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DOUGLAS-FIR TUSSOCK MOTH OUTBREAK HALTED

Highly successful trials were conducted this past summer by the Canadian Forestry Service (CFS) and the British Columbia Ministry of Forests (BCMF), using a naturally occurring virus to prevent an outbreak of Douglas-fir tussock moth in the Hedley-Keremeos Area of the Similkameen Valley.

The virus, known as nuclear polyhedrosis, can be duplicated in a laboratory and is simply infected, dried, and ground up tussock moth. It was applied aerially and on the ground at the beginning of an outbreak to determine if application could bring about collapse of the infestation before significant damage occurred.

The Douglas-fir tussock moth occurs periodically in outbreak numbers in the interior dry-belt coniferous forests of British Columbia and in the western United States. Although the tussock moth larvae can feed on the foliage of several tree species, the primary host in British Columbia is Douglas-fir; the United States has two additional primary host trees—grand fir and white fir.

The tussock moth overwinters in the egg stage, with larvae hatching in late May or early June, depending on the weather. After going through five or six growth stages, the larvae spin cocoons in late July or August.

Young larvae feed on new or current growth of the host tree, while older larvae, although preferring the current growth, can also feed on the old foliage. Only the older larvae can consume the entire needle. The attacked needles change color, giving the characteristic reddish brown appearance of the damaged needles and trees. Defoliation and damage is usually concentrated on the upper part of the trees.

At high larval densities, the trees may be completely stripped of their foliage and killed in a single season, although some trees exhibit dramatic foliage recovery after the outbreak has ended.

If the defoliation is moderate, the trees may survive. However, because of their weakened conditions, the trees may become highly susceptible to Douglas-fir beetle attack.

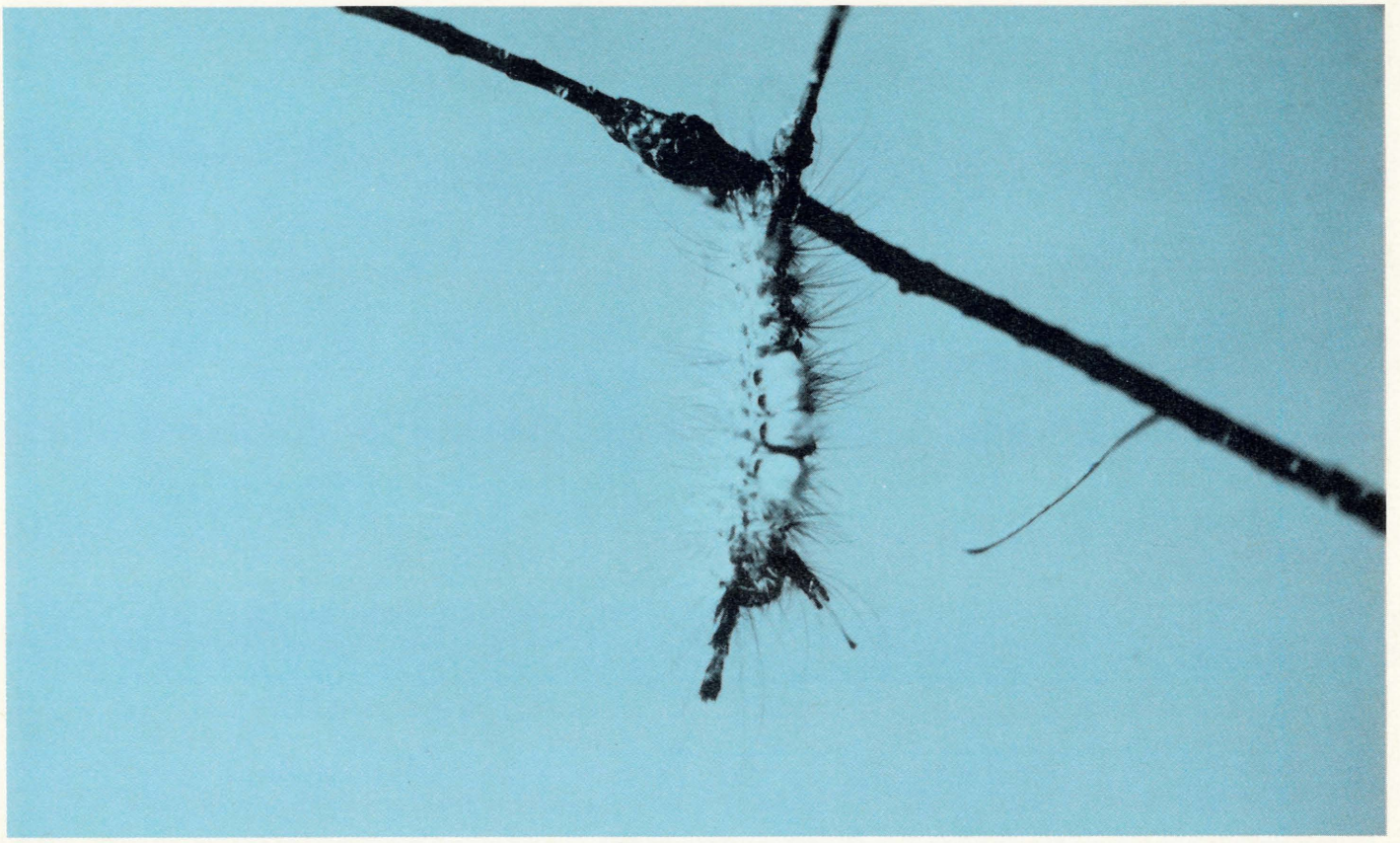
Tussock moth outbreaks usually last from two to four years in an area before they collapse naturally. Predators, parasites, pathogens, and starvation all contribute to population collapse.

