

IN THE STEPS OF DAVID DOUGLAS,
A MODERN VERSION
IN THE EYES OF
A TREE-CLIMBER'S SEED COLLECTION

CONE COLLECTING IN NORTH WEST AMERICA
THE DIARY OF A TREE CLIMBER ENGAGED IN CONE COLLECTIONS
FOR
THE INTERNATIONAL UNION OF FOREST RESEARCH ORGANISATION
(IUFRO) AND THE BRITISH FORESTRY COMMISSION
IN
THE YEARS 1976 AND 1978

by

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CONTENTS

Contents	1
Introduction	2
Acknowledgements	2
Reflections	2
1976 - Grand Fir [<i>Abies grandis</i> Lindl.]	4
Part I - Survey of Grand Fir	4
Part II - Collection of Grand Fir	19
Part III - Extraction of Grand Fir	29
BC Forest Service extractory at Duncan	29
Silvaseed Company extractory at Roy	31
1978 - Noble Fir [<i>Abies procera</i> Rehder]	32
Part IV - Survey of Noble Fir	32
Part V - Collection of Noble Fir	35
Part VI - Extraction of Noble Fir	41
1978 - Lodgepole Pine [<i>Pinus contorta</i> Douglas]	42
Part VII - Survey of Lodgepole Pine	42
Part VIII - Collection and extraction of Lodgepole Pine	43
Part IX - Some thoughts	49
Thoughts in general	49
Future collections	49
Forest tree species	50
Extractory notes	51
References	52
Appendix I - Plants and animals seen	54
Trees	54
Shrubs	55
Plants	56
Mosses, lichens and ferns	56
Mammals, birds and insects	57
Appendix II - Photographs, Maps and Postcards	58
Photographs	58
Maps	58
Postcards	58
Appendix III - Details of seed collections	59
1976 Grand Fir [<i>Abies grandis</i> Lindl.]	59
1978 - Noble Fir [<i>Abies procera</i> Rehder]	59
Appendix IV - People	60
Appendix V - Abbreviations and conversion factors	61
Abbreviations	61
Conversion Factors	61

INTRODUCTION

In 1976 and also in 1978 a visit was made to North West America for the purpose of collecting seed from the natural range of Grand Fir¹ and Noble Fir. The two projects were funded by IUFRO (International Union of Forest Research Organisations) under the direction of Dr. H. Barner, of the Danish State Forestry Tree Improvement Station, Humlebaek, Denmark, see Fletcher and Barner (1978) and Fletcher (1973, 1974, 1975 and 1979) for details. The actual collections were led by Dr. Alan Fletcher, of the Forestry Commission (FC), Genetics Research Branch, Northern Research Station, Roslin, Midlothian, Scotland. In 1978 after completing the collection of Noble Fir the party did a collection of Lodgepole Pine for the British Forestry Commission.

David Douglas (1799-1834) was born in Scone near Perth and died in the Sandwich Islands. He is remembered for his two great expeditions to North West America after an earlier trip to the eastern part of the United States (see Davies, 1980). He is credited with introducing 254 plants into Britain and including many trees and his name lives on in the Douglas Fir.

The collection team consisted of Alan Fletcher and myself of the FC Genetics Research Branch assisted by Patrick Cahalan, who was a student at Aberdeen University, and in 1978 by our colleague Colin McLean.

This is a short collection of diary notes made by the author which is a modern day review of some of the steps taken by David Douglas, and related through the eyes of a tree climber in a very different environment in many respects from that experienced and encountered by Douglas but never-the-less the trees themselves are the same, or direct descendants of the same, with many of the areas virtually untouched as of great natural wonder and beauty.

ACKNOWLEDGEMENTS

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REFLECTIONS

Following some of the 'paths' of David Douglas as we did elicits thoughts on comparisons between today as 170 odd years ago. The immediate response tended to be of course that there is no similarity, however on reflection there is indeed much which is completely

¹Common names used but scientific name given in Appendix I

unchanged. Trees themselves, indeed some of the Sugar Pine we saw were in all probability the same individuals which Douglas admired, what is a few hundred years in these circumstances! The wilderness areas, the visitation and mark of the wildlife in particular is to 'all intents and purposes' untouched. The greatest change I suppose is in the human (native) population, the follow to that is too obvious to even mention.

The quest for seed was just the same though the manner and aims perhaps a little different, Davies (1980), Smith (1997) plus Mitchell and House (1999). As I understand it Douglas did comparatively little climbing, relying on his gun with which he was reported to be a 'marksman'. We on the other hand climbed which was **hard** work and **dangerous**, at least these two words strike a 'chord' and of which Douglas was familiar. There is little to indicate that Douglas 'sampled a population' in all probability just one tree, which in itself is perfectly acceptable provided seed is not collected from **succeeding generations of that mother tree or worse still an individual of that generation**, what is termed a narrow genetic base and which in turn leads to inbreeding depression, usually over several generations (Phillips, 1994).

Douglas Fir plantings of outstanding merit are found at a number of places in Scotland.

- 1 Monaghty, Moray - the origin of this particular stand is known and is the result of one of the first FC imports as 22/19 and comprised the largest import of Douglas Fir ever made by the FC consisting of 4,000 lbs (1.8 tonnes) of seed. The seed was collected in 1921 from "Canada (Lower Fraser Valley, British Columbia, considerably west of Hope)" see Anon (1965). The Monaghty trees cover a large strip and are of magnificent form and size and as they form part of a forest walk it is hoped that they will remain intact for a long time (Phillips 1992).
- 2 Glen Tanar, Deeside - this is also 22/19 and although the original stand was felled, seed was collected and a large area planted in 1961.
- 3 Achnacarry, near Fort William - another wonderful old stand of 22/19 and which will never be felled as it was 'shot through' by the Commandos who had their training ground there in the early 1940s. I am told that the trees are 'full' of shot and shell and this it would be impossible to put them through a sawmill.
- 4 Glenferness, Nairn - again 22/19 and superb.
- 5 Plodda Falls, Glen Affric - planted in 1926 by Lovat Estate and believed to be 22/19.
- 6 Reelig, by Inverness - planted in 1901 by Lovat Estate, specific origin of the seed is not known.

²FC Seed Identity Numbers from 1921 to 1956 are in two parts, the first is the year of receipt and the second is the number of that collected in the year.

³All measurements are in imperial units but some metric conversions are included. See Appendix V for conversion factors.

1976 - GRAND FIR [*Abies grandis* Lindl.]

PART I - SURVEY OF GRAND FIR

Events demand a starting point and in this particular case it is at 5 a.m. on Thursday the 29th of July 1976 prior to catching the 7 a.m. flight from Dalcross, Inverness Airport for Heathrow whereupon to meet the leader of the expedition Dr Alan Fletcher, Geneticist with the Forestry Commission's Research Division.

After what seemed an endless period of waiting and walking down endless tunnels and corridors, finally boarded flight 123, a Boeing 747 named Ocean Clipper, bound for Seattle, Washington. How these enormous overweight looking machines ever get off the ground is difficult to grasp but somehow they do and once airborne remained so for over 9 hours (in fact 9 hours 12 minutes) describing a course across the top of the globe of 4900 miles at 35,000 to 39,000 feet. Time just seemed to stand still as if suspended above a soft white cloud blanket, an impression only enlightened when there was a breathtaking view of the Greenland ice cap, followed by an endless series of glimpses of tundra over the Northwest Territories.

At 10.30 p.m. BST (2.43 p.m. ST) on 29 July 1976 there was a return to earth at Seatac airport after having somehow lost out in 'time and space' (or if you wish gained).

Unfortunately the marvels of technology just couldn't last and one of Alan's cases refused to put in an appearance. The huge circular luggage separator revolved for the last time and the last item of baggage was claimed. Hours later it seemed after exhaustive searches and official enquiries and form filling the wayward case obstinately refused to reveal itself and Alan was forced to depart with only half the necessities of life.

Once through the formalities and seen fit to enter the US we were met by Bent Gerdes owner of Silvaseed (Manning Seed Company established in 1879 and purchased by Bent in 1968 to become Silvaseed Company) Then an incredible concrete multi-storey spiral shaped car park eventually emptied us into the middle of the Interstate (I) 5 highway - an experience in itself - to be carried along in a never ending stream of traffic.

Now we were really in America complete with bewildering signs, noise, traffic and movement. 12,000 miles later on the 7th of October flight 123 we left Seatac for the return to London but there was a whole world of events in between.

The first stop was Harmon's truck rental in Tacoma to collect a small pick-up, after which we headed to Motel 6 at Tumwater, Olympia and recovery from 'Jet lag'.

Friday 30 July 1976

Called at the Silvaseed office in Roy to see Bent and his staff, Rich Reeder who deals mainly with the nursery and seed extractory and Greg Patullo who is concerned with cone

buying. The whole structure held together with super efficiency by 'Joanne' Berg in the office. Discussion centred on the location of Grand Fir seed crops and the most- likely areas for our collection. There was an interlude while we went into Tacoma to collect a permanent rented van from 'Big Jim' Harmon and struck a very good bargain. The van was Ford Econoline BRV 588 Washington with plenty of space and one which Alan has used in previous collection tours.

Return to Roy to see the large polyhouses with Rick which were currently holding some 2 million Douglas Fir, all in polystyrene block containers which are used widely in the US and seem very satisfactory giving a large plant and excellent root so vital in successful establishment. Being an exponent of 'large containers' for forest tree planting this system impressed me especially as we in Britain are in the midst of difficulties with regard to second generation establishment. Results in the US are reported as being very good all round with good germination and field survival and early growth responses. A quick look round the extractory was very impressive as to, the scale of seed involvement when one reflects that this is just **one** seed merchant. Provisional arrangements were made to book the extractory for the IUFRO collections in the US at the end of September. The Canadian collections will be carried out at Duncan because of Import/Export regulations.

Saturday 31 July 1976

Started out on the first stage of the long haul survey of possible collection sites, heading west and north over the I.5 and joining the 101 coast route at Olympia and so up into the Olympic Peninsula. This a huge area and not a little point of land conjured up in my mind when thinking of the Lodgepole Pine of that origin back home.

Five miles from Olympia on road to Mudbay we saw our first Grand Fir not many trees but all with heavy cone crops, this was near the junction of the Evergreen State College, our access was easy but stopping on the side of the main highway was risky and frowned on by the highway patrol. This would be a very doubtful collection area and there was only something like 12 trees not very far apart and possibly from a limited source. Most of the crop was Douglas Fir with some Western Red Cedar and Lodgepole Pine. However it was encouraging to see the first Grand Fir **with** cones.

On road to Shelton continued to see odd patches of Grand Fir and single trees, all with heavy cone crops, later the next day on returning from north of the Olympics a more promising area of Grand Fir was found near the Shelton turn-off in a dead end road. Here the trees were much shorter and difficult to climb though there were some young regenerated groups also, about 20 feet tall with cones.

To the east of the main highway close to the airport again near Shelton there was an area of some 3-4 acres of Lodgepole Pine only slightly straighter than south coastal but poor in general terms. This was the only Lodgepole Pine seen of any extent at all and it seems very possibly the collection area known is our provenance experiments as "Shelton".

Near Eldon turned off westward up the Hamma Hamma for some miles but nothing seen. On to the next westward turn-off from the 101 to Duckabush where a good collection could be made at Collins Camp Site together with a better group to the east of the camp site on private ground (W. H. Price) road 2515.

At the Dosewallips on road 261 between Elkhorn and Steelhead camp ground some mature trees were seen but difficult of collection, though worth a look for squirrel caches. A further promising area seen one and a half miles east of Wilsons Creek (crick) between a field and the river. It might be acceptable to combine any collection from the Duckabush or the Dosewallips valley. These sites were considered rich alluvial soils and were situated on flat river terraces with Vine Maple, Large Leaf Maple and ferns. Other conifers were Douglas Fir, Western Hemlock and Western Red Cedar.

In the Sequim and Port Angeles area spent some time looking at scattered Grand Fir but the best by far was west along the coast at Elwha which was collected from in 1974 and will be one of the present controls.

The weather so far has been fine warm and dry with clouds of dust every time a vehicle passes on the forest roads,

Looking south from Port Angeles there was a magnificent view of Hurricane Ridge in the Olympic National Park.

Night spent in Port Angeles.

Sunday 1 August 1976

Took forest road up to Bon Jon Pass on Gupter Road. to Rock Creek at junction 2926 at 1000 feet, few small climbable Grand Fir seen with cones. Also looked at another area on Gupter Road at 800 feet on edge of clear fell but these were big trees and squirrel caches would be essential. The 1974 collection area looked at in passing. Passed over Bon Jon Pass and down to Quilcene without seeing anything further until reaching the Hood Bridge but the Grand Fir were too scattered and few in number and insufficient cones for our needs. Across the floating bridge to Port Gamble but all the Grand Fir seen were in gardens or private 'clearings' in the forest and would make collecting difficult or even impossible. To the east lay the Puget Sound but once over the bridge the road turned south on highway 3 to Poulsbo, Bremerton and Shelton (possible good collection site already mentioned) before returning to Motel 6 at Tumwater for the night.

One of a number of surprising contrasts regarding the Olympic Peninsula area was the growth of the Pacific Madrona which is confined to the eastern edge of the Olympics. Many of the specimens of *Arbutus* seen were of a small tree size with beautiful soft orange coloured stringy bark rather like Eucalyptus. This dry site and mild climate contrasts with the western Olympics and rain forests of the Hoh and Queets river while in the interior lies Mount Olympus rising to 7965 feet clothed in permanent snow and ice fields.

Tumwater was the nearest and most convenient stopping place for Roy and once there (at Motel 6) the usual place to eat at night (meal of the day) was across the I.5 at the Tyee which is one of the better motels with attached restaurants (a favourite with Bob Hope). Though having said that, all (or almost so) restaurants are **good** incredibly clean and with superb service.

Monday 2 August 1976

Breakfast at Tyee, but only one grumble with American breakfasts - no marmalade and no porridge. Travel to Roy pick up cone sacks, labels and kit and see Bent, Rich and Greg. Alan's case still not appeared.

Head east to Greenwater along the White River (aptly named for its greenish white colour from the melting ice fields of Mount Rainier) on highway 410 and found several small easily climbable Grand Fir near forest roads within the Snoqualmie National Forest. Some areas were being logged by Weyerhaeuser and one had to keep on the look-out for huge logging trucks which have a tradition of stopping for no one - man or beast. Strangely enough there was little dust resulting from logging traffic but it was soon clear that the reason for this was the practise of spraying diesel fuel onto the forest road surface which through time binds the surface and builds up a blackish coating almost a tar macadam.

On the way back to the main road saw something on the road ahead which turned out to be a 3 foot long Black King Snake (species unidentified). Later also saw first Chipmunk, the first of a great many over a wide range of habitats. It soon became clear to avoid contact with the plant Devils Club which has a nasty sting.

Climbed to Sun Top mountain to inspect a Noble Fir seed stand (United States Forest Service - USFS) but a poor cone crop with an estimate of 10-15 cones from 40 trees. Elevation was 4200 feet but unfortunately visibility was poor and just within the cloud cover. The forest road was somewhat steep, narrow and a trifle disconcerting (with a steep drop on one side) and the vehicle radiator was boiling by the time the summit was reached. Just above the seed stand at a turn road near the summit was a wonderful patch of Bear Grass.

Back on the highway swing south and climbed steadily through huge timber of Douglas Fir, Red Fir, Western White Pine, Nootka Cypress and Western Hemlock and just entering the eastern edge of Mount Rainier National Park where strictly enforced laws govern any human activity, no hunting, fishing or fires in fact the accent is on no change at all, no development whatsoever and as far as can be achieved in the modern world perpetual untouched wilderness.

On this occasion visibility was not very good but even so every aspect of this enormous area was breath-taking with or without views every turn of the road revealing new incredible structure of nature, from mudflows to bottomless ravines and endless snowfields. Before the limits of the forest were reached Douglas Fir was still surviving and of enormous size though in most cases with the upper crown broken and torn asunder. Finally at 5440 feet crossed the Chinook Pass, the crest of the Cascades where scattered

Rocky Mountain Fir survives alone in the harsh and heavy snow fall areas at the limit of tree growth. Richly coloured alpine meadows erupt between huge snowfields, an incredible sight. A beautiful scarlet flower was pointed out and identified as the Indian Paint Brush.

East again into the Chinook Pass and out of the park when suddenly at the very crest of the Cascades one can look west and east, as it were from the wet country to dry, almost immediately east of the crest there is a change of vegetation and by the time Naches River is reached one is into prairie land with Western Yellow Pine, Purple Sage and Rattle Snakes. This route, highway 410, leads to Yakima a centre of fruit growing in the heart of Washington warm country but our destination long before that was a turn-off, south before Cliffdale to Bumping Lake to a collection (1974 area) stand of Grand Fir (Integrade type looking similar to Colorado White Fir). Beautiful trees with deep blue foliage and smooth silver bark, all with heavy cone crops and although moderately large trees, climbable.

Return to Tumwater via highway 123 and 12 passing through Packwood, Randle and Morton all logging townships. On the way stopped off at VIPS at Chehalis for our meal of the day, off the I.5. The Interstate highway 5 runs from Vancouver, Canada to San Diego on the Mexican border a distance of over 1500 miles and along this huge distance there are numerous eating places of which VIPS, Dennies and Sambos are the most frequently seen with their enormous signs catching the eye of the never ending stream of traffic, and to cater for which they **never close**. These chain (also Pizza Parlours, Zobos, Mr. Milles, Smittys, Kentucky Fried Chicken and McDonalds) restaurants mentioned above deserve special mention for although perhaps they do not satisfy every taste they are all super efficient, immaculately clean and perhaps best of all extremely pleasant service. All the highway roadhouses appear to operate on the same system (perhaps a trifle monotonous) of a bar (non alcoholic) with high stools for quick split second service and a bench type table service. Menus are standard and after a while you don't need one which again perhaps leads to monotony but compared to British average standards of catering it is without doubt very good. Another innovation which pleased was the standard iced water and the countless cups of coffee for the price of one!

Night at Motel 6 Tumwater which is probably the best known and most reasonable chain motel strung along the I.5. All the motels appear to have a reasonable system of charges per room rather than per person, and tend to be standard in layout but immaculately clean and air conditioned. Only twice did we encounter interesting variations, once in North Bend, Washington (in 1978) at the Sunset Motel where the previous occupier of our room had kept his dog in the room cupboard. The second case was even more interesting and certainly a 'variant'. At the Motel in Spanaway the Manageress inferred that the beds were 'shared' only (at extra cost?). - next door **happened** to be a late night bar which advertised amongst other things "Topless Go Goes" - but this may have had nothing to do with it, we never went into either establishment to see (and you will have to take my word for that).

Tuesday 3 August 1976

Travelled to Hallmark Inn, Centralla for Alan to meet members attending North West US Genetics symposium.

Move south down I.5 and found promising small Grand Fir area near Winlock on McCorkle Road, cones very green as yet. Further south left the I.5 at Columbia Road at Washington State Boundary and crossed the mighty Columbia River into Oregon just 40 miles east of Astoria (Fort George) where David Douglas landed in 1825, Vancouver in 1792, Lewis and Clarke in 1805 and J. J. Astor in 1811 (Davies, 1980).

It is also of interest to note as regards these early pioneers that Vancouver was in the lower reaches of the Columbia River in 1792. Alexander MacKenzie burst through the continent to the Pacific but further north than Lewis and Clarke in 1793 while Lewis and Clarke crossed the Rockies to the mouth of the Columbia River in 1805. Simon Fraser descended the Fraser River in 1808 and J. J. Astor established a trading post at Astoria in 1811. The Tomson N. W. Company discovered the Athabasca Pass also in 1811. Douglas arrived at the mouth of the Columbia River on the 7th of April 1825.

Found an area of heavy coning Grand Fir on the road between Mist and Vernonia on Long View Fibre Company property. Travelled to McMinnville and spent the night at the Shadows Motel.

Wednesday 4 August 1976

Still moving south and several Grand Fir areas found:

- 1 Armstrong Road off route 22 to Salem. Large group, heavy coning, 8 miles west of turning to Dallas (223).
- 2 Near Pedee on route 223. Also south of route 20 east of Wren on road to Philomath.
- 3 Glenbrook and Alsea on side of Alsea River and just east of Alsea Recreation Area and falls.
- 4 Near Norway off highway 42 on road to Fairview and McKinley. Also 4 miles south of Coquille.

Earlier in day joined route 34 west of the University town of Corvallis and on passing through Tidewater looked in vain for Lodgepole Pine (remembering home provenance experiments) and then suddenly there they were two incredibly horrible specimens alongside the village store. At Waldport just have to stop and photograph more awful looking Lodgepole Pine with crowns and cones all to ground level, but of more immediate importance there before us was the Pacific Ocean.

