



Province of
British Columbia
Ministry of Forests

FOREST HEALTH PROGRESS

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

Volume XII, Number 1 (File 312-20)

May, 1993

THE SILVICULTURE FOREST HEALTH PROGRAM AND COMMITTEE

Welcome to the Spring 1993 Forest Health Committee meeting at 100 Mile House and thanks to the Cariboo Forest Region staff for organizing and hosting the meeting.

The Forest Health Committee -- in many ways a unique organization in the Ministry of Forests -- supports the development and implementation of forest health activities in silviculture. Obviously, the continued success of the Committee depends on positive support by silviculture staff and colleagues, and I urge you to continue or to increase your support and involvement with the committee.

Forest Health is an expanding component of the silviculture program with much potential for further development. It also faces several challenges such as establishing clear vision and goals; finding strong continuing research support, rationalizing allocation of resources, demonstrating and quantifying the economic, social, and environmental benefits of forest health treatments or practices. I am impressed by the enthusiastic support for forest health by all silviculture staff, and look forward to seeing further good progress in realizing the true potential of this important area of silviculture. Meetings such as this one are great for bringing together ideas and focusing them on the practical field situations. I encourage you to make the most of this opportunity. We're counting on you!

- H. Benskin, Director, Silviculture Branch, Victoria.

CONTENTS

SUBJECT	PAGE NO.	SUBJECT	PAGE NO.
1. Forest Health General	5	6. Personnel	36
2. Forest Insects	19	7. Meetings	41
3. Forest Diseases	26	8. Tabulations	43
4. Mammal Damage	31	9. Publications and Reports	47
5. Pesticides	32		

FOREST HEALTH PROGRESS

EDITORIAL AND COORDINATING STAFF

Editor:	P. J. Humphreys	Silviculture Branch
Production:	S. F. Turcotte	Silviculture Branch

ADVISORS

Entomology:	P. M. Hall	Silviculture Branch
Forestry:	M. Wyeth	Silviculture Branch
Pathology:	J. Beale	Silviculture Branch
Pesticides:	J. F. Henigman	Silviculture Branch
Planning:	J. Crover	Integrated Resources Branch
Range Management:	T. Lester	Range Branch
Research:	Vacant	Research Branch
Timber Management	R. Cozens	Timber Harvesting Branch

Address all correspondence to:

Ministry of Forests
 Silviculture Branch
 31 Bastion Square
 Victoria, British Columbia
 V8W 3E7

Attention: Ms. P. Humphreys

EDITOR'S NOTE

Forest Health Progress is intended to report to the Forest Health Committee of British Columbia on issues, projects and proposals by Ministry staff.

Contributions labeled with an appropriate subject heading should be submitted to the regional forest health forester, or advisor, who will edit and forward them to Silviculture 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

In response to one of our colleagues requests, the following executive summary was prepared for this issue of Forest Health Progress.

Several large-scale plans or projects were reported including: a draft Forest Health Five Year Strategic Plan (p. 5); a review of forest health concerns with silvicultural systems (p. 5); new forest damage measurement standards proposed to the Forest Productivity Councils (p. 6); a large-scale multi-pest survey of insects and diseases in conjunction with an inventory re-measurement project in the Arrow Timber Supply Area (p. 7); development of forest health information systems (p. 11 and 13); a draft provincial forest health training strategy and action plan (p. 12); and overviews of seed pest management projects (p. 14) and nursery pest management projects (p. 17). Briefer reports included a trip to the Blue Mountain's Natural Resources Institute (p. 6); Research Branch activities (p. 7); a prescribed burning research project to reduce damage from insects and diseases (p. 18); and a review of responsibilities for delivering forest health surveys in the province (p. 18).

Insect management projects included:

Gypsy Moth. 1993 gypsy moth treatments (p. 19); a gypsy moth risk assessment (p. 19); and a compendium of the 1992 Asian gypsy moth project in Vancouver (p. 19).

Mountain Pine Beetle. A new study of impacts in infested stands (p. 20); strategies for using baits (p. 20); regional allocations for treatments (p. 20); a benefit-cost analysis for management in two Timber Supply Areas (p. 21); and a draft policy to outline Ministry and licensee responsibilities for management activities (p. 21); and a combined stand susceptibility rating-wildlife habitat inventory project in the Morice Forest District (p. 23).

Defoliators. An economic assessment of western spruce budworm control was completed (p. 21). A project to control Douglas-fir tussock moth at Chilliwack with the bacterium *B.t.k.* was unsuccessful, in contrast to previous results reported from the United States of America (p. 25).