Among these mortality factors, virus is generally regarded as the most important natural cause of decline. However, the natural occurrence of virus usually happens *after* two or three years of defoliation when growth loss, dieback, and some tree mortality has already occurred.

This disease of the tussock moth can be caused by either of two distinct *nuclear polyhedrosis viruses* (NPV). Canadian Forestry Service scientists at the Forest Pest Management Institute in Sault Ste. Marie, Ontario, produced the virus under contract to the B.C. Ministry of Forests, who, in turn, supplied the research trials.

In 1975-1976, through a cooperative program among the CFS, the BCMF,

COVER PHOTO: Water-sampling tools at Spillimacheen, B.C.—part of the fertilization-on-snow project



and the United States Department of Agriculture Forest Service, the virus was tested successfully *during* an epidemic and prevented further outbreak.

This year, thanks to a highly sensitive trap monitoring system developed at the Pacific Forest Research Centre in Victoria and to an alert detection staff, early warning signals indicated that Douglas-fir tussock moth populations were approaching outbreak levels in the Similkameen Valley in southcentral British Columbia. This presented a unique opportunity to test the theory that applying the virus at the *beginning* of an outbreak may bring about the collapse of the infestation before significant damage occurs.

The trials, which were led by **Roy Shepherd** and **Imre Otvos** of the Canadian Forestry Service and **Rick Chorney** of the B.C. Ministry of Forests, consisted of applying the virus, after egg hatch, by helicopter with an orchard-type sprayer. The amount of NPV used was minimal. The beauty of using a virus is that, so long as a few larvae feed on tainted needles, the infection will spread naturally throughout the entire moth population.

Based on egg mass density and accessibility, ten plots were selected for the study, varying in size from half a hectare to nine hectares. Two plots were chosen for ground treatment with one control plot, and four plots for aerial treatment with three control plots. The ground-treated plots and their control all had moderate Douglas-fir tussock moth populations. One of the aerially-treated plots had a high population, two had moderate, and one had low. There was a control plot for each of these population levels.

Although researchers will follow the Douglas-fir tussock moth populations in all the treated and control plots for three years to determine the effect of the treatment on outbreak, results to date have proven the trials a success.

