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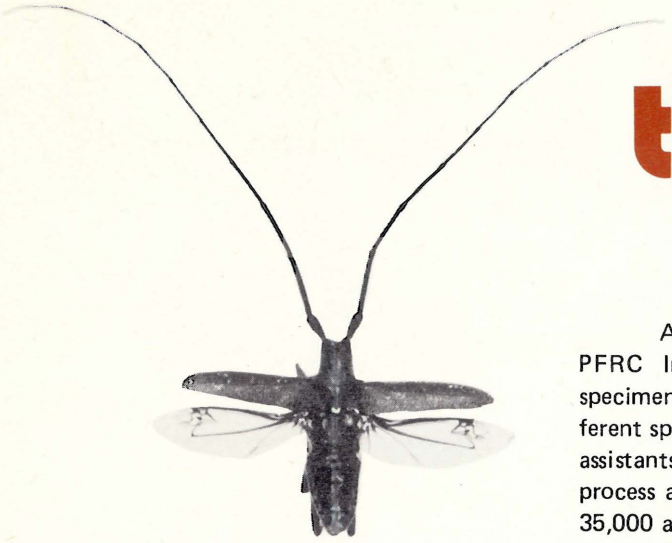


the Insectary

For over 30 years the Insectary at the Pacific Forest Research Centre, (PFRC), has been supplying the Forest Insect and Disease Survey, (FIDS), program with valuable information and identification of insects found in B.C. and the Yukon. In fact FIDS claims the distinction of having the longest continuous records on forest insects in North America.

On first glance this may not seem to be much of a distinction. However, in recent years, with insects destroying more and more of Canada's valuable forests, it is vital that records are kept on the comings and goings and habits of insects. These records allow protection personnel to make predictions about what will happen in the next year, and from historic perspective, predict what is likely to occur several years down the road and formulate management strategies accordingly.

"If we are going to win the war over insects it is essential that we keep track of the characteristics, occurrences, habits and patterns of insects from year to year," says **David Evans**, the Entomologist who has headed up the Insectary since its inception.

And keep track they do. The PFRC Insectary contains 65,000 specimens comprising over 5,500 different species. Each year Evans and his assistants **Erika Pass** and **Bob Duncan** process and document an average of 35,000 additional specimens. Information is kept on all of these but only representative samples are kept for reference purposes. The methods of preservation vary - some are pinned, some are placed in alcohol and some are freeze-dried like coffee!

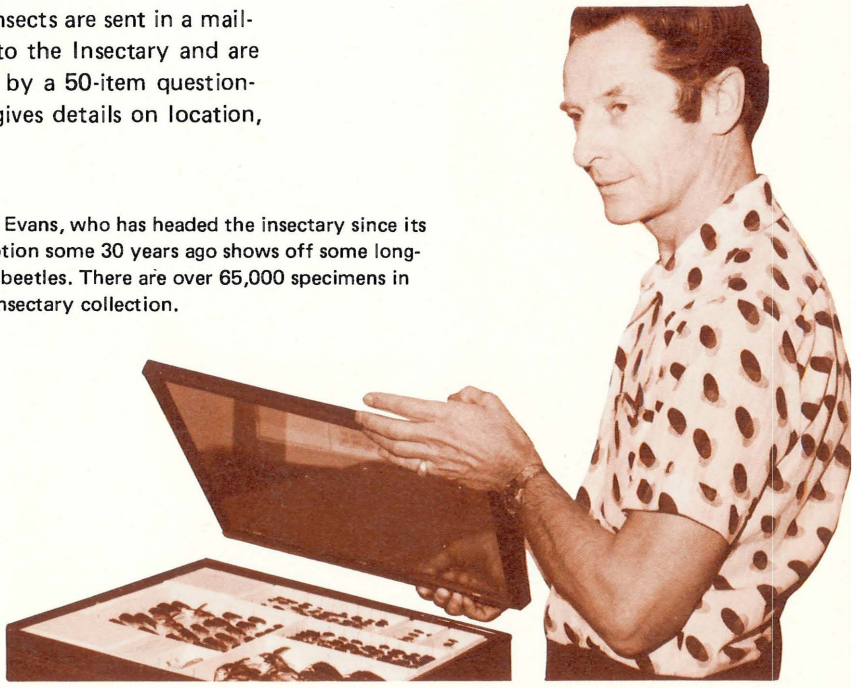
Each year about mid-May the FIDS Technicians head out to their respective districts and for the next four months, until about mid-September, they take samples of insects and diseases in the more than 100 permanent sampling stations in each of their districts, and at hundreds of other randomly-selected sites.

The insects are sent in a mailing cylinder to the Insectary and are accompanied by a 50-item questionnaire which gives details on location, host, weather conditions, size of insect population, etc. The field identification is then confirmed or altered after investigation by Insectary staff.

Three summer students are hired to assist with the heavy influx of samples during the peak period. The students sort the insects into main biological groupings and the Insectary staff decide whether or not the samples will be discarded, kept and preserved, or forwarded to a special area for rearing purposes.

REARING INSECTS

Evans and his staff attempt to simulate forest conditions in the rearing room. The chief enemies of the forest insect are drought and heat, so



Dave Evans, who has headed the insectary since its inception some 30 years ago shows off some longhorn beetles. There are over 65,000 specimens in the Insectary collection.

Cover photo. Tray of Rheumaptera hastata (Linnaus), alder looper moths, taken by Alex Craigmyle, PFRC photographer.

moderate temperatures and correct humidity levels must be maintained; and of course the insects must be fed - usually every four days. Rearing to adulthood takes anywhere from three months to three years depending upon the life cycle of the insect being reared.

Some of the insects sent to the rearing room end up in biological control programs. Parasitism was an important and widely-used practice in the pre-chemical days. With the onslaught of more lethal and faster-action pesticides and insecticides, parasitism as a population control technique went by the wayside for awhile. Lately the tide has turned. With environmental groups pressuring for the return of natural controls, parasitism is being tested again.

In the greater Victoria area where winter moth is a problem on shade and fruit trees, parasites of the pest were released in a number of locations in the area in the hope they will eventually control the winter moth. Sampling in 1980-1982 will determine if the parasites have become established and will reduce the winter moth problem.