At North Bend we passed the huge Weyerhaeuser mill and log ponds, while further on our first sight of large orchards of walnut, apple and pear. As in Washington, everywhere, big areas of 'shaped' Christmas trees, mainly Scots Pine. A strange tree began to appear dotted about usually as single specimens which revealed itself as the Oregon Myrtle or Californian Laurel-Bay, a beautiful small tree and a source of much local wood carving for the figure and grain of the wood.

Thursday 5 August 1976

Travel south on the coast highway 101 to find a good possible collection area at turning off to Orphir and one mile to private road where a notice says "end of county road". Approximately 10 miles north of Gold Beach. A second area either side of 101, five miles north of Gold Beach, stopping might be difficult

South then to Brookings and California state line where all traffic stops and a search is made for citrus fruits which are prohibited imports.

We are now in warmer climes at latitude 42° and into a more humid atmosphere due to the effects of the Humbolt current which often causes mist along the coastline. In fact in the three journeys along this route two were in partly misty conditions. More changes in vegetation now with the appearance of Eucalyptus and soon the great groves of Redwoods. Attempts to cash-in on areas of these wonderful remnants has resulted in gaudy hordings and displays with 'The Trees of Mystery' stickers for your car, all rather disappointing after the enlightened approach of the National Parks and Wilderness Areas.

Turn off 101 highway at Arcata onto route 299 for Redding with the dry country vegetation along the Trinity River where Western Yellow Pine abounds and where we saw our first Digger Pine with its huge spiky heavy cones awful form and sparse open crowns. Saw also Pacific Rhododendron (state flower) and Madrona.

One possible area Colorado White Fir seen on way to Redding in the Shasta area at Buckhorn Summit on route 299. Many of the logging areas have reverted to Alder and may take a long time to return to high forest. Of all the species and vegetation we saw alder was the most widespread and most depressing of trees often enclosing the highway for mile after mile.

Night at Moterio motel in Redding.

Friday 6 August 1976

From Redding to Burney to see Colorado White Fir area previously reported on by Tony Lewis where there was good coning and the trees were reasonable for climbing. Very dry arid country this with an elevation between 2000 and 4500 feet and a very red soil in places with much of the vegetation being Sage, Green Manzanita (manzanita is Spanish for little apple - the fruit) and Jeffrey's Pine (much larger cones than Western Yellow Pine).

A good area of Colorado White Fir seen beyond Montgomery Creek either side of Moose camp turn-off west of Hatchet Mount summit with good selection, variable sizes and cone crops. Also on route 89 between Burney and McCloud at about Ponderosa turn-off at 4500 feet (scattered coning trees, big area in Shasta National Forest. However the final choice will probably be about 2 miles north of McCloud where there is an excellent area of smallish trees with heavy cone crops and easy climbing (route 89). Called at the ranger station in McCloud for maps. The weather was now very hot and the sun was glinting off the white painted wooden buildings and houses in the main street somewhat resembling a

wild west township, except for the cowboys. Looking up the little street to the small church with its tall spire against the intense blue sky the eye was suddenly caught by the enormous 14,000 foot bulk of Mount Shasta towering into the sky its snow cover momentarily blinding.

Shasta Fir is the variant of Red Fir reputed to lie on the north-west slopes of Mount Shasta. Not all botanists agree to it as a distinguishable variety as it may well be an intergrade with Noble Fir and Red Fir. On leaving the Shasta area to join the I.5 again saw a strange operation with irrigation sprays covering a huge area of stacked logs in a mill area. It was explained that this was to prevent overheating and possible fire and also to prevent shrinkage and cracking before going through the saws. They use of high pitched hooters in logging operations (for safety reasons) and the logging towers are huge, like rockets.

Northward through arid prairie land and ranches with scattered sage and juniper past Yreka to cross the Klamath river before again crossing into Oregon. Past Medford and branch north following the Rogue river to Union Creek where there was an all to brief stop but for several important reasons. The first being for a call at Bessie's Cafe for her renowned 'Blueberry Pie and Cream', as no-one else can make it - and I can certainly ascribe to that. Secondly to see the largest pines in the world Sugar Pine, almost impossibly huge with their enormous pendant cones at the tips of the outermost branches. One of the famous quests of David Douglas, and over which he very nearly lost his life in confrontation with an Indian party. Western Yellow Pine seen growing to a huge size but dwarfed by the Sugar Pine. Saw first species of deer. Squirrel working everywhere and one seen carrying an enormous Sugar Pine cone. At higher elevation came across a very fine stand of Colorado White Fir, small, scattered, heavy coning. Much of the area is volcanic with areas of black lava beds, this often contrasting with the beautiful orange red bark of Western Yellow Pine. Very interested to see **very** yellow lichen on many of the older trees about Union Creek. This is thought to be in fact a form of the moss [*Isoetecium stoloniferum*] which grows extensively on the trunks of old Douglas Fir forests.

Passed north of Crater Lake towards Bend noting areas of large Red Fir and huge area of Lodgepole Pine finally passing through the tiny township of La Pine - I have now reached the peak of my career (Phillips, 1984). Enormous areas of pure "La Pine" Lodgepole Pine cover almost the total area between Band and Oakridge turn-off on highway 97, a distance of 57 miles all at high elevation of between 4000 and 6000 feet.

Night at Mountain Village Motel in Bend.

Saturday 7 August 1976

Bend to Oakridge via Century Drive to visit excellent stand of Grand Fir x Colorado White Fir (also collected a 1974), smallish trees of beautiful colour and form, plenty of cones and good access with only sparse vegetation which is typical of this whole vast high volcanic region. The trees in this stand of Grand Fir are of a transition type and more like the intergrade with Colorado White Fir, with very blue foliage and silver smooth bark.

On to Oakridge via Deschutes recreation area (winter sports) and miles of Lodgepole Pine (strangely enough the cones of the Lodgepole Pine in this area did not resemble the "La Pine" type of East Scotland (later however at McKenzie Pass many of the trees have the long pointed cone of the FC Identity Number 54/693 and 54/667. "La Pine" is a favourite of mine which performs extremely well at high elevation in Glenlivet, Clashindarroch and Tornashean back home in Scotland (Phillips, 1984).

Passed many volcanic areas fringed with magnificent Western Yellow Pine and I keep wondering why we don't have more provenance trials of this species. Crossed the Cascades at 6399 feet where tree growth is very poor though still growing Lodgepole Pine, Douglas Fir and Mountain Hemlock and down into route 38 at Squaw Butte. This term Butte often seen refers to small pyramidal hills almost certainly volcanic. Saw small Grand Fir coning area at Squaw Butte suitable for a special scientific study (according to Alan Fletcher) and travelled along Salt Creek.

I am continually amazed at the growth and form of Douglas Fir at high elevation which seems so far removed from most of our plantations which suffer so badly from exposure at **low elevation**.

Inspected a very fine area of small Noble Fir at Cross Creek off State 45 road 43 on Crown Zellerbach ground at head of 100 road but very few cones seen. This would be a **must** for any IUFRO Noble Fir collection.

Night at Red Fox Motel at Estacada. (Free biro pens).

Sunday 8 August 1976

Headed for Tumwater via Mount Hood area where a check was made on the coning. Using road S12 climbed to 5000 feet to Cloud Cap and Tilly Jane Camp Site where we saw Whitebark Pine. The species change according to elevation from low to high was most interesting and followed the sequence of Douglas Fir, Western Hemlock, Western Red Cedar, Grand Fir, Lodgepole Pine, Noble Fir, Western White Pine, Red Fir, Mountain Hemlock, Douglas Fir (again, high elevation type?), Engelmann Spruce, Rocky Mountain Fir and Whitebark Pine. The ground flora at high elevation was a blaze of colour, including Indian Paint Brush and Alpine Lupin.

On the way to Tumwater noted the first heavy fruit crops in the large orchards to the south of the Columbia River, apple, pear, plum, nectarine and peach. Many of the trees have pole supports to the heavy laden branches.

Night at Motel 6 Tumwater.

Monday 9 August 1976

Travelled to Roy but no mail and no case for Alan, long faces all round. Travel to Tacoma for van service at Harmons, then on to Seatac Airport but no news of case there either. Northward to Vancouver, Canada and book in at Villa Motel. Found Vancouver a very

brash modern city with its **well lit** seamy-side, and its rather stark and cold modernistic centre.

Tuesday 10 August 1976

Visit Prof. Oscar Sziklai at University of British Columbia and discuss work and obtain some climbing kit which he has kept in store for IUFRO. The University campus is a city in itself beautifully laid out with long lawns and trees and flower beds between the acres of buildings.

Later in the day travelled north west to West Vancouver on route 99 for ferry to Gibsons thence north to Earls Cove for ferry to Saltery Bay, here to meet Rod Stevens of MacMillan Bloedel Company (M&B) who was to accompany us for the next few days. Rod was particularly interested in any future Noble Fir collection which IUFRO might undertake. Travel to Powell River noting heavy cone crop on Grand Fir but only isolated trees and small groups round houses.

Night at The Inn at Westview..

Wednesday 11 August 1976

Had an early breakfast at 0630 and then quickly surveyed the area to the north of Powell River up to Lund but only isolated and scattered small groups of Grand Fir seen along the road, many in private gardens; climbing would be difficult. Later met Rod Stevens at the M&B office after which the three of us caught the ferry to Vancouver Island, a crossing which takes a hour and a half. Not far from our landing place at Comox on Vancouver Island, a very promising Grand Fir area was found at Buckley Bay on land owned by M&B. Also looked at reasonable stands further north at Oyster Bay and Oyster River. Continued northwards to the M&B logging camp at Kelsey Bay where we spent the night as guests of the company. Accommodation was in 3 storied wooden built houses and very comfortable. Met two students from the University of British Columbia who were assisting Rod and after dinner travelled up to an area to the west of Sayward which had a number of very large Grand Fir and possibly Pacific Silver Fir which M&B said they would collect from to obtain a seed sample for us. Rod had a .22 rifle with telescopic sights with him and this was tried out as a means of shooting off the tops instead of climbing for the cones. It seemed on this and later occasions to be quite successful.

On returning to the camp towards dusk stopped at the camp rubbish tip and were rewarded by the sight of seven adult and two baby black bears. This is a fairly common event at most local refuse dumps. One has to remember though that the animals are wild and not to be approached.

The logging camp is a large self contained complex with about 400 men engaged in logging, hauling and rafting the lumber. The enormous logging trucks come in from the felling areas with 40 to 50 ton loads which are banded and then hoisted by means of a large A-frame into the log pond for rafting; small iron boats like tugs and having two propellers push the logs into position to make-up huge rafts which are towed to the pulp mills and saw mills lower down Vancouver Island and over to Vancouver.

The whole camp is centred around the bunk houses and mess hall. Across from the bunk houses are the company offices and behind them is the truck yard and machine shops which operate day and night to keep the expensive machinery working. Food is beyond description both in variety and quality and of an excellent standard. Just beyond the camp is the ferry dock for Prince Rupert and onwards to Alaska. As well as the logging camp there is a trailer park housing the married men but very few permanent houses. Trailer (large caravans) are used because the loggers are transient and once an area is logged it would be impossible to sell a fixed house.

Thursday 12 August 1976

After a huge breakfast of great variety and having made up 'pieces' from the vast range of meat and fruit available travelled south with Rod down highway 19 and then turning west onto highway 4 to Port Alberni. A reasonable stand of Grand Fir was found near Port Alberni at Timberlodge Motel and behind a disused gas station on M&B land. Good Grand Fir cone crops were also seen around the golf course at Port Alberni and in surrounding private gardens. Back to Highway 19 eastwards highway 1 to find an excellent area on M & B ground south of Parksville and Nanoose Bay. Also at Kay Road next looked at old large Grand Fir again on M&B ground west of highway 1 off the main local line. Very heavy cone crops.

Finally looked at very good small trees with big cone crops around Cedar/Harmac near the Tree Improvement Research Station of M&B Nanaimo Division run by Rod Stevens. Left Rod at Harmac after looking at his tree improvement work on graft production and glasshouse work, small Douglas Fir clone bank and Arboretum. Many of the grafts appear to be 'wedge' and look very good. Alan bitten by mosquitoes.

South of Campbell River stopped for coffee at very nice restaurant called Pacific Village run by Danish couple, rather nice muffins (Bran). Furniture made of Lodgepole Pine.

Friday 13 August 1976

Travel south to Victoria calling at the Canadian Forest Service Research Laboratory at Burnside Road to pay respects and collect some kit. Many of the staff were out or away but saw Doug Taylor who is technician to George Edwards, engaged in seed research.

Later called on Bruce Devitt, Chief Forester of Pacific Logging and Chris Heaman responsible for Douglas Fir breeding work with BC Forest Service.

Found Victoria a very beautiful city and very "English" and in great contrast to Vancouver.

Rain most of the day, for a change. Spent night at Estrella Motel in Victoria.

Saturday 14 August 1976

Travelled to the west of Victoria to Metchosin area and found several good Grand Fir coning areas but all tending to be near houses or in gardens, but continued on to Sooke and eventually found a very nice large group of about 100 to 200 trees all coning heavily. Enquired at nearby house and gained permission to collect the cones later. Back to Highway 1 and on to Duncan to survey several more areas, finally making a provisional selection of two stands.

Several possible locations were noted during the day and these were as follows:

- 1 Metchosin - junction of Duke Road and Alert Head Road woodland beside farm.
- 2 Metchosin - good group to south of Alert Head Road about 1 mile further on from last area near small farm/croft.
- 3 Sooke - Libra Place off Aquarion Road near Rocky Point Road. Mostly in or about gardens and private ground.
- 4 Sooke - large group, smallish trees easy to climb on flat ground and with heavy cone crop. Area beside small croft house owned by John Muir recently from Britain. This was by far the most promising area for collection and permission was obtained to collect later. Location near John Muir elementary school 2 miles west of Sooke on Jordan River Road.
- 5 Duncan - 5 miles south of Duncan off highway 1. Many trees to east of highway.
- 6 North end Lares Road - 3 miles north of Duncan. Area owned by "Kings" from Arbroath who were out, and although we arranged to return later on, the last area looked at proved to be the most promising, and we never returned.
- 7 Cowichan Valley Road - very fine collection area which was in the end the site chosen, one mile north-west of highway 1 beside a power line. Large number of scattered trees and heavy cone crop, mainly north-west of a power-line. Finally passed through Indian reservation area near Duncan and although Grand Fir with cone crops were seen it was decided to refrain from any collections due to any possible social and political difficulties, which might arise.

Near Duncan surprised to see what appeared to be a 'Holly Orchard', but only noted in passing and no details as to whether it was selected breeding material and its composition and layout.

Whilst at Sooke saw a few areas of Lodgepole Pine not unlike our provenance material at home 'looking unusually thin' and so was not impressed. The incredible growth of Real Estate offices both in the US and in Canada is notable everywhere; every town however small has one or more offices and 'houses' mushroom everywhere with plots marked out with coloured tape in the 'bush'. Such development often results as an initial shack and looks awful. Many, 'pioneer' stakes in the wilderness as you might say appear broken down and untidy to say the least and **all** had their stark bright coloured sign - KEEP OUT - ABSOLUTELY NO TRESPASSERS - and BEWARE OF DOG - All rather daunting to a would be visitor and most of the dogs seemed to be "German Shepherd" and do bite.

Night at Collingwood Motel in Courtenay.

Sunday 15 August 1976

From Courtenay to Oyster Bay and recorded the details of the collection stand and checked the individual trees which on close inspection revealed a climbing difficulty and a ladder will be needed on some. The undergrowth is pretty dense and difficult to penetrate, however 20 trees should be possible in a full day while staying at Courtney only some 10 miles south. Also looked again at Buckley Bay and some extent the same applies though we did find some easier trees eventually.

South to Kay Road area but here trees were tiny, the problem may be insufficient cones and the area will have to be thoroughly covered.

Night at Coho Motel, Duncan. (Coho = Salmon).

Monday 16 August 1976

Called at Canadian Forest Research Laboratory (CFS) at Burnside Road Alan to see Dick Piesch and others; in the afternoon. Alan Fletcher went back to laboratory while I took the opportunity to see the British Columbia Forest Products mill across the road from our Motel.

Extremely interesting visit, from the log pond (rafted down from the big felling areas on the north and west of Vancouver Island) to the finished product, mainly bulk sawn timber - nothing is wasted all small residue going into chips for pulp, bark and sawdust burnt to provide power and press logs for firewood. All was noise and activity, and all visiting parties were guided along yellow painted safety walkways. Perhaps the most interesting operation was cutting veneers from raw logs just out of the pond to the finished plywood. Work went on 24 hours a day (3 shifts) with enormous output, making our mills look rather small in comparison.

Night at Estrella Motel, Victoria.

Tuesday 17 August 1976

To CFS Laboratory to fix roof rack and ladder then to Swartz Bay to catch ferry for Vancouver to meet the Air Canada plane from London with Patrick Cahalan, student of Aberdeen University who was to assist us in the IUFRO collections.

Eventually we headed south crossing the border by the Peace Arch and stopping overnight at Mount Vernon in the Motel.

Wednesday 18 August 1976

Travel to Seatac Airport to enquire about Alan's long lost suitcase but **still no word**. On to Roy for mail and discuss cone crops and ripening with Bent Gerdes and Rich, down I.5 to Winlock and sampled the cone crop but still not ripe, very green and hard and the cut seed is immature, also very low number of sound seed per cut surface, now begins to look less attractive as a seed source.

To Rainbow Creek, Falls Park to inspect large old Grand Fir but they would be very difficult to climb, we must only hope that squirrels collect and cache. The area is controlled by Washington State Forest Service and is a recreational park which would make collecting difficult without special permission.

Night at Cascade Motel, Chehalis.

Thursday 19 August 1976

Re-survey and check on the Randle, Packwood and Ashford areas but nothing worthwhile found to warrant a collection, there have been a number of seed lots called Ashford or Randle. The lower slopes throughout this area are mainly scrub Red Alder which must present a real problem to re-afforestation.

The expected regeneration of Douglas Fir failed to withstand the vigour of the early Alder growth and was completely suppressed. The only answer would seem to be to cut the Alder and find a market, and **plant** checking the Alder regrowth until the Douglas Fir grows above it. This may in fact be the plan as later in the day we passed an area being logged of Alder (for pulp?).

One of our few wet cool days.

Night at Chehalis.

Friday 20 August 1976

Down the now familiar I.5 through Portland and once more into Oregon. At Albany turned off onto route 20 and head east up the Santiam Pass to the crest of the Cascades to see the 1974 collection area of Grand Fir at 4817 feet, beautiful big trees at high elevation which is unusual for Grand Fir. There was not a heavy cone crop this year. On to route 126 and then 242 and McKenzie Pass at 5350 feet with wonderful views of the Three Sisters (all over 10,000 feet), Mount Washington, Mount Jefferson and Three Fingered Jack.

The high Cascades area is geologically young with extensive areas of volcanic ejecta of pumice, cinders, ash and basaltic material. Basalt from larva outpourings was Miocene epoch over almost the whole of the Columbia River Basin provenance between 2000 to 5000 feet (600 to 1500 metres) throughout 200,000 square miles (500,000 sq. km). In the black lava flow areas there is very little plant growth though here and there sometimes on a slight rise above the lava small groups of Alpine Fir and Lodgepole Pine and even odd individuals of Whitebark Pine. The reproduction of this species is largely dependent on the hoarding habits of the Large Jay, giving rise to groups of seedlings (Franklin, 1973), twisted into fantastic shapes. It was here that some samples of Lodgepole Pine foliage and cones resembled very very closely the "La Pine" of East Scotland and it seems likely that the large collection of 54/693 and 54/667 came from here - no wonder "La Pine" does so **well** on the wild tops of Glenlivet, Huntly and Clashindarroch. Very interesting elevational species changes in descending order Whitebark Pine, Alpine Fir, Engelmann Spruce, Mountain Hemlock, Western White Pine and on the flat plain desert conditions with Purple

Sage and pure areas of Western Juniper. This is the rain shadow area due to the orientation of the mountain chains across the line of the prevailing winds.

On a ranch near Sisters was surprised to see grazing Llamas, also Aberdeen Angus and Hereford cattle. Returning to Mountain View Motel in Bend for the night. Most American towns have digital clocks above the main streets, which also display temperatures prevailing from hour to hour.

Very interested to see 'Elgin' Avenue in Bend.

Saturday 21 August 1976

Once more took the long flat endless route 97 but this time leading south over the lava plains provenance characterised by young lava flows of moderate relief interrupted by scattered cinder cones and lava buttes. One such butte 'lava butte' lies just south of Bend to the west of the main road, 'a black cinder pile', atop of which is perched a USFS fire lookout.