"These tests indicate that increasing populations can be detected and treated before severe defoliation occurs", says Roy Shepherd. "Our tests show that populations of different densities were decimated, and by autumn, not one egg mass was found in the treated areas."

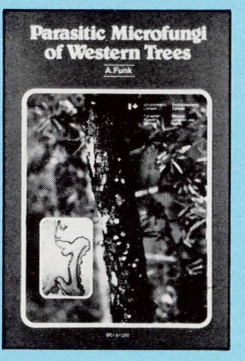
The tests also showed that the degree of spread was effective for at least 200 metres, but further testing will need to be conducted to determine if swathing can be employed to save this expensive virus.

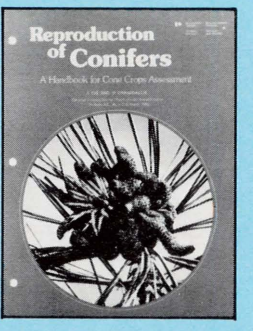
"The nice thing about using a naturally occurring virus, such as this, is that it is specific to the Douglas-fir tussock moth alone and causes no reaction to other living organisms in the forest environment or to humans", says **Robert De Boo**, Manager of the Forest Pest Management Branch, BCMF.

Encouraged by these results, efforts are now underway to begin long and extensive registration procedures that, if granted, will allow forest managers to effectively treat this forest pest with a natural biological control agent.

Two new handbooks have been written by Pacific Forest Research Centre (PFRC) staff and are available to "Information Forestry" readers to assist them in their forest management activities.

Two New Handbooks Available





"PARASITIC MICROFUNGI OF WESTERN TREES", by **Alvin Funk** contains a description of all known microfungi associated with stem diseases of western trees. This book has been prepared in an attempt to fill a need in forest pathology in western North America.

Approximately 200 species of microfungi are included—all from the Ascomycetes and the Deuteromycetes. The diseases induced by these microfungi are the cankers, diebacks, and shoot blights.

Notes on host range, disease symptoms, and taxonomy are included. The descriptions are arranged alphabetically by genus name of the microfungi. The keys for identification appear in the front of the book; the literature references, glossary, host index, and general index appear in the back. Black and white photographs and drawings accompany the text.

It is hoped this descriptive, taxonomic work will supplement other publications and give the forest pathologist an additional tool for identifying and diagnosing forest disease problems. **BC-X-222**

Copies may be obtained by filling in the enclosed reply card and mailing it back.

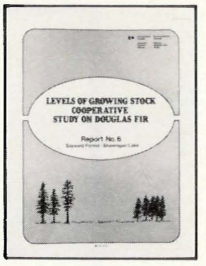
"REPRODUCTION OF CONIFERS—A HANDBOOK FOR CONE CROP ASSESSMENT", coauthored by **Slavjo Eis** and **Don Craigdallie**, is written in simplified language for the layman and only a few technical terms are used. The photographs concentrate on the main stages of development, generally only those that may be recognized by an unaided eye; a hand lens may be useful in the early stages.

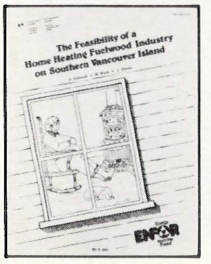
In 1979 the British Columbia Ministry of Forests used 1 666 kg of seed to produce about 63 million nursery seedlings for reforestation. By 1995 the seedling production is expected to reach about 185 million. Such a rapidly increasing reforestation program requires collection, processing, storage, and sowing of hundreds of seed provenances.

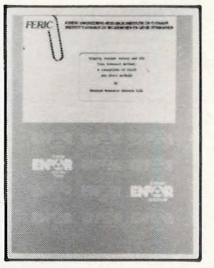
To successfully collect the forest tree seeds, knowledge of prospective cone crops is needed several months before cone maturation. The ability to estimate seed crops in advance will come with the understanding of the reproductive cycle of individual tree species and with the knowledge of the morphology of the reproductive structures.