Erika Pass and Bob Duncan examine vials of preserved parasites used for identification purposes.

LOTS OF INSECTS

According to Dave Evans, British Columbia is unique and compares with Ontario as being one of the most hospitable hosts for perhaps the largest variety of insects found in Canada. This he attributes to the variability in climate, altitude, land formations and tree hosts found within the province.

By far the largest number of specimens sent to the Insectary for identification are in the beetle family. Bark beetles are the biggest economic threat in the province.

More than 60 per cent of the species and 80 per cent of the total specimens sent to the Insectary can be identified by comparing them with those in the collection or by consulting reference material. Those needing further identification are sent to the Biosystematics Research Institute in Ottawa. The Institute is run by the federal Department of Agriculture and operates as an identification and information storage service.

This year for the first time the presence of the elm bark beetle, a carrier of Dutch elm disease, was detected and identified in British Columbia. Pheromone (sex attractant) traps attracted the beetles in the southern Okanagan Valley and a few were trapped in the Kamloops area. To date there is no evidence of Dutch elm disease in the province.

The use of computers to compile, store and retrieve information on insects has made the biggest impact on the operation of the Insectary over its 30 years in operation. It has taken over the record-keeping function of Evans' job and can provide people with information in a format which is useful to them in a short time-frame.

Computerized data is an excellent supplement to a specimen collection; however, it can never replace the value of being able to visually compare specimens with one another. The Insectary staff are constantly on the lookout for new additions to their collection which is accessible to provincial government personnel as well as industry. Entomology and biology students from all over the province visit the Insectary annually.

While no commercial value can be placed on the Insectary collection, the scientific value is immeasurable. It would be impossible to replace the collection even though most of the species are still around some 30 years later. The FIDS Technicians, upon whom the collection almost entirely depends, spend a great deal of their time on these important pests, but less on collecting for museum purposes. More emphasis is placed on assessment of pest problems, liaison work with the forest community and public, as well as detection and surveillance of other forest problems. (See next story on PFRC Herbarium.)

Daphyne Lowe
and Dr. Rich Hunt

THE HERBARIUM

The Herbarium at the Pacific Forest Research Centre (PFRC), differs from most herbaria mainly in its restricted purpose - an aid to forest pathology. Over the past 35 years it has become a valuable asset in the study of tree diseases. From merely a reference collection of a few conspicuous pathogens, mainly decay fungi, it has gradually grown in size and now constitutes the largest collection of fungi in western Canada - fungi being the major cause of tree diseases.

Identification of many of the hundreds of species of disease-causing fungi did not seriously start until the late 1940's. Now many of them are readily recognized and identified; however, new discoveries are still made yearly. Not too long ago it was discovered that mites were causing some symptoms classified in the past as diseases of unknown cause.

Currently there are over 26,000 specimens represented in the Herbarium covering approximately 3,500 different species - some collected as far back as 1889. Forest pathologist **Dr. Richard Hunt** and his assistant, **Daphyne Lowe,** handle approximately 500 disease samples per year. Between 10 and 15 per cent of these represent new disease records, either new findings of hosts or of disease causal agents.

Processing of Herbarium specimens is similar to Insectary procedures. It involves the selection, preparation, indentification, sterilization, recording, acknowledging and filing of plant material. All collections received should be accompanied by field data recorded on the same sampling form used to accompany Insectary specimens. Ultimately this information is coded and forwarded to Ottawa to be placed on computer inventory.

Collections are unpacked and sorted immediately on arrival at the Centre to avoid deterioration by moulds and insects. As many as possible are identified at this time. Some collections are discarded because of duplicacy or spoilage in transit, others are retained for isolation of the pathogens in pure culture, and the remainder are placed in the specimen dryer.

After being dried and sterilized the collections are retained in the appropriate location in the Herbarium, if identified, or mailed to specialists for further indentification if necessary. It is important to keep data on disease current and up-to-date. From this data a Check List and Host Index are prepared and used by forest pathologists throughout the north and south temperate zones. Reference to trends

in the past, coupled with knowledge of the present situations, aids PFRC Rangers in the field.

FIVE MAIN SECTIONS

The Taxonomic section of the Herbarium contains about 75 per cent of all the specimens. All species of pathogens and all host-pathogen combinations for which there are specimens are represented. It serves to provide material for taxonomy (classification) and etiology (research on the causes of disease).

Specimens contained in the Demonstration section are used for a number of purposes - for lectures and courses of instruction to stimulate interest in forest pathology among amateur botanists and students of forest pathology; for photographs to illustrate scientific publications; and, to familiarize Rangers with diseases they are expected to recognize in the field.

Dried and processed plant material such as leaf spots, dwarf mistletoe on conifer twigs and leaf rusts are displayed in the Riker Mount section. This type of storage makes the specimens readily accessible for study at any time and keeps the foliage green by being able to shut out the light source.

Many specimens are placed in the Surplus and Exchange section which serves a dual purpose as its name implies. Specimens are available to PFRC personnel and to any reliable institution or person outside the Centre. As well, specimens may be used in exchange for other specimens obtained from other herbaria. The PFRC Herbarium receives requests each year for specimens from local colleges and international institutions. International collaboration and the acquisition or loaning of specimens among foreign countries is a regular function of most larger herbaria.

The Herbarium also contains a collection of lichens, mosses, ferns and flowering plants characteristic of British Columbia and the Yukon. There are some 5,200 specimens representing 1,300 species in this non-diseased collection.

An inventory of the Herbarium will show that about 60 per cent of the species represented and about 85 per cent of the specimens deposited are fungi - the main cause of forest disease. In British Columbia the number one loss is from heart-rot caused by fungi followed closely by losses caused by dwarf mistletoes.