Moving south through endless "La Pine" Lodgepole Pine to Crescent following a minor road to Odell Butte 7035 feet a perfectly symmetrical enormous lava mountain accessible by a 'corkscrew' forest road. Western Yellow Pine persists almost to the top of the butte are of a large size, along with some Sugar Pine. At the base of the hill lie some of the largest Western Yellow Pine seen, in almost pure stands the beautiful orange bark contrasting with the deep blue sky. The heat was considerable as there was a glorious smell of 'roasting' forest. Found a very interesting small 'Pyrola' with no leaves and small waxy white pinkish bell-like flowers turned down as is typical of the Wintergreens. Koziuff (1978) quotes it as an oddity so called *Pyrola aphylla* which is really a form of *P. picta* or *P. asarifolia*, which is known as Shinleaf, - as suspected it is a saprophyte. At 6000 feet looked at Noble Fir/Red Fir transition area where the long cone types would appear to be Noble Fir and the short squat cones Red Fir.

On route to Union Creek area passing Grand Fir 1974 collection stand, and on to Crater Lake to see high elevation forest on the rim at 8000 feet. This is just about the timber line with Mountain Hemlock, Lodgepole Pine Whitebark Pine and Alpine Fir. This enormous volcanic crater must be one of the worlds largest and most incredible natural features with a jagged rim 35 miles round by roadway and the water of the crater is a startling intense blue, whilst near the centre of the lake the old cone vent juts above the water. This area is classified as the High Cascades provenance (Franklin, 1973) and most of the peaks in the area are made up of Olivine-Bearing Anderite and originated during the upper Pleistocene epoch. Bedrock is presumably observed by a mantle of pumice and ash and the most extensive of these resulted from the eruption of Mount Mazama (Crater Lake) which occurred about 6600 years ago.

Entering the Basin or Range provenance to the south and crossing the high plateau land below the crater again passed through true Juniper areas before moving along the eastern edge of Upper Klamath Lake. The marshland about the lake was a breeding ground for countless millions (trillions) of small green (lacewing?) flies and in no time the vehicle

was covered and the wipers were required to remove them from the windscreen.

Night at The Mallard Motel, just north of Klamath Falls.

PART II - COLLECTION OF GRAND FIR

Sunday 22 August 1976

Rose early and had breakfast at the High Shaperral complete with a Mexican waitress and cowboys (or almost). In good humour therefore, took highway 97 and crossed into California to meet our old friend the I.5 which was followed south to the McCloud turn-off to our 'Shasta Fir' site. A sample cut and showed that seed ripening was quite well advanced so Alan decided to collect. However just at that point thunderstorms broke and it continued to rain heavily for the rest of the day. Not a very good start to our first collection but remainder of day spent to good effect in writing etc., in the Timberline Motel in Shasta.

Monday 23 August 1976

COLLECTION GF 1

It was a great relief when dawn brought a brilliant sunny day with a deep blue sky in the true Californian tradition. It was also something of a relief to actually start work and we climbed 20 trees to fill ten sacks (about 10 bushels, 3-6 hectolitres). However this was an easy collection, small trees, branches near ground, heavy cone crop, even topography, little scrub and easy access. It was with a heavy load on the roof rack but with a light heart we set off over the I.5 to Weed, then taking a **minor** road from Gazelle to Somes Bar. This was an experience not to be repeated, and although only some 50 miles in extent it seemed never ending added to which we were not too sure of our whereabouts or in fact if the road led anywhere. To merely call it a minor road would be to do it an injustice, it was more of a shelf, 'crumbling away in places', alongside an occasional steep sided gully, narrow, twisting, turning and rough with clouds of dust, and very hot. Imagine our alarm therefore when a large loaded logging truck came up from behind us at speed, our only concern was to get out of the way - to this day we don't know how he made it, and while with our wheels seemingly half over the edge at times!

However there were 'lighter' moments when we saw some Jeffrey's Pine with their characteristically large cones; Baker Cypress and Brewer's Weeping Spruce - isolated species due to geological movement of mountain ranges and glacial affects (Pleistocene epoch) mainly on Siskiyou or Klamath mountains, also Digger Pine with their enormous heavy spiky cones very difficult to collect, almost crowning ourselves in the process of wrenching them from the trees. Let us hope IUFRO don't want a collection from this species!

Eventually we reached Willow Creek and highway 299 to Eureka. Somewhat exhausted one way or another we had a meal at the only restaurant and fell into bed at the only motel, sleep was not difficult, (on reflection not so **much** from exhaustion as relief and satisfaction).

Tuesday 24 August 1976

Refreshed by the morning, the route was due west to the Pacific on route 299 to Eureka thence to Big Lagoon to meet Fred Henschell of the Louisiana Pacific Lumber Company, who kindly showed us several possible Grand Fir areas including a recently clear felled site but unfortunately nothing suitable for our needs. A look then at the nursery area (polyhouses) similar to Silvaseed with Styro-Blocks and plants by the million, all looking very healthy with extremely high survival. Main species were Douglas Fir, Western Yellow Pine and Western Hemlock. Lunch now using a now very familiar 'Forestry Commission Speymouth Type' picnic table which was taken near the nursery in glorious sunshine. Before leaving this area took a final look to the south on forest roads and with great interest saw one of the few if not the only planted stand of Bishop pine which at first sight looked very like Lodgepole Pine and though vigorous and moderately straight very branchy with many double stems (compartment T.48).

Eventually returned to the I.5 and looked along roadside between Arcata and Trinidad but nothing further seen as regards Grand Fir. We were now at our furthest point south and 940 miles from Tumwater. A mile south of Patricks Point exit on 101 just south of the rest area there was a large group of big Grand Fir on the east side of the road, however decided against collection here putting our faith more on the area north of Gold Beach.

Night at the Bella Vista Motel in McKinleyville.

Wednesday 25 August 1976

COLLECTION GF 2

Commenced on second collection from smallish trees either side of the 101 five miles north of Gold Beach. Some deliberation on this collection as the cones were very green and hard though a few cuts showed reasonable embryo development and acceptable numbers of full seeds.

We soon learned how awful Silver Fir cones can be to collect and a large supply of throw away gloves is essential to cope with the abundance of resin which after a while turns the gloves into black encrusted sticky lumps with immovable fingers. Climbing easy but undergrowth a bit difficult to penetrate and carry out sacks.

Night at City Centre Motel, Gold Beach - not as romantic or attractive as the name implies.

Thursday 26 August 1976

COLLECTION GF 3

The third collection area lay some 100 miles north of Gold Beach off the 101 near Coquille and Norway. Though larger trees than at the last two sites all were climbable without too much difficulty and with plenty of ripe cones and not quite so sticky as at Gold Beach. The weather was now very warm and the minimum of clothing essential though the nylon boiler suits were a must and were an enormous saving on clothes. Exhausted but well satisfied so far.

Night at the Myrtle Lane Motel in Coquille.

Friday 27 August 1976

COLLECTION GF 4

Fourth collection at Alsea in very hot sunny weather which is more exhausting than the climbing.

Not many trees and not an abundance of cones but a reasonably good collection made. Crop not as ripe as could be wished though squirrels cutting a few. Climbing very easy, all small trees.

Night at Orchard Motel, Corvallis, with the swimming pool looking very inviting.

It now became necessary to off-load some of the sacks which we stacked along the side of the motel to allow maximum aeration and prevent overheating, this was only necessary for sacks inside the van, those on the roof were left in place. Failure to remove full sacks from inside the van would result in excess moisture and unpleasant conditions for the passengers.

Saturday 28 August 1976

Travel to Roy with a very full heavy load of some 40 sacks. Looked at Pedee site in passing but decided against this area due to too few trees and possible difficulties over ownership.

Re-look also at Armstrong Road (Dallas area and decided on it as a collection site but on asking permission to collect from the owner Alan got himself bitten by the Alsation - perhaps we should have taken more heed of the usual notice 'Beware of the Dog, Keep Out'! Though it did not appear too bad a wound it seemed sensible to obtain medical advice (in case of rabies) so we went to the hospital in Dallas where the leg wound was dressed. This all entailed of course much form filling and a great deal of interest in our origin and what we were doing. An amusing sequel to all this was when we presented ourselves at the hospital reception this young lady became markedly flustered (I don't know why - perhaps being suddenly confronted by 3 handsome young men!), and called

over the phone to the medical staff with the announcement "I have a dog here bitten by a leg". The hospital exploded!

There was some good ending to the day for when we reached Roy, Alan's case had arrived after having been to Washington, DC. There was also the very welcome mail. As a final ending to our adventures, discovered it was Alan's wedding anniversary.

The cones were off loaded onto the racks at Silvaseed and then off to Motel 6 at Tumwater and a meal at the Tyee and a sound sleep.

Sunday 29 August 1976

Travel to Nanaimo, Vancouver Island, via Vancouver and ferry, a distance of 228 miles. A day of travel over a route fast becoming very familiar, from the concrete skyline of Seattle to the concrete skyline of Vancouver.

Night at Fairways Motel in Nanaimo.

Monday 30 August 1976

COLLECTION GF 5

Back to Kay Road to make our first collection in Vancouver Island and 5th of the tour. The cone crop was ripe to very ripe which is somewhat surprising after finding the very hard green cones nearly 1000 miles south at Gold Beach in Southern Oregon only five days ago. Met the forester with MacMillan Bloedel, Cai Hermansen and arranged for five large Grand Fir to be felled as part of our sample collection, the remainder - some eighteen trees were climbed, altogether this yielded 10 very full sacks (over 12 bushels).

Near accident when the top of the tree on which Pat was collecting broke but all was well and he didn't fall. This was of course a difficulty and danger with Grand Fir. Almost invariably the cones are at the topmost whorls and the diameter of the stem of Grand Fir in the upper crown is very small, added to which the wood is **very** brittle. All in all another successful day, in very warm sunny weather.

Night at the Fairways Motel in Nanaimo.

Tuesday 31 August 1976

COLLECTION GF 6

Met Rod Stevens and Don Pigot at Cedar Harmac and travelled to North Bay to collect from 20 trees mainly by felling and shooting out tops. Weather very hot and sunny, with good ripe cones.

With Rod and Don paid our first and **only** visit to a pub, small rather old world and rustic set in somewhat unusual surroundings, one had almost to push through the undergrowth to

get to it. Beer rather expensive at \$1.50 for a small bottle, but very good, perhaps because it was our only inbibement of alcohol in some 7000 miles.

Night at Thunderbird Motel in Duncan.

Wednesday 1 September 1976

COLLECTION GF 7

Move to Port Alberni, Sproat Lake West and collection completed with help from Rod and Don. A big collection made by climbing, felling and shooting, from 22 trees yielding 20 bushels approx.

Night at Thunderbird Motel, Duncan.

Thursday 2 September 1976

COLLECTION GF 8

Collection west of Victoria completed in brilliant sunny conditions but exhausting carrying the sacks out to the van some distance from the site. 20 trees sampled, 17 sacks, 20 bushels approx. Now fully loaded for a return trip to the Duncan extractory and off-loading the sacks onto the high racks for drying-out and awaiting kilning. An excellent system this and simple but very difficult to get foresters back home to do anything about air drying.

Night at Thunderbird Motel.

Friday 3 September 1976

COLLECTION GF 9

Collection completed after some difficulties over ownership and obtaining a key to a gate leading into the area. Excellent embryo development and ripening. Approx. 20 bushels collected. Duncan collection site on the road to Mexulie Lake (Mountain provenance).

Night at Thunderbird Motel.

Saturday 4 September 1976

COLLECTION GF 10

Buckley Bay collection completed under very wet and dangerous conditions. Best area was half a mile up forest road, with large number of Grand Fir in mixture with Douglas Fir and Western Red Cedar all heavy coning. Approximately 18 bushels collected.

Night at Collingwood Motel, Courtenay.

Sunday 5 September 1976

COLLECTION GF 11

Oyster Bay and a day of wet and misery made worse by difficult climbing and a poor crop with hard green cones and poor embryo development. All this and resin encrusted cones under a wet dull sky. Most of the evening spent drying out sodden clothing, followed by deep sleep only to be wakened up in the dead of night by a women in the motel being rather unwillingly arrested by the Royal Canadian Mounted Police, nothing to do with us I might add.

Night at Collingwood Motel.

Monday 6 September 1976

Return to Duncan, and the cones to the storage racks. Time to see the British Columbia Forest Museum which is a very large open air 'exhibit' of early logging in BC complete with an old steam engine used in early logging operations hauling coaches round the area for the benefit of visitors. Enormously interesting and well presented, showing every aspect of forest operations in natural surroundings in the days of huge trees and huge logging operations, but too much to take-in in the time available. Travel south to Victoria but missed ferry to Port Angeles so back to Saanich for the ferry to Vancouver, and then south again passing under the Fraser River and over the border into the US.

Stop for the night at the MK II Motel at Mount Vernon.

Tuesday 7 September 1976

Back to Tacoma for van service at Harmons and Alan to the Bank. Onward then to Roy for mail and to see Bent Gerdes about use of the extractory.

Traffic accident east of Roy and another one near Hood River - first accidents seen in 7000 miles of travel.

Weather sunny dry and warm and this has been a feature of most of the tour to date. Excellent meal at the Char Burger - cooking over charcoal - near Hood River in the Columbia River Valley. Interesting collection of forest tools hanging from the walls of this Char Burger (as in 50% of the restaurants throughout Washington and Oregon). Noted some 'Planet' tools. This route is highway 80 Portland to New York.

Night at The Vagabond Motel looking down into the mighty Columbia River.

Wednesday 8 September 1976

COLLECTION GF 12

To Bend via the Mount Hood road and into the desert region (Columbia River Basin) mainly of Basalt formation of huge extent covering over 200,000 square miles of Washington, Oregon and Idaho.

Much of the desert region from Warm Springs to Bend is irrigated with vast systems of spray pipes even some seen on huge wheels which move slowly over given areas completely automated, water is pumped from the incredibly sparkling fresh Deschutes River. Much of the crop is mint and sweet corn.

Called at the Forest Service office then on to the collection site off Century Drive. Cut tests showed very low seed set with poor embryo development, and also very few trees with good cone crops, the net result being only 6 sacks of cones. Beautiful stand this, like Shasta. The stand is in the introgression area between Grand Fir and Colorado White fir (mid Idaho - Salmon River). Form of the trees is excellent. This was a recollection from a site sampled in 1974 and used as a control in experiments.

A very warm lovely day after cold morning start (often the case in the high elevation regions).

Night at Mountain Village Motel, Bend.

Thursday 9 September 1976

COLLECTION GF 13

From Bend to Oakridge site which turned out to be not a large collection but nevertheless approximately 10 bushels from 20 trees scattered along the edge of a railway line. Extremely hot sunny weather and exhausting work.

On the route between Odell Butte and Crescent Lake saw more examples of the excellent form of the Colorado White Fir of Bend and Shasta. One wonders if the cross (specific) between Colorado White Fir and Grand Fir might give useful progenies. Also saw examples of heavy coning on Engelmann Spruce and here again the cross Sitka Spruce and Engelmann Spruce could have useful possibilities.

Night at Orchard Motel, Corvallis.

Friday 10 September 1976

COLLECTION GF 14

On arrival at the Dallas site was alarmed to find the crop far advanced in cone ripening and many of the trees have open cones disintegrating. However, managed to select and collect from 12 trees (9 sacks). The site is very sheltered from the east and obviously

catches the sun - today is an example - oven hot and utterly exhausting. Weather blisteringly hot (93oF) and much liquid consumed - mainly 7-Up, juice and milk.

Travel to Forest Grove and spent night at Holiday Motel

Saturday 11 September 1976

COLLECTION GF 15

Weather now cooler, relief. Made an excellent collection at Long View Weed area from 20 trees (15 bushels). Cones just ripening and trees of fine form.

Travel to Roy and leave cones, then to Chehalis for the night at Cascade Motel. Road traffic hair raising; lanes for buses and cars with a minimum of 3 persons, the traffic near cities is quite overpowering.

Sunday 12 September 1976

Travel to Naches via the White Pass Highway, the huge bulk of Mount Rainier to the west and on through the Park. The policy of the Parks Department, I find very realistic despite some feeling that a greater degree of management is necessary such as old and dead tree felling. I think the untouched wilderness is right, no felling, no development, no hunting, no fires, sanitation felling as it is called is not warranted in my opinion.

The size and particularly the form of the old Noble Fir seen is truly incredible and a lot more energy should be given to its provenance and breeding potential for British Forestry. What wonderful country this is with such a wealth of natural forest. The Nisqually River is a beautiful sight, rushing greenish white from the snowfields and glaciers.

Strangely enough noted the large green leaves of the Skunk Cabbage for the first time though it is very common in wet places. It took me some time to understand the meaning of signs reading 'Comfort Station'. Once again we were across the Cascades from wet west to dry east into desert land and the warmth.

Night at The Whistling Jack (A Marmot of the rodent family) Motel on the Naches River. It was something of a relief to see that most of the mountain roads have runaway vehicle escape routes.

Monday 13 September 1976

COLLECTION GF 16

Bumping Lake collection area completed in perfect weather but only 6 sacks (20 trees) a light crop but all trees climbable. This is the best stand I have seen for form, and is the eastern Cascades control. Cones were still green and hard but a cut suggested a good

percentage of sound seed. Bumping Lake was a re-collection of a 1974 control lot.

Crossed back over the crest going west and had a wonderful view of Mount Rainier without cloud and perfect visibility.

Night at Kings Motel, Enumclaw.

Tuesday 14 September 1976

COLLECTION GF 17

Dawned wet and persisted most of the day, so decided to deposit cones at Roy and then head for Olympics but on way looked in at Shelton to find the cones very ripe and some falling apart. However collected from 6 small trees by climbing and filled 3 sacks and then collected 5 sacks from squirrel caches.

Called at the Pacific National Bank in Parkland. Night at Thunderbird Motel in Shelton.

Wednesday 15 September 1976

COLLECTION GF 18

To Winlock only to find that too many trees have over-ripe cones and in any case the number of trees was such that no worthwhile collection could be made. Decided to travel to Rainbow Falls Park via Pe Ell, and on route several Grand Fir areas seen but for one reason or another they did not fulfil requirements. Arrived at the Park and obtained permission to collect from squirrel cuts - fortunately many cones were to be found on the ground throughout the Park and 7 sacks were collected.

Travel back to Enumclaw and spent the night at Kings Motel.

Thursday 16 September 1976

COLLECTION GF 19

The Greenwater area collected and an excellent crop of some 15 sacks though cones still very green and hard (compared with Dallas), many more could have been collected, and looked longingly at another area a few hundred years old up the White River with some 200 trees. Many scattered trees also throughout mainly Douglas Fir area. This could be a good future commercial collection area.

Saw some Beaver workings.

Night at Thunderbird Motel, Shelton.

Friday 17 September 1976

COLLECTION GF 20

Travel to Duckabush and successfully collected 7 sacks from squirrel cuts and caches. Then on to Dosewallips to find most of the cones very ripe and disintegrating. No collection made. Dull damp day.

Night at West Motel, Sequim.

Saturday 18 September 1976

COLLECTION GF 21

Elwha and the last collection completed (Louella cancelled due to insufficient trees and cones also very green and small).

Saw black bear at Louella.

Night at Indian Creek, in Indian Valley Motel.

Sunday 19 September 1976

Travel south via west Olympics and saw Hoh River and the Rain Forests with many of the trees festooned with the moss *Isoetes stoloniferum*, very humid and wet and in great contrast to the east side of Mount Olympus.

Also saw the remains of the reputed largest Red Cedar but now only a huge decayed stump. Girth of over 66 feet.

Back to Shelton via Aberdeen, Hoquiam and Elma all logging towns and famous names to us for Douglas Fir and Sitka Spruce. It's my birthday, yes, a young 50!! No celebrations - nobody knew - just as well, I could have been thrown into the nearest river.

Night at Thunderbird Motel,, Shelton.

Monday 20 September 1976

Two more sacks of cones collected from the Duckabush area from squirrel caches, then travel to Spanaway for the Bank and to Roy to unload cones and collect mail. Back onto the I.5 and northwards to spend night at Mk II Motel at Mount Vernon. Sunny dry and very warm.

Tuesday 21 September 1976

Early start to catch the ferry from Anacortes to Sidney and then Victoria. Very misty at first but clearing to sun in the Gulf Islands. Starter trouble at Motel in Victoria.

Night at Estrella Motel, Victoria.

For some while we had all been suffering from a dreadful itch which turned out - not to be 'fleas' but Poison Oak which can on certain individuals cause severe and widespread inflammation. It was first 'noted' at Naches on the 13th-14th September. The rash is common in Oregon and can be contracted from the Sumac plant (Poison Oak) of which there are three main species Poison Ivy, Poison Sumac and Poison Oak, all of the Anacardiaceae family. It seems very likely that we all caught it at Dallas which will be long remembered for this and other reasons. Treat Poison Oak with strong soap, keep skin clean, disinfect old clothes to stop spread. Apply calamine lotion. Rash can be quite severe, Alan much worse than Patrick or myself. Alan has an unfortunate tendency to suffer adversely from Poison Oak, mosquitoes and of course dogs. The sumacs are a source of tannin, waxes, dyes and varnishes and medical compounds. Some species cause serious skin inflammation and are found from BC to California.

