesque Silver Lake.

Dinner With Weyerhaeuser

The Red Lion Inn at Kelso was the venue for a tastefully presented buffet evening meal thoroughly enjoyed by everyone. Will Heath from

Western Forest Tours, our guides for the tour, introduced Dick Bohlig and his wife, Conor Boyd of Weyerhaeuser and John Keatley, land and timber manager Longview operations (Weyerhaeuser).

Ted Farrell spoke and said how pleased the Society was to have Weyerhaeuser as guests and for giving us such a great day – one we will remember for a long time. He presented our guests with "The Forests of Ireland" and Society ties.

There then followed an interesting question and answer session. Conor Boyd took the floor first saying that export customers were paying U.S. \$190 per m³ for logs, U.S. \$50 higher than local mills. Japan is one of their major overseas customers for Douglas fir logs. There it is used in construction of traditional post and beam houses. The Japanese have found Douglas fir superior to any other imported species.

Weyerhaeuser originally bought their lands from various railway companies. These companies had been given vast stretches of land in the early pioneering days. Three hundred and sixty five thousand ha (9000,000 acres) of land, with a covering of old growth Douglas fir were bought for \$17/ha (\$7/acre). Today's prices for similar land would be about in the range of \$30,000/ha (\$12,000/acre).

John Keatley manages an area of some 160,000 ha (400,000 acres), with a team of 11 foresters. He was directly involved in the recovery of timber after the Mount St. Helens eruption. Replying to questions concerning low planting density, he said that research trials are presently looking at planting density and its effect on wood quality.

Trials have been done using containerised Douglas fir seedlings, but

costs are very high compared to bare-rooted stock.

Growing of red alder commercially is at an early stage of development. There appears to be a future for the tree in furniture production and as a source of hardwood pulp. Germany is already importing some mature alder from the Pacific North West. They see it as an environmentally friendly species.

Environmental pressures have caused a marked decline in harvest volumes in Washington, Oregon and California from 101 m³ million cubic metres in 1987 to 81 m³ million currently. Nineteen ninety two figures will be in the range of 45 – 50 m³ million.

Replying to a question regarding the reduction in North West timber exports to the E C, Conor Boyd said he wasn't worried unduly as their major customers are in the Pacific Rim countries.

Rounding off an interesting evening and a memorable day, Ted Farrell again thanked all concerned. He also stressed very firmly that management of forests should remain in the hands of foresters and not environmentalists. We are adequately trained to manage our timber resource in a proper and responsible manner.

Overnight Beaverton (Portland).

Richard D. Jack

SATURDAY, 10th OCTOBER, DAY 3 Trees, Cheese and Ocean Breeze

The group headed west from the Ramada Inn, Beaverton on Highway 8 to Forest Grove via Hillsboro – a traditional agricultural town, nowadays becoming increasingly popular as a dormitory town of Portland. We arrived at the Forest Grove District HQ of

the Oregon Department of Forestry and already at 09.30 the temperature was over 10° C. Here we met Dave Johnson, District Forester of the Oregon Forest Service. Within the district is the 146,000 ha Tillamook State Forest known as the Tillamook Burn due to its four devastating fires – at six year intervals between 1933 and 1951 which destroyed 143,600 ha of mainly old growth forest. Only 2,400 ha of the original forest survived.

If the chilling devastation of Mount Helens was still a major topic of conversation after the previous day's tour, then the Tillamook Burn surely matched it in terms of scale of destruction and eventual rehabilitation which involved the Oregon Board of Forestry, Oregon citizens, industry, inmates from prison camps and the schools.

Most of the group had some experience of forest fires, and allowing for Dave's detailed description of the fire and an excellent video, it was still impossible to comprehend the enormity of these fires. For example the 1933 fire destroyed 80,000 ha of first growth Douglas fir in less than a day. Unlike Mount St. Helens, reforestation was more protracted. The six year cyclical fires played havoc both on salvage operations and attempts at reforestation. First, the area had to be protected and as 100,000 ha was owned by the private sector there was little interest in protection or rehabilitation. The State stepped in and acquired the land in 1940. Reforestation began in 1949. Today, the administrative bodies governing the forest are the Oregon Board of Forestry and the Oregon Department of Forestry.

As we drove west we could experience at first hand the results of the

rehabilitation of the Tillamook Burn. The scale of reforestation across the 60 km journey was awe inspiring. The trees decreased in size as we moved from east to west beginning with mature Douglas fir – just outside Cottage Grove which were part of the first planting – ending in the east which was finally completed in 1970. Reforestation was a team effort. The Oregon State Forestry used their own employees and contractors. Some planting was even carried out by school children which became part of special school forests. Perhaps we might introduce this idea into the Irish educational system. Even inmates from the Smith Fork Inn prison camps played their part in the planting programme. Incidentally these inmates – now numbering 85 – are still used for planting and fire fighting.

The forests are now divided into a series of compartments with major firebreaks. These are supplemented by a secondary system including access roads. Firefighters now have 30 minute access to fire danger areas.

There are many different planting regimes including:

- conventional planting
- aerial seeding
- natural regeneration

As there was no ground cover, aerial seeding of Douglas fir using 0.8 kg seed per ha (34 pound of seed per acre) was carried out on 46,000 ha. Most of the planting however was carried out manually as it is today. Douglas fir is the main species covering 90% of the Burn. The Oregonians are at ease with Douglas – they have a Douglas culture. It is featured in their houses, hotels and number plates of cars. It

is their State tree and vital to their economy. Alder is the most commonly planted broadleaf. While it has excellent potential for furniture its yield is less than a third of Douglas fir. Alder is also root rot free unlike Douglas fir. Almost 50% of some Douglas stands are now affected by *Heterobasidion annosum* (*Fomes annosus*). The remaining species comprise western red cedar, western hemlock, noble fir, and Sitka spruce. Noble fir, surprisingly, has an excellent reputation as both a construction and furniture wood. At first glance stocking looks as heavy as ours but like the Weyerhaeuser plantations of the previous day stocking is only 1,000 trees per ha or 3 x 3 m spacing. However, 100% success rate at establishment gives it a uniformity which gives the impression of high stocking.

