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PFRC
Goes to Seed

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V8Z 1M5.

Vol. 6 No. 3
Fall 1979

IMPROVING A VALUABLE RESOURCE

Approximately 80 million seedlings will be required every year for the reforestation program planned for British Columbia. This need has generated a heavy demand for high quality seed, much of which must eventually come from seed orchards of genetically improved trees.

The demand for seed does not stop there, however. Even larger quantities are required from both B.C. and the Yukon for overseas forestry programs, particularly in Europe. The large foreign market calls for high quality seed from quite specific natural stands, until seed orchards are able to meet these requirements also.

In response to these needs, and to the resulting massive movement of regional genetic resources, the tree and seed improvement program at PFRC is now focussing on the enhancement of quality and quantity of forest tree seed supply in B.C. and the Yukon.

This is accomplished through an integration of research and services. Research is conducted for a comprehensive range of problems in selection, production, procurement, processing, utilization and resource inventory. Services are provided to develop and maintain regulatory standards of authenticity and quality of seedlots required for the seed export industry.

SEED IMPROVEMENT RESEARCH

A report that prechilled (stratified) seeds of *Pinus ponderosa* could be air-dried and returned to cold storage for up to nine months without adversely affecting their viability stimulated similar investigations on *Abies* seeds from B.C. sources.

The experiment revealed that not only can prechilled *Abies* seed be dried and stored for one year without significant losses in seed quality but that significant increases in germination can accrue. Both germination rate and capacity was increased after almost all storage periods by partially drying prechilled seeds prior to storage.

The knowledge gained from this research could prove of great benefit to suppliers of seed, who may be able to prepare their seed well in advance of the required date and store them without any adverse effect.

Other research studies have been conducted to find methods of improving the use efficiency of seedlots by identifying and separating germinable and non-germinable seeds.

Some methods tested include the flotation-separation technique in which seeds are immersed in water and other media and are separated as a result of their ability to float in a particular fluid. There is some potential for seed separation here but a number of problems have yet to be overcome.

Another method of sorting seeds includes the use of air separation. A successful aspirator-type seed cleaner/sorter has been developed by **Dr. George Edwards** that works well with most conifer species. The basic theory behind this technique is that the device sucks up the lighter, less desirable seeds, leaving the denser ones behind. (See photo on page 3.)

Efforts to identify germinable and non-germinable seeds have included trials with x-ray contrast agents. These

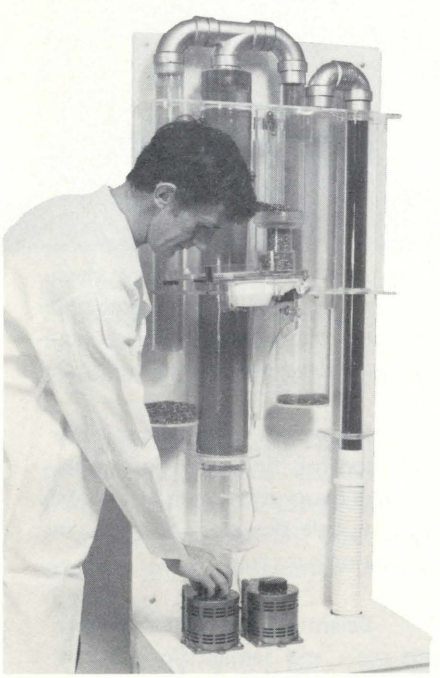
agents are materials which will penetrate the damaged or less viable seeds and will enhance contrast on an x-ray photo, thus making them more easily identifiable.

Studies are also being carried out aimed at characterizing the seed source from physical and biochemical properties of the seed and from physiological properties of seedlings - a sort of forensic analysis.

CONE CROP FORECASTING

About 2 000 kg of seed are needed annually for the reforestation and seed export programs underway in the region. Export requirements are approximately three times those of the domestic ones.

Advance knowledge of prospective cone crops is needed as an aid to cone collectors. The cone crops may be predicted from the initiation of reproductive buds, the development of flowers, and ultimately, cones.