It was of interest to note that Garry or Oregon Oak is the main white oak in Oregon and wood is supplied to cooperages such as Craigellachie in Moray.

Misty at first, clearing to sun in Gulf Islands.

PART III - EXTRACTION OF GRAND FIR

BC FOREST SERVICE EXTRACTORY AT DUNCAN

This was carried out by us with help from Mary Hamilton and Betty who worked in the seed lab.

Wednesday 22 September 1976

Victoria to Duncan. All lots including 40 sacks from Kelsey Bay (collected by M&B) put into the kiln, all in good condition and reasonably dry from the period on the racks (8 collections). All the Grand Fir seed collected in BC extracted at Duncan, Vancouver Island and not allowed into the US due to Woolly Aphid.

Night at Thunderbird Motel, Duncan (To 28th). Very wet all day.
Evening meal at 'The Dog House'.

Thursday 23 September 1976

All lots (except Kelsey Bag) put through kiln (even Oyster Bay). No difficulties and the majority of the cones broke down well.

Friday 24 September 1976

All lots put through the tumbler extractor and the rough cleaner, and a start made on the dewinging and scalping. Fine sunny and warm.

Saturday 25 September 1976

Whole day on cleaning and five lots completed to dewinging and scalping. Visit from local press. Again fine and sunny.

Sunday 26 September 1976

Dewinging and scalping completed and all lots now ready for last screening on gravity table separator. Another very warm and sunny day.

Monday 27 September 1976

All eight collections now completed on gravity table and each lot of seed weighed and packed in two halves (security against loss) ready for air freight to Denmark. There were big differences between the various collections as regards amounts of seed. Sooke and Kelsey Bay give the lowest yield and Duncan and Buckley Bay the highest which could be just poor pollination or indeed a provenance difference. Another press visit. Warm and Sunny.

Celebration beer over our evening meal at 'The Inn on The Green', prior to our departure and Patrick's leaving to return to Aberdeen University.

Tuesday 28 September 1976

Leave Duncan for Victoria where Alan called on George Edwards at the Burnside Lake with seed samples. Later to the Research Office in the centre of Victoria. To Airport to put Patrick on plane for the first leg of his journey home. Back then to the B.C. Research Office in Victoria before catching the ferry to Vancouver, and head south into US. Crossed border safely with the seed. Warm sunny and dry.

Night spent at the Aloah Motel in Bellingham.

Wednesday 29 September 1976

Travel to Seattle stopping at 'southcentre' and on leaving van refused to start again. Sent for mechanic from Harmons who eventually started the vehicle, thereafter making for Tacoma where a new starter was fitted. On to Roy for mail and then Tumwater for the night of the 30th. Mainly sunny dry and warm after early slight mist.

SILVASEED COMPANY EXTRACTORY AT ROY

Thursday 30 September 1976

Spent long day on filling the trays with cones and all lots put into the kiln by 8.30 p.m. with help from Rich and 3 men. Not forgetting James, Jim and Annie who gave tremendous help and friendship. Sunny dry and warm after slight mist and clouds.

Motel 6 at Tumwater until Tuesday 5 October.

Friday 1 October 1976

Mainly checking over kit. Cones in kiln not yet ready to come out and some still a little pitchy. Decide to begin extraction on Saturday. Afternoon to bank and booking flight home on 7th. Dry warm and sunny.

Saturday 2 October 1976

Commenced extracting but encountered difficulties over the use of the small drum extractor. Finally arranged to use the large rotary extractor but not until some lengthy adjustments and fitments had been made taking up much of the morning. A great deal of help from the Silvaseed staff allowed us to get through 11 lots by the end of the day. Slight rain but mainly dry, cooler.

Sunday 3 October 1976

All lots put through the dewinger. Bend, Shasta and Greenwater lots very pitchy Gold Beach collection put over the gravity table, and seed not looking too good with poor development of endosperm and embryo.

Monday 4 October 1976

All lots put through the clipper machine and most over the gravity table. Shasta very damp so put into cold store for the night. Moisture content taken of all lots and some still too high and will require to be dried in kiln.

Tuesday 5 October 1976

Several lots loaded into trays for drying in kiln to lower moisture content - some lots (Shasta) having 17%; "the aim is to decrease this to 8% to 9.5% by running the kiln for a maximum of 4 hours. A start made on weighing seed and packing into two samples which will be air shipped to Denmark. Dry sunny periods, warm.

Wednesday 6 October 1976

Complete checking the seed and weighing - total 200 kg from about 330 sacks (400 bushels, 146 hectolitres).

Left for Seattle airport (Seatac) and flight to London. Alan to on to Blind Bay in the interior of BC to see Frank Barnard of Western Tree Seeds about Lodgepole Pine seed for the Forestry Commission.

Night at Travel Lodge, Seatac.

Silvaseed commenced their own extractions today, already they have 40,000 sacks of cones on the racks, mostly Douglas Fir - not a good year. In 1966 they had 100,000 sacks.

Thursday 7 October 1976

Left Seatac on Plymouth Rock Clipper at 1450 in brilliant sunny weather after early mist on the snows of Mount Rainier, clear to the east. The flight path was NE, just east of Mount Baker and east of Salmon Arm over Columbia Reach and the Rockies. Across Jasper at about 31,000 ft and then into cloud near Edmonton, with fantastic colours at cloud base of orange, blue and green. Some breaks in the cloud allowed glimpses of Alberta and Slave Lake, then crossing over into Saskatchewan and over the NW corner of Lake Athabasca, the famous early route of the Athabasca Pass from Western to Eastern sides of the North American continent to the Hudson Bay Company post at York Factory. Into NW Territories above low cloud. Light going fast at 1715 and a distinct line between light and dark getting nearer and nearer. Dark at 1745. At 2330 ST (0600 BST) coming in over Hebrides and Skye, dawn just showing, very bumpy. Scattered lights showing through cloud, wonderful colours of blue, green, orange, red and yellow. Passed over Glasgow at 0645 every light showing as a network of lines. Landed at London, Heathrow at 0745.

1978 - NOBLE FIR [*Abies procera* Rehder]

PART IV - SURVEY OF NOBLE FIR

Friday 8 September 1978

Arrived at Seatac airport aboard PAN-AM 747 with Colin McLean and Patrick Cahalan at 1400, in light rain somewhat unexpectedly but after a rewarding flight over the Rockies and the vast forests of the Northwest.

After customs and immigration clearance met Dr. Alan Fletcher who had proceeded us out by two weeks. A slight delay occurred until part of my luggage was found - thereafter we boarded the same vehicle used in the 1976 tour and headed south down the I.5 to Centralia for our first night at the Hallmark Inn. "Strangely" enough the first person we met was Roger Lines who with Alan was over for the meeting of IUFRO Provenance Groups dealing with Douglas Fir, Lodgepole Pine, Sitka Spruce and Silver Fir.

Prior to the meeting and prior to our arrival, Alan and Dr. Barner (Danish representative of IUFRO who is responsible for the seed collections) had paved the way for the collections and travelled some of the routes we would follow.

Saturday 9 September 1978

To the Silvaseed Company plant at Roy to fit the roof rack and to collect cone sacks. Meet and discuss collections with Dave Gerdes. First shopping expedition at Spanaway for food over the weekend. At Baw Faw (Weyerhaeuser land) and on Pe Ell road near the MacDonald Seed Orchard of Weyerhaeuser Company up to 2300 feet good Noble Fir area seen with plenty of trees and easy to climb **but** very little coning to be seen. Unfortunately heavy rain and poor visibility made observation difficult. Decided to return later.

Night at Cascade Motel, Chehalis, Washington, and evening meal at Kit Carsons.

Sunday 10 September 1978

At Larch Mountain, Washington which is near Yacolt and 20 miles south of Mount Saint Helens, found a very good area of Noble Fir with plenty of cones. A cut test showing enormous amounts of full seed per cone but not quite ready for collection - though State of Washington Department of Natural Resources had started collecting.

Many people in area 'hunting and shooting', it being the weekend.

Larch Mountain, Oregon (Control) is another good Noble Fir area but at higher elevation (2600 feet) and merging with Alpine Fir. Rain still persisting, heavy at times with some thunder, not at all the sort of weather expected, even though we were still in the Western Cascades and separated from the Columbia Basin by the High Cascades.

Travel back to the Columbia River and spend the night at the Meredith Motel, Hood River, Oregon.

On entering our motel room and looking out of the window down onto a vast sweep of the Columbia River my attention was drawn to several large black 'crows' identified by Colin as Kites - Rough Legged Hawks. On walking down to the Char-Burger for the evening meal one could clearly see the dry scrub hills in sunshine far to the east making the Columbia Basin east of the High Cascades. A quite remarkable visual geographical expression of climatic zones as could be found anywhere.

Monday 11 September 1978

Called at the Ranger Station at Parkdale for information on Noble Fir sites, first to:

- 1 Mount Defiance-Rainy Lake - good cone crop, easy collecting. Also noted a good Grand Fir area as well.
- 2 Laurence Lake - moderately good prospects. Lunch at Kinnikinnick (Bearberry), camp site (East of Mount Hood).

- 3 Robin Hood Camp Site - moderately good prospects.
- 4 Lolo Pass - again good possibilities but crop somewhat scattered - younger material.
- 5 Estacada - an excellent stand, large area, young trees in pure crop. Easy climbing and heavy cone crop, perhaps the best collection area seen and obviously natural regeneration from a large original population - area was on Crown Zellerbach land.

Saw our first Blue or Stellas Jay - very colourful and beautiful birds. Later came across an interesting shrub Chinkpin of the Beech family with heavy burrs like Spanish Chestnut (Kazlott, 1978).

This was our **first** dry day and with sunny periods. Called at Ranger Station at Zig Zag.

Night at the Red Fox Motel, Estacada, Oregon.

Tuesday 12 September 1978

To Wolf Camp Butte where at 4500-5000 feet found an excellent area of Noble Fir with good coning and moderately easy climbing, however a report from Forest Service did not give much hope for a good seed set, cones not ripe.

Wonderful views of Mount Hood and Mount Jefferson from the series of sharp ridges and escarpments. Patrick had quite an experience when two wolves passed below him from his rocky ledge. Afternoon to Odell Butte, West of Bend to find a very good crop of Noble Fir/Red Fir (transition zone), branches a bit down swept but not impossible to climb.

Noted 'mint' fields of the desert between Madras and Redmond. At last the weather seems to have improved with glorious sun and warmth - we were now of course east of the Cascades and in the Columbia Basin area. All the way down from the Columbia River was sun and dry desert through Warm Springs Indian Reservation, Madras, Redmond and Bend at one point stopped to inspect a forest of Western Juniper (also known as Sierra Juniper) growing in dry arid soil (Cox, 1983).

Night at the Sportsman's Lodge Motel, in Bend, Oregon.

Wednesday 13 September 1978

Purchased 2 - 6 foot ladders and straps for roof-rack before -travelling on to Odell Butte but due to the onset of more rain decided to head for Oakridge and after seeing Forest Service located a suitable area for collection at Groundhogs Mountain though here too were wet conditions and so not possible to start the collection.

For the first time we saw Incense Cedar in the wild, and quite a good, clean timber tree though believe it is susceptible to rot. The Incense Cedar we have at home look nothing like this and may well be clonal and closely related at least. Also saw a very large Sugar Pine which must be near the northern limit of the species (Randall, Keniston and Beven,

1957). Also noted much Antelope Brush growing under the cover of "La Pine" Lodgepole Pine.

Night at Halls Motel, Oakridge, Oregon.

PART V - COLLECTION OF NOBLE FIR

Thursday 14 September 1978

COLLECTION NF 1

The first collection was at Odell Butte, Oregon on USFS ground and by great good fortune the weather cleared to a glorious day of sun and warmth - even at 6400 feet the conditions were perfect, climbing easy once over the difficult lower 15-20 feet. 19 bushels collected from 31 trees. The cones in good condition, with little effect from seed wasp. High number of seeds per cone. Cones rather green and hard. As already mentioned the Noble Fir may be an intergrade species with Red Fir.

There was an interesting ground flora dominated by two main shrubs Green Manzanita and Snowbrush (Franklin and Dryness, 1973). Noted many squirrels and chipmunks, with the squirrels already cutting and several piles of cones were seen.

Also what appeared to be Phantom Orchid growing on rotting wood under heavy shade, quite colourless and jelly-like, almost transparent.

Night at again Halls Motel, Oakridge.

Friday 15 September 1978

COLLECTION NF 2

At 3500 feet, this Control collection at Mary's Peak, Oregon (USFS). Weather returning to dull and damp at first but fortunately clearing to a warm, sunny day.

This was an excellent collection area with large areas of Noble Fir and very large cone crops, many age classes in the pure stands from large old trees of 9 foot diameter, cones just ripe and in perfect condition, no seed wasp seen. Collected from 30 trees.

Forest Service very strict about the collection as one forester was present throughout the operation, later another forester arrived who was not satisfied with our papers and in due course the sheriff arrived but by this time it all appeared to be sorted out and we were not detained!

Marks of and very strong smell of bear down in the older Noble Fir but nothing seen.

Night in the Town House Motel in the university town of Corvallis, Oregon, one of the most pleasant of the American small towns we came across.

Saturday 16 September 1978

COLLECTION NF 3

Oakridge (Juniper Ridge), Oregon (USFS) is a transitional area at 5600 feet. In perfect weather made a very good collection of 23 bushels from 23 trees. The centre of the collection area was open with almost pure Beargrass. Also identified Tiger Lily and a most beautiful coloured snake appeared to be California Mountain Kingsnake (Kezlott, 1978).

Night at Pacific 6 Motel, Coburg, Oregon. Being the weekend, much at risk from the shot of hunters from all directions.

Sunday 17 September 1978

COLLECTION NF 4

At 3200 feet, Laurel Mountain (Bureau of Land Management). Collection completed in very wet miserable conditions but a good collection made of 24 bushels from 22 trees. The trees were a little scattered but cut tests showed a good pollination. Many of the trees carried cones of immensely large size with heavy crops on individuals.

A feature of the area was the often dense carpet of Canadian Dogwood.

Night at the Town House Motel, Corvallis, Oregon.

Shot at by passing hunters in their car. (But they missed!)

Monday 18 September 1978

COLLECTION NF 5

Head of 100 Road (Crown Zellerback), Oregon. An excellent area of very large extent, an 'easy' collection but not a heavy crop, 23 bushels from 23 trees.

Two men from Brown Seed Company, Vancouver, Washington, stopped and disputed our right to collect as the firm had exclusive rights to collect. However we convinced them all was well and that we had full permission.

Night at Red Fox Motel, Estacada, Oregon.

Hired a U-Haul in Corvallis for the transportation of our 100 sacks of cones to Roy.

Tuesday 19 September 1978

At Roy, Washington, loaded cones on to the racks for drying and trailer returned to U-Haul at Parkway, and then to the bank for money, and a Safeway for food stocks

Travel to Everett for night. Incredibly heavy traffic. Weather still sunny, dry and warm. **Another** birthday. Now (still young) 52!

Night at Waits Motel, Everett, Washington.

Wednesday 20 September 1978

COLLECTION NF 6

At 4000 feet, Burlington Northern, Stevens Pass, Washington (control seed source). This was a south-facing site at mid-elevation with large areas of somewhat open and scattered Noble Fir. Difficult collection, mainly because of the large size of the trees and because some collecting had already been made on many of the 'easier' trees, however 22 trees sampled and 18 bushels obtained. One of the most northerly stands of the species (not found in Canada).

Night at Sunset Motel, North Bend, Washington.

Thursday 21 September 1978

COLLECTION NF 7

At 3750 feet Stampede Pass, Washington and Snoqualmie Pass, Burlington Northern. Several pickers have obviously been in the area, so collection was a little difficult from the biggest trees only, however a good collection was made from 19 trees yielding 22 bushels. Weather good and sunny after a damp start. Silvaseed picking from individual trees for progeny work.

Headed for Enumclaw but no vacancies, same at Tumwater, eventually spent the night at the Park Hotel, Centralia, Washington.

Friday 22 September 1978

Travelled to Larch Mountain, Washington, but low cloud and very wet conditions made any collection impossible. On to Ranger Station to arrange about week-end work.

Stayed at Meredith Motel, Hood River, Oregon until Monday 25 September.

Saturday 23 September 1978

COLLECTION NF 8

At 4200 feet on Red Mountain, Washington (USFS). An excellent collection was made of 18 bushels from 30 trees, but small cones.

Could not reach the collection area due to very rough, slippery track. Several other cone pickers in the area but all having pick-ups and four-wheel drive trucks including USFS. Trial riders also in the area which did not help matters. There was therefore a long haul to carry the cones down to the vehicle but towards the end of our labours a USFS truck helped with the last few sacks, which was an enormous relief.

The day turned out sunny all day and the scenery was magnificent, with views of Mount Hood and Mount Adams, and the wonderful Autumn colours of the Vine Maple. Passed through some Lodgepole Pine at Petersons Prairie, very young trees but presumably the same origin as our home provenance experiments.

Sunday 24 September 1978

COLLECTION NF 9

Mount Defiance, Oregon (USFS) - huge potential cone crop but approximately 90% of the developing conelets in the Spring were stunted and killed probably by frost and cold winds. The worst damage was from the top of the tree downwards, though some smaller, sheltered trees were unaffected. Only 11 bushels were collected from 30 trees.

Dry, sunny and warm.

Monday 25 September 1978

COLLECTION NF 10

Elkhorn, Oregon (USFS) - only managed 15 bushels from 28 trees due to the cone crops being very ripe and in many cases breaking up.

Very warm, dry sunny weather. Later went to the summit of Cloud Top 6000 feet on the slopes of Mount Hood and saw Whitebark Pine growing in severe exposure and area of heavy snow. It was interesting to see the deep snow-line marked on the stems of the Mountain Hemlock showing as an abrupt halt in the growth of stem lichen.

Tuesday 26 September 1978

COLLECTION NF 11

At 3500 feet on Larch Mountain, Oregon (USFS) - control. Problems with slow puncture, and finally purchased a new tyre. Hire U-Haul. A very good collection in good

conditions. Large trees only just climbable but with rewarding results after a long climb, big cones and many, with 21 bushels from 20 trees. Exhausting work.

Night at the Park Hotel, Centralia.

Wednesday 27 September 1978

To Roy to take cones to extractory and collect mail, thence to Parkway for the bank and to deposit the U-Haul trailer. Travel to Enumclaw and booked in at the Kings Motel. Later on the way to the next collection site, Mowich Lake, we broke down with fuel blockage.

Thursday 28 September 1978

At Enumclaw and to garage for repairs.

COLLECTION NF 12

At 5300 feet Corral Pass, Washington (USFS) - in the afternoon made, a start on the collection, conditions wet but 9 bushels gathered. The first stop had been at Mowich Lake but the trees were difficult to climb, though there were good cone crops. The Forest Service had been collecting but using irons, and some private collectors also.

The highlight of the day came when Alan and Colin saw a Cougar cross the track in front of them while sitting in the van, whilst Patrick and I who were coming down the hill must have passed within yards of the animal without seeing it.

Night at Kings Motel, Enumclaw.

Friday 29 September 1978

Completed collection in perfect dry sunny weather with wonderful views of Mount Rainier. This area was relatively high at a level with Alpine Fir and Engelmann Spruce. 17 Bushels harvested.

COLLECTION NF 13

Mud Lake, Randle, Washington (USFS) - in afternoon made a start at Mud Lake at the end of a 30 mile forest road.

At evening meal I asked for marmite! What's that? Night at Mountain View Lodge Hotel, Packwood, Washington.

Saturday 30 September 1978

Mud Lake - very difficult working conditions with low clouds and rain. Found *Sorbus scopulina* but had to abandon collection because of weather.

Carlton Ridge is impossible to climb and no squirrel cuts, very disappointing as this is quite a magnificent stand with heavy crop of cones but enormous trees and some of the largest Noble Fir I have seen. Also large Douglas Fir and Western Hemlock in this area as well as Pacific Silver Fir.

Found Lady Fern, a sign of a good moist brown earth associated with Pacific Silver Fir of optimum growth.

Night at Mountain View Lodge Motel, Packwood.

Sunday 1 October 1978

Mud Lake at 4800 feet - rain at first but by the time we reached the site it had started to clear and the rest of the day was sunny and dry.

Made a very good collection from 40 trees yielding 18 bushels.

Back to Motel by 4 p.m. with Alan and Patrick leaving for Roy with cones and returning that night having had a puncture on the way.

Night at Mountain View Lodge Motel, Packwood.

Monday 2 October 1978

COLLECTION NF 14

At 3950 feet Elk Lake, Oregon (USFS) - travel from Packwood (new tyre at Salem) then to thence to Detroit Ranger Station. Finally to Elk Lake over difficult roads. Very good cone crop and the first squirrel cuts so two sacks filled and another six by climbing.

Frost at first but beautiful warm, sunny day thereafter.

Night at Mike's Motel, Detroit.

Tuesday 3 October 1978

Completed the collection in the morning with 20 bushels from 30 trees in total.