Dave Johnson acknowledged the views of some tour participants about possible poor form as a result of wide spacing and told the group that pruning is now being carried out to improve timber quality. Stocking is reduced to 500/ha during a pre commercial thinning (18-20 years) which is really a cleaning operation. Final stocking will be approximately 100 trees/ha.

Tillamook is close to Oregon's main population centres from Portland down through the Willamette valley. The demand for recreational facilities is huge and Dave sees this as an inherent part of the forest multi-use role. These include fishing, boating, camping, horse riding, hunting and motor cycling. Tillamook – an Indian name for land of many waters – offers these amenities in abundance.

As we moved south-westwards we saw how easy forestry and agriculture blend in the landscape along the

Wilson river even though the woods are predominantly coniferous. Here in the Tillamook valley we saw the neat farmsteads of Swiss settlers whose dairy herds supply the Tillamook creamery which produces the world famous Tillamook cheese.

We arrived at Tillamook at 11.30 a.m. and sampled some of these cheeses including spread cheeses such as Jolly Jack and their excellent cheddar which would give the best of Irish cheddar a good run for its money. Tillamook cheeses are the biggest sellers in the Pacific North West. This has all taken place relatively quickly because Tillamook County didn't even begin to be settled until the latter end of the last century.

After Tillamook, we travelled north on Highway 1001 – a coast road running from Canada to Mexico. We passed through Bay City, Brighton Wheeler and Nehalem Bay. We stopped at Manzanita Beach where we get our first real view of the Pacific. Here we saw our first old growth Sitka spruce, which is a protected species.

We lunched at Cannon Beach, Oregon State Park, which was established in 1932. The Sitka spruce grows right down to the beach and like Manzanita is protected.

After lunch we travelled a few miles north and then turned off Highway 101 to begin our journey back through the northern section of Tillamook. First we visited Klootch Creek, home of the world's largest Sitka spruce. Any forester wishing to measure it would need a diameter tape of over 500 cm. Its circumference is 1,600 cm and when last measured for height it was 65.8 metres with a crown spread of 28 metres.

Later we stopped at Camp 18 logging

museum where there is a permanent display of rail wagons and skylines.

As we drove back through northern Tillamook in the evening sun it was difficult to imagine that this forest in the north west is only twenty years old. While it has well over 90% Douglas fir and other conifer cover, foresters here made optimum use of birch and alder when planning the Tillamook landscape.

Overnight Beaverton (Portland).

Donal Magner

SUNDAY, 11th OCTOBER, DAY 4

Columbia River Gorge

As the only sea-level river flowing through the volcanic rock of the Cascade Mountains, the Columbia River is both a natural wonder and an important transportation corridor. Our first free day in Oregon was to be spent exploring the Columbia River Gorge.

When Lewis and Clark explored the Columbia River in 1805, they opened the way for further settlement.

For many years the Gorge has been the focus of public attention because of its unique natural features, its offering of a variety of opportunities for public recreation and its contribution to the Pacific North West. Recognising these interests, the 99th US Congress passed an Act creating the Columbia River Gorge National Scenic Area covering 115,000 ha. The Act was signed into law by President Reagan in November 1986.

After leaving Portland and travelling east along Interstate Route 84 we soon arrived at our first stop, Multnomah Falls, the second highest waterfall in the country with a drop of 189m. After a brief stay we were back on the coach again and climbing along Route 84,

passing Bonneville Lock and Bonneville Dam and on past the Bridge of the Gods which takes its name from Native American legends. Geologists say that large landslides may have temporarily dammed the river here, giving rise to legends of a great stone arch built by the Gods for Indians to use in crossing the river.

Leaving the Columbia, and heading south along State Route 35, passing through apple and pear orchards we arrived at the small town of Parkdale for a lunch stop.

After a most pleasant buffet lunch provided by Marian and Catherine, from Western Forest Tours, the group headed for our final stop of the day – Timberline Lodge, a remarkable building on the slopes of Mount Hood. Towering above us we saw Mount Hood with its snowcovered peak, Oregon's tallest mountain. Timberline Lodge, a national historic landmark, is a huge stone and timber building, made of indigenous materials in the depression years of the early 1930's and employed hundreds of craftsmen in its construction. Perched at over 1800 m (6,000 ft) elevation on the side of Mount Hood, the Lodge is entirely handmade, from its massive, hand-hewn beams to its handwoven draperies. Today, the Lodge is operated as an exclusive hotel, catering for walkers in the summer months and for skiers in the winter.

Leaving Timberline Lodge in the late afternoon we returned to Portland via Interstate 26, travelling along the valley of the Sandy River with a stop, for dinner in Sandy, a small town close to the city of Portland.

Overnight Beaverton (Portland).

John Fennessy

MONDAY, 12th OCTOBER, DAY 5 Weyerhaeuser Forest Nursery

We left Beaverton heading south for the Willamette Valley. The bus joined Interstate 5 and we travelled south, left the motorway at Aurora, and headed for our first stop of the day at Weyerhaeuser's Aurora Forest nursery.

The nursery at Aurora is one of five belonging to Weyerhaeuser's western nursery division; the others being Klamath Falls and Turner in Oregon, Mima and Rochester in Washington. It was purchased in 1974 and comprises a total of 79 ha (195 acres) which includes four ha (nine acres) which are leased. Our hosts for this stop, Martin Treboser and Rod Miller explained that the nursery, is located along a main road with 800 metres frontage. At any one time they have 52 ha (128 acres) of beds producing a range of plants which include 1+0 seedlings, plug seedlings and miniplug seedlings for transplanting; 1+1 transplants which is the major stock type and 2+1 transplants for transplanting in visually sensitive areas – a practice they referred to as "greening up". The nursery soil is a sandy loam with a pH of 6.0.

The nursery is run on a three year fallow cycle that is, one year fallow, followed by a year in seedling production and another year in transplants.

1. Fallow year

Areas are left fallow for one year to allow time to treat weeds and soil pests and to build up soil fertility. The soil is sterilised to kill weed seeds and pests by fumigating with methyl bromide or chloropyckrin. The ground is covered with a 2mm polyethylene sheet until the fumigation is complete.

