



Province of
British Columbia
Ministry of Forests

FOREST HEALTH PROGRESS

A summary of forest health activities in the British
Columbia Ministry of Forests.

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A NEW FOREST HEALTH MONITORING SERVICE

In March 1995, most of us were very concerned to learn that the Canadian Forest Service will greatly reduce, if not eliminate, the Forest Insect and Disease Survey (FIDS). In April, 1996, FIDS will be replaced by a new forest health or biomonitoring service which is yet to be defined.

Ministry of Forests staff, B.C. Parks, forest industry and public have relied on FIDS as an expert, third-party for a myriad of services: identification of insects and diseases; overview surveys of mature and young forests; custody of reference collections and data; developing new survey techniques; monitoring insect outbreaks; expert advice; and technical publications.

Personnel managing parks or other protected areas will keenly miss the current FIDS surveys and advice, and Ministry of Forests staff can expect to experience more difficulties trying to prevent excursions or incursions of damaging insects or diseases.

The decision to cut FIDS was made unilaterally—without consultation—nation-wide, apparently in response to the federal budget cuts. Although it was clearly stated by federal and other staff that Canadian Forest Service surveys do not duplicate ministry activities, there appears to be a perception that FIDS activities were too operational in nature, and too similar to ministry activities.

We are analyzing functions or services that FIDS supplied, and determining probable impacts of the cuts on ministry programs or staff, particularly at districts. The results will be used to determine the priority or value that the ministry places on these services, and as a basis to develop options to preserve or replace these essential services.

- J. Muir, Silviculture Practices Branch, Victoria.

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FOREST HEALTH PROGRESS

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EDITOR'S NOTE

Forest Health Progress is a report to the Forest Health Committee of British Columbia on issues, proposals, projects and results by Ministry of Forests staff. Brief, informal and informative articles are welcome from all staff.

Contributions labeled with an appropriate subject heading should be submitted to regional forest health staff, or advisor, who will edit and forward them to Silviculture Practices Branch. Forest Health Progress is submitted to the spring (May) and winter (December) meetings of the Forest Health Committee.

Authors should be contacted for any clarification, as the contents of this report do not necessarily constitute official statements of the Ministry of Forests.

EXECUTIVE SUMMARY

This issue of the Ministry of Forests report to the Forest Health Committee of British Columbia contains several reports of forest health projects and plans.

General interest items include: development of training courses for silviculture surveys and prescriptions (p. 4); a video on forest health activities (p. 4); a course on forest health for stand tenders (p. 5); global warming and increased leader weevil attack on spruce on northern Vancouver Island (p. 5); a collection of forest health photographic slides (p. 6); a new aerial survey technique using the global positioning system and a laptop computer (p. 6); a personal experience with silviculture training (p. 7); priorities and support for forest health research (p. 8); a report of seed pest management activities (p. 8); and corrections to a report on forest health treatment options (p. 11).

Forest insect reports include: a balsam woolly adelgid survey (p. 12); review of a draft bark beetle management responsibility policy (p. 12); a technical audit of bark beetle management near Williams Lake (p. 12); updates on findings and activities to eradicate introductions of Asian and North American strains of gypsy moth (p. 13); progress on a mountain pine beetle impact study (p. 13); spruce beetle surveys and impacts in areas of spruce defoliated by western hemlock looper near Prince George (p. 14); a spruce beetle management training course (p. 14); study of competitive exclusion of spruce beetle by secondary bark beetle and by semiochemical inhibitors (p. 15); management and trials to control western spruce budworm (p. 15 and 16) and western hemlock looper (p. 16); trials of neem, a new insecticide, to control white pine weevil on spruce (p. 17); bark beetle management activities (p. 18); and a course for forest workers to conduct beetle probes (ground detection surveys, p. 18).

Disease management activities included a white pine trial for resistance to blister rust (p. 19); an analysis of armillaria root disease survey data in the Nelson Forest Region (p. 19); an update on the development of the model PROGNOSIS for determining root disease and other effects (p. 20); and development of a root disease computer-based training module (p. 21).

A model and decision-making profile has been developed to determine risks in spacing pine stands (p. 22).

Canadian Forest Service scientists at Sault Ste. Marie are developing modified viruses that have potential for enhanced control of defoliating insects (p. 23); and a summary of use of monosodium methanearsonate (MSMA) in British Columbia was published (p. 24).

- J. Muir, Silviculture Practices Branch, Victoria.

FOREST HEALTH - GENERAL

Forest Health Training Courses for Silviculture Surveys and Silviculture Prescriptions. Materials for both courses are currently undergoing final updates and integration of relevant Forest Practices Code technical information. This project is contracted out to Laing & McCulloch, and they are also updating the slide and specimen portion of both courses, a final draft should be available mid-May, 1995.

These courses are in very high demand at the moment. Once they are complete, we will set up a contract to handle advertising, registration, and basic set-up of course sessions. We will also hold a "train the trainers session" through a contract.

Mike Pedersen and Patricia Humphreys will be responsible for the Forest Health for Silviculture Surveyors course. However, responsibility for the Forest Health for silviculture prescriptions (developed and piloted in conjunction with Forest Health for Silviculture Surveyors) needs to be reassigned.

- P. Humphreys, Silviculture Practices Branch, Victoria.

Introduction to Forest Health. A 10-minute video presentation to accompany the recently produced forest health brochure is being reviewed by branch management for approval for distribution.

The video highlights interviews with district and regional forest health staff on their work to protect B.C. forests.

An explanatory pamphlet is being developed to help viewers define various technical terms used, and to present some background material for several of the technical issues mentioned in the production.

Further video imaging is planned for prescribed fires in the Kamloops Forest Region, and if anyone is interested in getting high-quality images of forest health operations, please contact John Muir. New images will be inserted in the video production to improve its quality and relevance to current issues.

- J. Muir and P. Humphreys, Silviculture Practices Branch, Victoria.

Forest Health for Stand Tenders. This one-day course (a morning indoors followed by an afternoon field session), originally developed for use in the Cariboo Forest Region, has been revised for delivery throughout British Columbia. The course is intended for spacing workers.

This course will be available through Ralph Winter or John Muir, Silviculture Practices Branch.

Don Doidge, Cariboo Forest Region, is the contact person for more information on this course.

- M. Hamm, Cariboo Forest Region, Williams Lake.

Global Warming—It's Back! After a two year hiatus, following the eruption of Mount Pinatubo in the Philippine Islands, global warming seems to be back on track. The third warmest year on record was 1994, with the March to October period being the warmest ever! The year with the warmest world mean temperature in recorded history is 1990, and 1991 is the second warmest year. The 1980's were the warmest decade, and it appears the 1990's will be warmer still. [For those of you that have been following this, Jim Hansen's climate model predictions seem to keep coming true (Kerr, R.A. 1993, Vol. 259, Science)].

Following the eruption of Mount Pinatubo in June 1991, (the most massive since Krakutoa in 1883), temperatures cooled somewhat (i.e. returned to "normal"). The last half of 1992 was cooler by 0.5°. A long-lasting haze of sulfuric acid droplets in the atmosphere is believed to have been the cause. Also during this period, accumulation rates of atmospheric greenhouse gases, CO², methane, nitrous oxide, and CO, slowed sharply or stopped (cause unknown). However, by mid-1993, CO² accumulations returned to the rates that were occurring prior to the eruption. The warming trend seems to have returned.