COLLECTION NF 15

At 4000 feet Idanha (Fisher Point) - this was a felling area in which Alan had arranged for our collection. Only 8 bushels managed as USFS had already collected 500 bushels!

Night at Mike's Motel, Detroit.

Wednesday 4 October 1978

Travel to Roy and cones to extractory with brief call at Seattle Southcentre for kit to travel to Everett en route for Vancouver.

Night at Waits Motel, Everett.

Thursday 5 October 1978 to Thursday 19 October 1978

See Parts VII and VIII for report of work on Lodgepole Pine.

PART VI - EXTRACTION OF NOBLE FIR

Friday 20 October 1978

At Silvaseed in Roy we removed all 194 lots of Collection 1 from the racks onto pallets ready for loading. The plant is on a 24 hour shift so we worked all night and should have the kiln filled by midday on Saturday.

Colin left to return home.

Saturday 21 October 1978

At Roy, all seed lots into the kiln by 6 p.m.. All night shifts.

Sunday 22 October 1978

At Roy, 8 lots extracted by 6.30 p.m.. All night shifts.

Monday 23 October 1978

At Roy, all lots extracted by afternoon and 3 lots scalped by midnight.

Tuesday 24 October 1978

At Roy, all lots scalped and dewinged by 3 a.m. (Wednesday).

Wednesday 25 October 1978

At Roy, all lots put over gravity table.

Thursday 26 October 1978

At Roy, commenced weighing and packing prior to air freighting to Denmark, as is

*We collected 15 lots and 4 were obtained from commercial sources - see Appendix III for details.

the custom for security reasons, each lot split in half into separate shipments. Also carried out moisture content checks which is a vital element in storage. Six lots had a moisture content of over 10% (9% is the level for storage) and were put back in the kiln to dry overnight.

Friday 27 October 1978

At Roy, completed packing and weighing after which all the seed was put into the Silvaseed cold store to await shipment (15 lots). The total collection weighed 641 lb. (291 kg) of seed. This was at the first weighing, there being some slight adjustment for the 6 lots which were kiln dried to reduce the moisture content. All this from 7 to 8 tons of cones!

In the afternoon left Roy for Seatac airport for plane to London.

1978 - LODGEPOLE PINE [*Pinus contorta* Douglas]

PART VII - SURVEY OF LODGEPOLE PINE

A report about this part of the trip collecting for the British Forestry Commission was published in Scottish Forestry (Phillips, 1987) and see also Hopkinson (1931).

Thursday 5 October 1978

At Vancouver the team split up, Alan and Patrick to make collections at Garibaldi on the BC mainland and Mesachie Lake on Vancouver Island. Colin and I caught Boeing 737 of Pacific Western Airlines and flew out over and up the Strait of Georgia, Queen Charlotte Strait and Queen Charlotte Sound and up the BC coast islands and the Hecate Strait in beautiful clear, sunny weather. However on approaching Queen Charlotte Island (QCI) a bank of cloud covered the island and this persisted through most of our stay, together with rain which reminded us of our Scottish west coast! Low cloud made the approach to Sandspit airport difficult and nerve-racking but after two attempts we made it. On landing we collected our rented car (Budget) MRS 83S Toyota Corolla and headed for Queen Charlotte City via the Skidgate ferry to Graham Island. After some difficulty and wandering around the rather sad and broken down looking 'city', found the ranger Ben Hansen and obtained permission to collect Lodgepole Pine cones. This request caused no small surprise so it seemed. At the Government Agents Office obtained a very good map of Graham Island.

Left Queen Charlotte City on the only road north to Tlell where the National Parks Department have their office and from there north-west to Port Clements on the way passing large areas of mainly moribund Lodgepole Pine growing in muskeg with a few scattered large trees near the road edge and on slightly dryer ground but no cones seen.

Night spent at the Golden Spruce Motel, Port Clements owned by Stan Newcombe who is the cone buyer for Frank Barnard of Western Tree Seeds who is to undertake the Lodgepole Pine seed extractions for the FC. Our evening meal was taken in a somewhat broken down cafe at the local gas (petrol) station.

The standard of life and housing appears to be very low - more as I would imagine in the far north of Alaska and the North West Territories.

PART VIII - COLLECTION AND EXTRACTION OF LODGEPOLE PINE

Friday 6 October 1978

COLLECTION LP 1

After breakfast at the petrol cafe, drove to Parks Office at Tlell but no one about. Returned then to the areas seen in passing on Thursday between Tlell and Port Clements as sampled by Keith Illingworth but very few cones and about 80% of these were riddled by the cone borer *Eucosma recissoriana* and useless. The bulk of this area was on muskeg where growth was moribund and trees only a foot or two in height. Everything very wet and our feet in no time were sodden also.

The second area was near Hogan Point also noted by Illingworth, have again poor growth on the muskeg but not so much cone borer and we collected a sample off some 100 trees.

A third area off the main road side south of Hogan Point yielded much better results with very few infected cones. Any better growth occurred largely on disturbed soil at the roadside and slightly better drained areas.

Night at the Seegay Inn, Masset (Later learned that this motel was burned to the ground in 1979.) We experienced very poor food and a strange listless atmosphere. During the night there was considerable disturbance from without and in the morning the area was strewn with broken bottles, the hotel door smashed and a hut overturned and our car displaced (but fortunately undamaged).

Saturday 7 October 1978

Continued with cone collections alongside the road south of Masset to Port Clements and again very wet, dull and unpleasant, the rain and wet feet finally forcing us to return to Masset to buy wellington boots. Shopping was very poor and as with Queen Charlotte City and Port Clements, Masset is run down and dejected looking with miserable housing and an unhappy looking population. In the forests also there is a dejected and forlorn look with regrowth extremely poor with many dead, decaying and sickly trees in a desolate landscape. Huge areas are on muskeg where growth is at its lowest and with little or no drainage. Tree growth stagnates and although the worst muskeg looked treacherous we never encountered floating bog conditions.

Almost minute changes in topography resulted in dramatic changes in tree growth while herb and shrub growth remained much the same. The main tree species on the muskeg were Lodgepole Pine, Yellow Cedar, Western Hemlock and Western Red Cedar. In the lower vegetation there 'thrived' such plants as Swamp Laurel, Pacific Labrador Tea, Salal, Kinnikinnick, Bog Bilberry and Skunk Cabbage.

In many areas dead, bleached spikes of cedar point skyward as evidence of long past forest fires and where the topography changes and becomes more uneven with dips and hollows. These are often choked with fallen decaying log lying in stagnant water.

Night spent in the Singing Surf Inn just outside Masset where the accommodation was considerably better and the food also, and with no night disturbances.

Sunday 8 October 1978

In the morning we drove east from Masset along the north coast to Yakan Point passing on the way a large flock of Canada Geese in their homeland as it were, feeding in a short grassy marsh area. The plan was to search for other areas of Lodgepole Pine but in the event none were found but it was extremely interesting to see the development of Sitka Spruce along the shore-line in a comparatively **narrow** band and to the very tip of rock cliffs and sandy places. Nowhere did the species penetrate more than a few hundred yards inland thereafter replaced by Red Cedar and Western Hemlock. The growth of the Sitka Spruce was poor and the form dreadful, and despite the nearness to the sea the whole area is rain forest with enormous hanging strands, and cushions of moss including *Isoetes*, much a feature of many rain forests of the west. Quite apart from its intense botanical interest it was a dank, dripping and depressing sight, especially when one thinks of the flourishing Sitka Spruce forests at home many of which were probably derived from this very area. There seems little doubt that a great deal of our seed from Masset came from this area and most probably collected by the Haida Indians just to the north-west of the town of Masset and along Masset inlet.

Actual collections would most likely have come from the lopping of trees since squirrels are a relatively recent acquisition/introduction. There seems to have been no felling and climbing would have been difficult perhaps. Everything is sodden and dripping into a waterlogged forest floor and most trees seem to be almost in check and unhealthy, indicating that some of the big old Sitka Spruce at Tow Hill must have been incredibly old.

Spent the night at the Golden Spruce Motel only to find our little petrol station cafe closed and so we dined in meagre fashion.

Monday 9 October 1978

On the advise of the Ranger at Queen Charlotte City a visit was made to an area on the Bay Road near Juikatlá west of Port Clements to see some 'good growth' Lodgepole Pine. Indeed the growth **was** better than anything we had seen to date but still they were growing in semi-waterlogged ground though not muskeg and in general there is more

uneven topography. There were no pure stands of Lodgepole Pine but a mixture with mainly Cedar and Hemlock. Several individual trees were in fact quite outstanding and the largest seen was estimated to be all of 9 feet (2.7m) in girth and 92 feet (28m) in height with superb form - if only we could have collected scions. All these trees of course quite unclimbable without special equipment.

Whilst on the road to Juskatla camp which is a private logging road owned by the MacMillan Blodel Company we took the opportunity to see the Golden Spruce which is a natural yellow Sitka Spruce and quite outstanding.

Night at the Golden Spruce Motel.

Tuesday 10 October 1978

Completed all the possible Lodgepole Pine collections along the Masset - Port Clements road which over the period covered an eight mile stretch mid-way between the two townships. Our total collection was $1\frac{3}{4}$ sacks or 3 bushels of cones and in the circumstances this was thought to be reasonable bearing in mind the extremely poor crop, tiny cones, plus the time spent locating the areas, and last but not least the miserable weather conditions. Our expected average yield was 425g to yield 31,000 seedlings or 18,000 transplants but in the event the first yield was almost twice this at 775g of seed. The cut tests carried out certainly indicated a good seed set and the amount of male flowers seen supported this. From a genetical point of view this collection was an extremely valuable one as the number of individuals sampled over a very wide area was probably in the region of 6,000.

The cone prospects for 1979 were good but again mainly on the edges of the muskeg and roadside.

It was interesting to note that the only really thriving life form seen was that of the Raven (and heard).

Last night spent at the Golden Spruce Motel.

Wednesday 11 October 1978

Travelled to Sandspit airport to return rented car and catch the 1.10 p.m. plane to Vancouver which flew via Smithers. At Vancouver we caught the 5.30 p.m. plane to Victoria to be met again by Alan and Patrick.

Night at the Capri Motel in Victoria. Had evening meal at "Denny's" one of the very few American chain restaurants in Canada.

Thursday 12 October 1978

COLLECTION LP 2

Travel north 150 miles to Campbell River then 50 miles west to Gold River, through the Strathcona Provincial Park, a company town of the Danish Tahsis Company who have

large investments in land, timber and sawmilling. This was one of the most pleasant townships we had come across with the main part of the housing and town centre built on a flat river terrace.

A start was made on collecting from a young 10-16 foot tall Lodgepole Pine reservation just south of Gold River now the local "tip" where every evening the black bears would come down to scavenge and where one could watch those beautiful animals from within the safety of the vehicle.

It was at Gold River that Larsen planted his first larch.

Night at The Chalet Motel in Gold River.

Friday 13 October 1978

Continued picking south of Gold River filling almost one sack (2 bushels) after which we moved to another site by the trailer park and cemetery but although the trees were small this cone crop was very light and not much progress was made. Individual trees carried reasonable crops but these trees were few and far between. Another possible area off the Port Hardy road turned out to be difficult, not too good as regards form and difficult to climb.

Most of the hills were steep sided and rocky and many of the slopes carried large pockets of Lodgepole Pine in inaccessible situations which would have made collections extremely difficult or impossible. The form of the trees in these areas looked to be very good from a distance though we were never able to obtain a closer look. The steep sided valley continued south-westward to meet the sea at the Muchalat Inlet thence due west, to the coastline looking out to Nootka Island.

A fine sunny day after early haze and even slight frost.

Night at the Chalet Motel.

Saturday 14 October 1978

Collection completed in the morning from all the available sources to be found but not a very good crop with only 1½ sacks filled though many trees sampled. On the whole I was not too impressed with the Gold River Lodgepole Pine and although reasonably straight the branching tended to be a bit long and the foliage thin. Saw no large trees at all.

In the afternoon went to Twaddle Lake off the Port Hardy road to see a magnificent stand of Pacific Silver Fir reputed to be 250 years old from which Thasis have collected cones this year, by helicopter!

The thought was to perhaps collect some cones from possible squirrel caches but very few could be found. However we added to our collection from the helicopter dump point where a pile of cones had been discarded due to insect attack.

Cone collections by helicopter could be used by the FC as a possible means of securing crops of difficult access without resorting to unproductive felling etc. A platform is secured to skids on the helicopter and the collector is safely secured on this. The crowns of the heaviest coning trees are cut with pruners or a saw, and a loop of wire attached. About six tops can be secured in this way before the helicopter needs to return to the collecting point.

Night at the Chalet Motel.

Sunday 15 October 1978

Travelled to Ucluelet and Tofino and surveyed the area for cones but the prospects were far from good and next year (1979) would be much better on the assessment of the cone crop. Most of the possible sites were within the Pacific Rim Park but a good area was seen around the Tofino Airport which was outwith the park limits. An alternative area seen on our journey west of Parksville was either side of the road above Cathedral Grove beyond Port Alberni (Mount Bland).

Much of the material seen between Ucluelet and Tofino resembles very closely that of QCI in all respects. A good collection could be made in 1979 if clearance is obtained from the appropriate authority.

A strong demarcation line of Sitka Spruce exists along the Long Beach area south of Tofino.

Night at the Thornton Motel, Ucluelet.

Monday 16 October 1978

Called on the Pacific Rim National Park ranger and obtained permission to make a research collection but written authority must first be obtained from Parks Director in Calgary.

Later we made a small research collection from about 100 trees in the Rain Forest car park area. This area is of easy access and easy picking and suitable for any future collections (a good crop exists for 1979). The trees are all low, bushy and well spaced and dry underfoot as a change from the muskeg. Collections would have to be made in August/September as most of the cones are now open. All the Lodgepole Pine seen resembles the QCI type in morphological terms and most cases grows in much the same sort of ground (muskeg). No large trees seen.

In passing had a look at the Rain Forest trail which was very similar to the Hoh River area in the Olympic Peninsula of Washington, with huge moss-covered Western Red Cedar, Western Hemlock and Sitka Spruce predominating.

Travel to Port Alberni to see ranger for a permit to collect cones at Alberni Summit. This turned out to be a very good collection site. There was a very different Lodgepole Pine type which tended to be light foliated on their branches but very straight. Possibly due to the very close grown stems which tended to be thin. In many ways a strange site with little

vegetation and great slabs of rock everywhere, no doubt indicating the pockets of soil were very shallow. At the top of the hill there were many bush trees with heavy cone crops and easy to collect. That afternoon _ of a sack collected.

Night at Esta Villa Motel, Port Alberni.

Tuesday 17 October 1978

COLLECTION LP 3

All day collecting at Alberni Summit, and at the end of it the total was 5 bushels.

Weather superb, sunny and dry.

Night at Esta Villa Motel, Port Alberni.

Wednesday 18 October 1978

Collection completed at Alberni Summit with a total of approximately 7 bushels. Travel to Duncan and leave cones, then on south to Victoria, leaving roof-rack and ladders with George Edwards of CFS.

Night at the Islander Motel, Victoria.

COLLECTION LP 4

At Garibaldi was carried out by Alan and Patrick.

COLLECTION LP 5

At Masachie was carried out by Alan and Patrick.

At the end of the day the extraction results showed that we had collected a total of 5.557 kg. of seed from the 5 sites.

Thursday 19 October 1978

At Victoria where Alan went to see BC Forest Service staff and to obtain maps. Travel to Tumwater via Victoria ferry to Port Angeles and Olympic Peninsula.

Night at Motel 6, Tumwater until Thursday 26 October.

PART IX - SOME THOUGHTS

THOUGHTS IN GENERAL

Road manners and driving are outstandingly good, perhaps it may be the speed restriction of 55 mph or good policing but never-the-less signalling is good, speed is observed and risks and bad driving are seldom seen. One can change lane on any side but other vehicles always give way. Many rules are quite different from those in UK. For instance where safe to do so it is permissible to turn right on Red and flashing Red gives right of way to all.

The growth of Realty is enormous and the reason for this is obscure but perhaps the pioneer spirit is still alive. Everywhere small clearings in the "Forest" are seen with "huts" and houses going up often ramshackle. Immediately this happens a notice goes up "Keep Out". This latter expression sounds a little harsh and is often accompanied by "Beware of the Dog". The explanation may be found in the growth of a young nation of mixed origin and there is a physiological need to protect and survive. A rather strange first sign of a Staked Claim to ground is the sight of pieces of coloured tape hanging from branches along the demarked area.

The brashness of signs in towns and enormous multiplicity of hoardings is confusing and gaudy with the added feature of multiple overhead wiring of electric and telephone wires in all directions. Some poles carry telephones, electric and "other" wires all "mixed-up together.

Eating out is **very good** and can be indulged in throughout the day or **night** and most towns (even small ones). Waitress service is outstandingly good, cleanliness perfect, though the menu tends to become a little stilted.

Late opening of shops is a real feature in almost every town, and most of the super-markets and Malls open every night (and Sundays) to 9 p.m. or even midnight. The accent on shopping is in huge Malls out of town with parking

FUTURE COLLECTIONS

There are always big differences between individuals (genetic) but perhaps the variation between populations as regards seed viability is not so much a genetic factor as one of

- 1 Pollen supply.
- 2 Germination.
- 3 Development and a controlling factor, weather.

There were enormous differences between areas as regards cone ripening e.g.:- Dallas cones breaking up while Greenwater and Oyster Bay were hard and green as was Gold Beach which is over **1000 miles** south of Oyster Bay.

Bend in southern Oregon was semi-ripe but poor seed set was probably due to a light pollen supply.

Two teams and more money **and** time is the only answer to current collection time, but this does not answer poor development due to other agencies.

If it was possible to rely on squirrels this would certainly be the 'easier' way to collect but they do not always cut, when they do and one can find the caches the cones are usually ripened and have been kept well, moist without moulding, so seeds probably develop well in this case.

Probably 20 trees per site is too small a number but then this is the 'considered' figure and in a practical way the number of trees one/two men can collect from in a day plus travel.

Collections should only be made in areas of heavy coning or where the trees in the population are 'reasonably' close together but in some cases one must accept a low cross pollination if the population is required for testing.

If time and money allowed perhaps collections should be carried out over two or even three coning seasons over the same populations.

Genetically the best stands have probably been 'missed out' due to difficult or 'near' impossible climbing and in such cases one would like to have seen 'unusual' collection practices used such as harvesting by helicopter (not too unusual in the US).

FOREST TREE SPECIES

The various species in their natural environment was of considerable interest as a study in itself. The two species which were of special interest were Douglas Fir and Noble Fir both of these species are at present considered of relatively minor importance in our forest programme though both grow extremely well in their own environment and produce a very large volume of timber of good quality.

Douglas Fir covers enormous areas of Washington, Oregon and BC and is the major species of those areas, growth is rapid and form exceptionally good. It is the form of the Douglas Fir which is of such interest especially in the high inland areas which contrasts greatly with ours at home which in the main is poor in form wherever exposure is involved. One wonders if the high elevation Douglas Fir would be more suited to our climate in many cases.

Noble Fir is a species which should only be planted at moderately high elevations not in the valley bottom as so often seen in Britain. Magnificent Noble Fir stands grow to enormous size with a very high form factor and incredibly straight stems, on the high slopes of the Cascades. Certainly a species we should provenance test - sampled at least to IUFRO standards.

Alpine Fir is a very high alpine timber line species but one worth provenance sampling for the increasingly difficult high sites we may have to consider.

Pacific Silver Fir is a species with a tremendous range and surely worth provenance testing at least.

Engelmann Spruce is again high to moderately high elevation species of wonderful form and again its range suggests more provenance work is desirable. Genetically well worth some work on crossing with Sitka Spruce. There are natural hybrids in the Skagit Valley in BC.

Western Yellow Pine has a great natural range and although mainly a dry area species but nevertheless worth some study in limited areas of Britain.

Mountain Hemlock is strictly a high elevation tree with a moderately wide distribution and almost untried in the UK.

Western Red Cedar has been rejected for a long time because of rust in the nursery, and rot in the forest but little provenance data available. A tree of considerable potential for growth rate and quality. Climate and soil differ greatly in many respects of course to the UK but there would seem to be very strong reasons (economic) for alternative species in the British forest programme (certainly from a research base).

Sugar Pine does not have a wide range but a tree of huge size and perhaps a proper provenance testing should be attempted.

Hybrids - some work would be justified on crossing various related species though care would be needed to ensure a good population base.

EXTRACTORY NOTES

- 1 Storage Racks
- 2 Fork Lift
- 3 Kiln Loading Ramp
- 4 Decked Trays and Rail System
- 5 Kiln at 90oF
- 6 Tumbler Stainless Steel Seamless Thrasher
- 7 De-winging
- 8 Clipping
- 9 Scalping
- 10 Gravity Table
- 11 Purity
- 12 Moisture Content 9%
- 13 Storage at +2oC
- 14 1% Moisture Loss for every hour at 90oF
- 15 Air Column for Removal of Pitch

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APPENDIX I - PLANTS AND ANIMALS SEEN

Scientific names for conifers according to Dallimore and Jackson (1966) and for other trees and shrubs Rehder (1940).