2. One year seedlings

After seed bed formation in winter and spring, sowing takes place in April. Precision sowing is used throughout. Species sown are primarily Douglas fir with noble fir, grand fir, western hemlock and Sitka spruce. Seeds are sown according to specific climate zone origin. Seed lots are rigorously logged and tagged. During the summer nitrogen is applied and water is continuously applied using an irrigation system with pipes located every six lines.

Because of the practice of leaving ground fallow combined with fumigation, weed control is kept to a minimum. Grasses provide the main problem and these are usually treated with Devrinol.

3. 2nd year transplants (1+1)

At the end of the first year seedlings are lifted, root cut and packed for lining out. Lining out is done using self-propelled machines. During the year transplants are subjected to a regime of root wrenching combined with restricted irrigation. This is repeated frequently to improve stem diameter at the root collar.

Where there is a threat of frost damage a minimum temperature of 0°C (32°F) is maintained by watering. At the end of December transplants are lifted and prepared for transport to the planting sites.

In the case of 2+0 plants these are left in the seedbeds and subjected to the same treatment as for 1+1 transplants with the addition of undercutting of the root system. These are also lifted in December.

Packing

Two fifteen man crews lift and place plants in bins which are then stored in

the packing shed for a day. Over the packing period a total of 27 million units will be processed. A crew of 85 people will examine, grade, root prune and pack on average 400,000 – 500,000 plants per day. The procedure is as follows:

- (i) plants are loaded onto conveyer belts from the bins
- (ii) each plant is individually checked for root quality, root diameter and height, 1+1 transplants for reforestation sites must be 61 cms (24 inches) from root collar to tip, all plants must have a minimum root collar diameter (RCD) of 4mm, on average 10% of 2+0 and 30% of 1+1 are culled due to poor roots and RCD under 4mm
- (iii) all plants are root-pruned as follows: groups of 15 trees are put onto a circular toothed table, roots facing outwards, where they are root pruned, this pruning will not affect the tap roots of plants, because previous wrenching in the seed beds or transplant lines will have produced a good fibrous root system which is not touched when extraneous roots are clipped off
- (iv) plants are placed in bags, 160 in each but the bag must not weigh more than 23 kg (50 lbs), the bags are made of polyethylene on the inside and double paper on the outside, these bags will fit a frame on the planters back so there is a minimum of handling involved
- (v) the bags of plants are now either transported to the planting site or held in cold storage, at -2°C (28°F).

Planting takes place from January to April on low elevation sites and into

May or early June where planting is being carried on up to the snowline. Of the 27,000,000 plants produced, approximately 50% are used by Weyerhaeuser. The remainder are either grown under contract or sold speculatively.

It is worth mentioning that the nursery, from office to packing sheds as well as the nursery proper was spotlessly clean. There were ample meeting rooms, canteen and shower facilities which were of the highest quality. I think this was reflected in the meticulous way in which plants were produced and the end result that we saw on successive days on establishment sites.

Finally we were shown a large area of western yew (*Taxus brevifolia*) plants produced from cuttings. Cuttings are rooted indoors and are grown-on outdoors for a period of three years. After this all plants are lifted and macerated. The resultant extract TAXOL is currently being studied as an anti-cancer agent and there are on-going clinical trials. Research and production of the product is a joint venture between Weyerhaeuser and Bristol-Myers Squibb, a large US pharmaceutical company.

Oregon Forestry Department's Seed Orchard

We left Weyerhaeuser's Aurora nursery and travelled west approximately 25 km to St. Paul, the site of Oregon Forestry Department's seed orchard.

The State orchard, sited on 65 ha (160 acres), has two main areas of operation, the production of seed from selected superior seed trees and the development of future improved seeds trees from grafted stock.

1. Seed Trees

The seed trees currently in the orchard are approximately 17 years old and were developed from seedlings. Two species, Douglas fir and western hemlock, predominate.

Douglas fir

The main emphasis in seed production is to produce site specific seed, as Douglas fir is a very site specific species with local variations occurring within very short distances. Elevation and latitude play an important role in determining performance.

Spring girdling of seed trees is carried out three times every six years. This has the effect of stimulating both male and female flowers into seed production. Calcium nitrate is applied every year at a rate of 450 kg/ha (400lb/acre).

Cone collection begins in August. Cones are hand picked, family by family, for around \$20/bushel. The seed produced from Douglas fir cones is sold for \$770/kg (\$350/lb). It is estimated that each kilo yields 88,000 seeds which have a 90% germinative capacity.

Western hemlock

Western hemlock is planted mainly in coastal regions. Seed production is poor with usually 50 bushels of cones being produced each year. Western hemlock seed is sold for \$3300/kg (\$1500/lb), with an estimated 550,000 seeds/kg.

2. Grafting

Douglas fir scions are grafted onto specially developed rooting stock. It can take 20 years to develop rooting stock which will accept most grafts but even then rejection can occur. Scions come from either selected plantations or progeny trials. Grafting is carried out

on stock plants on site and is a top rather than a side graft. Two grafts are made, one for analysis and one for production. The analysis graft is made to monitor possible rejection. As rejection of the grafted stock can still occur after 20 years this is a very important operation. Once it has been determined that the graft has been successful the seed tree is shifted using a tree spade and moved to a predetermined area in the seed orchard.

Leaving the State seed orchard we travelled down to Salem, Oregon's capital city and administrative centre, to lunch at the Willamette valley winery. Lunch was again an experience, set as it was, in a wooden two storey building in the centre of the vineyard. The winery has only recently been established – in the last 3-4 years – but already produces some decent, if expensive, red and white wines. The building is typical of many we saw in Oregon showing the many uses that Douglas fir can be put to. There was superb decking around and to the side of the building made from planed, preservative treated Douglas fir. Our host for lunch was Mike Miller. Mike, a former state forester for Oregon State, is the Executive Director for the Associated Oregon Loggers. He gave us some insight into the effect that the spotted owl has had on the logging industry in the State. The associated Oregon loggers encompasses 700 logging companies each of which employs on average 6/7 loggers per company. Originally these companies averaged 11/12 loggers per company so there has been a drop from around 8,500 loggers to between 4,200 – 5,000. He explained that the environmental impact of the spotted owl had serious implications for the lumber industry.