I have been tracking the warming trend of recent years in relation to spruce weevil (*Pissodes strobi*) hazard on northern Vancouver Island. Comparing May-September heat accumulations (degree-days) above a threshold of 7.2°C for the years 1989, 1990, and 1994, with the climatic "normals" for the Port Hardy climate station show how warm it has been.

Years	° Days
1951-80 normals	731
1961-90 normals	750
1980-90 mean	787
1989	876
1990	923
1994	903

Note: Weevil broods require 888° days to develop to adults.

Areas that were considered to have a low hazard for weevil infestation ten years ago because they were too cool, are now much warmer, and capable of supporting weevil brood development. Indeed, some of these areas on northern Vancouver Island and the mid-coast are now experiencing increasing weevil infestations. The weevil problem is expanding.

- D. Heppner, Vancouver Forest District, Nanaimo.

Forest Health Slide Collections. Forest health slide collections for each region have been completed. Each set of slides includes images of life histories, symptoms, damage, survey methods and control for all the major forest health insects, diseases, and wildlife. An information sheet for each organism is provided.

This slide collection is available for use by contacting regional forest health staff. Additional slide material will be added to the collection as it becomes available. Any slides you feel would be useful can be forwarded to us, and we will copy and distribute them to the other regions.

- K. White and A. Pollard, Silviculture Practices Branch, Victoria.

Real-Time, Digital Mapping System for Aerial Pest Surveys. An in-flight mapping system has been developed in the Cariboo Forest Region which will simplify data collection and compilation of pest data. This is a flexible mapping system which utilizes Global Positioning System (GPS) technology to display the aircraft's location and enables the surveyor to digitize attack locations on a laptop computer while in the air.

Pest data are placed on the map using visual cues and forest cover information obtained from the map base. The location of the aircraft is positioned on the screen using icon of the aircraft to assist the surveyor in navigation and orientation to the ground.

The map is automatically oriented with the direction of travel to the top of the screen.

Position is updated by pressing the F1 key. The surveyor may toggle between any of three map scales to achieve the most accurate mapping.

The function keys on the keyboard have been programmed to simplify the digitizing process. Pest type, line weight, level, and colour are automatically set with a single keystroke.

A label is attached to each infestation location identifying the pest type, and area of the infestation, in hectares.

The package also includes a semi-automated colour theming module which allows mapsheets to be modified to reflect distinct ground features.

Geographic coordinates may be obtained through the computer for navigation back to areas of interest using a hand-held GPS. The entire system may also be carried in a vehicle to relocate infested areas.

Paper maps may be plotted at any scale for field or office use.

The software has been developed to be flexible, both for the user and for potential incorporation of new technology and/or other uses of the system. Future options may include Geographic Information System (GIS) technology for automatic compilation of survey data, and incorporation of a pen-based computer system to further simplify of the digitizing process.

Microstation® software and a GPS unit with a communication port are required to run this system. This aerial survey software package is available to Forest Service Employees on request.

- K. Howse, Cariboo Forest Region, Williams Lake.

Silvicultural Immersion of a Forest Entomologist. As the first forest entomologist in British Columbia to complete module one of The Silviculture Institute of B.C. (SIBC), I would like to briefly report on the "inner sanctum" for other potential enrollees. First of all, when trying to enroll, if you don't do silviculture prescriptions or don't have traditional silviculture experience, you're definitely at a disadvantage. I told the registrar that while it was not my job to do silviculture prescriptions, it was certainly my job to check them occasionally. Accordingly, I enclosed an 11-page silviculture audit report which I had co-signed with two silviculture foresters. Since my application was accepted, I guess I convinced the registrar and board of directors that forest entomology was indeed an integral part of silviculture!

Module one (Basic Principles) was a bit of an endurance test to wade through the binder of pre-reading assignments and then sit in a classroom for 10 days and listen to 16 guest lecturers! The talks ranged from soil mycorrhizae to the autecology of brush species and, for the most part, were interesting and well presented. Two-hour exams scheduled at the mid-point and on the final day tended to focus your commitment to evening studies. Some current and former Forest Health Foresters (Pest Management Coordinators) are presently enrolled in, or have graduated from, SIBC. I'm sure the latter individuals would readily provide details on other modules for any prospective applicants.

- R. Hodgkinson, Prince George Forest Region, Prince George.

Priorities and Support for Forest Health Research. A talk on priorities for forest health research was given at a forest research colloquium April 19, 1995, at the University of Victoria, with the following abstract.

The British Columbia Ministry of Forests is committed to protecting forest resources from damage by insects, diseases and other influences. Currently, silviculture program activities to maintain forest health amount to approximately \$15 million annual program expenditures, not including salaries and overhead. Encouragement and support for forest health research is important to apply, direct, and improve forest management practices, and to demonstrate opportunities for new forest investments to protect or enhance provincial forest resources.

Ministry activities have mostly focused on management of bark beetles and defoliating insects. In future, more emphasis will be directed towards root diseases, leader weevils and stem diseases of young trees. Prevention of new pest introductions to British Columbia is emphasized, and several large-scale tree breeding and selection projects are underway to enhance genetic resistance.

On-going ministry priorities for research include detection of insects and diseases, quantification of effects, development of improved treatment strategies and tactics, assessments of hazard and risk, determination of thresholds for forest practices and forest health treatments, and development of models or decision aids for preparing silvicultural and stand management prescriptions.

Recently the ministry has supported a variety of arrangements for research projects including direct contracts, NSERC grants, support for graduate research, and cooperative agreements with federal research agencies and industry. Recent federal budget reductions and cuts to federal forest research activities related to forest health, indicate that the ministry will have to support more research activities by universities and other organizations. An ancillary benefit of support of research at universities is post graduate training of potential candidates for ministry positions.

- J. Muir, Silviculture Practices Branch, Victoria.

Seed Pest Management Report, Spring 1995. The Seed Pest Management group is expanding. We expect to be hiring a new Pest Management Biologist this spring to handle our growing interior operations. This summer two cooperative education students will be working on aspects of the *Dioryctria* coneworm project. We remind those involved in natural stand cone collections that we are always available for consultation and will perform pest analyses and monitoring of any natural stand cone crop destined for Tree Seed Centre processing.

A half day workshop on Sunday, October 15, 1995, entitled *Cone and Seed Insect Biology and the Future of Seed Orchard Insect Management* is being conducted by the Seed Pest Management Officer at the Joint General Meeting of the Entomological Societies of Canada and British Columbia (October 14-18) at Victoria, British Columbia. Participants will include researchers and orchard workers from across Canada and the United States. Between 200 and 300 entomologists are expected to attend this meeting.

By late April, 1995, monitoring of cone and seed insects in coastal seed orchards was nearly completed and stem and foliar problems was well underway.