Note - * seen but not mentioned in report

Date in brackets is date of first introduction to Britain.

TREES

Alaska Yellow Cedar - see Yellow Cedar

Alder - *Alnus rubra* Bong. and *Alnus oregana* Nutt.

Alpine Fir or Subalpine Fir or Rocky Mountain Fir - *Abies lasiocarpa* (Hooker) Nuttall. -
Whitepass Highway, Washington [1863]

Baker Cypress - *Cupressus bakeri* Jepson

Bishop pine - *Pinus muricata* D. Don. - Eureka, Oregon

Brewer's Weeping Spruce - *Picea breweriana* S. Watson

Californian Laurel-Bay or Oregon Myrtle - *Umbellularia californica* (Hook. & Arn.) Nutt.

Californian Red Fir or Red Fir - *Abies magnifica* A. Murray - intergrade with *A. procera*
[1851]

Coast Redwood or Redwood - *Sequoia sempervirens* (D. Don) Endlicher - Coast Road,
101, Oregon [1843]

Colorado White Fir - *Abies concolor* (Gordon) Hildebrand - Burney and Redding,
California, intergrade with *A. grandis* in Southwest Oregon/Northwest California [1873]

Digger Pine - *Pinus sabiniana* Douglas - California, named after Joseph Sabine [1832 by
Douglas]

Douglas Fir - *Pseudotsuga menziesii* (Mirbel) Franco. - Packwood Randle, Vancouver
Island [1827 by Douglas]

Engelmann Spruce - *Picea engelmanni* (Parry) Engelmann - Inland Mountains, High
Elevation [1864]

Garry oak or Oregon Oak or Oregon White Oak - *Quercus garryana* Hook - named after
N. Garry, Hudson Bay Company [1825 by Douglas]

Grand Fir - *Abies grandis* Lindley - intergrade with *A. concolor* in Southwest Oregon/
Northwest California [1831 by Douglas]

Incense Cedar - *Calocedrus decurrens* (Torrey) Florin. - Estacada, Oregon [1853]

Jeffrey's Pine - *Pinus jefferyi* A. Murray - Burney, California [1853]

Juniper - see Western Juniper

Large Leaf Maple - *Acer macrophyllum* Pursh.

Lodgepole Pine - *Pinus contorta* Douglas - coast Washington and QCI

* Low's Silver Fir - *Abies concolor* (Gordon) Hildebrand var. *lowiana* (Gordon) Lemmon
- near Union Creek

Madrona - see Pacific Madrona

Mountain Hemlock - *Tsuga mertensiana* (Bongard) Carriere - high elevation [1854]

Noble Fir - *Abies procera* Rehder - intergrades with *A. magnifica*, Marys Peak, Ore, Odell
Butte (Transitional)

Nootka Cypress - *Chamaecyparis nootkatensis* (D. Don) Spach

Oregon Myrtle - see Californian Laurel

Oregon Oak - see Garry Oak
 Oregon White Oak - see Garry Oak
 Pacific Madrona or Madrona- *Arbutus menziesii* Pursh. - seed collected 1978
 Pacific Silver Fir - *Abies amabilis* Douglas ex Forbes [1830]
 Poison Ivy - *Rhus toxicodendron* L
 Poison Sumac - *Rhus vernix* L
 Ponderosa Pine - see Western Yellow Pine
 Red Fir - see Californian Red Fir
 Redwood - see Coast Redwood
 Rocky Mountain Fir - see Alpine Fir
Sorbus scopulina Greene
 Scots Pine - *Pinus sylvestris* L
 Sierra Juniper - see Western Juniper
 Shasta Fir - *Abies magnifica* A. Murray cv. *shastensis* Lemmon
 Sitka Spruce - *Picea sitchensis* (Bongard) Carriere - Olympic Rainforest, QCI [1831 by Douglas]
 Subalpine Fir - see Alpine Fir
 Sugar Pine - *Pinus lambertiana* Douglas - Union Creek, Oregon [1827 by Douglas]
 Vine Maple - *Acer circinatum* Pursh.
 Western Hemlock - *Tsuga heterophylla* (Raf.) Sarg. [1851]
 Western Juniper or Sierra Juniper - *Juniperus occidentalis* Hooker, f. - Warm Springs, Oregon
 Western Red Cedar - *Thuja plicata* D. Don - Indian Creek, Washington and Olympics, QCI [1853]
 Western White Pine - *Pinus monticola* Douglas ex D. Don
 Western Yellow Pine or Ponderosa Pine- *Pinus ponderosa* Douglas - Odell Butte, Oregon [1827 by Douglas]
 Whitebark Pine - *Pinus albicaulis* Engelmann - Mount Hood, high elevation [1852]
 Yellow Cedar or Alaska Yellow Cedar - *Chamaecyparis nootkatensis* (D. Don) Spach. - Queen Charlotte Islands [1854]

SHRUBS

Antelope Brush - *Purshia tridentata* DC.
 Bearberry - see Kinnikinnick
 Big Whortleberry - see Mountain Huckleberry
 * *Berberis nervosa* - low, unbranched (compare with *B. aquifolium*)
 * Blue Berried Elder - *Sambucus glauca* Nutt.
 Bunchberry or Canadian Dogwood - *Cornus canadensis* - Laurel Mountain
 Californian Hazel - *Corylus californica* (A.DC.) Rose. - (similar to *C. cornuta* March. - Beaked Hazel)
 Canadian Dogwood see Bunchberry
 Chinkapin - *Castanopsis chrysophylla* (Hook.) DC
 False Boxwood - *Pachystima myrsinites* Raf.
 * Fremont Silk Tassel - *Garrya fremontii* Torr.
 Green Manzanita - *Arctostaphylos patula* Greene
 Kinnikinnick or Bearberry - *Arctostaphylos uva-ursi* (L) Spreng.
 Mountain Huckleberry or Big Whortleberry - *Vaccinium membranaceum* Torr.

- * Oregon Grape - *Berberis aquifolium* - tall (compare with *B. nervosa*)
- Pacific Labrador Tea - *Ledum columbianum* - Muskeg, QCI
- Pacific Rhododendron - *Rhododendron macrophyllum* G. Don
- Poison Oak - *Rhus diversiloba* Torr. & Gray - Dallas
- Red Huckleberry - *Vaccinium parvifolium* Sm. - QCI
- Salal - *Gaultheria shallon* Pursh. - QCI (also in my garden, from Benmore)
- * Salmonberry - *Rubus spectabilis* Pursh.
- * Thimbleberry - *Rubus paviflorus* Nutt.
- Swamp Laurel - *Kalmia occidentalis* Small. - Graham Island, QCI

PLANTS

- Alpine Lupin
- Beargrass - *Xerophyllum tenax* - Suntop, Cloud Top, Washington
- Bog Bilberry - *Vaccinium uliginosum*
- Cliff Paint Brush - see Indian Paint Brush
- Common Sage - see Purple Sage
- Corral Flower - *Heuchera* sp. - not sure if this is the one found by Douglas, one in my garden)
- * Coral Root Orchid - *Corallorhiza* sp. - dark moist forest, parasitic on fungi and roots
- Devils Club - *Oplopanax horridum* - shady forests, stinging
- Harsh Paint Brush - *Castilleja hispida* - lower elevation (compared with *C. rapicola*)
- Indian Paint Brush - *Castilleja rapicola* - high alpine (compared with *C. hispida*)
- Mint
- Phantom Orchid - *Edurophyton austinae*
- Purple Sage - *Artemisia tridentata* Nutt.
- * Pussy Toes - *Antennaria lanata*
- * *Streptopus roseus* - rosy twisted stalk
- Shinleaf - *Pyrola asarifolia*
- Skunk Cabbage - *Lysichiton americanus* - widespread (found in Moray in 2002)
- Snowbrush - *Ceanothus velutinus*
- Tiger Lily - *Lilium columbianum* - Juniper Ridge, Oregon
- *Twin Flower - *Linnaea borealis* - Elk Lake, Oregon
- * Vinilla Leaf - *Achlys triphylla* - everywhere
- * Wild Ginger - *Asarum caudatum* - Stevens Pass, Washington
- Wintergreens - *Pyrola aphylla*, *P. picta* or *P. asarifolia*

MOSSES, LICHENS AND FERNS

- Lady Fern - *Athyrium filix-femina* - Carlton Ridge, sign of good loam in Pacific Silver Fir stands of optimum growth
- * Lichen - *Caloplaca* sp. - yellow crust on rocks
- *Old Mans Beard - *Usnea hirta* - yellow form of lichen
- Moss - *Isoetecium stoloniferum* - grows extensively on tree trunks (Douglas Fir) in natural forest. Also in long streamers in rain forest, Hoe River, Olympics and Tow Hill area of QCI and Torfina, Pacific Rim Rain Forest. A form of this moss may be a yellow

- moss growing on trunks of Western Yellow Pine , east of Cascades.
* Staghorn Moss - *Lycopodium alpinus* - Stevens Pass, Washington

MAMMALS, BIRDS AND INSECTS

Not a very inspiring list - too much attention to trees!

Beaver
Black Bear
Black King Snake (species unidentified)
Blue or Stellas Jay
California Mountain Kingsnake - *Lampropeltis zonata*
Canada Geese
Chipmunk
Cone Borer - *Eucosma recissoriana*
Cougar or Mountain Lion
Deer
Green Lacewing Flies - Upper Klamah Lake, Oregon
Large Jay - *Nucifraga columbiana* - Oregon Cascades
Llamas
Marmot - Whisting Jack
Rattle Snake
Mountain Lion or Cougar
Raven
Rough Legged Hawk (Kite) - Columbia River
Squirrel
Stellas or Blue Jay
Wolf
Wooly Aphid

APPENDIX II - PHOTOGRAPHS, MAPS AND POSTCARDS

PHOTOGRAPHS

- 28 Aug 1976 Loaded and off to the Seed Extractory at Roy.
- 17 Aug 1976 Log raft of Vancouver Island.
- 16 Aug 1976 BC Forest Products Mill - Victoria.
- 8 Sept 1978 Greenland ice cap.
- 12 Sept 1978 Mount Hood from ridge of Wolf Butte.
- 25 Sept 1978 Mount Hood and Whitebark Pine.
- 6 Aug 1976 Alan and Sugar Pine, Rogue River.
- 21 Aug 1976 me and Western Yellow Pine.
- 12 Aug 1976 me (again) and a small logging truck.
- 20 Aug 1976 Three sisters. Volcanic ash and larva beds.
- 13 Sept 1976 Mount Rainier at 5500 feet from White Pass Highway. Alpine Fir.
- 13 Sept 1976 Mount Rainier. Alpine meadow.
- 6 Oct 1976 The Team, press photo in Cowichan Leader, Duncan.
- 6 Oct 1976 Bent Gerdes and Joanne of Silvaseed at Roy.
- 21 Aug 1976 La Pine (Lodgepole Pine), 15 miles straight to Crater Lake.
- 12 Oct 1978 Bears at Gold River, Vancouver Island, BC.
- 10 Oct 1978 Lodgepole Pine on Muskeg between Masset and Port Clements, QCI.
- 14 Sept 1978 Odell Bute, Oregon, first NF collection. Cahalan, McLean and Fletcher, 6400 ft.

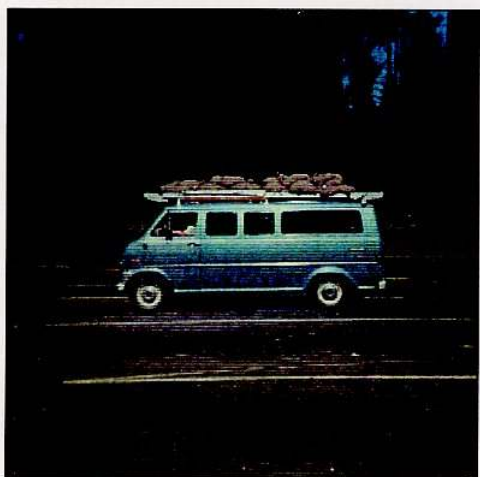
MAPS

- 1 Queen Charlotte Islands
- 2 British Columbia
- 3 Washington
- 4 Oregon
- 5 California

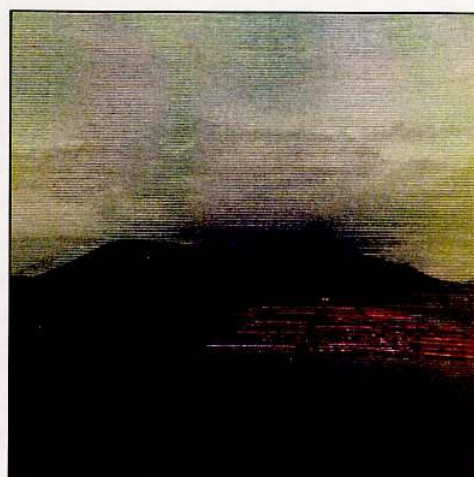
POSTCARDS

Indian Paint Brush
Crater Lake
A large load, probably Western Yellow Pine
Mount Rainier and Vine Maple
Mount Shasta and Rabbit brush
Beckies Cafe (road to Crater Lake) - 'Blueberry Pie'
Black Butte near Mount Shaster
Mount Hood and Beargrass
Western Red Cedar
Three Sisters, Oregon
Vancouver, BC (note log pond)
Spar tree
Mount Adams, Washington

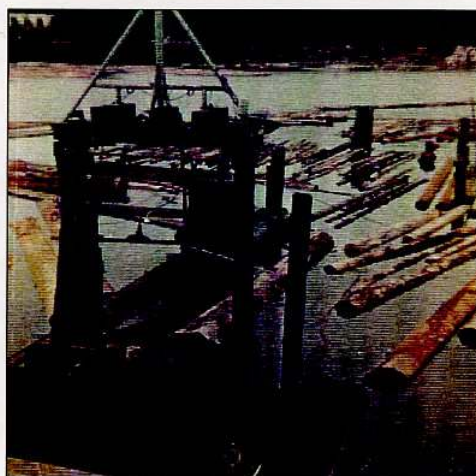
PHOTOGRAPHS 1/5



28 Aug 1976
Loaded and off to the Seed Extractory at Roy.



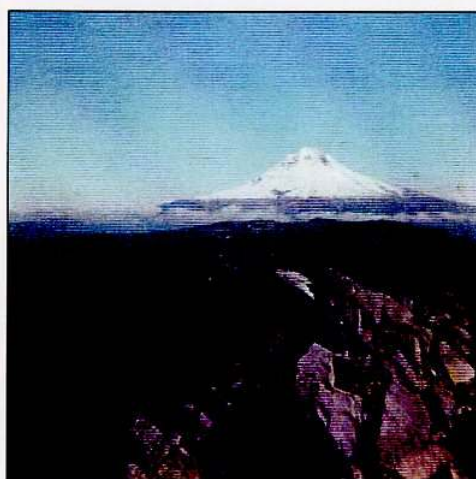
17 Aug 1976
Log raft of Vancouver Island.



16 Aug 1976
BC Forest Products Mill - Victoria.



8 Sept 1978
Greenland ice cap.



12 Sept 1978
Mount Hood from ridge of Wolf Butte.

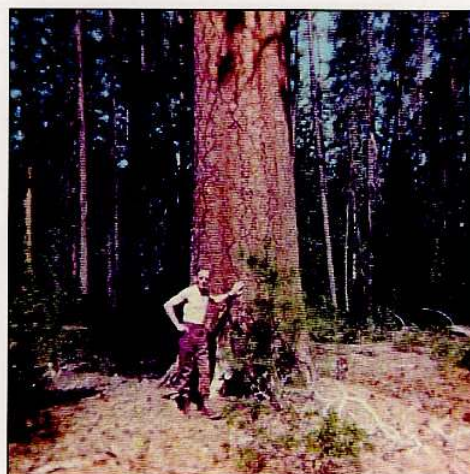


25 Sept 1978
Mount Hood and Whitebark Pine.

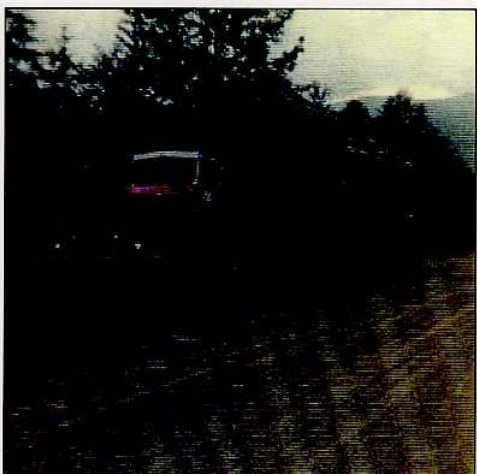
PHOTOGRAPHS 2/5



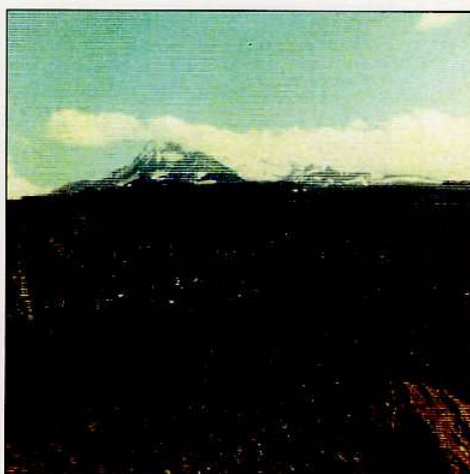
6 Aug 1976
Alan and Sugar Pine, Rogue River.



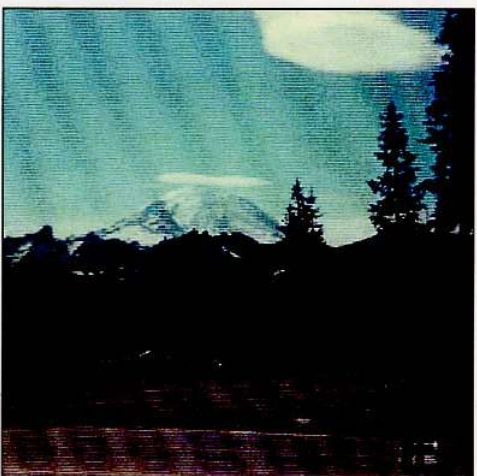
21 Aug 1976
me and Western Yellow Pine.



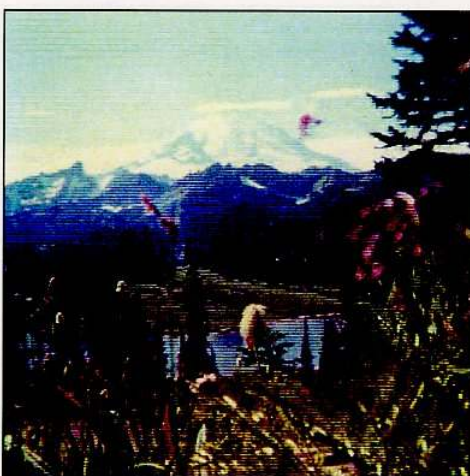
12 Aug 1976
me (again) and a small logging truck.