Dr. George Edwards, PFRC research scientist, using his invention - a tree seed cleaner/ sorter.

To capitalize on these indicators a systematic procedure for forecasting, rating and reporting crops is necessary. Annual cone crop statistics are gathered and compiled into cone crop bulletins. This information should provide, in time, a base for studies of cone crop periodicity so that through understanding of the reproductive process, reasonably accurate and timely predictions of cone crops can be made.

In conjunction with this study, research is underway that will enable collectors to recognize the reproductive buds of conifers in the Fall - a year before maturation. This would assist collectors in predicting future seed crops well in advance.

As a further aid to cone collecting, researchers are currently looking at the development of an aerial branch sampler and cone collector. All artificial reforestation practices depend on an adequate seed supply from a wide variety of geographic, altitudinal and species sources. High quality seed is obtainable during heavy cone crop years but time available for harvest is limited to a few weeks each year. Harvests are rarely maximized particularly from remote and inaccessible forests. Such a device would prove a great boon to the industry.

SEED CERTIFICATION SERVICES

OECD

Several countries that import forest tree seed in commercial quantities from B.C. and the Yukon have insisted that, as from 1970, forest reproductive materials be imported only in compliance with the OECD (Organisation for Economic Co-operation Development) scheme. Since that time PFRC, as the certifying agent for forest tree seed collected under the scheme in B.C. and the Yukon, has certified several millions of dollars worth of seed - the value and quantity of which rise each year.

These sacks contain 150 kg of lodgepole pine seeds which were brought to PFRC for testing. With lodgepole pine seeds selling for between $300 to $1,000 a kg, this represents a very valuable cargo.

Over 10 tonnes of seed have been certified since the scheme began. At $300 to $400 a kilogram, today's seed is even more valuable, and prices approach $1,000 a kilogram for some sources. In 1978 the estimated value of seed certified was over $1 million - in 1977 it was $250,000.

PFRC has three official seed inspectors who verify the source of the seed through a series of inspections of collection sites, extractories and seed stores. The purpose of these inspections is to ensure that seed exported to countries participating in the OECD scheme originates from localities specified. Inspectors are required to judge whether cone and seed descriptions are authentic. (See story on page 5 .)

There is a great and increasing demand from Sweden for lodgepole pine seed and the further north they originate, the more valuable they are to Swedish importers, who are looking for trees to match their harsh climate. The milder British Isles import Sitka spruce from the Queen Charlotte Islands. Seedlots of 11 species have been certified since 1970, and several new species will be included in 1979.

Seed export thus provides a thriving industry in western Canada,

and will continue to grow as more countries find uses for Canadian seeds. The industry provides seasonal employment in remote areas and foreign earnings for Canada. There are presently three seed export companies operating within B.C. and the Yukon.

ISTA

PFRC membership in the International Seed Testing Association, ISTA, was sought in 1978 primarily to complement the role already performed in seed certification under the OECD scheme.

The ISTA program calls for the verification of the quality, rather than the source, of the seed. International rules for testing have been adopted in many countries as a means of providing standardized, comparable tests of seed quality.