This handbook was written with that in mind. It is being published in loose-leaf format so that species information may be added as it becomes available. The first volume, published in March 1981, contained information on Douglas-fir, lodgepole pine, western hemlock, and yellow cedar. The second volume contains information on interior spruce (Engelmann and white), grand fir, ponderosa pine, and larch (western and alpine). By the time the handbook is complete, the authors hope to cover 20 conifer species and eight broadleaf species. **BC-X-219**

New Publications







- **LEVELS-OF-GROWING-STOCK COOPERATIVE STUDY IN DOUGLAS-FIR. Report No. 6: Sayward Forest, Shawnigan Lake**

  J.T. Arnott and D. Beddows

  The Canadian Forestry Service maintains two of nine installations in a regional, cooperative study on the influences of nine levels-of-growing-stock on tree growth in young Douglas-fir stands. Data are presented for the first eight and six years at Sayward Forest and Shawnigan Lake, respectively. The effects of the calibration thinnings are described.

  BC-X-223

- **THE FEASIBILITY OF A HOME-HEATING FUELWOOD INDUSTRY ON SOUTHERN VANCOUVER ISLAND**

  D. Gemmell, M. Ward, and L. Davis

  A feasibility study of a home-heating fuelwood industry was conducted for the southern tip of Vancouver Island. This study was contracted to the Sierra Club of western Canada under the Energy from Forest Biomass (ENFOR) program.

  BC-X-224

- **FOREST INSECT AND DISEASE CONDITIONS, British Columbia and Yukon, 1981**

  G.A. Van Sickle

  This summary of forest pest conditions in British Columbia and the Yukon in 1981 was compiled from records and field reports of 12 forest insect and disease technicians.

  BC-X-225

- **A REVIEW OF ENERGY REQUIREMENTS TO COMMINUTE WOODY BIOMASS**

  K.C. Jones & Associates Ltd.

  This report compares, in graphical and tabular form, the energy required to comminute woody material to nominal sizes using chippers, chunkwood chippers, hammermills, brush flails, roll crushers, and baling mechanisms. The energy requirements to produce surface areas perpendicular and parallel to the grain are also compared.

  ENFOR Project P-28
  Special Report No. SR-14

- **FIELD TESTS TO DEVELOP ENERGY-SAVING WOOD COMMINUTION TECHNIQUES**

  K.C. Jones & Associates Ltd.

  This report examines the energy requirements for comminuting residues recovered from conventional logging operations. It is a summary of the result of four field tests.

  ENFOR Project P-28
  Special Report No. SR-15

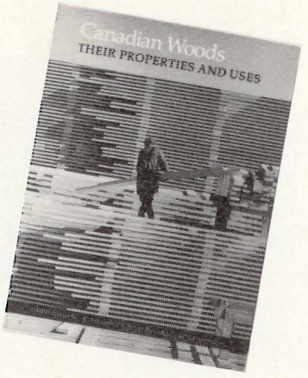
- **LOGGING RESIDUE SURVEY AND THE LINE TRANSECT METHOD: A Comparison of Field and Photo Methods**

  Dendron Resource Surveys Ltd.

  The volume of logging residue calculated from photogrammetric and ground measurements were compared to assess the reliability of low-level 70 mm photography for such inventory.

  ENFOR Project P-28
  Special Report No. SR-16

NOW AVAILABLE



Canadian Woods
Their Properties and Uses

The first edition of **Canadian Woods** was published in 1935, the second in 1951. This long-awaited third edition, completely revised and expanded, is a comprehensive overview of today's multifaceted forest industry.

With contributions by 23 specialists, it provides a complete review of the woods found in Canada and their commercial uses. It discusses their structure, strength, and other physical properties, as well as wood chemistry, lumber production, wood drying, wood protection, glues, and gluing.

There are chapters on the processing and use of woods and wood products, panel products, houses and structures, pulp and paper, and codes and standards in Canada.

In hardcover cloth binding, the new **Canadian Woods** has about 400 pages and is lavishly illustrated with more than 280 photographs and drawings. It will be an essential reference book for students and practitioners in the forest professions and industries.