20 Aug 1976
Three sisters. Volcanic ash and larva beds.



13 Sept 1976 - Mount Rainier at 5500 feet
from White Pass Highway. Alpine Fir.

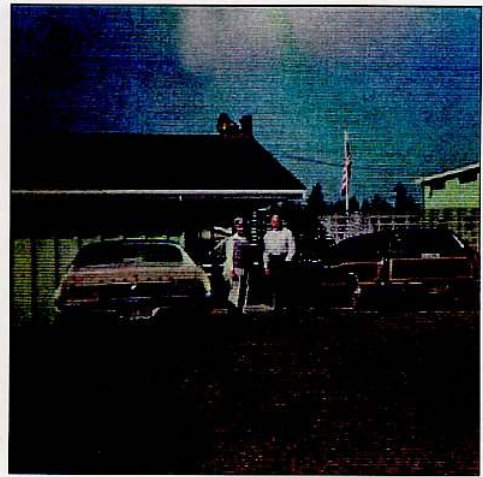


13 Sept 1976
Mount Rainier. Alpine meadow.

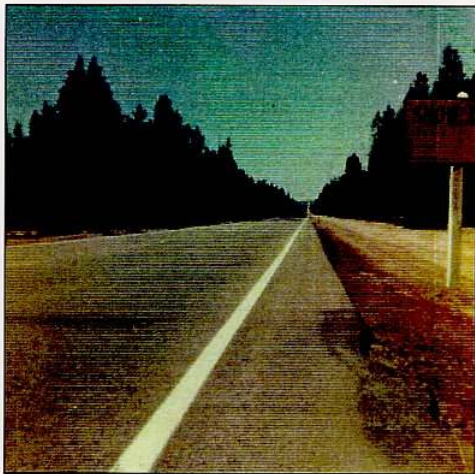
PHOTOGRAPHS 3/5



*6 Oct 1976 - The Team, press photo
in Cowichan Leader, Duncan.*



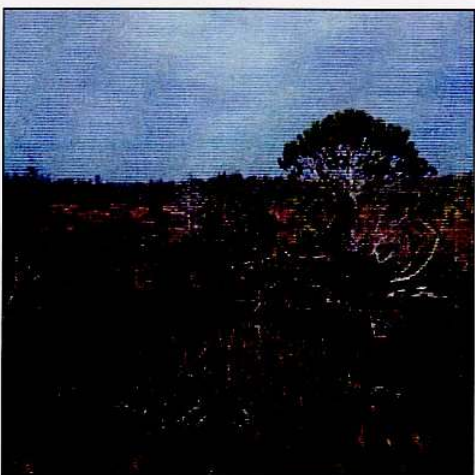
*6 Oct 1976
Bent Gerdes and Joanne of Silvaseed at Roy.*



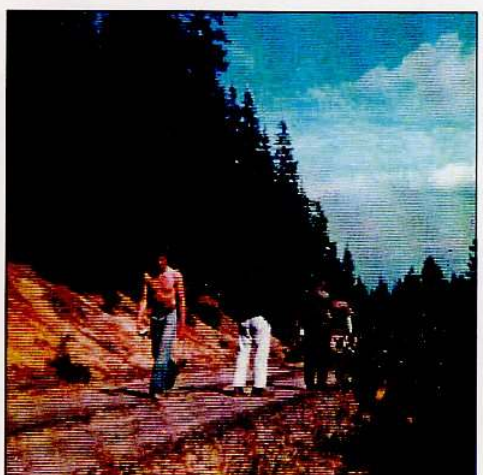
*21 Aug 1976 - La Pine (Lodgepole Pine),
15 miles straight to Crater Lake.*



*12 Oct 1978
Bears at Gold River, Vancouver Island, BC.*



*10 Oct 1978 - Lodgepole Pine on Muskeg
between Masset and Port Clements, QCI.*

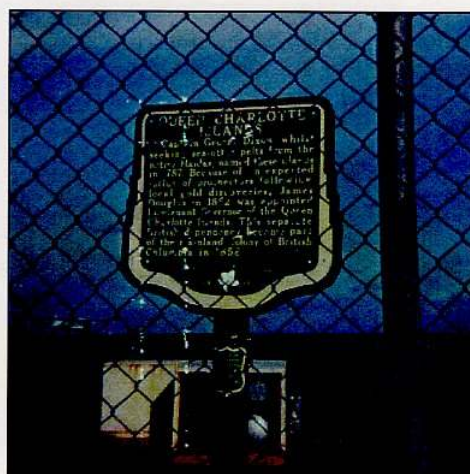


*14 Sept 1978 - Odell Bute, Oregon, first NF
collection. Cahalan, McLean and Fletcher, 6400 ft.*

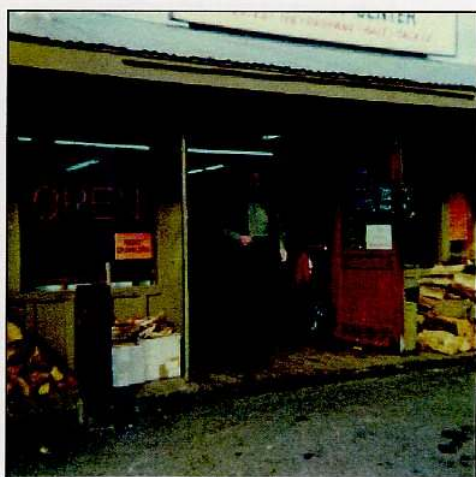
PHOTOGRAPHS 4/5



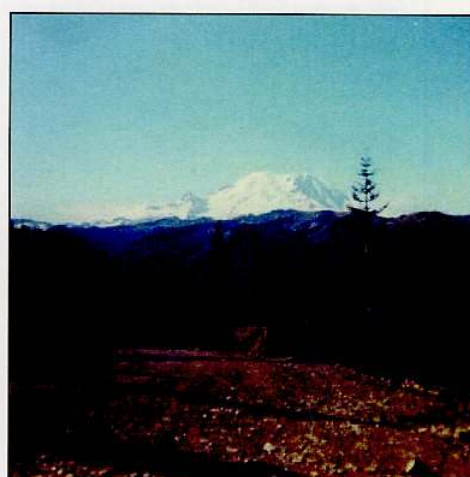
20 Aug 1976
Lava McKenzie Pass.



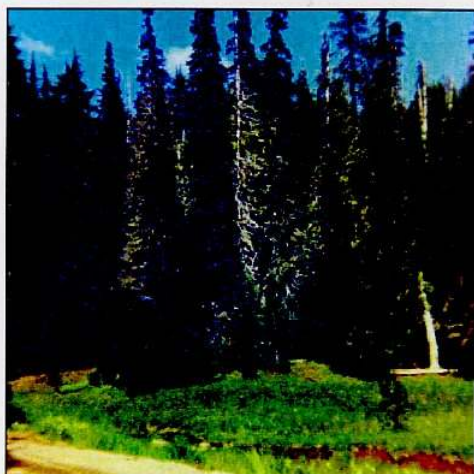
11 Oct 1978
Sandspit Airport.



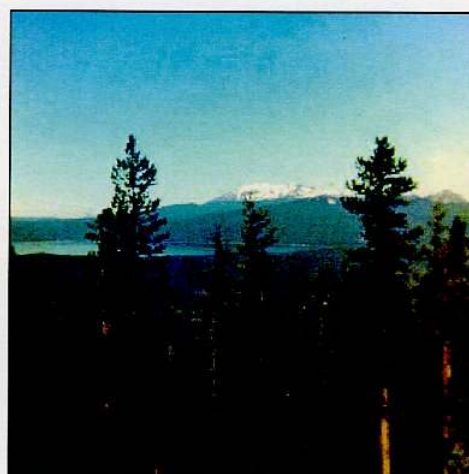
12 Sept 1978
Odell, Oregon. Gas Station.



28 Sept 1978
Washington, Mt ??, Coral Pass.

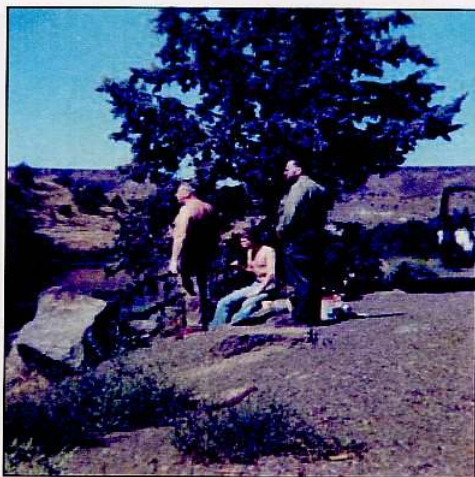


20 Aug 1976
McKenzie Pass.

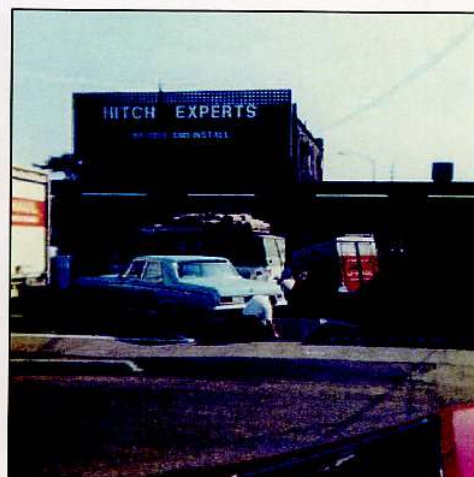


21 Aug 1976
Crescent Lake from Odell Butte, 6000ft.

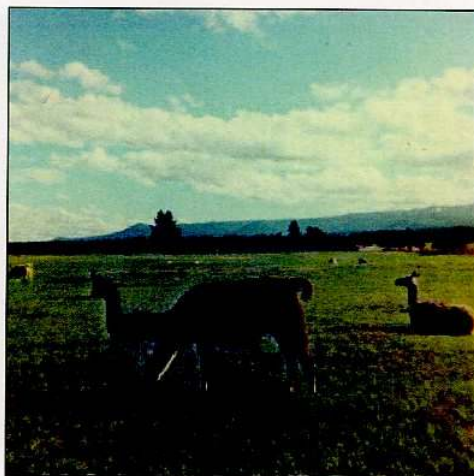
PHOTOGRAPHS 5/5



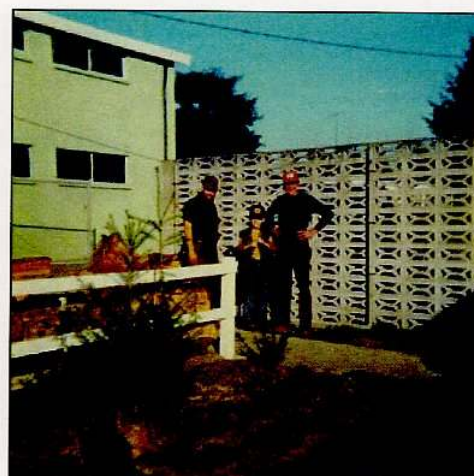
*12 Sept 1978 - Warm Springs, Oregon.
On foot from Hood River to bend.*