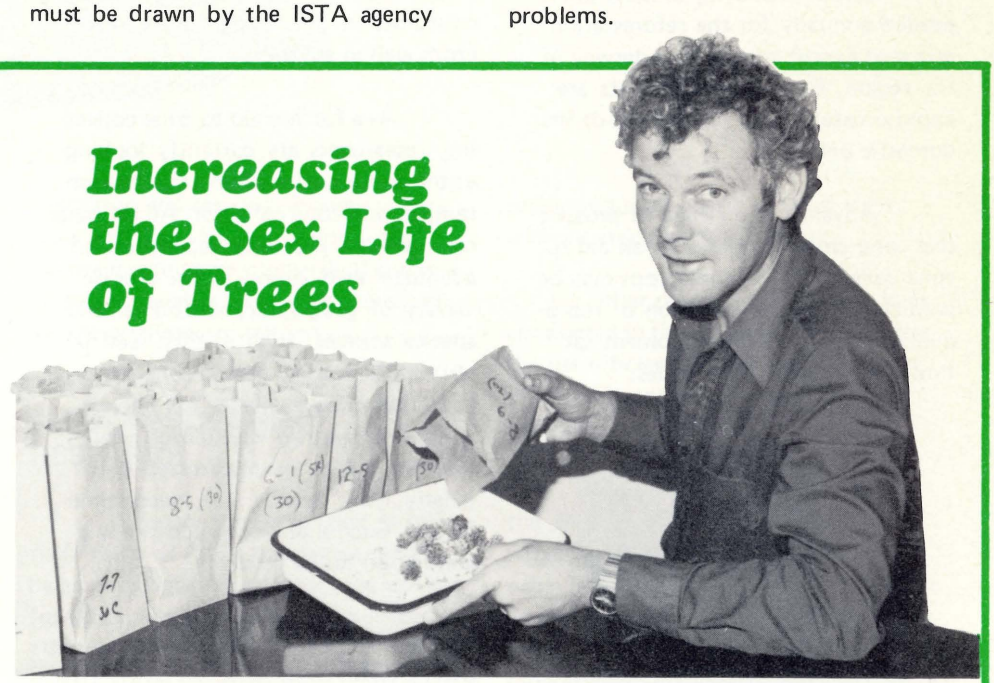
Two types of certificates are issued - blue and orange. Blue certificates apply only to the sample submitted by the dealer. The Inspector, who has no control over the taking of the sample, can only certify the sample and not the entire seedlot.

For orange certificates, which certify the seedlot as a whole, samples must be drawn by the ISTA agency and the seed containers then sealed to prevent tampering. The Inspector then applies the same tests as he does to blue lot certificates, and certifies tne entire seedlot.

Since the beginning of 1979, PFRC in its first year of operation, has issued 16 orange and four blue certificates. The number of tests is expected to increase in accordance with the OECD program activity.

PFRC now offers the full range of services needed by the Canadian seed export industry, in addition to research capability for solving associated problems.

Increasing the Sex Life of Trees



High up in the hills of Vancouver Island are some very sexy hemlock trees. Staggering under their burdens of cones, some are so heavily laden they are in danger of breaking. The sexual precocity of these young saplings is of particular interest to PFRC research scientist, Dr. Doug Pollard.

Why would scientists wish to stimulate flowering, especially in small hemlock trees only two or three years old? Well, a hemlock tree will not normally flower before it is 20 years old, making genetic improvement a slow business.

Hemlock happens to be a very important tree for the pulp and paper industry in coastal British Columbia. More and more hemlock seedlings are planted each year, and foresters see this as an opportunity to improve the genetic quality of forests in their care. Just as in corn-breeding, fast-growing varieties of forest trees can be obtained by careful breeding and selection.

One focus of Dr. Pollard's research is to understand and exploit processes by which trees become sexually mature. For some time biologists have known that a naturally-occurring substance called "gibberellic acid" plays an important role in flowering, and that it has many forms. Researchers at the University of Calgary identified the most effective forms of this acid and forest scientists injected special mixtures of it into young trees with remarkable results.