Starker Forest

After lunch we moved on to our final stop of the day to the Dan Farmer tree farm of "Starker Forest". We were met by Gary Blanchard, the Chief Forester of Starker's. Gary explained that Starker forest comprises 24,000 ha (60,000 acres) and has a management staff of seven foresters. It was started in 1936 when Therman J. Starker, who was in the first class of forestry graduates from Oregon State University, began buying parcels of land for \$2/ha (\$5/acre).

The management aim of the forest is to respace and thin the plantations on a rotation of 60 years. Respacing generally takes place at 15 years and the first commercial thinning at 25 years. There are three further thinnings at 35, 45, and 55 years before clearfell. The intention is to finish with 200-250 stems/ha (80-100 stems/acre) with a mean dbh of 46-50 cms (18-20 inches) and 2 rings/cm (5/6 rings/inch). Pruning is not carried out as part of the silvicultural practice. The clearfell will yield approximately 250 cubic metres/ha (20,000 board feet/acre) with a current price of \$100/cubic metre (\$500/1,000 board feet).

At the time of our visit they had completed a felling of 10 ha (25 acres) and were now heading into reforestation with its associated problems. Some of the reforestation costs were as follows:

Cut and burn – \$40-80/ha
(\$100- \$200/acre)

Plant 850-1000 plants/ha
(350/400 plants/acre)

Spray grass/light vegetation
\$125/ha (\$50/acre)

A second spray, using Roundup, will be required.

One of the problems they encounter

in establishment is the high temperatures experienced during and after planting. The forest is located at an elevation of 180 m (600 feet) with a rainfall of about 1300/annum (50 inches/annum). Always looking for alternative markets the foresters at Starkers have developed a small niche market for the sale of edible fungi – in this case “Chanterelle” (*Cantharellus cibarius*) which grows wild among the woods. As we were leaving we stopped to look at some broadleaved species interspersed among the Douglas fir. One in particular caught my attention – the golden chinquapin (*Chrysolepis chrysophylla*). Its fruit is very similar to that of the Spanish chestnut.

Overnight Corvallis.

Richard Clear

TUESDAY, 13TH OCTOBER, DAY 6 **Oregon State University, College of Forestry**

Professor George Brown, Dean of the College of Forestry of Oregon State University (OSU) at Corvallis welcomed the Society to the University. He outlined the main issues in Oregon forestry today:

- timber supply
- rural community stability and health
- integrated forest resource management
- value added manufacture

The total area of Oregon is 25.1 million ha, of which 10.9 million ha (43%) is covered by forest and of this area 7.9 million ha is commercially owned. About 63% is publicly owned by the US Forest Service and Bureau

of Land Management. The remaining 37% is privately owned with industrial forest businesses accounting for 21% while the remaining 16% is owned by 25,000 non-industrial private owners.

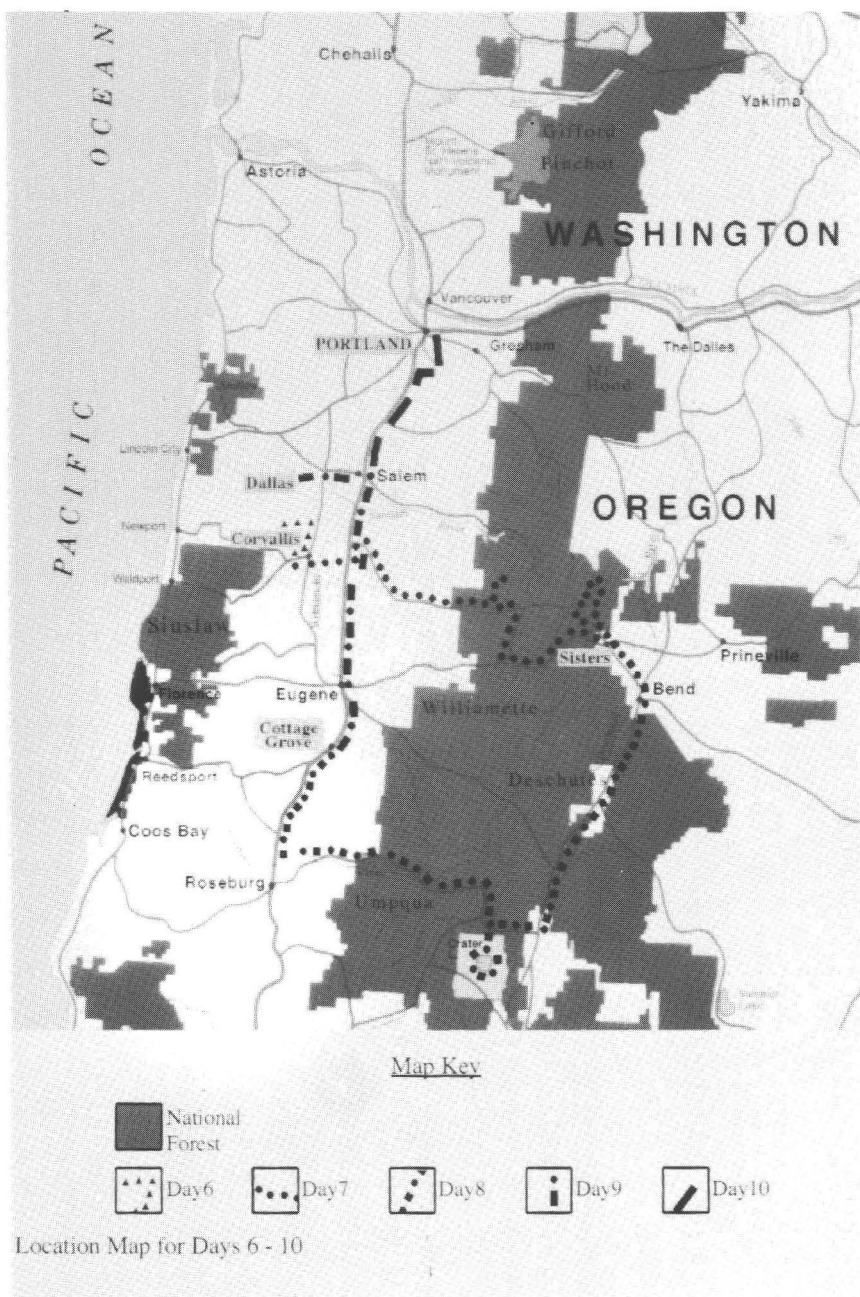
Over the period from 1977 to 1986 the annual harvest averaged 36.5 million cubic metres but this has declined in recent years. In 1989, 91,000 people were directly employed in the forest industry in the State. In the financial year 89-90 local taxes raised on the sale of public timber, the harvest of private timber and on property taxes associated with forest lands totalled \$360 million.