Canadian Woods is published in French under the title **Les bois du Canada—leurs proprietes et leurs usages.**

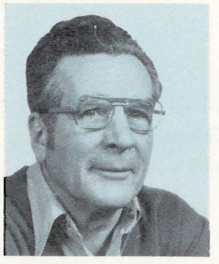
The English edition is published jointly by the Canadian Forestry Service and the University of Toronto Press, and the French edition by the Canadian Forestry Service and Editions du Pélican, Québec. Copies are available at $27.50 from leading booksellers or may be ordered from the publishers:

University of Toronto Press
63A St. George Street
Toronto, Ontario
M5S 1A6

Editions du Pélican
Case postale 1182
Québec, Qué.
G1K 7C3

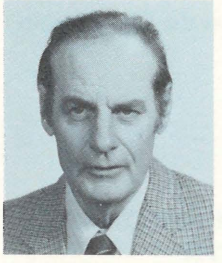
Retirements

Three members of the PFRC senior professional staff retired this past December with a cumulative service record of over 112 years to the Public Service of Canada.



R.L. "Lew" Fiddick retired with over 39 years of service to the Canadian Forestry Service. He has been Chief Ranger with the Forest Insect and Disease Survey (FIDS) since the program began. In this capacity, Lew has covered more British Columbia territory than perhaps any other PFRC employee.

J.M. "Jim" Kinghorn leaves with over 33 years of service. His major contribution to the Canadian Forestry Service was the research and development of container planting techniques—most notably, the styroblock container, which has earned international acceptance and is used extensively in the province of British Columbia for reforestation. Jim, on loan to the Ontario Ministry of Natural Resources, spent his last year assisting CFS with their reforestation program.



A. "Al" MacEwan Scientific Editor at PFRC since 1967, retired after 40½ years of service—26 of which were with the RCMP. He has shepherded thousands of manuscripts through to publication during his 14 years with PFRC and his editing expertise will be sorely missed.

Staffing action is currently underway to fill these vacancies, and readers of "Information Forestry" will be apprised of replacements as they are hired.

Vancouver Island Hosts Tree Improvement Meeting

The 18th biennial meeting of the Canadian Tree Improvement Association, held this past summer in Duncan, British Columbia, attracted 180 delegates from Canada and the United States, making it one of the largest events of its kind in North America.

Technical sessions began with a keynote speech by **Roy Faulkner**, Principal Geneticist of the British Forestry Commission, who presented a comprehensive review of tree improvement research and development.

Seed Orchards

The first part of the symposium, chaired by **Mike Crown**, B.C. Ministry of Forests, dealt specifically with seed orchards. **Ralph Bower**, MacMillan Bloedel, gave a broad overview of the progress and the current state of the seed orchard program in British Columbia. **Steve Ross**, B.C. Ministry of Forests, in a paper with **Dick Pharis**, University of Calgary, discussed recent developments in techniques to enhance flowering and seed production in conifers and proposed two new concepts—the outdoor hedged orchard and the indoor potted orchard—as possible solutions to meet the deficiencies of conventional orchards.

John Owens, University of Victoria, examined the potential for phenological control of pollen in the light of pollen cone and pollen development in B.C. conifers, and **Gordon Miller**, Pacific Forest Research Centre, addressed the problems of insect pests in seed orchards. The seed orchard section was rounded off by **Chuck Masters** of Weyerhaeuser, who outlined his company's seed orchard program.

Strategies for Tree Improvement

The second part of the symposium dealt with strategies for tree improvement and was chaired by **John Barker**, Western Forest Products. **Don Lester**, Crown Zellerbach, outlined strategy options and how they are selected; his recognition of the human element was well received.

Tree improvement programs in the United States and British Columbia are further ahead than many programs elsewhere in Canada, yet all forest managers are required to pursue genetic improvement in their planting stock. This problem was addressed by **Yves Lamontagne**, Min. des terres et foréts, Québec, in his consideration of interim seed supplies. **Marie Rauter** and **Jim Hoot**, Ontario Ministry of Natural Resources, surveyed the applications of rooted cuttings in tree improvement programs and mentioned, in particular, breeding, cutting, and production seed orchards, and research and production plantations.