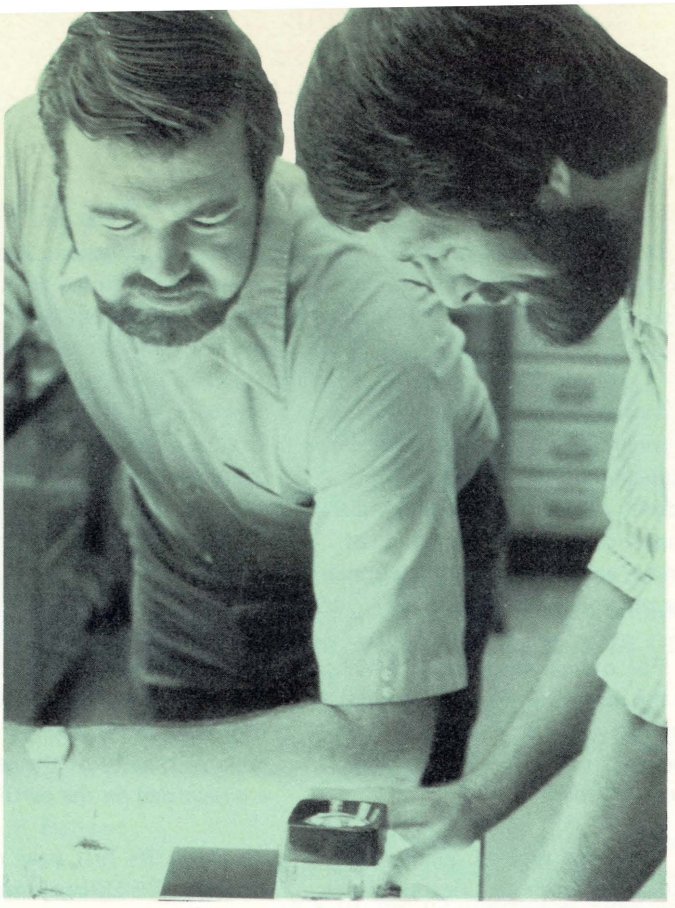
Fortunately for breeders of western hemlock their species responded better than any other commercial tree so far tested. Best results have been obtained on rooted cuttings from older trees, but even young plants raised from seed show encouraging response.

Flowering is not completely under control, however. For some unknown reason the treated trees form mainly female flowers. The males are still playing hard to get.

Scientists are confident that both male and female flowers can be produced at will, once a suitable recipe with gibberellic acid is found.

TREE SEED INSPECTORS

An Unusual Job



Frank Portlock (left) and Doug Taylor have unusual jobs. They are two of a handful of people in all of Canada who are certified Tree Seed Inspectors.

The export of tree seed is becoming big business in western Canada, especially in British Columbia and the Yukon. Three B.C. companies are now competing in a growing industry that is presently doing business in excess of one million dollars a year.

The biggest customers for B.C. and Yukon tree seed are the Europeans and since 1970 they have requested that seed exported from Canada be certified under the OECD (Organisation for Economic Co-operation and Development) scheme as to the authenticity of their source. Some importers are now asking for verification of quality of seed as well. This is where Frank Portlock and Doug Taylor become involved as Tree Seed Inspectors.

Frank is a Tree Seed Inspector for the OECD scheme - that is he issues a Certificate of Provenance asserting that a particular seedlot does indeed originate from the location it claims it does.

Verifying location means thousands of miles of travel a year for Frank, mainly between the months of September and January - the time during which the cones are picked and the seeds extracted. It is not unusual for him to log 2,000 miles in a week and he has been as far north as Mayo Landing in the Yukon to do so. Even in beautiful B.C. weather conditions vary during this time and Frank can remember making inspection trips during minus 35°F temperatures.

Inspection procedures begin with a site visit. The company notifies PFRC that cones are being picked in a certain location and an Inspector will arrange to meet with the company supervisor at the location and will visit various cone collection sites in the area. The site is inspected at the time of cone picking for potential yield, and for verification of description and ecological continuity. Field storage facilities are inspected for adequate protection of cones, for proper arrangement of bags and for proper labelling. Basic data such as latitude, longitude, and elevation have always been recorded, but site inspections this year require Frank to conduct full site and stand descriptions for each place he visits. This important ecological and stand information will be available to seed dealers and buyers alike, and, of course, adds to our knowledge about Canadian forests.

There is a further inspection of cones stored at the seed extractory. In addition, progress records of seedlots in the extraction process are examined. Certificates of Provenance and shipping labels may be issued after a final inspection of the seed. These labels must be attached to the seedlot and cannot be opened until the buyer does so.

In 1978, primarily to complement the OECD certification role, PFRC applied for membership in ISTA - the International Seed Testing Association. Doug Taylor, as a seed Inspector for the ISTA program, verifies the quality of the seed, as opposed to its source.