Spruce Beetle. In Prince George Forest Region, low (-34° C) winter temperatures had little effect on overwinter mortality of spruce beetle and mountain pine beetle (p. 22). A project is underway to update operational surveys, including cruising manual codes, for spruce beetle (p. 22).

White Pine Weevil. Several projects for white pine weevil (on spruce) were reported, including: hazard ratings for four western districts of the Prince Rupert Forest Region

Disease management projects included:

Development of the Research Branch TASS-ROTSIM model to project effects of laminated root rot in young, coastal Douglas-fir stands (p. 26); development and training for PROGNOSIS and several insect and disease components (p. 26); surveys for armillaria root disease in the Robson Valley Forest District (p. 27, p. 28); a report of circinatus root rot of spruce (p. 28); pre-stand tending survey of lodgepole pine for stem rusts in Vanderhoof Forest District (p. 28); a report of white pine blister rust in "exotic" white pine plantations in the Queen Charlotte Islands (p. 29); a trial to reduce blister rust infection of white pine nursery stock (p. 29); and in the Boundary Forest District an equipment trial of a "Tree Max" pop-up spacer to selectively remove whole trees and prevent build-up of root disease (p. 29).

Other forest health projects included:

Mammals. Monitoring and control of damage from voles, red squirrels, and porcupines (p. 31).

Pesticides. A new arrangement for the Forestry Continuing Studies Network to deliver the pesticide applicators course (p. 32); development of an instructors manual and teaching aid kits for the forest pesticide applicators course (p. 32); experimental trials of a herbicide oil (p. 33) boron rods (p. 34) and boron liquid (p. 34) to control mountain pine beetle; and registration status of MSMA used for single-tree treatments to control bark beetles (p. 35).

We would appreciate your comments about this summary, particularly if you would like to see it in future issues.

- J. Muir, Silviculture Branch, Victoria.

FOREST HEALTH - GENERAL

Five Year Strategic Plan 1993/94 - 1997/98. The Forest Health Five Year Strategic Plan offers three options to improve the security of old growth forests and enhance the productivity of young stands while supporting the forest management objective of sustainable development. The recommended option should increase the yield of timber by about 8 million cubic meters per year over the amount currently protected by forest health treatments and create up to 39,000 jobs per year. The cost of this recommended option is \$22 million. The plan is currently being reviewed for the second time by regional forest health staff. Barring any unexpected difficulties, the plan should be completed by July, 1993.

- J. Henigman, Silviculture Branch, Victoria.

Invitation to the Official Opening of the New Facility at the Saanich Seed Orchard and Test Nursery Site. Last year, the old Saanich Seed Orchard office building was renovated and expanded to accommodate the administrative offices of Coastal Seed Orchards, and Island Nurseries (Duncan), and the Seed Pest Management Lab. The official opening of this facility will be on June 21, 1993 from 12:00 noon until 4:00 p.m. and is timed to coincide with the annual B.C. Seed Orchard staff group meeting (Victoria, June 22-24). All interested parties are invited to attend and meet the staff, witness the ribbon-cutting and other ceremonies, tour the facility, and help consume various delectables. We look forward to a good turnout at:

Saanich Seed Orchard and Test Nursery
7380 Puckle Road
Saanichton, BC V0S 1M0

For further information call 652-5600.

- R. Bennett, Silviculture Branch, Victoria.

Problem Analysis on the Extent of Control of Pest Problems in Forest Stands Managed with Different Silvicultural Systems. This contracted report summarizes all the information, issues and concerns related to the control of damaging agents in the context of the application of different silvicultural systems. The report was submitted by the consultant some time ago and several of its recommendations have been adopted. The report was reviewed by ministry staff and is now ready to print. Copies of the report should be available in a few months.

- J. Henigman, Silviculture Branch, Victoria.

Trip to Northeastern Oregon's Blue Mountain Forest. Dr. George Krumlik, Research Branch and I visited the Umatilla National Forest in Pendleton, Oregon, and met with the forest supervisor and his forest health staff. We discussed their forest health problems and how they solve them in a planning and operations treatment sense. We then traveled to LaGrande, Oregon, to visit Thomas Quigley and a number of the Pacific Northwest research staff to learn about the role of the Blue Mountains Natural Resources Institute. The Institute facilitates an interesting working interface between public and private forest stakeholders and US Forest Service researchers and operations staff. The Blue Mountains Natural Resources Institute provides biologically feasible forest management options to maintain ecosystem health and sustainability.