The State has six main regions: (1) the Coast Range (2) the Willamette Lowland (3) the Cascade Mountains (4) the Klamath Mountains (5) the Columbia Plateau and (6) the Basin and Range Region. One quarter of the State is desert – to the east of the Cascade mountains.

The Cascade Mountains are of volcanic origin and the soils are derived from tuffs, breccia and pumices. These weather into deep, free draining soils. This region is the location of many of the finest old growth and second growth Douglas fir stands in the State. The Cascades include many of the highest peaks in North America such as Mount Hood (3424 m) and Mount Jefferson (3111 m).

The Willamette Lowland is a narrow strip of land wedged between the Cascade and Coast Ranges. The soils are alluvial in origin and are highly productive. It is the most important agricultural and industrial region in the State and over half of the population live there.

The Coast Range borders the Pacific ocean and is the lowest of Oregon's mountain ranges rising to a maximum



of 1249 m at Marys Peak. The Klamath Mountains are comprised of a number of different soils most of which are highly productive for forest growth.

Professor Brown went on to outline the Forest Research Laboratory (FRL) of OSU. The FRL is a public research organisation that has as its mission to 'Conduct well coordinated problem-solving research that provides knowledge for the integrated management of forest resources for multiple values and products which meets society's needs, with special attention to social and economic benefits'. He outlined four key ingredients for the success of a research programme:

- competence and credibility
- objectivity and reliability
- relevance
- the acceptance that research results affect decisions

The total budget for forestry research in 1989/90 was \$11.5 million (£8.0 million). This budget was funded through two main sources: (1) appropriated funds (which support the permanent faculty) which accounted for 36% of funding (state general fund 15%, a harvest tax which is levied at the rate of 30 cents per 1000 board feet 17% of funding, and Federal funding 4%). (2) grant funds for fundamental research work which accounted for 64% of funding.

The research budget was divided among the following sectors:

- processing: 22%
- multiple land-use: 13%
- forest protection: 26%
- silviculture: 39%

Research results are communicated to users by a variety of mechanisms: through research publications, newsletters, workshops, symposia and conferences, through continuing education courses, research cooperators, through forestry graduates, personal contact and through forestry extension. The latter – getting research results to the users – is one of the major tasks of the FRL. There is a state-wide programme of forestry extension, there are eight full-time specialists at the FRL and a further thirteen agents in the counties. It is based on problem solving education and has a broad audience orientation with special county emphasis on the non-industrial private owner. This programme is a major source for research application, user feedback, and problem identification.

The campus of OSU is a major centre for forestry research. Apart from OSU (budget \$11.5 million), there are staff from the Environmental Protection Agency (budget \$5.4 million), US Department of the Interior, National Park Service, Cooperative Park Studies Unit (budget \$ 0.6 million), USDI, Bureau of Land Management, Cooperative Research Unit (budget \$1.8 million), US Department of Agriculture, Forest Service, Pacific Northwest Research Station (budget \$6.0 million) engaged in forest research. The total investment in research in 1989 was \$25.8 million.

The Cooperator Programme is another of the major tasks of the Forest Research Laboratory. In 1989/90 there were 285 formal cooperators and the work ranged from grants and contracts for research, to formal research cooperatives (seven in operation), through to in-kind support for the FRL.

The research programme is coordinated through a Statutory Advisory Committee and additional feedback and guidance comes from cooperators, resource management professionals, associations and resource organisations, user feedback, formal programme reviews, and Executive and legislative action.

After Professor Brown's presentation the Society was taken on a guided tour of the College laboratories.

The first stop on the tour was the Forestry Media Centre where the objective is to help improve teaching and to disseminate a forestry extension package. Its functions also include an instructional development programme which provides seminars and workshops on teaching and consults with individual faculty members. Students also have access to the centre. The Forestry Media Centre is an important part of the faculty and is an indication on the emphasis placed on acquiring good communication skills for faculty and graduates alike.

The College has a computer laboratory where we were given a hands-on demonstration of the GIS system. Satellite images on the GIS have been used to estimate forest volume and these have been found to correlate reasonably well with measured volume.

The Forest Products Laboratory is investigating shrinkage of wood and the variation in the moisture content of kiln dried wood. The latter can create problems especially where different species are dried together and used in composite products such as gluelam. Differential shrinkage can occur in use and result in surface checking in the beam.

In the Composite Wood Labora-

tory Dr. Philip Humphrey explained some of the work they are doing on modelling the hot pressing process of fibre board production in order to provide a tool that will aid in controlling the density of the board. He also gave a description of some of the newer composite wood products such as LVL (Laminated Veneer Lumber), parallam (being developed by McMillan Bloedell), OSB (Oriented Strand Board) and flakeboard (very similar to OSB). The overall objective in these products is to utilise relatively low value raw materials to produce a composite that has consistent strength and stability characteristics. He sees raw lumber being gradually replaced by composites as the supply of high quality lumber from virgin forests is replaced by wood from plantations of fast grown species with higher proportions of juvenile wood.

The Wood Engineering Laboratory is concerned mainly with testing wood strength and they have recently completed a strength testing programme on local softwoods to determine their suitability for the European market. They also have a programme of testing the suitability of Siberian larch for the US market. There is some import of Siberian lumber, with discussion in some areas of extensive imports to substitute for local supplies which are being tied up by environmental regulations. (The current estimate is that the harvest has been reduced by 20 to 25 million cubic metres because of the spotted owl controversy). There is also work on testing connectors for timber trusses and how these can be improved, and on wooden transmission poles.