Some seed is worth over $1,000 per kg. and dealers are anxious to have certificates attesting to the quality of their seed in order to know the true germinative value when dealing with the buyer.

At the moment PFRC is certifying mainly lodgepole pine. Sweden,

one of the countries asking for both OECD and ISTA certification, requires a minimum 80 to 85% quality performance on the seed they buy depending on its source.

Two types of certificates are issued under the ISTA program. Blue certificates apply only to the sample submitted by the dealer. The Inspector, who has no control over the taking of the sample, can only certify the sample and not the entire seedlot.

For orange certificates, which certify the seedlot as a whole, samples must be drawn by an ISTA Inspector and the seed containers then sealed to prevent tampering.

The same type of quality tests are applied for both certificates. Rules for applying these tests are set out by ISTA as a means of providing standardized, comparable tests of seed quality. In lodgepole pine, for example, dealers are required to supply a minimum working sample of 25 gm. Nine gm. are then selected for purity tests in which the seeds are hand-sorted for debris, scales, etc. Seedlots must be 95% pure to leave the country and Doug says they seldom get samples with less than 99% purity - an indication of the high standards of extraction developed by Canadian seed dealers.

A 21-day germination test is the final step before certification. From the results of these tests the Inspector can calculate the percentages of quality of the seed and they are recorded on the certificate.

In its first year of ISTA certification PFRC has issued 16 orange and four blue certificates. Business is expected to increase as dealers become anxious to determine the quality of their seed, and as buyers become more selective about their purchases.

While the inspection work that Doug Taylor and Frank Portlock carry out is essentially a service to the seed export industry, there are other potential benefits to the Canadian Forestry Service that can be realized through their work. Information can be obtained on seed yields from different sites and locations and statistics can be kept on the international movement and location of Canadian forest gene resources. It's vital to keep track of where our valuable tree seed resource is going.

The future looks bright for the Canadian seed export industry, and as business expands so too will the work of tree seed inspectors like Frank Portlock and Doug Taylor.

CHINESE FORESTRY DELEGATION VISITS CANADA

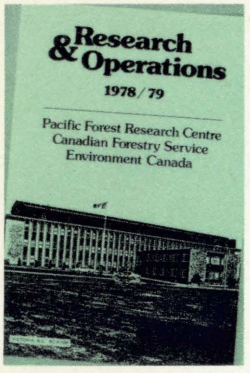
A six-man delegation of Chinese forest fire control experts recently spent 12 days in Canada as guests of the Canadian Forestry Service examining and discussing forest fire control equipment and techniques used across the country.

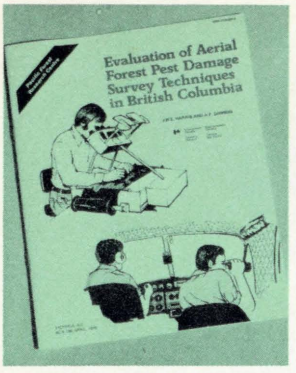
The tour, which began in Ottawa, took them to federal and provincial forestry centres in Quebec, Ontario, Alberta and British Columbia. They were also given the opportunity to talk with industry people along the way.

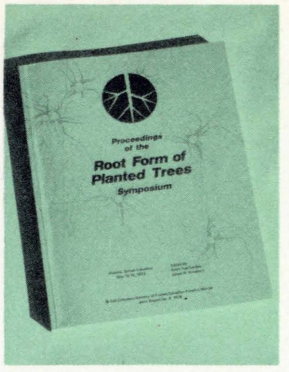
The delegation spent their last day of the tour visiting with staff of the Pacific Forest Research Centre. Delegation leader, Shiguang Li, Deputy Director of the Forest Management Bureau, Peking, said the fact finding mission was "very successful and the delegation was most impressed by methods used in Canada to control forest fires".