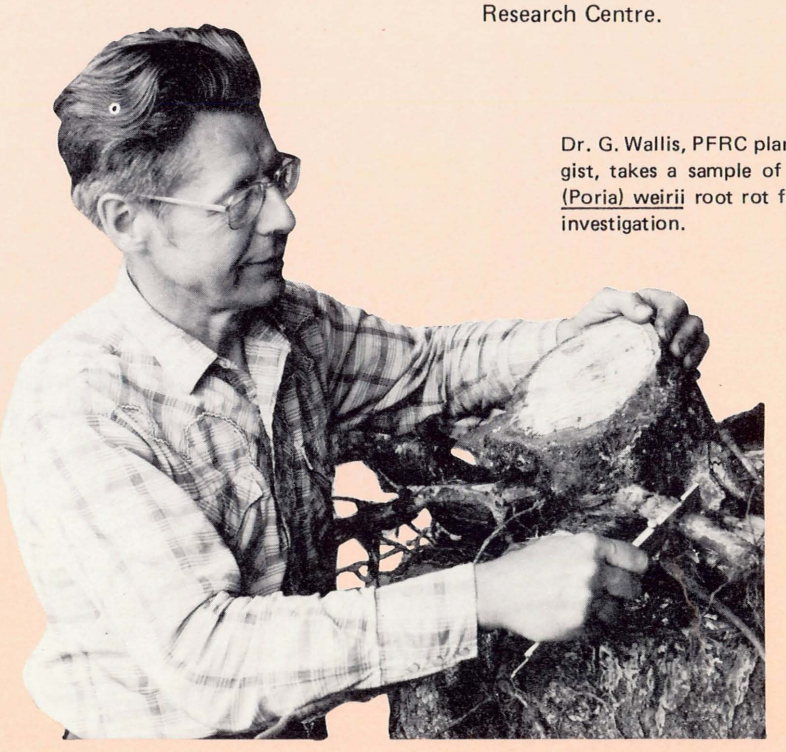
EXTENSION WORK

While the chief function of the Herbarium staff is to identify and investigate forest diseases, the very fact that PFRC is located in urban Victoria means that the first warm weekend in Spring is usually followed by a deluge of visitors to the Centre, samples in hand, enquiring about the state of their fruit or ornamental trees.

During the Fall months Dr. Hunt and **Dr. Al Funk,** another PFRC pathologist and mycologist advise a steady stream of visitors to the Centre on the edibility of mushrooms. A mushroom clinic is run at least once during the peak season in a local shopping centre giving Vancouver Island mushroom hobbyists an opportunity to get firsthand information. The mushroom collection is one of the fastest growing in the Herbarium.

Dr. Hunt also works with the provincial ministries of agriculture and forestry on a number of cooperative research projects which includes a study into ways of controlling phytophthora root rot in ornamental Lawson Cypress

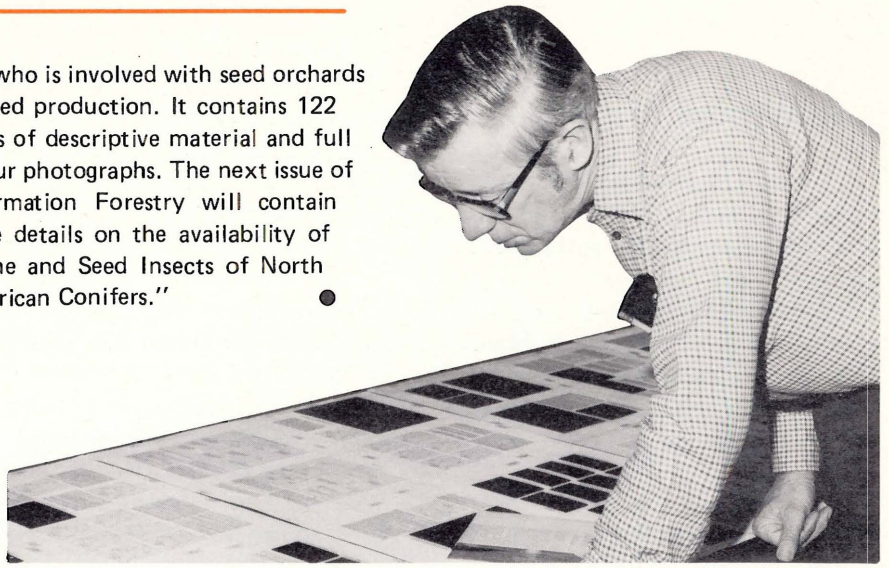
With disease becoming more and more recognized as a limiting factor in the management of forest plantations, it is a certainty that the identification and diagnostic services of the Herbarium staff will play an important role in future research and operations of the Pacific Forest Research Centre. ●



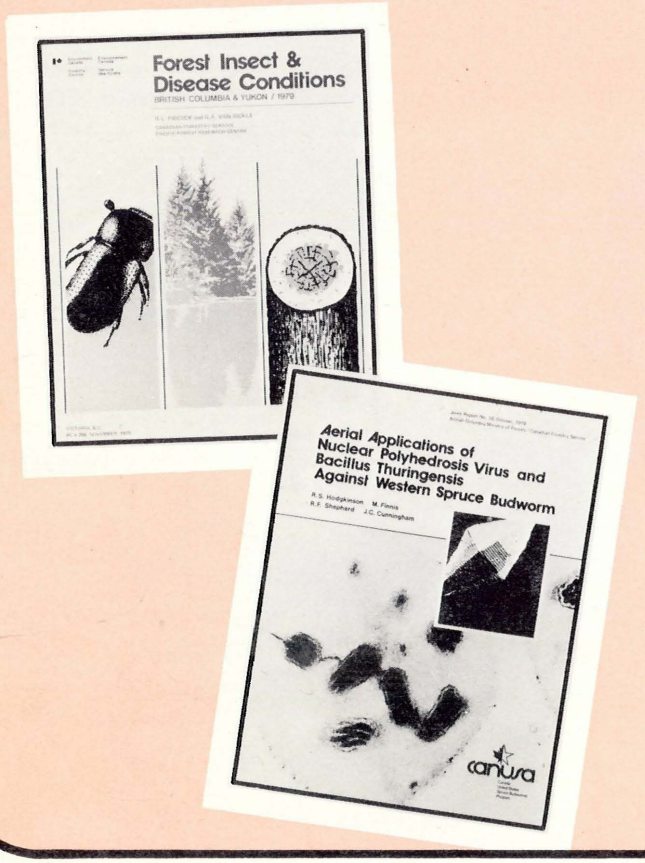
Dr. G. Wallis, PFRC plant pathologist, takes a sample of Phellinus (Poria) weirii root rot for further investigation.