In comparison to last year, large cone crops are expected. Levels of redcedar cone midge (*Mayetiola thujae*) and Douglas-fir cone gall midge (*Contarinia oregonensis*) are low. Stem and foliar pests are at variable levels with notably green spruce aphid (*Elatobium abietinum*) and balsam and hemlock woolly adelgids (*Adelges piceae*, *A. tsugae*) needing control at several sites. In the interior, monitoring of cone and seed insects has not begun yet except in larch, but stem and foliage monitoring has commenced. Larch cone adelgid (*Adelges lariciatus*) is present in large numbers in conelets at two western larch orchards. Gall aphids (*Adelges spp.*, *Pineus spp.*) were low at most sites but required treatment in three spruce orchards at one site. Sequoia pitch moth is present in considerable numbers in lodgepole pine holding beds and trials at several orchard sites.

Recent or current research:activities included

Fir coneworm, *Dioryctria abietivorella*. In conjunction with Simon Fraser University, pheromone blends will be tested again this year at two Douglas-fir sites: one coastal (seed orchard) and one interior (natural stand). We are refining the blends to develop an effective fir coneworm monitoring program and subsequently test it in mating disruption and/or mass trapping trials.

Douglas-fir cone gall midge, *Contarinia oregonensis*. Taking advantage of a bumper crop of cone gall midge last year, a contract was established with Simon Fraser University to determine the sex attractant pheromone(s) of this insect. A male antennal response has been successfully obtained and the compounds involved are currently being characterized.

Sequoia pitch moth, *Synanthedon sequoiae*. The University of Northern British Columbia has been contracted to study various aspects of the biology of this insect and help develop a management program for it. This study is being conducted primarily at the Prince George Tree Improvement Station. Additionally, pitch moth larvae have been collected from several coastal and interior (Okanagan Valley) locations and are being reared to adulthood at Simon Fraser University for refinement of the pitch moth pheromone profile.

Spiral spruce cone borer, *Strobilomyia neanthracina*. Collaborative research contracts with the Canadian Forest Service (Sault Ste. Marie and Fredericton) and the University of New Brunswick, have just commenced using the Skimikin Seed Orchard facility. Two projects are being undertaken: one to determine the spruce conelet volatile compounds which attract ovipositing cone borer adult flies and a second to see if this species uses a cone marking pheromone after oviposition, as does a closely related species in eastern Canada. If identified, these compounds have potential for use as monitoring and trapping tools (conelet volatiles) or as oviposition deterrents (cone marking pheromone).

Western conifer seed bug, *Leptoglossus occidentalis*. Simon Fraser University is commencing a contract to assess actual impact of the conifer seed bug on seed crops and help develop a monitoring program for it.

Larch cone adelgid, *Adelges lariciatus*. A trial designed to test the effect of this adelgid on seed production in western larch is in progress. We expect that low to moderate cone infestations have little or no effect on seed quality and quantity.

Yellow-cedar eriophyid mite, *Trisetacus chamaecyparis*. Sevin XLR+™ applied last year in late summer to a well infested yellow-cedar orchard successfully knocked down the eriophyid population. The population has remained low subsequently.

Green spruce aphid, *Elatobium abietinum*. Pirimor™ was used successfully this spring in a trial against green spruce aphid in a Sitka spruce orchard.

Abies entomofauna inventory. Cones collected last year for this project are currently in rearing facilities at the Canadian Forest Service's Forest Pest Management Institute (Sault Ste. Marie). This project will be continued this year.

Neem trials against spruce and larch insects. Trial work by Phero Tech Inc. continues to test the effects of a neem (azadirachtin) formulation on green spruce aphid in Engelmann and Sitka spruce, larch cone adelgid in western larch and gall aphids and spiral spruce cone borer in interior spruce. Last year's trials showed little or no effect on the insects. Trials have been modified this year, but have shown no great effect on green spruce aphid. Interior trials were in progress in late April, 1995.

Spruce cone rust, *Chrysomyxa pirolata*. The fungicide efficacy trial will be resumed this spring after a year's rest due to low cone crops. Metiram will be tested on interior spruce cone crops as an alternative to ferbam for control of spruce cone rust.

Seed orchard fertilizer regimes. As part of our effort to examine the effects of fertilizers on pest insects, we contracted Delia Hill to canvass ministry and industry orchard managers about their approaches to seed orchard nutrient management. A questionnaire was prepared and circulated to all British Columbia orchard managers; a good level of response resulted.

Other projects. Other projects planned for 1995 include vegetation management using Spectrum™, a soap based product, at the Saanich Seed Orchard site; Pirimor™ efficacy against hemlock woolly aphid later this spring at a coastal seed orchard site; management of root collar weevil (*Hyllobius warreni*) in lodgepole pine seed orchard stock; and improved monitoring and risk prediction for spruce cone rust.

For information on seed orchard and natural stand cone and seed pest monitoring services, 1995 monitoring results, detailed information on the projects briefly summarized below, or the workshop, please contact Seed Pest Management at 652-6593 (office) or 652-7613 (lab).

- R. Bennett, Silviculture Practices Branch, Victoria.

Corrections to *Options for Forest Health in British Columbia: An Analysis for Forest Health Treatments*. We corrected some typographical errors in the publication. The original publication contained some errors in the description of the method of analysis used to evaluate the various forest health treatments, making it difficult to understand how the analysis was done. If you have a copy of this report, please contact us for a copy of the erratum.

New copies of the report have been produced, with the corrected text. If you would like a copy of the report, please contact us.

- John Henigman, Silviculture Practices Branch, Victoria.

FOREST INSECTS

Balsam Woolly Adelgid Survey. Several positive finds of balsam woolly adelgid have occurred in the past few years in areas outside of the quarantine zone. These finds have necessitated modifications to the quarantine zone boundaries and the regulations on movement of *Abies* material throughout the province. A survey was undertaken in the spring of 1995 to determine the current range of the balsam woolly adelgid in areas currently outside the established quarantine zone. Seventy-seven stands of *Abies* were sampled on Vancouver Island between Port Alberni and Campbell River. These samples have been stored at Pacific Forestry Centre in Victoria, and will be examined in the next few months. Preliminary results indicate that there will be positive finds. This will require a review of the effectiveness of the quarantine zone and the need for further modifications.

- P. M. Hall, Silviculture Practices Branch, Victoria.

Bark Beetle Management Responsibility Policy. A policy outlining responsibilities for licensees and the Ministry of Forests to undertake various activities to manage bark beetles under a variety of land tenures was prepared as a draft ministry policy and circulated for comment. The draft was also reviewed by Legal Services Branch. The result of the reviews was that the draft policy was not considered valid for several reasons:

1. the sections of the *Forest Act* cited as the authority for the policy will no longer exist when the *Forest Practices Code Act* is in place;
2. the definition of the land area where a licensee was responsible for activity costs implied a land based tenure rather than a volume based tenure; and,
3. it is not proper for the Ministry to establish policy for licensees.

Therefore, the draft policy will not be pursued further. However, review of the *Forest Practices Code Act* and the Operational Planning Regulations indicate that the intent of the draft policy can be implemented under the general planning provisions. Further research on this issue will take place in the next month or so.

- P. M. Hall, Silviculture Practices Branch, Victoria.

Bark Beetle Technical Audit. A comprehensive technical audit of the bark beetle program in the Williams Lake Forest District and the Cariboo Forest Region was requested by the district and region. The scope of the audit is similar to bark beetle audits conducted in the Penticton and Boundary Forest Districts. An audit team has been assembled and the audit is scheduled to begin the week of May 7, 1995. The audit should be completed and a report prepared by the end of June, 1995.