Photographed at PFRC are (left to right) Jianbei Liu, Foreign Affairs Bureau, Ministry of Forests; Huanneng Zheng, Assoc. Prof., Northeast Forest College; Erzheng Zhou, Deputy Division Chief, Forest Management Bureau, Ministry of Forests; Ross Macdonald, Director, Forest Protection Branch, CFS, Ottawa, Shiguang Li, Deputy Director, Forest Management Bureau, Ministry of Forests; Terry Honer, A/Director, PFRC; Bud Smithers, Regional Director-General, Environment Canada, Pacific Region; Guangshen Cong, Engineer, Institute of Forest Protection; and Jizhong Jin, Engineer, Institute of Forest Protection.

RECENT PUBLICATIONS







Research and Operations, 1978/79, Pacific Forest Research Centre, Canadian Forestry Service, Victoria, B.C.

This report on forest research and operations at the Pacific Forest Research Centre reflects the progress made during the fiscal year 1978/79 in achieving program objectives in British Columbia and the Yukon.

BC-X-199

Evaluation of Aerial Forest Pest Damage Survey Techniques in British Columbia

J.W.E. Harris and A.F. Dawson

Detection and appraisal of forest pest damage in British Columbia is done either by sketch-mapping or aerial photography, often yielding different results. This report studies both methods and recommends the use of improved sketch-mapping procedures, supplemented by aerial photography.

BC-X-198

Copies of these publications may be obtained by filling out the enclosed card and returning it to the Information Office, Pacific Forest Research Centre, 506 West Burnside Rd., Victoria, B.C. V8Z 1M5

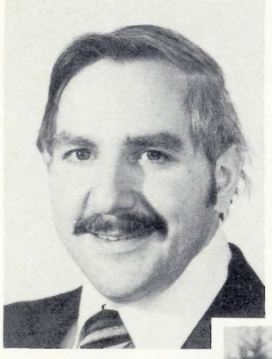
Proceedings of the ROOT FORM OF PLANTED TREES Symposium, Victoria, B.C., May 16-19, 1978.

Edited by Evert Van Eerden and James M. Kinghorn

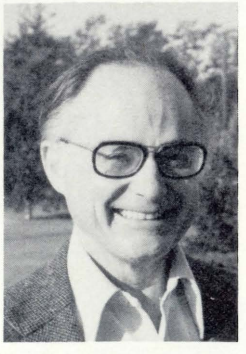
The papers contained in these Proceedings represent a broadly based view of the morphological aspects of root form, with contributions from Denmark, Fiji, Finland, France, New Zealand, Sweden, Tunisia, the United States and Canada.

British Columbia Ministry of Forests/ Canadian Forestry Service Joint Report No. 8, 1978.

RESEARCH SCIENTISTS APPOINTED



John Manville



Ernst von Rudloff

Dr. T.G. (Terry) Honer, R.P.F., A/Director, Pacific Forest Research Centre is pleased to announce the following two appointments to PFRC:

Dr. John Manville

A native of Victoria, B.C., Dr. Manville received both his B.Sc. (1964) and his Ph.D. (1968) from the University of British Columbia. He was formerly employed with Forintek Canada Corp. and the Western Forest Products Laboratory, Vancouver, B.C.

In his new position Dr. Manville will set up a research program to assess the impact of several insecticides and herbicides on the forest eco-system.

Dr. Ernst M. von Rudloff

Dr. von Rudloff is on a two year secondment to the Centre from the Prairie Regional Laboratory of the National Research Council, Saskatoon, Saskatchewan. Dr. von Rudloff received his B.Sc. (1948), his M.Sc. (1950) and his Ph.D. in organic chemistry in 1953 from the University of Pretoria, South Africa.

Dr. von Rudloff is conducting chemosystematic studies of Canadian conifers by means of lenfoil terpene analysis. In particular he is studying the lodgepole pine, spruce, Douglas-fir and western hemlock to determine if the results of the studies will be of practical value in forest genetics and tree improvement programs.

HIGHLIGHTS OF MID-SEASON PEST CONDITIONS

The annual forest insect and disease survey in British Columbia and the Yukon was carried out this summer by pest survey technicians of the Forest Insect and Disease Survey (FIDS) staff of the Pacific Forest Research Centre (PFRC). This is part of a national Canadian Forestry Service program.