CONE AND SEED INSECTS OF NORTH AMERICAN CONIFERS

Al Hedlin, who retired last December from PFRC after 22 years' service with the Canadian Forestry Service, pores over galleys of the book, "Cone and Seed Insects of North American Conifers." before sending them to the publisher. The book, which is the culmination of five years' work, is being produced under the sponsorship of the North American Forestry Commission, FAO. It is the combined effort of Canada, the United States and Mexico, with Al as the co-ordinator. The book, which will be available in April, is designed for the practicing forester, particularly one who is involved with seed orchards or seed production. It contains 122 pages of descriptive material and full colour photographs. The next issue of Information Forestry will contain more details on the availability of "Cone and Seed Insects of North American Conifers." ●



Recent Publications



● **Forest Insect & Disease Conditions, British Columbia & Yukon / 1979**

R. L. Fiddick and G. A. Van Sickle

This report details the important forest pest and disease conditions in British Columbia and the Yukon for 1979. It contains a summary of field records and reports submitted by field technicians for all districts, which in previous years was published in seven separate editions.

BC-X-200, November 1979

● **Aerial Applications of Nuclear Polyhedrosis Virus and *Bacillus Thuringiensis* Against Western Spruce Budworm**

R.S. Hodgkinson, R.F. Shepherd, M. Finnis, J.C. Cunningham

The western spruce budworm has been a major defoliator of Douglas-fir in B.C. for many years. Promising developments in the use of microbial insecticides led to this evaluation of a nuclear polyhedrosis virus and a bacterium, *Bacillus thuringiensis* Berliner, for the control of this pest.

Joint Report No. 10, October 1979

Copies of these publications may be obtained by filling out the enclosed card and returning it to the P.F.R.C. Information Office.

RE-ORGANIZATION AT THE PACIFIC FOREST RESEARCH CENTRE

Dr. T.G. Honer, R.P.F., Acting Director of the Pacific Forest Research Centre, recently announced organizational changes within the Centre aimed at improving and strengthening the activities and resources of the Canadian Forestry Service in British Columbia and the Yukon.

The Forest Insect and Disease Survey (FIDS) group will be staffed to a full complement of 24 persons. This increase and re-assignment of staff will strengthen the detection capability within the region. FIDS is responsible for monitoring the occurrence, incidence and fluctuation of important forest insect and diseases and appraising the damage caused by them. FIDS will now report to the Forest Environment program area also responsible for research in forest fire, meteorology, environmental impact assessment, damage appraisal and impact of forestry practices. Formerly FIDS reported to the Forest Protection program area.

The existing computer services will be amalgamated under the Forest Resources program area and will result in the creation of a new position - Head of Computing and Image Analysis Services. This group will provide PFRC scientific and administrative staff with needed computer services and will operate the newly installed GEMS 300 image analysis system.

During the next few months existing vacancies will be filled in the economics, damage appraisal, fire research and pest survey fields. As well, the research position dealing with cone and seed insect problems, which was vacated due to a retirement, will be staffed as soon as possible.

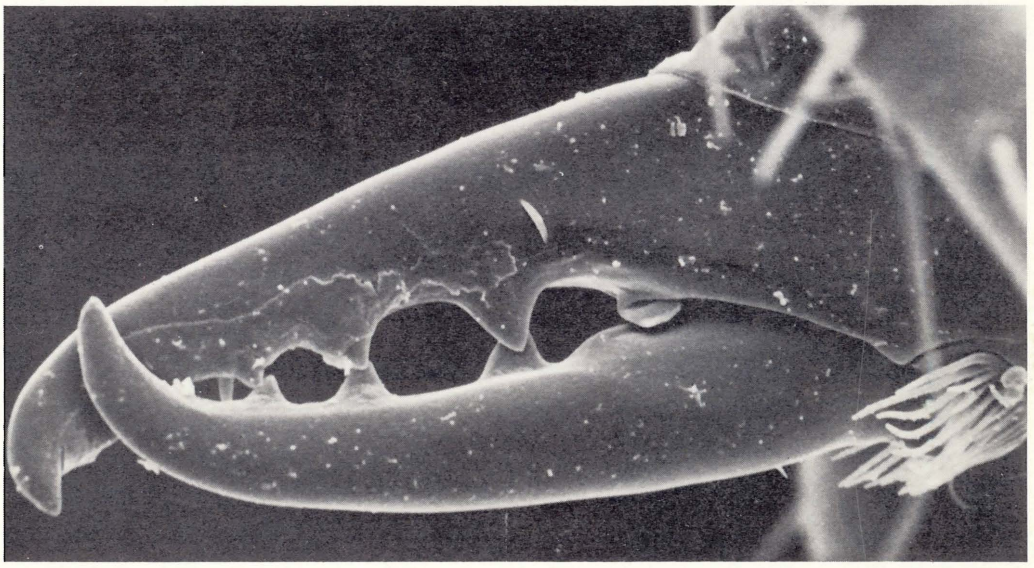
There will be no changes in personnel heading the four main program areas within the Pacific Forest Research Centre. They are:

- Forest Environment, Cliff Brown, Program Manager.
- Forest Economics, Dr. Glenn Manning, Acting Program Manager.
- Forest Protection, Dr. Doug Miller, Program Manager.
- Forest Resources, Dr. Terry Honer, Program Manager.