*25 Sept 1978
U. Haul, Gortland. Oregon.*



*20 Aug 1976
Llamas, Nr Sisters.*

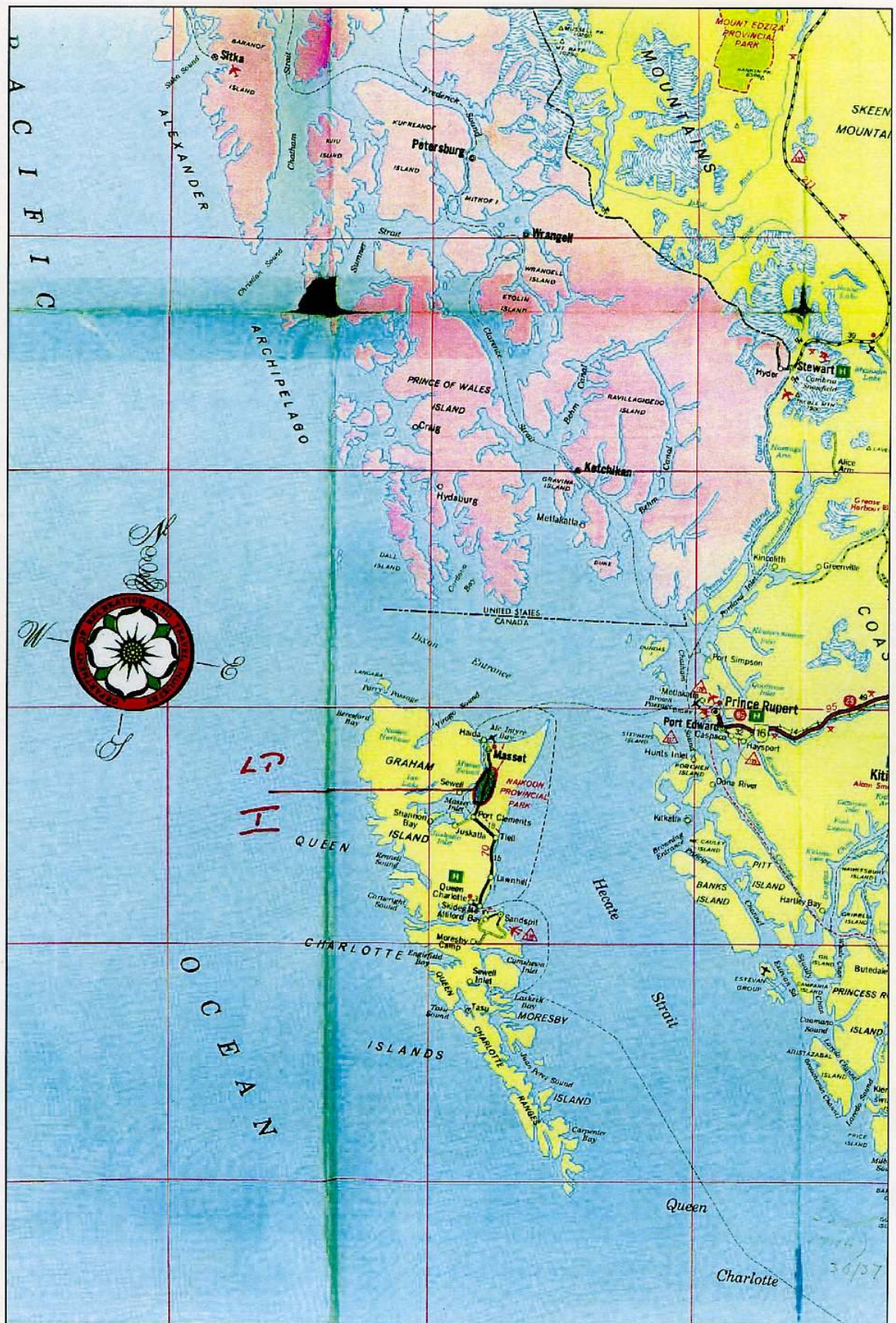


*6 Oct 1976
Ros, Rich & son with Alan at ??.*



*5 Oct 1978
Boeing 737 at Vancouve to Sandspit Q.C.I*

MAP 1/5



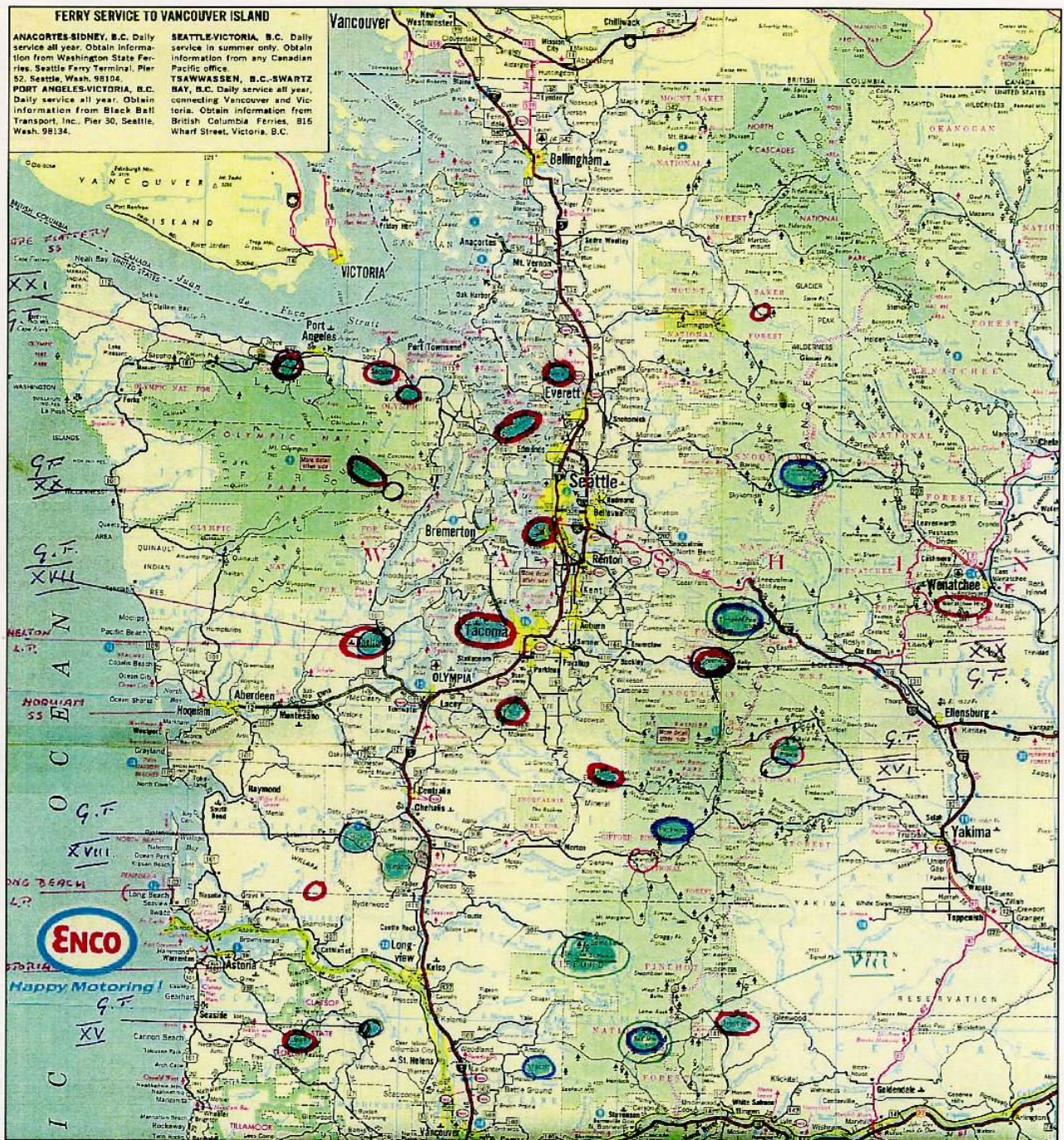
Queen Charlotte Islands

MAP 2/5

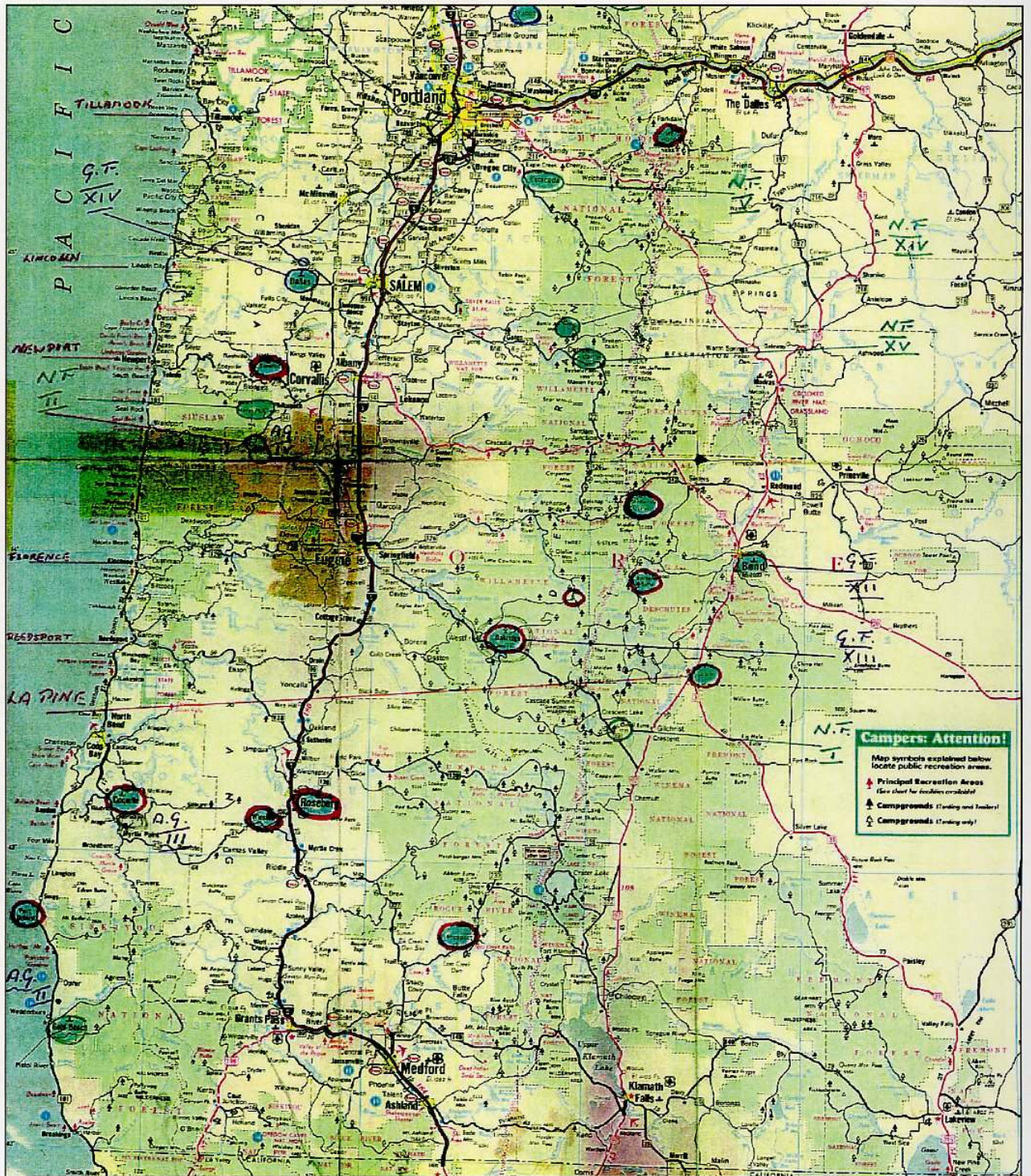


British Columbia

MAP 3/5

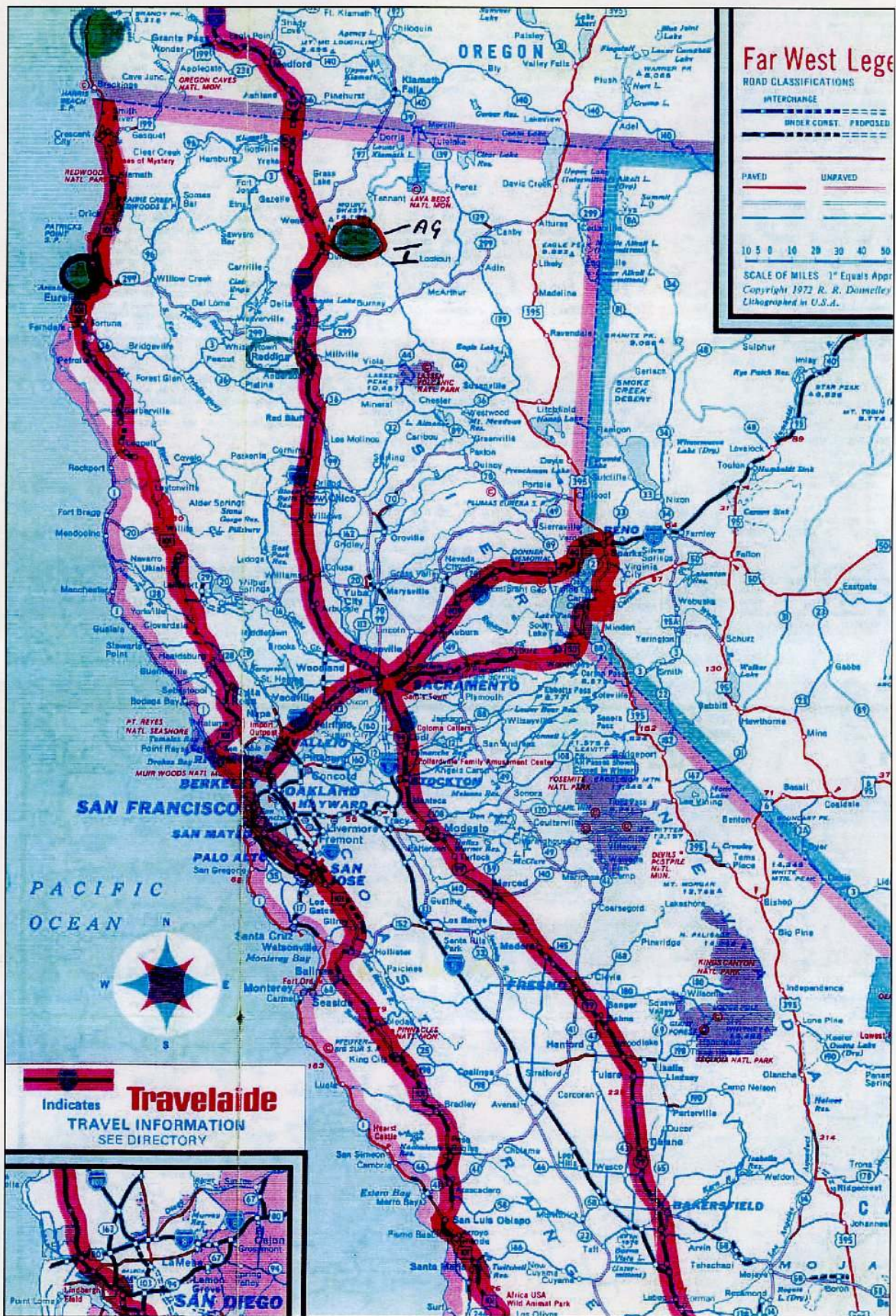


Washington



Oregon

MAP 5/5



California

POSTCARDS 1/4



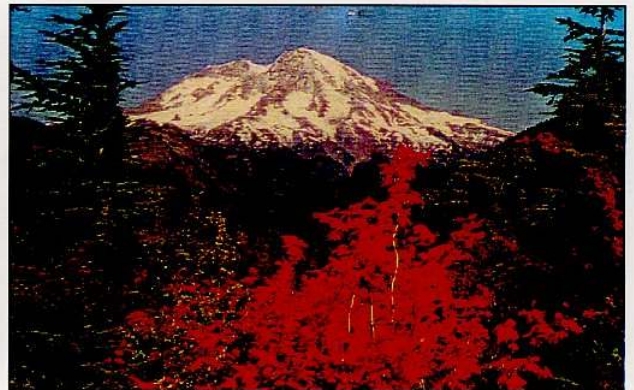
Indian Paint Brush



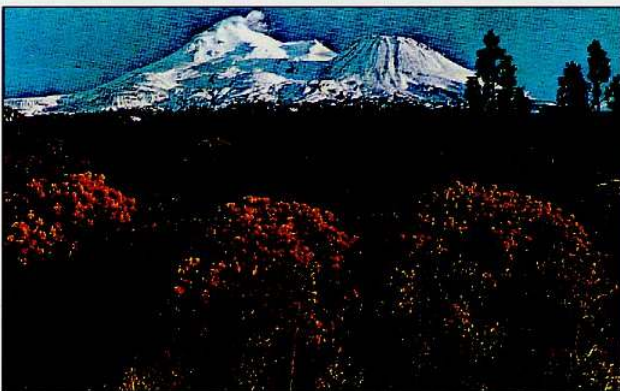
Crater Lake



A large load, probably Western Yellow Pine



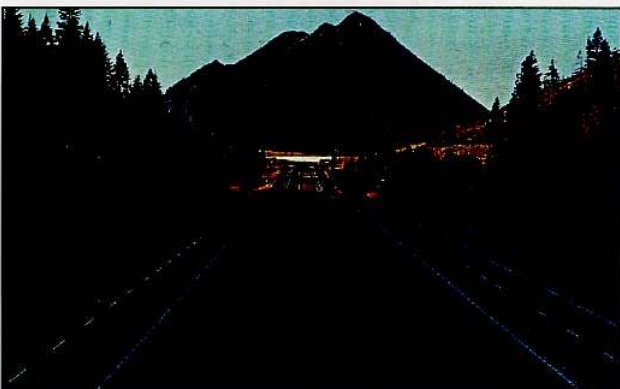
Mount Rainier and Vine Maple



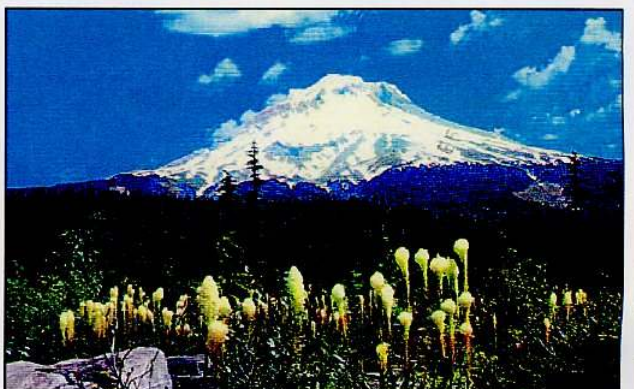
Mount Shasta and Rabbit brush



Beckies Cafe (road to Crater Lake) - 'Blueberry Pie'

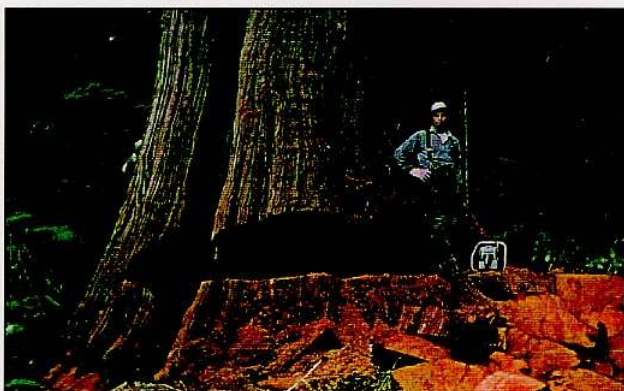


Black Butte near Mount Shaster

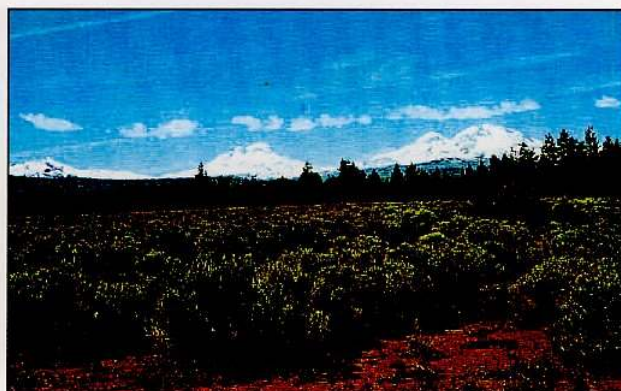


Mount Hood and Beargrass

POSTCARDS 2/4



Western Red Cedar



Three Sisters, Oregon



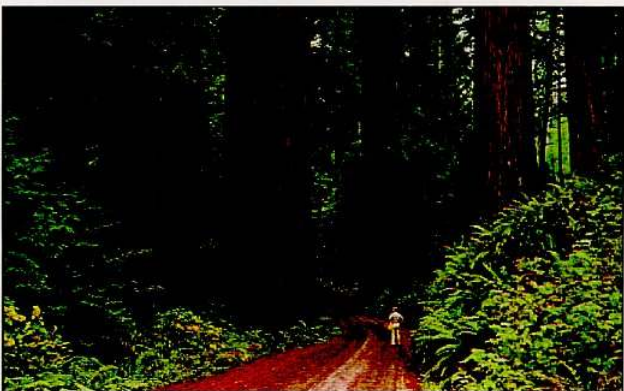
Vancouver, BC (note log pond)



Mount Adams, Washington



Spar tree

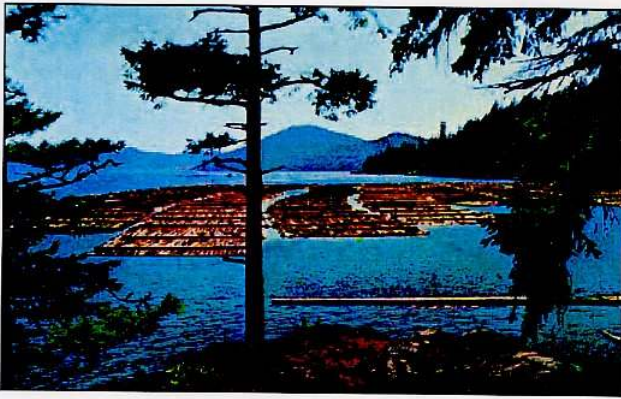


Coast Redwoods, Sequoiadendron giganteum



Broken Top Crater, Central Oregon

POSTCARDS 3/4



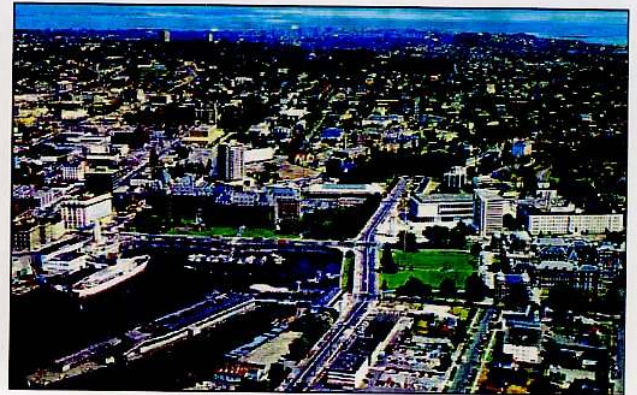
Log Rafts, Vancouver Island B.C



Monterey Pine, Pinus Radiata, California



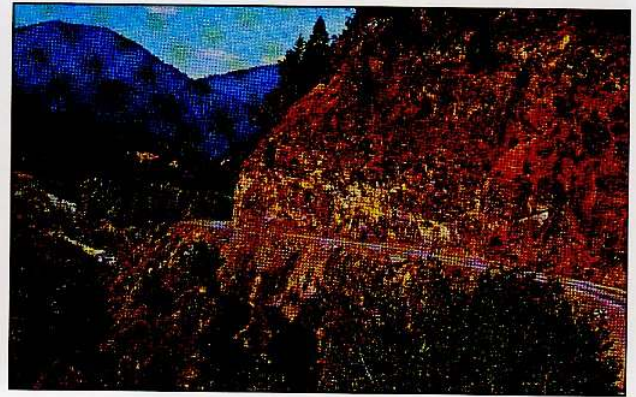
Whistling Marmot



Victoria, the capital city of British Columbia



The Chipmunk, Universal Habitant of Woods & Mountains



Road along the Klamath River, Calif



Toacoma Mall & Mount Rainer



The Coho Motel, Vancouver Island

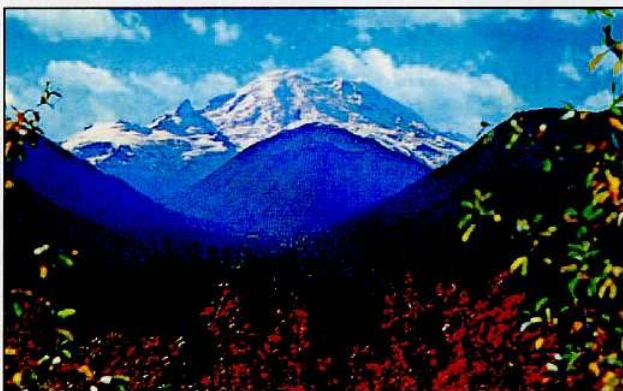
POSTCARDS 4/4



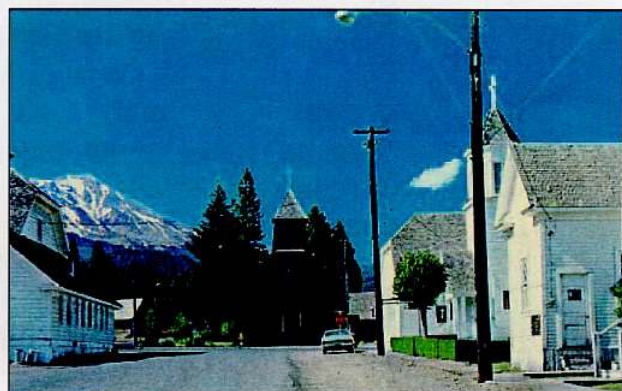
Brown Bears



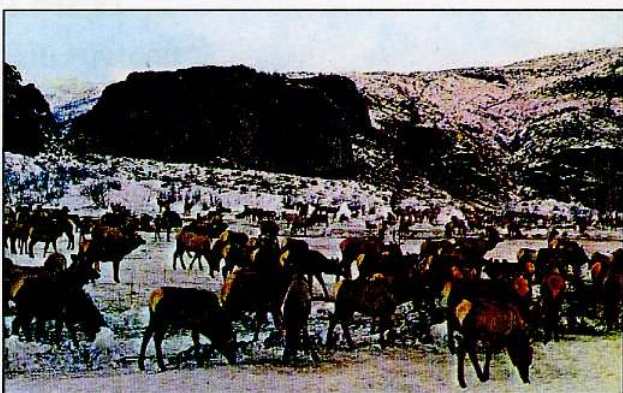
Mount Hood, Oregon's Tallest Mountain



Mount Rainier



McCloud, Calif



Elk winter feeding near Yakima, Washington



Oregon Toothpick

APPENDIX III - DETAILS OF SEED COLLECTIONS

1976 GRAND FIR [*Abies grandis* Lindl.]

No.	State	Location	Date
1	California	McCloud, Shasta	23 Aug 1976
2	Oregon	Gold Beach	25 Aug 1976
3	Oregon	Norway	26 Aug 1976
4	Oregon	Alsea	27 Aug 1976
5	BC	Kay Road, Vancouver Island	30 Aug 1976
6	BC	Cedar Harmac, (North Bay) Vancouver Island	31 Aug 1976
7	BC	Sproat Lake, Vancouver Island	1 Sep 1976
8	BC	Sooke, Vancouver Island	2 Sep 1976
9	BC	Duncan, Vancouver Island	3 Sep 1976
10	BC	Buckley Bay, Vancouver Island	4 Sep 1976
11	BC	Oyster Bay, Vancouver Island	5 Sep 1976
12	Oregon	Bend	8 Sep 1976
13	Oregon	Oakridge	9 Sep 1976
14	Oregon	Dallas	10 Sep 1976
15	Oregon	Weed	11 Sep 1976
16	Washington	Bumping Lake	13 Sep 1976
17	Washington	Shelton	14 Sep 1976
18	Washington	Rainbow Falls	15 Sep 1976
19	Washington	Greenwater	16 Sep 1976
20	Washington	Duckabush	17 Sep 1976
21	Washington	Elwha	18 Sep 1976

1978 NOBLE FIR [*Abies procera* Rehder]

No.	State	Location	Date	Owner	Kg
1	Oregon	Odell Butte	14 Sep 1978	USFS	21.5
2	Oregon	Mary's Peak	15 Sep 1978	USFS	28.5
3	Oregon	Juniper Ridge	16 Sep 1978	USFS	19.0
4	Oregon	Laurel Mountain	17 Sep 1978	BLM	8.0
5	Oregon	100 Road, Estacada	18 Sep 1978	Crown Zellerbach	14.5
6	Washington	Stevens Pass	20 Sep 1978	Burlington Northern	15.5
7	Washington	Stampede Pass	21 Sep 1978	Burlington Northern	13.0
8	Washington	Red Mountain	23 Sep 1978	USFS	16.0
9	Oregon	Mount Defiance	24 Sep 1978	USFS	12.0
10	Oregon	Elkhorn	25 Sep 1978	USFS	11.0
11	Oregon	Larch Mountain	26 Sep 1978	USFS	24.0
12	Washington	Corral Pass	28/29 Sep 1978	USFS	16.0
13	Washington	Mud Lake	29 Sep-1 Oct 1978	USFS	17.0
14	Washington	Packwood, Elk Lake	2 Oct 1978	USFS	17.5
15	Washington	Idanha	3 Oct 1978	USFS	8.5
16	Washington	McKinlay Lake	from commercial collection DNR		19.0
17	Washington	Hungrey Peak	from commercial collection DNR		7.5
18	Washington	French Butte	from commercial collection DNR		10.5
19	Washington	Larch Mountain	from commercial collection DNR		12.0

APPENDIX IV - PEOPLE

Persons with whom we worked or had contact:

US

Bent Gerdes	owner Silvaseed
Dave Gerdes	son of owner of Silvaseed
Mike Gerdes	son of owner of Silvaseed
Rich Reeder (Rick)	polyhouses, seed extraction, Silvaseed
Greg Patullo	cone buyer, Silvaseed
Joanne Berg	secretary, Silvaseed
Jerry	foreman, Silvaseed
Jim	part time, Roy Fire Service, Silvaseed
Annie	part time, Silvaseed
Jerry Franklin	USFS Research Department, Corvallis
Chris White	University of Oregon, Corvallis
Fred Henschell	Louisiana Pacific Logging Co.
Roy Stonecypher	Weyerhaeuser Corporation
Bruce Devitt	Pacific Logging
Bill Harmon	'Big Bill' Harmons Truck Rental, Tacoma

BC

Frank Barnard	Western Tree Seeds, Blind Bay
Rod Stevens	MacMillan Blodel
Cai Hermansen	MacMillan Blodel
Don Pigot	MacMillan Blodel
Stan Jetzen	Duncan Works Department, Vancouver Island
Mary Hamilton	Seed Laboratory, Duncan, Vancouver Island
Betty	Seed Laboratory, Duncan, Vancouver Island
Sid Sykes	Ranger BC Forest Service
George Edwards	Burnside Laboratory, Victoria
Dick Piesch	Burnside Laboratory, Victoria
Chris Heaman	BC Forest Service, Research
Prof Oscar Sziklai	University of BC, Vancouver

APPENDIX V - ABBREVIATIONS AND CONVERSION FACTORS

ABBREVIATIONS

BC - British Columbia
BLM - Bureau of Land Management, Oregon
BST - British Summer Time
CFS - Canadian Forest Service
DC - District of Columbia
DNR - Department of Natural Resources, Washington
FC - Forestry Commission
GF - Grand Fir
I.5 - Interstate 5 highway
IUFRO - International Union of Forest Research Organisations
LP - Lodgepole Pine
M&B - MacMillan Bloedel Company
mph - miles per hour
NF - Noble Fir
QCI - Queen Charlotte Islands
ST - Standard Time
UK - United Kingdom
US - United States
USFS - United States Forest Service

CONVERSION FACTORS

acres to hectares 0.404686
bushels to hectolitres 0.363687 (note not bushel US)
feet to metres 0.3048
lbs (pounds) to kg (kilogrammes) 0.453592
square miles to square kilometres 2.58999
tons to tonnes 1.01605