McDonald Forest

After lunch in the nearby Avery Park we travelled a short distance by bus to the College McDonald Research Forest which comprises 5800 ha of mainly second-growth Douglas fir, much of it planted by the Civilian Conservation Corps (CCC) before the Second World War. There is a wide range of age classes as some of the areas were replanted several times. The forest is an important part of the teaching and research roles of the College; there are over 60 field experiments located there.

Being so close to Corvallis public relations is very important. Consultative meetings are held with local residents once a year and an explanatory brochure is distributed outlining the work in the forest. Recreation is an important use, with over 50,000 day visits each year. In addition to these uses the forest provides a source of revenue for the College.

In the north end of the forest we visited a forest harvesting project. The objective was to investigate the possibility of shelterwood regeneration of Douglas fir in a stand that had been opened up by storms in previous years. One of the major attractions of shelterwood regeneration is that it overcomes public hostility to clearfelling. Regenerating a light demanding species such as Douglas fir under shelter is difficult but on suitable south facing slopes it may be possible. The site was being thinned using a 50 feet Ross Tower skyline.

Dr. Ed Alrich outlined the three key factors for efficient cable logging:

- planning
- crew training
- proper equipment

Cable logging has been found to be cheaper than skidding on sites with slopes greater than 40%. The cost of cable harvesting is from \$15-20 per cubic metre. The maximum haulage length is 700-800 m with a 30 m side-haul distance on either side. One hundred and fifty to 250 cubic metres are typical amounts harvested in each set-up of the system with a maximum of up to 470 cubic metres per day. The maximum load on each haul is 15 cubic metres.

One of the noticeable features of harvesting in Oregon is the almost exclusive use of full tree extraction using either skidder or cable systems with little forwarding of shortwood. This is partly due to tradition and tree size but also to the approach of loggers in Oregon to harvesting where force is the order of the day – it is difficult to conceive of loggers using sophisticated forwarders or harvesters, although they are being used to a limited extent on some of the flatter sites.

The next stop was at a field trial examining spacings of Douglas fir from 1.5 x 1.5 m to 6.4 x 6.4 m. The trial has been installed in the past five years throughout the Pacific Northwest in order to provide a comprehensive database on the effect of spacing on the growth of the species in the region.

The final stop of the day was in a thinning trial where there was an intensive investigation on skyline logging on steep terrain. The trial was located in a second growth Douglas fir stand where the objectives were to make skyline logging more economic and to investigate the impact of different types of logging on soil compaction. The trial began in 1972 and has produced the largest database on thinning in the Pacific North West.

At the end of the day the Society were the guest of the College of Forestry at a barbecue dinner at Peavy Lodge in the McDonald Research Forest. Professor Brown wished the tour success in the coming days. The President Ted Farrell thanked Professor Brown and his staff for their time and hospitality in making our visit to the College and Research Forest such a success.

Eugene Hendrick

Christmas Tree Farm

After lunch some of the group visited Holiday Tree Farms, a few miles from Corvallis, and one of Oregon's largest. Established in 1955, it now carries an average inventory of five million trees and has an area of 1,200 ha. During our visit they were already well into their wreath making season. These were placed in cold stores.

The US Christmas tree market is now very competitive so production costs are kept to a minimum. This was evident in the use of Mexican workers in wreath making. Each had a minimum target of 50 wreaths per day. If a worker failed to reach this he/she was sent home. The farm produces mainly Douglas fir which was selling as low as \$7.00 per tree, reflecting both the over-supply of Douglas fir and the US recession. They also grow noble fir, grand fir, white pine and Scots pine. Lately they have introduced Fraser fir and believe that it has excellent potential.

Holiday Tree Farms, despite its size is a family run business owned and managed by the Schudels. They also have a nursery where they grow all their own plants.

Spacing is 1.5 x 1.5 m and all trees are sheared each year, which to an Irish

eye presents an artificial looking tree. However, this is what the customer wants and also ensures that despite irregular form at early stages of growth, trees can be sheared into a standardised shape. The rotation is 8 to 12 years – Douglas fir generally being a faster grower than noble fir.

Because of the scale of operation they make maximum use of helicopters in delivery of trees to central depots and in spraying. Helicopter rates were \$425 per hour which is about half the Irish rate.

The Schudel family keep up to-date with new growing and production techniques, from tree provenances and ground preparation to chemical sprays and harvesting machinery. They adapt their own machinery if they cannot buy it and they believe that having their own nursery gives them the edge over their competitors. The motto of Dave Schudel is: "we don't just work here, we also study here".

Overnight Corvallis.

Donal Magner

WEDNESDAY, 14th OCTOBER, DAY 7

Willamette Valley Agriculture

We left our base in Corvallis and headed eastwards across the Cascade mountains. This area was in sharp contrast to what we had seen in N.W. Oregon. The soil is much lighter, rainfall is lower 150-180 mm/yr (6-7"/yr). Snowfall of 80-100 mm/yr (3"-4"/yr) makes up somewhat for the low rainfall. We passed through the Willamette valley which is mainly agricultural land. Rye grass is grown extensively and is famous world wide and is used in lawns.

The main towns here are Lebanon and Sweet Home, once home to 2,000

– 3,000 loggers. Most of the logging on neighbouring hills was done during World War II. The area is home to numerous sawmills and plywood plants. We stopped at Willamette National Forest Park which is mainly old-growth forest and good spotted owl habitat. Large areas of forest land are now tied up owing to the conservation of the species.

Road development costs are shared by the forest owners. Roads are used by the public and have to be maintained.

Foster Reservoir Big Tree

The first stop of the day was at a Douglas fir, typical of what the old growth forest contained. This specimen stood over 60 metres with a dbh of 380 cm. On our way to second stop we saw old growth forest of Douglas fir, noble fir and white pine. Old growth noble fir was used a lot in door frames, it is however, liable to shake or splitting caused by wind much more so than Douglas fir.

Skyline Logging Operation

The second stop of the day was at a skyline logging operation in a Federal forest at Deer Creek. The wood is sold by public tender. Logging takes place for ten to ten and a half months of the year, depending on weather conditions. The logging was being carried out by the Wymer Logging Company which does most of the logging for Willamette Industries Inc. (sawmills division).