- P. M. Hall, Silviculture Practices Branch, Victoria.

Asian Gypsy Moth. In 1994, six male moths of the Asian strain of gypsy moth were found in pheromone monitoring traps. Two moths were found in a single trap in the port area of Nanaimo; three moths were found in widely separated traps about in Surrey; and, a single moth was trapped in Langley. Egg mass surveys in these areas were negative. No information is available as to the source of these moths or the mode of introduction.

Because of this lack of information, no eradication spray program is scheduled for 1995 in these areas. Intensive and extensive delimitation trapping will be conducted in the summer of 1995 in these areas to determine if a population exists, and to precisely locate the epicentre. A spray program will likely be proposed for 1996, if trap catches in 1995 show a growing population.

- Peter M. Hall, Silviculture Practices Branch, Victoria.

North American Gypsy Moth. Several male moths were caught in monitoring traps in locations on southern Vancouver Island and the lower mainland. Moth catches in Nanaimo and Victoria indicated that eradication programs in 1994 were successful. Moth catches in Hope indicate that eradication was not successful; however, moth catches did not indicate the precise location of any surviving populations. Therefore, intensive trapping will be conducted in the Hope area to refine future treatment requirements.

An eradication program utilizing aerial application of *B.t.k.* will be undertaken in and around Canadian Forces Base - Chilliwack in the spring of 1995. Trapping will continue in 1995, and the Ministry of Forests will continue to support and assist Agriculture and Agri-food Canada in gypsy moth detection and eradication efforts.

- Peter M. Hall, Silviculture Practices Branch, Victoria.

Mountain Pine Beetle Impact Study. Questions have been raised regarding the eventual fate of stands infested by mountain pine beetle. It is necessary to know the composition of the residual stand after the infestation has subsided to determine the need for rehabilitation or to estimate the regeneration delay or remaining volume in the stand for harvest planning.

In the spring of 1995, the first phase of a study to determine final beetle impacts was carried out in the Penticton and Vernon Forest Districts. A number of plots were established in untreated stands where mountain pine beetle had completed the infestation cycle. Measurements on the plots included species and diameter distribution before and after the outbreak, and other mensurational data. Plots were identified by biogeoclimatic sub-zone as stand response was expected to vary.

In the second phase of the study, to be carried out in the summer of 1995, vegetation and regeneration surveys will be conducted in the same stands. The information will be evaluated to determine loss and regeneration potential of stands by sub-zone and will also be used to attempt to quantify the Shore/Safranyik hazard rating system. A report will be produced in the spring of 1996.

- P. M. Hall, Silviculture Practices Branch, Victoria.

Spruce Beetle Attacks and Ground Surveys in Areas Defoliated by the Western Hemlock Looper. In the Prince George Forest Region, an outbreak of western hemlock looper has severely damaged western cedar, western hemlock, and white spruce. A study was undertaken to assess the amount of spruce beetle attacks at three levels of defoliation severity caused by the looper.

Results indicated that significantly increased levels of beetle attack occurred in areas where white spruce was severely defoliated by the looper. The area of increased beetle attack occurred in an environmentally sensitive drainage and encompasses an area approximately 1 km by 20 km. Recent blowdown did not seem to be contributing to the increased attack.

The increased beetle attack is not expected to cause more tree mortality because most of the trees will probably die from the looper defoliation. However, the beetle attack will likely hasten tree deterioration thereby further decreasing the amount of salvable wood.

Ground survey methods for spruce beetle in areas of severe defoliation were evaluated. Modifications to current methods of ground surveys of the beetle were necessary because beetle attack symptoms are not well expressed. For more details, please contact the authors.

- S. Taylor, Prince George Forest Region, Prince George, and
S. Lindgren, University of Northern British Columbia.

Spruce Beetle Management Training in the Yukon. The Department of Indian Affairs and Northern Development (DIAND) - Forest Resources in the Yukon, is facing a 32,538 ha spruce beetle outbreak near Kluane National Park and Haines Junction. In an attempt to manage some of the smaller, lighter infestations, the Yukon requested that I inspect the area and present a course on the use of trap trees for spruce beetle suppression.

Seventeen people from the southwestern Yukon attended a one-day training course in Haines Junction, held February 7, 1995. Attendees included staff from DIAND District offices, forestry contractors, and members of the Champagne-Aishihik First Nation. The course included a 3 hour classroom session, a 15 minute instructional video, and a 2 hour field practicum on spruce beetle identification and selection and deployment of conventional and lethal trap trees. I have been invited to return to Haines Junction in late August 1995, to give a spruce beetle probing accreditation course.

- R. Hodgkinson, Prince George Forest Region, Prince George.

Disruption of Spruce Beetle Aggregation in Prince George Region. Graduate student Therese Poland and Dr. John Borden, Simon Fraser University, are continuing their research in the Mackenzie and Prince George Forest Districts on the competitive exclusion of spruce beetle by two secondary bark beetles and by semiochemical inhibitors. The Prince George Forest Region provided support via a \$5,000 contract in 1994, and plans to continue similar support in 1995. With beetle management restrictions recently enacted for riparian reserve zones, we are hopeful that this research will lead to further options for managing spruce beetle in such sensitive zones. For details on the above research, please contact Therese Poland or Dr. John Borden directly.

- R. Hodgkinson, Prince George Forest Region, Prince George.

Western Spruce Budworm in the Kamloops Forest Region. The 1995 western spruce budworm spray program was much smaller. Due to the success of our treatments in past years, and the natural downswing in the budworm population, approximately 10,000 ha were treated with *Bacillus thuringiensis* var. *kurstaki* (B.t.k.). Areas treated are located in the Kamloops, Merritt and Lillooet Forest Districts.

In May an attempt will be made to finish some burning at the underburn site in Merritt Forest District. Two more locations are being prepared for underburning in the Kamloops Forest District. About 200 ha of interior Douglas-fir near Stinking Lake have been spaced (variable density spacing regime) to improve the stand vigour and resilience to future budworm damage. We anticipate that many more sites will be spaced over the next few years under Forest Renewal BC.

The dynamics of western spruce budworm dispersal in terms of impact to understorey trees are not well understood. A dispersal and impact assessment trial has been established near the underburn site in the Merritt Forest District. The relative impact caused by three different stages of budworm dispersal will be evaluated.

The trial involves trapping dispersing larvae, and isolating the damage caused by each larval stage. For example, first and second instars disperse in late summer and overwinter on understorey, intermediate and overstorey trees. If select understorey trees are then kept free of any additional larvae moving onto them, the defoliation caused by these larvae as they develop through to sixth instar can be determined. Similarly, the impact of fourth, fifth and sixth instars raining down from overstorey trees will be quantified.

By assessing the importance of larval 'rainfall' from mature, overstorey trees onto understorey trees, as well as patterns of dispersal, silvicultural decisions can be made to manage stand structure to minimize the impact of budworm on the understorey layer within a stand.

- L. MacIaughlan, Kamloops Forest Region, Kamloops.