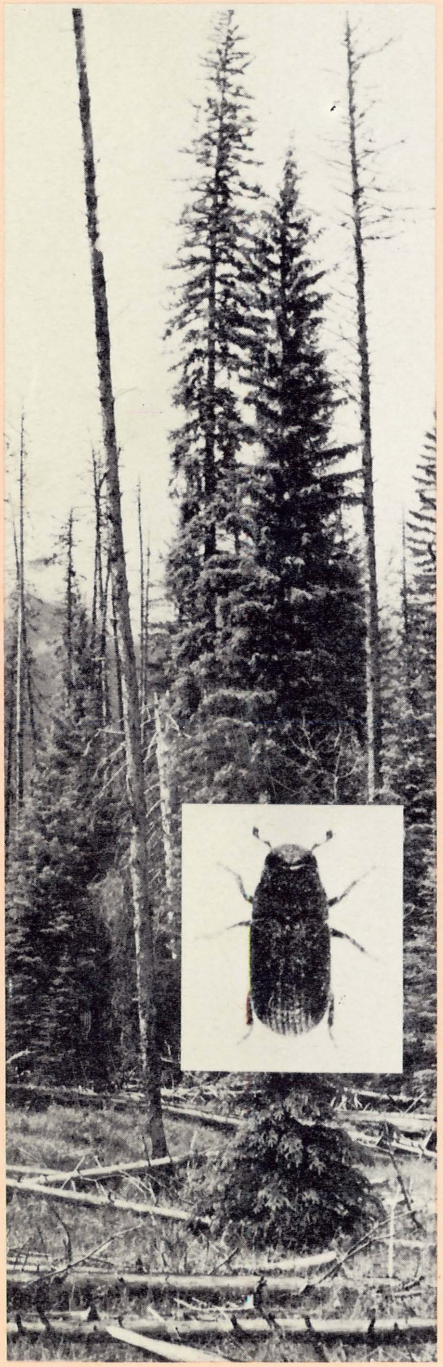
"These changes in organization take place immediately and I trust that in the very near future the Pacific Forest Research Centre will have its full complement of research and technical personnel enabling us to increase and diversify our research and survey efforts in B.C. and the Yukon," said Dr. Honer. ●

What is it?

Scanning electron micrograph of the pincer (chelicera) of a common forest soil mite, family Ologamasidae, magnified 1330 times. Photograph was taken by PFRC soil zoology technician Leon Bjerstedt.



Pine Oil Prevents Mountain Pine Beetle Attack



Research staff at the Pacific Forest Research Centre earlier last year determined that pine oil sprayed on bark surfaces of Douglas-fir log sections delayed and reduced attacks by Ambrosia beetles and appeared to reduce bark beetle attacks.

As an extension of this study an experiment was conducted last summer to determine the effect of pine oil on attacks by mountain pine beetle on living lodgepole pine trees. The experiment was carried out in an older than 140-year primarily lodgepole pine stand east of McLeese Lake, B.C.

EXPERIMENT

Twenty uninfested pine trees were selected in an area adjacent to natural infestation of mountain pine beetle. The lower 2.4 m of the stems of ten trees were sprayed to the drip point with undiluted pine oil (Norpine 65), with a garden-type pressure sprayer. The other ten trees were left as untreated controls.

Each of the 20 trees were then baited at breast height with two polyethylene caps containing 0.5 ml of a mixture of trans-verbenol and alpha-pinene (9:1), and with 5 ml of 95% ethanol in a loosely capped polyethylene Boston bottle to take advantage of possible synergistic effects.

RESULTS

The trees were checked daily from July 19 - 30, inclusive, and on August 14 and 21. The first attacks were observed on July 23 on untreated trees. By the end of the experiment on August 31, when beetle flight had ended, eight of the ten untreated trees were heavily attacked. The remaining two received zero and two attacks, respectively. Nine of the pine oil treated trees remained free from attack. The tenth had 15 attacks above the treated part of the stem and six within the treated area; all galleries in this tree were pitched out.

No evidence of phytotoxicity owing to the treatment was observed on the trees by October 9, although damage occurred to underbrush near the stem of the treated trees.

Dr. Les McMullen and **Bill Nijholt**, who conducted this experiment, will keep the trees under observation for evidence of resistance to future beetle attack and of phytotoxicity. The pine oil, as applied, was effective in reducing attacks by the mountain pine beetles.

Application of this treatment to large forest areas is not practical at this time for reasons of cost and ease of application. However, it may be the answer for smaller privately-owned forested areas of high aesthetic value which are infested with mountain pine beetle.

Mountain pine beetles continue to be the biggest insect problem in B.C., causing damage to more than 85 000 ha of forests in 1979. ●