The site was a staggered clearfell coupe of about 14 ha. Logging concessions follow contour lines but there environmental pressure to make these more irregular and less unsightly. The site was at elevation of 1,100 m with an

annual rainfall of 400-500 mm/yr (15" – 20"/yr) and a lot of snow. Felling is done 3 – 4 weeks in advance of extraction.

The team for the skyline operation was comprised as follows:

- hook tender – in-charge of operation
- skyline operator
- loader operator (John Deere grab and loader)
- sorter who segregates logs into up to nine different sizes
- chainsaw operator tidying up logs and cross cutting as necessary
- operator rigging and setting-up skyline
- two men choking timber who also help setting up skyline

On very difficult terrain another man is added to the crew.

The full set-up time was about eight hours for a four man crew. A motorised carriage or skycar is used to reduce the number of set ups. To change to another extraction rack took about two hours for a four man team. The maximum rack length was 1,200 m with a side-haul of 400 m. The daily output was in the region of 200 cubic metres. The total price of the equipment on the site was about £500,000.

All timber measurement is done by an independent third party using the Columbia Logger Scale system which measures in board feet (200 board feet = one cubic metre of roundwood). Three log sizes are commonly used for Douglas fir: 10.5 and 6.2 metre (34 and 20 feet) lengths which are mainly used for pulpwood, and 4.3 metre (14 feet) lengths which are used for sawmilling. The cost of felling is about £1.70/cubic



Skyline logging at Deer Creek

metre which added to the cost of extraction and haulage to mill of £11.10 and £3.90/cubic metre respectively gives a total of £16.70/cubic metre.

The third stop was in a shelterwood cutting of a mixed stand of Douglas fir, noble fir and grand fir on Federal forest land. Some of the trees were retained to provide shelter and provide spotted owl habitat. Wide chain saw bars were used (914-1066 mm (36-42 inches)) and trees of over 42 inch butt diameter must be felled by two men for safety reasons. The fellers are paid about £10/hour.

After lunch we headed for Sisters which was our final destination for the day. We climbed up to 1370 m elevation (4,500 feet) passing through forests of spruce, lodgepole pine, white fir and noble fir, passing Lost Lake on the

way. Here we say dead trees killed by the spruce bud-worm. These eventually fall to the ground and is not permitted by the state to remove dead trees. Spraying insecticide against the pest is now banned in 49 U.S. States. We passed through the Santiam Pass at 1468 m (4817 feet) to the eastern side of the Cascades. At lower elevations incense cedar and ponderosa pine predominate with stands of inland lodgepole pine. The rainfall in this region is 500 mm/year with a snowfall of 90 mm/year. Night time temperatures frequently fall as low as - 22°C.

The day ended when we arrived in Sisters to stay at the appropriately named "Ponderosa Inn".

Overnight Sisters.

Con Nyhan

THURSDAY, 15th OCTOBER, DAY 8
Willamette Industries Inc. Particle
Board Factory, Bend

The plant was built in 1965 and employs 175 people, it is highly automated. It operates 350 days per year. The product is called KorPINE.

Sawdust and shavings from kiln dried pine, that is residues from windows and doors etc., is the raw material used, and it is stored undercover. The species mix most suitable for this process is pine/fir. Pine is preferred, due to too much resin in firs. Bark is not used due to discolouration of end product. Storage capacity of raw material is nine days, from 700 to 1,000 tons per day is used. \$50 per dry ton is paid for raw material delivered in. The plant is

operated seven days per week twenty four hours per day. The main source of energy is steam, all bark and sanded dust is blown into the furnace, in a similar process to burning natural gas.

In the main process, the raw material is screened, refined and blended with 7% wood resin to form a mat on caul plates. A pressure of 25 kg/cm² (350lbs per square inch) is applied at 160°C (320°F). Two lines 152 x 549 cm (5 x 18 feet) and 122 x 489 cm (4 x 16 feet) are used, producing 3.7 to 4.3 million linear metres (12 to 14 million feet) per month. There are four different thicknesses produced ranging from 6.4 to 28.6 mm (1/8 to 1 1/4 inches). After pressing the boards are sanded to a finish.



Michael O'Brien (extreme left) presenting a Society tie to Rod Moye of Wymer Logging, watched by John Fennessy, third from left and the President, Dr. Ted Farrell.

Strict quality control is applied at all stages. The main research laboratory is in Albany. The company has three more mills, one using pine and two using Douglas fir.

An electronic beam is used to produce a high gloss coating on 30% of the finished product. Seventy percent of the output is exported to Pacific Rim countries – South Korea, Japan and Taiwan, the remainder is sold on the home market. The main uses for the product are interior cabinets and furniture and the biggest market is DIY.

using tree shears, flail delimbing and debarking and chipping. The chips are blown directly into large truck trailers for dispatch.

We made our way on through Deschutes National Forest to Crater Lake National Park. The main attraction, Crater Lake was formed when the Mount Mazama collapsed nearly 60 centuries ago. Leaving Crater Lake we travelled through Umpqua National forest to Cottage Grove.

Overnight Cottage Grove.

Tim O'Regan

Salvage Logging of Lodgepole Pine

In the afternoon we visited a site where salvage logging of lodgepole pine, killed by bark beetle was underway. The operation on a very flat sandy site consisted of full tree harvesting

FRIDAY, 16th OCTOBER DAY 9
Willamette Industries Inc.
Papermill, Albany

In the morning the Society visited a Willamette Industries Inc. paper mill



Salvage logging and chipping of lodgepole pine near Bend.

near Albany. The group was addressed in the office buildings by Mr. Keith Ivell – purchaser for the plant. He explained that the mill uses chips, hog fuel, and waste paper. Each day 100 – 120 truck loads of raw material are off-loaded at the mill, half fibre(chips) and half waste paper. The main species used are Douglas fir and western hemlock. Bark is used to generate steam.