Field Trial Using Mimic 240 LV Against Western Spruce Budworm. The combined efforts of the B.C. Forest Service, Canadian Forestry Service and various suppliers of *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*), have resulted in an integrated approach to managing the western spruce budworm. Although results obtained with *B.t.k.* are acceptable, results are variable. Chemical insecticides are available for use in the province, but they are usually not considered because of their effects on non-targets, and other environmental concerns. However, for the management of forest defoliators, such as the western spruce budworm, it would be very desirable to have a wider choice of environmentally acceptable products, especially products with improved efficacy.

A new product, Mimic 240 LV®, is designed to control only certain lepidopteran pests. Mimic® causes a premature molt in susceptible target lepidopteran species by mimicking the natural substances that induce a molt. Upon ingestion of this product, larvae stop feeding within an hour, and within days, prematurely molt, thus killing the insect.

To test the efficacy of Mimic® against western spruce budworm and provide data for registration purposes, a replicated field trial is proposed. In Douglas-fir stands located in the Interior Douglas-fir (IDF) biogeoclimatic zone where budworm populations are predicted to produce moderate or greater levels of defoliation, Mimic® will be applied to designated blocks. Three blocks of approximately 50 ha in size will be treated with Mimic® at a rate of 2 litres per ha.

The product will be applied once, when the budworm is in the peak fourth instar. Appropriate buffer zones will be set up and all normal parameters for aerial spraying will be adhered to and monitored (drift, wind, temperature, relative humidity). Check blocks of corresponding size with comparable insect densities will be established and compared to the treatment blocks.

- L. MacIaughlan, Kamloops Forest Region, Kamloops.

Western Hemlock Looper, Where Are You? We are attempting, yet again, to get additional data to include western hemlock looper (*Lamdina fiscellaria lugubrosa*) on the label of a *B.t.k.* product. A trial is tentatively planned for the Sugar Lake area in the Vernon Forest District to test the efficacy of Foray 48B® against looper (if there are any loopers left). Stay tuned for the continuing story of hunting for loopers!

- L. MacIaughlan, Kamloops Forest Region, Kamloops.

Neem Trials. Our neem (active ingredient azadirachtin) working group met again this past winter, compared results and discussed future projects. Some positive results were obtained in the 1994 trial done in the Kamloops Forest Region using neem as a post-oviposition spray. However, pre-oviposition had still to be tested. Therefore, two trials will be conducted in 1995 in the Kamloops Forest Region, with neem on white pine weevil (*Pissodes strobi*) in interior spruce plantations. The trials will address two questions:

1. What is the optimal timing of neem application post-oviposition by *P. strobi*? The 1994 results indicated that significant larval mortality occurs as evidenced by reduced adult emergence. However, since neem was applied immediately post-oviposition, weekly until pupation, what is the optimal timing to reduce emergence to a minimum? Further, will these post-oviposition treatments reduce female fecundity and survival?
2. Can pre-oviposition treatment of trees with neem save leaders by reducing or eliminating oviposition, or by killing eggs and developing larvae?

For the post-oviposition trial, young, planted or natural, spruce stands with a moderate to high incidence of weevil attack will be chosen as test sites. Trees will be 1.0 m to 2.0 m in height to allow for easy treatment and assessment. Candidate stands will be monitored closely, late April to early May, to determine when field oviposition is occurring. When oviposition is evident on a suitable number of spruce trees, the three treatments described below, with corresponding checks, will be established. Neem will be applied using backpack sprayers.

Timing of treatments	Number of neem treatments	Number of trees	Total number of tree-equivalents
1. Immediately following oviposition	Two applications of neem at about a four day interval	30	60
2. Second instar (about two weeks following #1)	Two applications of neem at about a four day interval	30	60
3. Immediately following oviposition and at second instar (about two weeks apart)	Two applications of neem at about a four day interval, at each treatment time	30	120

For the pre-oviposition trial, young, planted or natural, interior spruce stands in high hazard ecosystems with a high incidence of 1994 weevil attack will be chosen as test sites. Trees will be between 1.0 m to 3.0 m in height to allow for easy treatment and assessment. Of a total of 40 plots established, half (20 plots) will be treated with neem and half (20 plots) will be used as checks and treated with a water/solvent solution. Each plot will be established around a 1994-attacked spruce tree and will consist of ± 10 trees around each attacked tree. Trees with the longest, largest 1994 terminal shoots will be chosen. This selection process should maximize the probability of weevil attack within plots. The total number of trees treated with neem will be ± 200 , treated twice, at about a four day interval (pre-oviposition). Candidate stands will be monitored closely in mid- to late April to determine when weevil activity begins (pre-oviposition). Neem will be applied using backpack sprayers, and covering the top three years growth.

- L. Maclauchlan, Kamloops Forest Region, Kamloops.

Bark Beetles and Other Projects. Numerous projects are scheduled for summer and fall 1995. Various techniques of baiting, and conventional and lethal trap tree placement are being evaluated for spruce beetle. Projects in young spruce and pine are continuing and summer students are adding to the regional insect collection and display.

- L. Maclauchlan, Kamloops Forest Region, Kamloops.

Bark Beetle Probing for Forest Workers. This five-day course is intended to teach forest workers compass use, map-reading, survey techniques and equipment use, bark beetle identification, and probe methodology. It has been developed for Cariboo Forest Region, but can be modified for use with any district procedures.

The Training and Development Section of Forestry Division will evaluate this course for possible revision to a provincial version. In the meantime, Leo Rankin, is the contact person for more information on this course, and copies are available as needed from the forest health group in the Cariboo Forest Region.

- M. Hamm, Cariboo Forest Region, Williams Lake.

FOREST DISEASES

Trial of White Pine Seedlings for Blister Rust. Three thousand western white pine seedlings were planted in March, 1995, at the Surrey Nursery in a test to determine whether interior- or coastal-raised seedlings have less white pine blister rust infection. The trial also tests if progeny from Texada Island seedlots display more resistance than seedlings from other sources.

Five seedlots (three from Texada, one each from Halfmoon Bay and Lillooet) were raised under two stock types (bareroot and plug) in two nurseries (Surrey, on the coast and K&C, in the interior). This created 20 treatments. Each treatment had 150 seedlings randomly selected for planting. Two replicates were created with seedlings divided into two lots with half being planted in each replicate. Each replicate, therefore, has 20 randomly assigned rows each containing 75 seedlings from one treatment.

The trees will be assessed every year for development of rust blisters and mortality. It is expected that the trial will last at least 10 years. It is possible that some of the non-Texada stock will also be subject to branch pruning in order to test the efficacy of current field practice. Thanks to Suzanne Diveau at the Surrey Nursery for her assistance and Steve Lauriault and crew from Hawkeye Reforestation for their terrific planting job.

- S. Zeglen, Vancouver Forest Region, Nanaimo.

Armillaria Root Disease Problem Analysis in the Nelson Forest Region. Work is progressing on the analysis of armillaria root disease data collected by Nelson Forest Region and district staff, and recorded on the Integrated Silviculture Information Systems (ISIS), and by independent pixel surveys. These data will be used to produce a summary report of armillaria incidence based on biogeoclimatic zone and subzone, inventory type group, tree density, previous tree species, and silvicultural treatments. Any relationships between these variables will be reported, and should be useful in future silviculture and forest level planning for the Nelson Forest Region. Identification of susceptible stands will be used to calibrate the Western Root Disease Model (part of the PROGNOSIS or Forest Vegetation Simulator Model) which will allow for more accurate predictions of stand productivity under various armillaria intensities.