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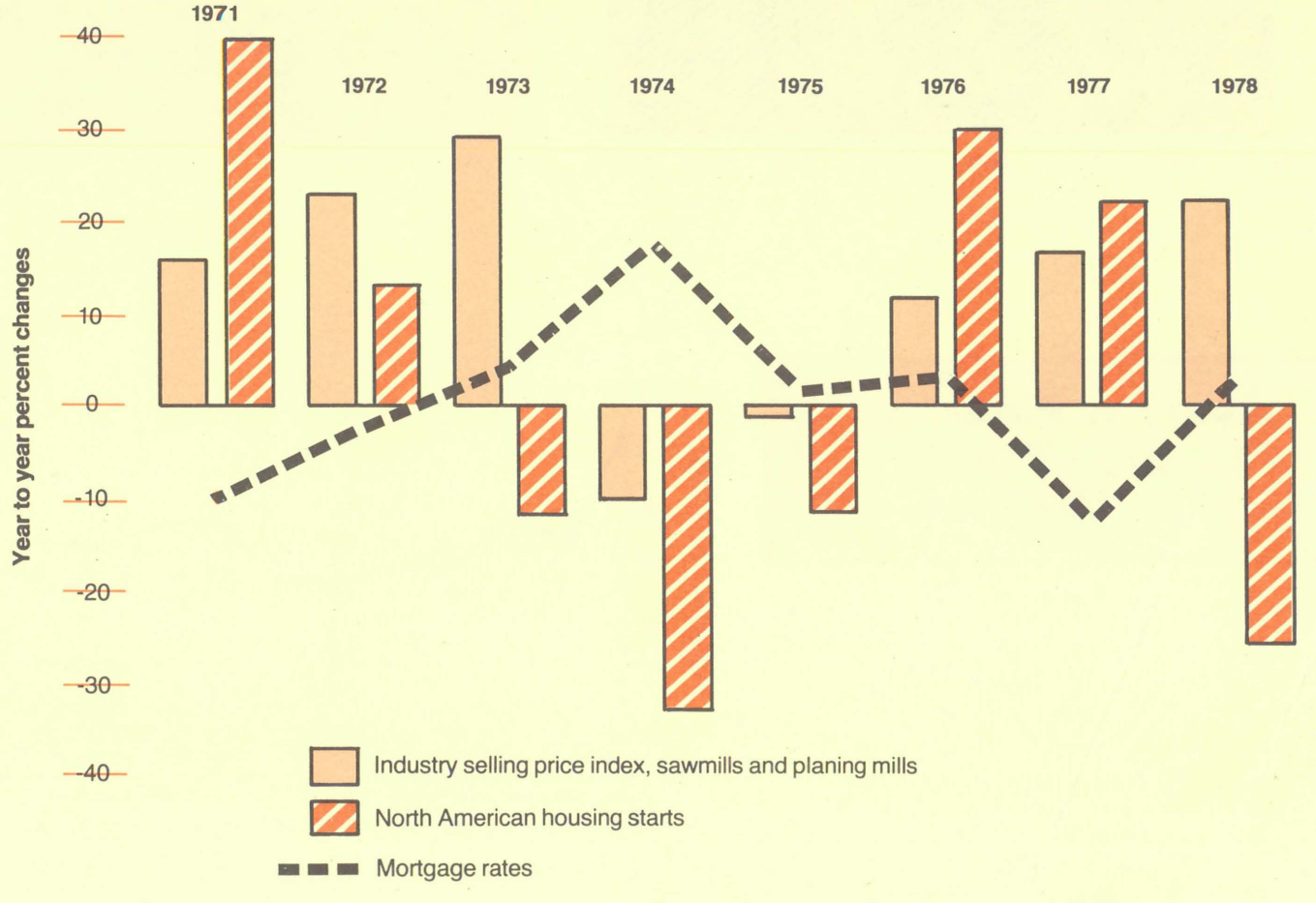
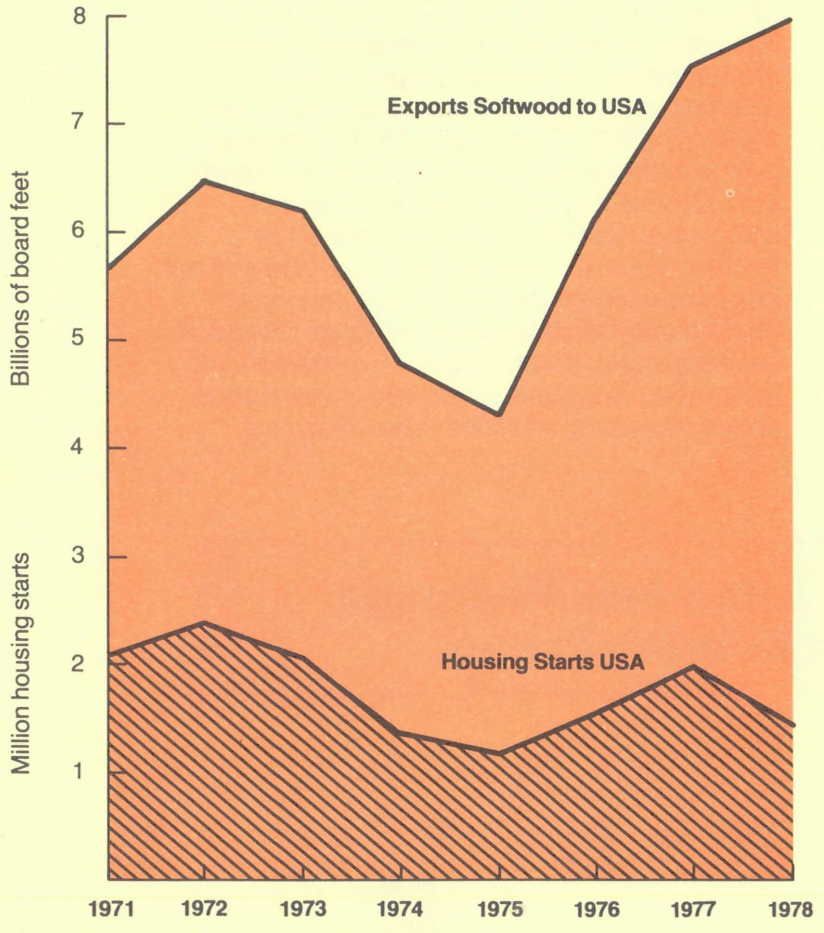
Lumber Cycles

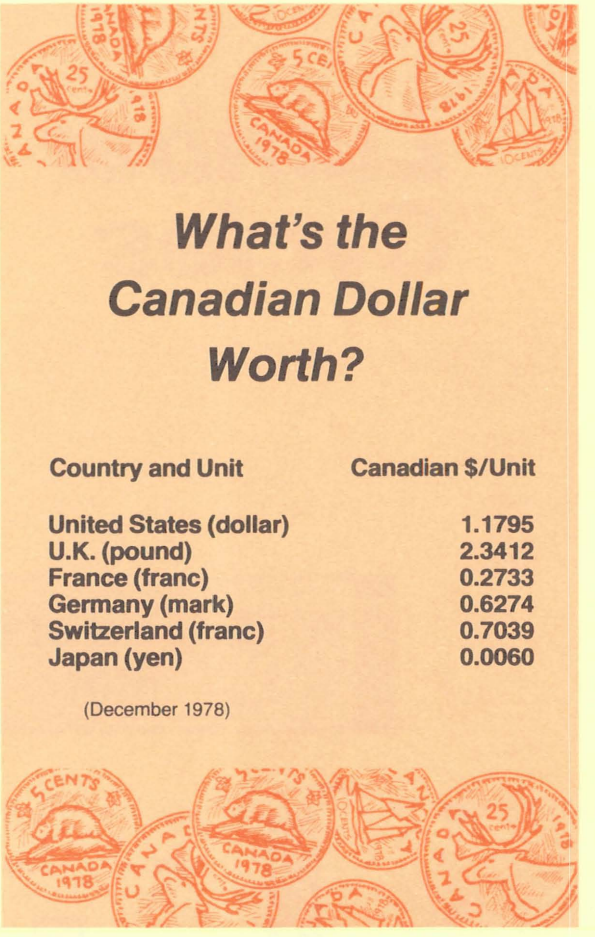
The lumber industry in B.C. has always been subject to cycles, with the effects being shown in lumber prices, production, exports and unemployment. Down cycles occurred in 1952, 1956-57, 1966-67 and 1974-75. The industry is now entering another downward trend, though only after setting records for prices and production. Lumber cycles are caused by fluctuations in the economies of Canada and our largest customer, the U.S. These economic fluctuations are reflected in mortgage rates and housing starts, which in turn affect the demand for lumber. The statistics presented here show some interesting relations in recent cycles.