Technicians were assigned to survey their districts from May through September. Pest populations were sampled at 100 or more permanent sampling stations in each district and additional observations were made in hazard or problem areas. Areas of major defoliator and bark beetle activity were sketch-mapped and photographed during aerial surveys and ground checks were made this fall.

Mountain Pine Beetle

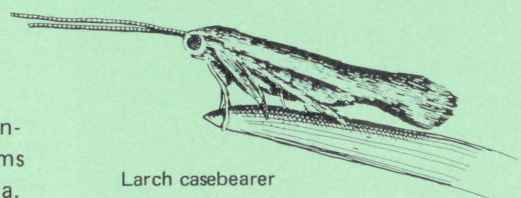
The mountain pine beetle continued as one of the major pest problems in the Province active over 74 000 ha. Infestations and tree mortality occurred in the East Kootenay from the international boundary north through the Flathead, Elk, Kootenay and Columbia River valleys to Wood River. In the lower Flathead River drainage, infestations expanded from a few patches of 10 to 50 trees two years ago to encompass most of the mature lodgepole pine stands in Sage, Nettie, Cabin, Kishinena and Adamina Creeks. Pine stands in West Kootenay were less heavily attacked, although generally there was an increase of 20 to 50% in the number of trees killed.

In the Central Interior the beetle is continuing to kill large volumes of pine west of Okanagan Lake and in Ashnola River Valley, Goldbridge, Stein River and Mission-Belgo Creeks. The outbreak in the Kliniklini River Valley near the western boundary of the Cariboo Region subisded after most mature pine was killed, although some 20 000 ha are currently infested from Charlotte Lake to Tatlayoko Lake.

In the north, pine stands between Babine Lake and Kitwanga have come under heavy beetle attack.

Spruce budworm

Spruce budworm infestations declined in the Pemberton area but the population persisted in some areas and defoliation occurred in several previously uninfested locations. Total area of defoliation was 49 000 ha with severe defoliation over 5 180 ha in the Hope-Fraser Canyon-Coquihalla area. In addition to some scattered tree mortality in previously heavily defoliated areas, varied amounts of mortality and top kill occurred on delineated areas totalling 5 700 ha.



Larch casebearer moth

Larch casebearer

Defoliation of western larch by casebearer expanded and increased throughout the east and west Kootenay, with severe defoliation in the Crescent Valley, Arrow Lake and Pend-d'Oreille River, Creston and Cranbrook areas.

Pine shoot moth

In an effort to prevent the establishment of European pine shoot moth in Interior B.C., a cooperative survey involving CFS, B.C. Ministry of Forests and Plant Quarantine personnel, was again conducted from Osoyoos to Kamloops. Infested ornamental pines found at 60 residential locations were treated.

Spruce beetle

Spruce beetle infestations continued near Smithers Landing on Babine Lake and there was an increase in the number of trees killed north of Vanderhoof and east of Prince George. Extensive windthrow of white spruce which occurred in 1978 was attacked in 1979. This could result in much increased populations and post a threat to mature spruce stands in the areas.

Aspen defoliators

Aspen trees were defoliated by the large aspen tortrix near Fort Nelson, Kledo Creek and at several locations along the Yukon River in the Yukon. The Bruce spanworm defoliated aspen in the Smithers-Burns Lake area, south of Fort St. John and near Dawson Creek. A disease aspen leaf and shoot blight, again affected much of the foliage in many areas also.

Needle cast

A larch needle cast caused discoloration of larch foliage in the eastern portion of Kamloops Region and throughout the range of larch in east and west Kootenay.

Lodgepole pine trees throughout much of the Interior were infected with a needle cast which infects the previous years needles. After several years of infection only the current years needles remain on some trees.

A needle cast of Douglas-fir occurred over an unusually large area in the upper Klanawa River Valley south of Alberni Inlet. Severely infected trees retained only the 1979 foliage.