- K. White and A. Pollard, Silviculture Practices Branch, Victoria.

PROGNOSIS Update. Progress on developing an accessible version of the growth projection model PROGNOSIS for use in evaluating forest health issues in British Columbia was erratic in 1994-95, but a considerable step was made recently with the development of a root disease component.

PROGNOSIS, now called the Forest Vegetation Simulator (FVS), is widely used in the USA for forest management planning and silviculture prescriptions. FVS is the only available model to project growth of mixed-species and/or uneven-aged stands, and it appears applicable for southern interior BC forests. A variant also was developed for coastal Alaskan forests.

However, for use in British Columbia, the model must be tested and calibrated before the results can be used with confidence. Over the last few years it has been tested for use in British Columbia by Inventory and Silviculture Practices Branches, and recently a new Windows interface was developed with metric conversion for the base FVS model. Progress to date in implementing FVS in British Columbia has been sporadic because of staff preoccupation with other pressing resource management issues.

Recently, we decided to re-emphasize development of the associated pest modules for use in British Columbia. These include root disease, western spruce budworm, Douglas-fir tussock moth, bark beetles and dwarf mistletoes. In collaboration with US Forest Service staff who have been working on developing and using the model, we contracted a firm to develop the newer version western root disease model for use in British Columbia, and to compare results of test analyses using both the old and new versions. Preliminary runs indicated that the new version in the Windows format performs satisfactorily.

Future work planned includes developing a user manual, demonstrating the model to potential users, testing and calibrating the root disease module for conditions in British Columbia, and developing the other insect and disease modules for use here.

Given the success of this recent step, we are confident that we will be able to provide usable insect and disease modules with FVS for ministry use within a few years.

- J. Muir and J. Beale, Silviculture Practices Branch, Victoria.

Root Disease Management Training Course. This course was piloted in the Cariboo Forest Region in 1994. In the fall of 1994, laminated root rot and Forest Practices Code Root Disease Guidebook technical information were added.

In January, the new course materials were reviewed by the regional pathologists and it was decided to restructure the course to more closely follow the revised contents of the guide book. We refined the learning objectives to be more specific and learner-centered and all relevant technical material was assembled in a new format. This new edition is being reviewed, and when completed, this course will also be available for delivery.

A root disease computerized training tutorial, *The Tree Doctor* has been developed to become part of the course materials for the Root Disease Management Course, and as a pilot project for this kind of interactive training tool. The package was developed by Doug Corrin of Malaspina College. It includes information, identification and management sections based on the Root Disease Guidebook and the Field Guide to Pests of Managed Forests. *The Tree Doctor* will be sent out for testing and review by regional pathologists and/or district staff.

- P. Humphreys, Silviculture Practices Branch, Victoria.

MAMMAL DAMAGE

Red Squirrel Damage Forecast Model and Decision-Making. A model (see Tabulation Section) created by Dr. Tom Sullivan, University of British Columbia, enables operational staff to predict when and where outbreaks of squirrel damage are likely to occur in managed stands (pre-spacing) of lodgepole pine. The decision-making profile assists staff in determining the risk of damage if a stand of pine is spaced.

To use the profile, score one point for each "yes" answer to the following nine conditions:

When:

- Is there a regular cone crop in nearby mature spruce or Douglas fir forest?
- Within ± 2 years from expected peak of snowshoe hare cycle (reduced predation on squirrels)
- Average pine stand diameter >6.0 and ≤ 20 cm dbh
- pine age classes 1 and 2 (10 - 40 years)

Where:

- extensive pine stands (>1000 ha)
- incidence of attack $>15\%$ in unspaced stands
- high slash load after spacing
- high levels of brush
- fertilization planned

<u>Checklist score</u> (maximum of 9)	<u>Degree of risk</u>
1-2	Low
3-5	Moderate
6-9	High

We hope that the model and spacing treatment thresholds will help take the mystery out of controlling squirrel damage.

- J. Henigman, Silviculture Practices Branch, Victoria and
Dr. T. Sullivan, University of British Columbia, Vancouver.

PESTICIDES

Genetically Modified Viruses. Genetically modified viruses are being developed by the Canadian Forest Service in Sault Ste. Marie as possible control treatments for defoliating insects. Dr. W. Cheliak and colleagues have isolated naturally occurring nuclear polyhedrosis (NP) viruses of eastern spruce budworm and have successfully modified the viral genome in ways that increase effectiveness as a control agent. So far only laboratory studies have been conducted, and discussions are taking place to pursue limited field trials.

I recently attended a workshop in Toronto to discuss the appropriateness of conducting research field trials with a genetically modified virus. This workshop focused on questions associated with what the public will wish to know about this research, before granting permission allowing treatment. Obviously, the public can be expected to ask some tough questions about the health and environmental risks associated with the research. A new draft of the results of this workshop will soon be completed. When I receive this document, I will supply copies of it on request.

Two modifications of the NP virus have been achieved. The genetic material associated with virulence of the virus to the host budworm can be altered so that the infected larva will stop feeding and die faster. The genes involved with production of the protein coat also can be disabled. This latter modification would prevent the virus from being able to effectively reproduce itself.

These modifications could result in two different scenarios for control of the budworm. If a more virulent virus with the ability to reproduce were released, we could expect that the new virus would establish in the environment and become an ongoing disease of the budworm. If the virus without the ability to reproduce were released, only larva directly contacted would succumb and regular additional sprays of the modified virus would be necessary for continued pest control.

If you would like more information on this research to genetically modify a virus to control forestry pests, please contact me.

- J. Henigman, Silviculture Practices Branch, Victoria.

Monosodium Methanearsonate (MSMA). A summary publication, *Public Health and Environmental Impacts of Monosodium Methanearsonate (MSMA) as Used in Bark Beetle Control in B.C.*, by Frank Dost, of all information associated with the pesticide MSMA is now available. MSMA, originally used as a herbicide in conifer thinning, now is used to control mountain pine and spruce bark beetles through individual tree treatment.

The publication contains descriptions or discussions including:

- chemistry of this methyl arsonate compound;
- patterns of use in B.C. forestry;
- environmental behavior and metabolic fate of MSMA;
- toxicology of MSMA;
- environmental toxicity of MSMA;
- potential for exposure; and
- a health risk assessment for MSMA in B.C. forestry.

This comprehensive review of information on MSMA has been distributed widely to federal and provincial environmental, forestry and fisheries government agencies involved with the use or regulation of MSMA. The report (FS 48) is available from the Technical and Administrative Services Branch.

A separate report entitled *Summary of Cost Information on the Use of MSMA and the Alternative Pile and Burn Treatment Method* has also been completed by us. This report would be of interest to those wishing to assess the benefits and costs of using MSMA. Please contact me if you wish a copy.

- John Henigman, Silviculture Practices Branch, Victoria.

Purchase of Douglas-fir Tussock Moth Virus Insecticide. Nuclear polyhedrosis virus was used successfully against Douglas-fir tussock moth in 1991, 1992, and 1993. Approximately 1600 ha were treated over the three years, no site was treated more than once. The virus effectively stopped individual infestations and prevented extensive damage. The outbreak collapsed in 1993, and no treatments were necessary in 1994.