Impact of Housing and Mortgage Rates on Lumber Prices



B.C. Exports of Softwood Lumber to USA Related to USA Housing Starts



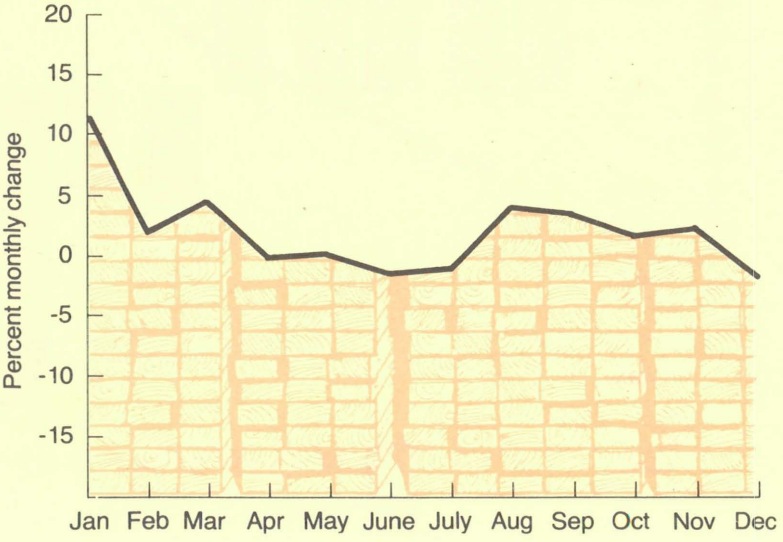


What's the Canadian Dollar Worth?

Country and Unit	Canadian $/Unit
United States (dollar)	1.1795
U.K. (pound)	2.3412
France (franc)	0.2733
Germany (mark)	0.6274
Switzerland (franc)	0.7039
Japan (yen)	0.0060

(December 1978)

Average Monthly Lumber Prices - 1978

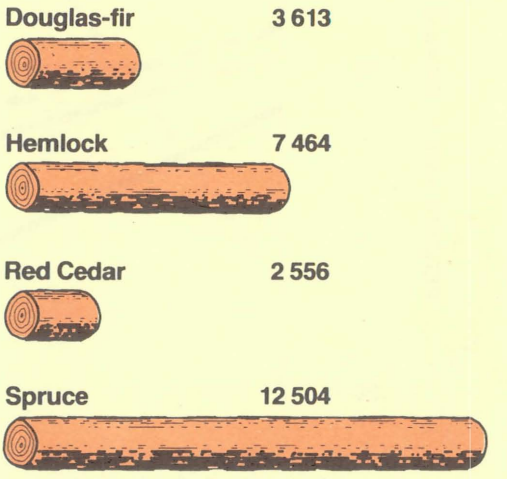


Species Harvested - 1978

('000 m^3)

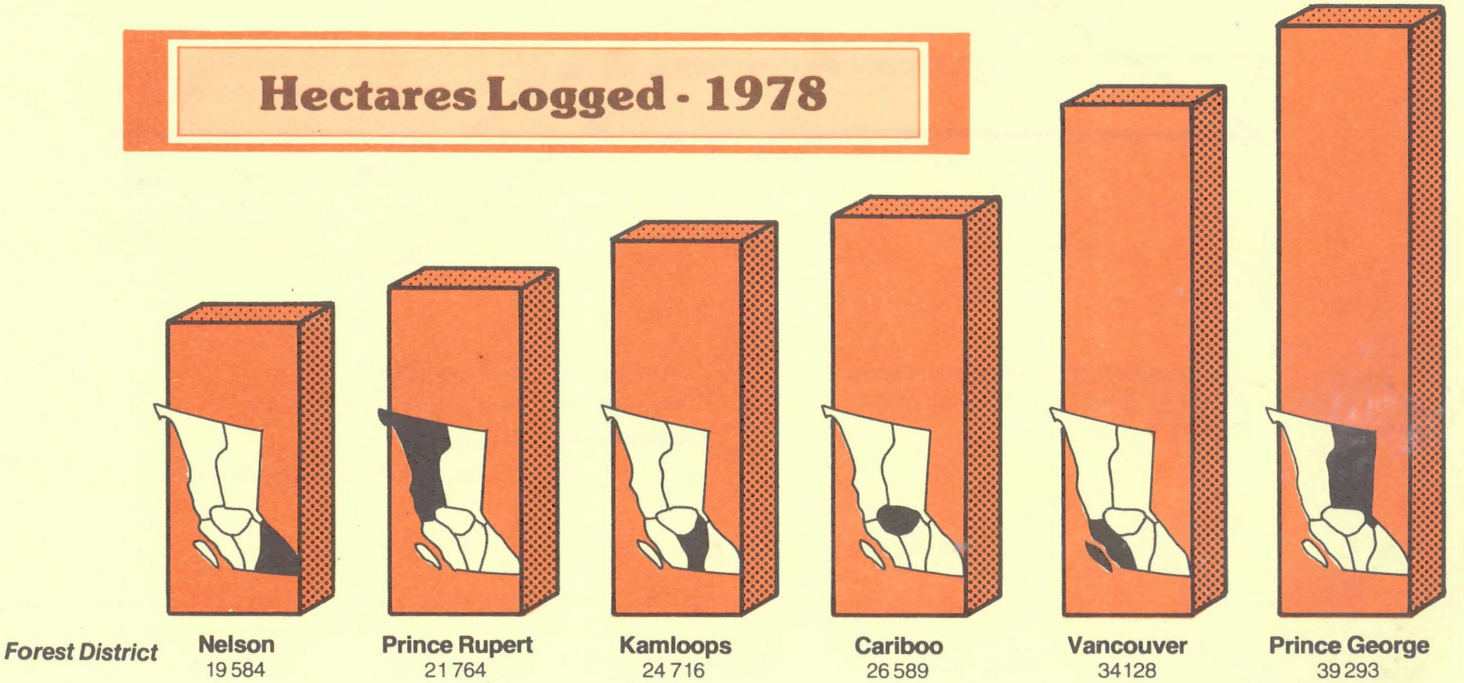
Production of Lumber by Species - 1978

('000 m^3)