The chip pile – a veritable mountain – spread over a vast area, amounted to two months supply. The factory was experiencing difficult times and ensuring continued supplies was proving more and more difficult due to environmental constraints greatly reducing logging activities in the State. Supplies are received from an 80 km (50 mile) radius and half are sourced from residues produced by the parent company. Moisture content is in the region of 50% depending on the season. Costs have tripled in the last few years due mainly to shortages – a bone dry ton costing approximately \$100.

The group was split in two for a tour of the factory which uses the Kraft pulping process. The plant has three paper making machines. A computerised control room has recently been installed. The chips – a mixture of new and old – are first cooked under pressure in a mixture of water and sodium hydroxide. Uniformity of chip size is crucial for control of cooking and rejects end up as hog fuel. Cooking takes approximately half an hour. After cooking the chips are washed 3-4 times to remove lignin from the mix. When washing is finished the water – 99% of the total – is removed by initially scraping, then extruding onto a felt press, and finally by drying on a canister that is steam heated. The moisture content at the end of the

process is 7%. The lignin removed is burned and chemicals are retrieved.

The paper made at the Albany plant is 'liner board grade' – the type used in cardboard boxes. Strength is imparted to the paper by aligning the fibres in different directions – achieved in practice by making the paper from three layers each with the fibres in a different direction. Control of directionality is achieved by the speed at which the 'mush' is fed onto the wire mesh for drying. 'Brown grocery bag' type paper is also produced.

Thirty eight to forty five million litres of water (10 to 12 million gallons) of water are used by the plant each day. Great emphasis is placed on recycling and the plant has its own treatment system. The plant has a second fibre operation which recycles OCC – old corrugated containers. It uses 500 tons of this material each day. The material is cleaned and passed to blenders and mixed with virgin fibre. The recycled fibres are weaker as each handling reduces the strength. The paper produced from these fibres cannot be turned as quickly on the drums and accordingly it has higher costs associated with it. However, OCC has 80 – 85% achievable efficiency. In the layered paper the top layer is 100% virgin fibre, the middle layer is 100% recycled fibre and bottom layer is virgin/recycled. All the production from the plant is presold.

The Chairman for the day, Mr. Paddy Glennon, complimented the people guiding the tours and thanked all involved for a very interesting morning.

Sawmill/Plywood Plant – Dallas

The Society visited a combined sawmill and plywood plant in the afternoon.

Bob Sloan set the scene for the visit. The original mill was built in 1905 and many changes had taken place since then. Much modernization was imminent – a new scanning system to be operational by Christmas.

Each plant uses approximately 250,000 tons of roundwood per year.

The group was divided in two and while one visited the sawmill the other visited the plywood plant. Schematic diagrams of both were provided before the tour commenced.

Sawmill

Almost everything going to the mill is butt reduced. Figures for recovery indicated that a figure of 59% was achieved – this did not include bark. The mill employs a grading system for its sawn lumber and figures given would indicate that 10% makes the best grade, that is, select. The next grade is known as two or better and 65% ends up in this category. The remainder is consigned to three and economy.

At the time of the visit prices for sawn lumber were going down. This was not a cause for concern as prices were heading for a level that was previously deemed to be healthy.

Plywood Plant

The guide for the plywood plant was Scott McIntyre. He first drew attention to the reserve which is retained in the event of a breakdown in the chop saw. The principal species used is Douglas fir with western hemlock comprising six to ten percent of the total. The chop saw cuts the logs into the correct lengths before they are dispatched to the steamer. Here the logs are exposed to temperatures of 100°C in the form of

steam up to 18 hours to prepare them for peeling. Before they are fed to the rotary peeler a scanner finds the dead centre of the log. Once mounted a 51 cm (20 inch) log is reduced to a 9 cm (3.5 inch) stake in 10 seconds. The thin sheets of veneer are fed along a conveyor belt. A moisture scanner sorts the veneer into sapwood and heartwood. This is essential as each type requires a different drying schedule.

After drying, the sections pass through a very labour intensive process whereby sheet is placed successively on sheet. Numerous gluing operations also take place. Strength in all directions is imparted to the board by originating the sheets so as to ensure that the wood fibres lie in different directions. Finally the requisite number of sheets are in place and they are subjected to great force and heat which bonds them permanently together. Trimming of the edges leaves the product ready for grading and packing.

The plant produces a number of different grades of plywood. All the production is bonded with 'outdoor' glue. This is to prevent litigation/complaints in the event of improper use.

The Chairman thanked all those who had helped to make the day a success.

Overnight Salem.

Paddy O'Kelly

SATURDAY, 17th OCTOBER DAY 10

The Tour proper finished on Friday, Saturday was the first full free day and the morning was spent shopping at Clackamas Town Centre south of Portland. In the evening we moved to our hotel, the Shilo Inn, close to Portland Airport.

That night the Annual Society dinner was held at which the President Ted Farrell thanked all those who made the 1992 Study Tour such an outstanding success. Copies of *The Forests of Ireland* were presented to our hosts, Larry and Marian Christiansen, and Wil and Catherine Heath. They in turn presented the Society with a copy of *Oregon's Forests*.

Study Tour participants

Denis Beirne, John Brady, Pacelli Breathnach, P.J. Bruton, Richard Clear, John Connelly, Maureen Cosgrave, Myles Cosgrave, Tony Crehan, Pat Crowley, Jim Crowley, Gerry Dolan, Joe Doyle, Charlie Farmer, Ted Farrell, John Fennessy, Gerry Fleming, Brigid Flynn, Lily Fur-

long, Paddy Glennon, Richard Griffin, Eugene Hendrick, George Hipwell, Liam Howe, Tom Hunt, Richard Jack, Harry Kerr, Donal Magner, Tony Mannion, Brian Monaghan, Eric Neyt, Noreen Nyhan, Con Nyhan, Tim O'Brien, Pat O'Brien, Michael O'Brien, Michael O'Donovan, Paddy O'Kelly, Tim O'Regan, Pat O'Sullivan, Denis O'Sullivan, Gerry Patterson, Tom Purcell, Peter Raftery, John Roycroft, Mossie Ryan.

Sponsorship

A portion of the cost of the Study Tour was provided by Coillte and the Forest Service. The Annual Society Dinner was sponsored by Smurfit Natural Resources.