Virus used between 1991 and 1993 came from stocks on hand of Virtuss® (produced by the Canadian Forest Service) and TM-Biocontrol-1® in the spring of 1995 (produced by the USDA Forest Service). In 1995, an effort was made to replenish virus stocks with a further purchase of TM-Biocontrol-1® from the USDA Forest Service. Funds were obtained sufficient to purchase 5000 acre doses (approximately 2000 ha doses) to ensure adequate stocks of virus on hand for future expected outbreaks. This purchase was not completed due to difficulties with purchasing the US product.

The Ministry of Forests still maintains a stock of virus that is likely sufficient for the next outbreak expected towards the end of this decade. However, other avenues of obtaining a virus supply will be examined this year to ensure that the capacity to deal effectively with tussock moth is maintained.

- P. M. Hall, Silviculture Practices Branch, Victoria.

PERSONNEL

SILVICULTURE PRACTICES BRANCH

John Muir	Forest Health Officer	Victoria	387-8740
Peter Hall	Forest Entomologist	Victoria	387-3842
Val Fletcher	Forest Health Research Forester	Victoria	356-8763
Vacant	Forest Pathologist	Victoria	387-8739
John Henigman	Forest Health Forester	Victoria	387-8738
Patricia Humphreys	Forest Surveys Technical Officer	Victoria	387-8737
Shirley Turcotte	Forest Health Management Secretary	Victoria	953-3582
Mike Wyeth	Silviculturist	Victoria	387-8922
Jacob Boateng	Brushing & Seeding Specialist	Victoria	387-8905
Nancy Densmore	Stand Tending Forester	Victoria	387-8912
Don Summers	Manager, Nursery and Seed Culture Extension	Surrey	660-8855
Bev McEntire	Pest Management Biologist, Seed Production	Victoria	652-7613
Michelle Hall	Pest Management Biologist, Seed Production	Victoria	652-7613
Dave Trotter	A/Nursery Pest Management Specialist	Surrey	582-6910
Robb Bennett	Seed Pest Management Officer	Victoria	652-6593
Brian Wikeem	Provincial Noxious Weed Coordinator	Kamloops	376-3973

CARIBOO FOREST REGION

Regional Staff

Al Randall	Resources Manager	Williams Lk.	398-4399
Mark Hamm	Forest Health Forester	Williams Lk.	398-4441
Leo Rankin	Forest Entomologist	Williams Lk.	398-4439
Don Doidge	Forest Pathologist	Williams Lk.	398-4442
Guy Newsome	Stand Tending Silviculturist	Williams Lk.	398-4400
Chris Easthope	Range Agrologist	Williams Lk.	398-4396

District Staff

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Bob Mitchell	Forest Health Officer	Chilcotin	394-4700
Dave Greenley	Resource Officer Silviculture	Horsefly	620-3200
Derek Poole	Forest Health Officer	Horsefly	620-3200
Charles von Hahn	Resource Officer Silviculture	Quesnel	992-4400
Brad Powell	Forest Health Officer	Quesnel	992-4400
Gerry Chapman	Resource Officer Silviculture	Williams Lake	398-4341
Von Vickers	Forest Health Officer	Williams Lake	398-4341
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Don Wright	Forest Health Officer	100 Mile House	395-7873

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Lorraine Maclauchlan	Forest Health/Research	Kamloops	828-4177
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Phil Youwe	Range Resource Agrologist	Kamloops	828-4097
Hadrian Merler	Research Associate	Kamloops	828-4176

District Staff

Dan McDonald	Silviculture Officer	Clearwater	587-6713
Rob Martin	Forest Health Specialist	Clearwater	587-6781
Brent Olsen	Resource Officer-Silviculture	Kamloops	371-6577
Joan Demale	Resource Clerk-Silviculture	Kamloops	371-6529
Dave Piggin	Forest Health Specialist	Kamloops	371-6518
Dave Horne	Resource Officer, Silviculture	Lillooet	256-1229
Ed Senger	Forest Health Specialist	Lillooet	256-1227
Ed Nedokas	Resource Officer, Silviculture	Merritt	378-8400
Pat Byrne	Forest Health Specialist	Merritt	378-8449
Margot Hollinger	Forest Health Specialist	Penticton	490-2242
Savas Koutsantonis	Forest Health Technician	Penticton	490-2250
Bob Johnson	Senior Zone Forester	Salmon Arm	832-1426
Jim Wright	Zone Forester, Silviculture	Salmon Arm	832-1424
Wayne Anshelm	Forest Health Specialist	Salmon Arm	832-1428
Jerry Wearing	Resource Officer, Silviculture	Vernon	558-1776
Eric Haupt	Forest Health Specialist	Vernon	558-1784

NELSON FOREST REGION**Region Staff**

Art Stock	Forest Entomologist	Nelson	354-6633
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Gerald Reichenback	Stand Tending Forester	Nelson	354-6280
Grant Griffin	Range Officer	Nelson	354-6211

District Staff

Tom Johnston	Resource Officer - Silviculture	Arrow	365-8615
Ross Elliott	Forest Health Officer	Boundary	442-5411
Liz Goyette	Forest Health Officer	Cranbrook	426-3391
Kevin Edquist	District Silviculturist	Golden	344-7500
Emile Begin	Forest Health Officer	Invermere	342-4200
Richard Mazzochi	District Silviculturist	Kootenay Lk	825-1142
Bill Beard	Resource Officer - Silviculture	Revelstoke	837-7611

PRINCE GEORGE FOREST REGION**Region Staff**

Robert Hodgkinson	Forest Entomologist	Pr. George	565-6122
Richard Reich	Forest Pathologist	Pr. George	565-6143
Stuart Taylor	Forest Health Forester	Pr. George	565-6123
Heather Dawson	Vegetation Mgmt Forester	Pr. George	565-4113
Les Herring	Silv. Systems Forester (G & Y)	Pr. George	565-6191
Ken Long	Range Specialist	Pr. George	565-6138
Bruce Johnson	Range Development Coord.	Pr. George	565-6139

District Staff

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Dave Banham	Forest Health Technician	Vanderhoof	567-6363
Keith Gordon	Zone Forester	Ft. St. James	996-5272
Dale Desrochers	Forest Health Technician	Ft. St. James	996-5248
Carl Hovey	Resource Assistant	Ft. St. James	996-7131
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Chris Broster	Forest Health Technician	Mackenzie	997-2200
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Gord Haley	Resource Officer - Silviculture	Ft. St. John	787-5634
Steve Lindsay	Resource Officer - Silviculture	Ft. Nelson	774-3936
Neil Edwards	District Silviculturist	Ft. Nelson	774-3936

PRINCE RUPERT FOREST REGION**Region Staff**

Gerry Pinkerton	A/Silviculture Officer	Smithers	847-7512
Tim Ebata	Forest Entomologist	Smithers	847-7479
Alex Woods	Forest Pathologist	Smithers	847-7478
Lou Tromp	Stand Tending Forester	Smithers	847-7514
Don Russell	Range Officer	Smithers	847-7443
Doug Kelly	Vegetation Mgmt. Forester	Smithers	847-7757