Southern pine tree improvement programs have long been the symbols of progress in North American tree improvement. **John Talvert**, Tree Improvement Cooperative, North Carolina, took a reflective view of first-generation programs, discussed realization of the commonly observed three percent gain, and stressed the opportunities presented by continued first-generation improvement during second-generation activities. The purpose, strategy, and procedures in advanced generation orchards were reviewed by **Hans van Buijtenen**, Texas A and M University; again, the experiences in southern pine breeding provided a valuable glimpse of the future in store for Canadian tree improvement.

Current Seed Technology Practices

Four speakers evaluated the use of current seed technological practices in seed orchards in the third and final part of the symposium. **Brian Haddon**, Canadian Forestry Service, outlined cone collection and handling, stressing attention to logistics and administrative procedures. **Oscar Sziklai**, University of British Columbia, reviewed seed processing and concentrated on seed extraction and methods and equipment used for small lots. **Carole Leadem**, B.C. Ministry of Forests, discussed seed testing, identification of seed source, determination of seed ripeness, and monitoring of seed orchard production. **Jengi Konishi**, B.C. Ministry of Forests, dealt with seed storage and utilization, briefly touching on orchard management practices and identifying some research projects.

Proceedings Available

All of the papers presented at the symposium, including summaries of operational orchards visited on the field trip, will be published in Proceedings, together with papers from the Seed Technology Workshop. These Proceedings are recommended to all scientists and managers who require a state-of-the-art review of some of the key issues facing research and development in seed orchards and tree improvement in Canada today.

The Proceedings are available free of charge by writing: **Dr. D.W. Yeatman, Petawawa National Forestry Institute, Chalk River, Ontario, KOJ 1JO.**

FIRST FEDERAL / PROVINCIAL RESEARCH AGREEMENT SIGNED

Federal Environment Minister, **John Roberts**, and B.C. Minister of Forests, **Tom Waterland**, recently signed the first federal/provincial Memorandum of Understanding concerning the coordination of forest research.

The purpose of the agreement is to enhance the contribution of the forest research programs of the Canadian Forestry Service (CFS) to the management of the forest resource in British Columbia. Similar agreements will be signed with other provinces over the next several months.

The objectives of the memorandum are:

- To ensure the fullest, most efficient, and effective use of the forest research resources available to the two agencies.
- To allocate research activities to minimize duplication of effort and to best utilize specialist capabilities.
- To facilitate forest research programs through cooperation in planning and implementation.

In order to avoid unnecessary duplication of staff and facilities, the following guidelines have been established for the two agencies involved:

- The CFS will develop its capability in forest protection research to address major problems in fire, insects, and disease.
- The B.C. Ministry of Forests will develop and maintain an extension program for practitioners of forest management in the province, to assist in transferring forest protection technology.
- The Ministry of Forests will develop and increase its capability in silvicultural research and development.
- The CFS's silvicultural research activity will be directed toward in-depth basic research in support of the Ministry's silvicultural program.

"This is really a formalization of the cooperative research work that has been taking place between the Pacific Forest Research Centre and the B.C. Ministry of Forests for many years", says **Ross Macdonald**, Regional Director of the CFS.

"We are pleased to continue these cooperative efforts and look forward to directing our current, as well as our new, research activities to the needs of the forest industry of British Columbia."

The full text of this agreement may be obtained by circling publication on enclosed postcard.

AN INVESTMENT IN THE FUTURE—
Canada/British Columbia Subsidiary Agreement on Intensive Forest Management

Government of Canada/
Province of British Columbia

The cooperative federal/provincial effort will concentrate on four key areas to be studied over the five-year project with $25 million being spent on: backlog reforestation, juvenile spacing, fertilization, and forest protection on managed stands. Mark enclosed reply card for a copy.

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