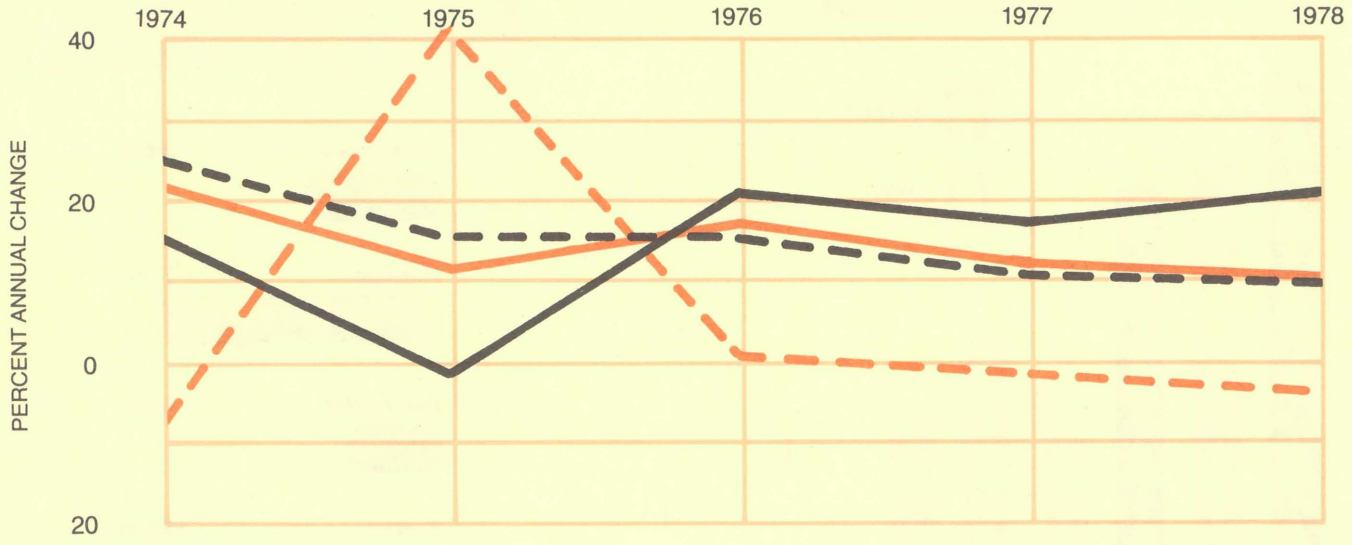
Total Softwoods	29 599
Total Hardwoods	3

Hectares Logged - 1978



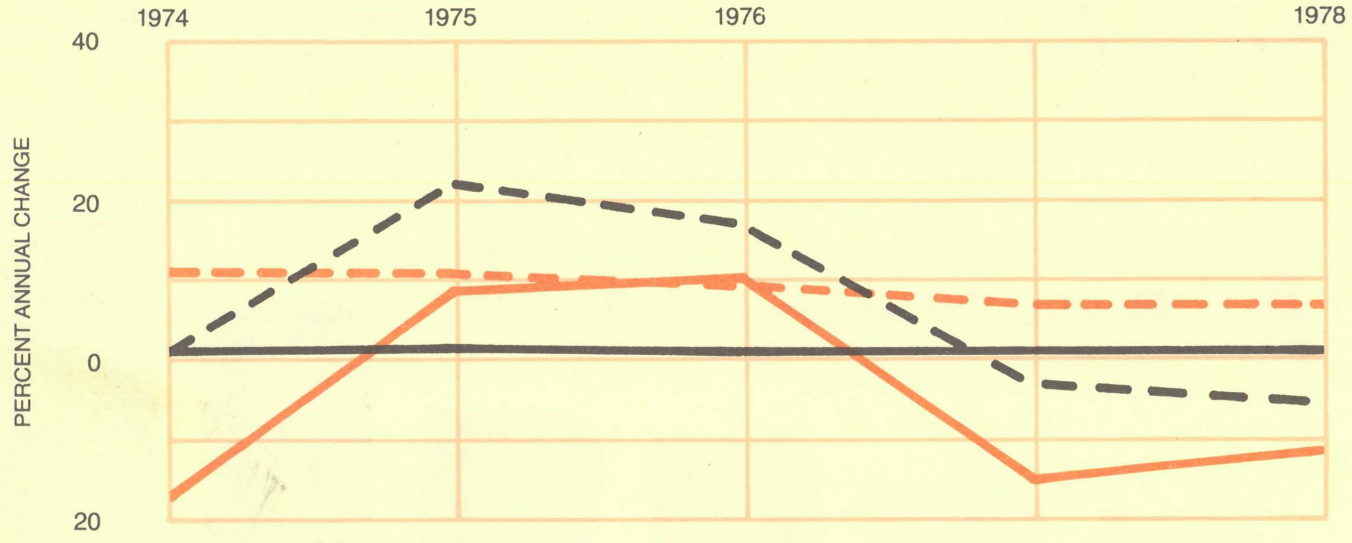
Some British Columbia Economic Indicators

(Percent Changes)



Personal income, employment and the value of shipments are major factors that reflect the economic health of the forest industry.

- Gross Provincial Product
- Total Personal Income
- Unemployment Rate
- Selling Value of Factory Shipments



The growth of the economy is based, to a large extent, on the use of wood products.

- Housing Starts
- Value of Building Permits
- Population
- Consumer Price Index (Vancouver)

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Environment Canada Forestry Service

Environnement Canada Service des Forêts

Source
- B.C. Government
- Stats. Canada
- CPPA