District Staff

Gary Lloyd	Resource Officer-Silviculture	Bulkley	847-6307
Bill Camenzind	Audit Forester	Bulkley	847-6310
Henry Hartman	Resource Officer-Silviculture	Cassiar	771-4211
Glen Buhr	District Silviculturist	Cassiar	771-4211
Bob Wilson	Resource Officer-Silviculture	Kalum	638-3290
Doug Davies	Audit Forester	Kalum	638-3290
Janice Bianco	Resource Officer-Silviculture	Kispiox	842-6581
Bob Fedorchuk	Audit Forester	Kispiox	842-6581

PRINCE RUPERT FOREST REGION**District Staff (Con't)**

Bruce Ward	Forest Health Technician	Morice	845-6224
Ruth Edwards	Resource Officer-Silviculture	Morice	845-6200
Mike Grainger	Resource Officer-Silviculture	North Coast	627-0462
Alex Gauld	Silviculture Planner	North Coast	627-0475
Mark Vieweg	Resource Officer-Silviculture	Lakes	692-7515
Terry Thrower	Resource Assistant-Silviculture/Protection	Lakes	692-7515

VANCOUVER FOREST REGION**Region Staff**

Don Heppner	Forest Entomologist	Nanaimo	751-7107
Stefan Zeglen	Forest Pathologist	Nanaimo	751-7108
Mel Scott	Stand Tending Forester	Nanaimo	751-7105

District Staff

John Ingram	Resource Officer - Silviculture	Campbell Rv.	286-9300
Lucy Stad	District Silviculturist	Chilliwack	794-2100
Brenda Cosgrove	Forest Health Technician	Chilliwack	794-2100
Paul Chalifour	Audit Forester	Duncan	746-2700
Allan Powelson	District Silviculturist	Mid Coast	982-2000
Mark Palmer	District Silviculturist	Pt. Alberni	724-9205
Chuck van Hemmen	Resource Officer - Silviculture	Pt. McNeill	956-5034
Ron Diprose	Forest Health Technician	Sunshine C.	485-0730
Mark Salzl	District Silviculturist	Qn. Char. Is.	559-8447
Jeff Fournier	District Silviculture Planner	Squamish	898-2100

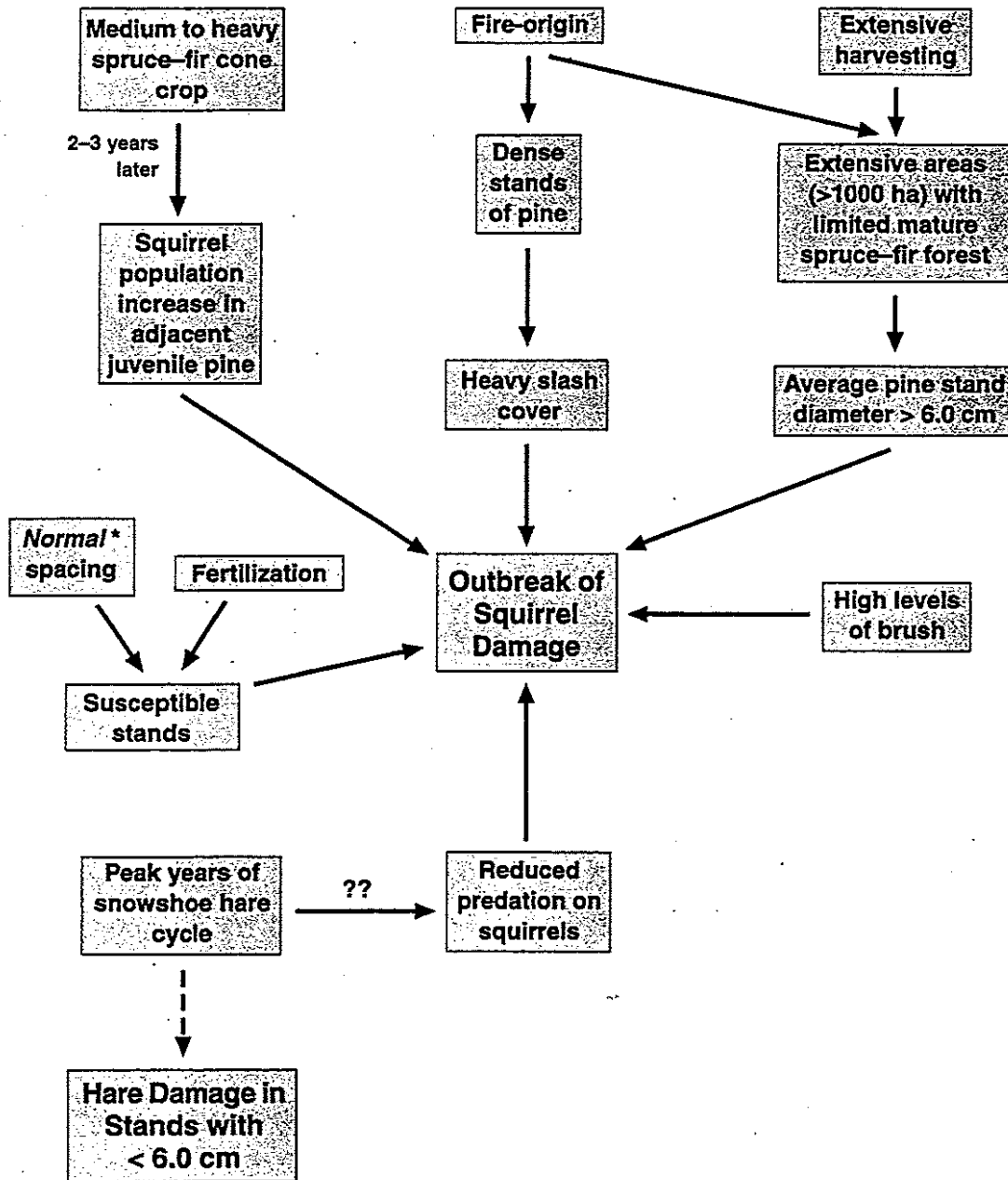
MEETINGS

Yukon Forests: A Sustainable Resource. The first-ever forestry symposium to be held in the Yukon was attended by approximately 200 people in Whitehorse, February 2-4, 1995. The three-day symposium was jointly sponsored by Yukon College and the Canada-Yukon Cooperation Agreement on Forestry Development. Nineteen invited speakers came from the Yukon, Alberta, British Columbia, Alaska, and Wisconsin. One of the Yukon's current challenges is a large spruce beetle outbreak near Haines Junction and Kluane National Park. The author gave a paper entitled *Management of the Spruce Beetle - the Scourge of Northern Spruce Forests*. Symposium proceedings will be available from Yukon College by early summer. Post-conference entertainment included the lively *Yukon Sourdough Can-Can Dancers* and an amusing spoof of the R.C.M.P. Musical Ride.

- R. Hodgkinson, Prince George Forest Region, Prince George.

TABULATIONS

Forecast Model for Red Squirrel Damage to Lodgepole Pine *Interrelationship of Factors*



* Normal spacing in this case is any pine spacing undertaken without expectation of squirrel damage that would result in greater than 1000 stems per hectare.

- J. Henigman, Silviculture Practices Branch, Victoria and Dr. T. Sullivan, University of British Columbia, Vancouver.

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