On the second day we toured the Heppner Forest District and were bombarded with views of extraordinary insect and disease damage. Tree mortality was most evident in understory Douglas-fir and grand fir due to defoliation caused by western spruce budworm and Douglas-fir tussock moth. The advent of selection and partial cutting systems in those forests was not linked to enough understory burns and other density control measures that might have prevented the insect epidemics. Soil compaction by cattle and extensive cattle ranging throughout these forests, especially in the riparian zones, has severely increased stream temperatures causing fish habitat disturbance. A big concern over the loss of biodiversity due to the extensive cattle ranging was also raised. Another major problem is the wide range of tenures in any one locality which makes management, including the determination and application of treatments, very difficult.

- J. Beale, Silviculture Branch, Victoria.

Forest Damage Measurement Standards: A subcommittee to the Technical Advisory Committee of the Forest Productivity Councils of British Columbia has spent the last year developing a set of minimum standards to measure forest damage due to biotic and abiotic agents. The measurement standards are primarily intended for use in assessing growth and yield permanent sample plots, but since the individual tree is the basic sampling entity, the standards should be applicable to forest inventory and some operational forest health surveys. A final draft was recently circulated to the Ministry of Forests and the Forest Productivity Councils for review and comment. Central to the damage measurement standards is a set of logically consistent definitions for damage incidence, severity, intensity and intensity classification at the appropriate tree (entity) and sample plot level. These definitions are in the context of damage appraisal terminology and support an analytical process that takes field assessed measurements (standardized) to quantify the effects of damage in terms of growth, yield and quality to tree and plot data. The damage incidence codes are a revision and expansion of the previous Damage and Condition Codes (FS 747 form). Damage severity codes are new and provide a mix of continuous and categorical codes for all damage agent types (e.g., root rots, defoliators and small mammals). Both incidence and severity are assessed at the individual tree level. A computational

severity code (0-5) is used to estimate damage intensity at the sample plot level. The computational severity code, while not used at the field assessment level, is part of the data compilation. Further classification of intensity into four classes (healthy, low, moderate and severe) then enables ranking and comparison of sample plots or other higher level strata.

The damage measurement standards have been in partial use for some time now in Silviculture Surveys, Inventory and Growth and Yield programs, but are getting a full testing in the field assessment and analysis of the Forest-Level Multipest Survey pilot project in the Nelson Forest Region.

For further information please call Jeff Beale (387-8739). I wish to thank the strong efforts of the Forest Damage Measurement Standards subcommittee in bringing this new standard into practice.

- J. Beale, Silviculture Branch, Victoria.

Management Leadership in the Research Branch. I spent 50 weeks working as the acting manager of Forest Productivity and Decision Support in Research Branch. In that capacity I was able to lend weight to supporting work on the TASS-ROTSIM model for developing pest affected managed stand yield tables for laminated, armillaria and tomentosus root rots and Sitka spruce weevil. I was also involved in exploring the potential role of Research Branch in providing research and technical extension support for the PROGNOSIS model. A third area of involvement was in the development of corporate logical data model for growth and yield and inventory that involves Inventory, Research, Silviculture and Information Systems Branches.

- J. Beale, Silviculture Branch, Victoria.

Forest-Level Multipest Survey Pilot Project Conducted in the Arrow Timber Supply Area (TSA), ICHdw Subzone in 1992. The Ministry of Forests, Silviculture Branch, Forest Health subprogram (formerly Protection Branch, Pest Management), established in 1980, has experienced an evolving need for information to drive the subprogram and influence forest management in both planning and operations. In the absence of adequate information, various forest pest sampling projects have been attempted to meet the subprogram needs. The Forest Health subprogram has in the past, and continues to be, the focal point in the Ministry of Forests for determining damage incidence (occurrence) and impact caused by forest pest insects, diseases, mammals and abiotic conditions. The reason for estimating damage incidence and impact is to provide guidance and increase accuracy in forest level planning exercises (e.g., calculating long-run sustainable yields, determining Allowable Annual Cuts, adjusting yield tables and Silviculture treatment program planning). Furthermore, there are legal requirements for stand level pest risk assessments as part of the Pre-harvest Silviculture Prescriptions which necessitate knowledge of stand hazard (susceptibility to

infestation) and pest risk (probability of infestation and predicted damage intensity). Estimation of stand hazard, pest risk and yield impact planning factors can only be obtained through regular assessment of damage incidence, impact and forest-pest dynamics.

Several programs presently have, or are planning to implement, forest level sampling which would significantly address the Forest Health subprogram's planning and pest risk assessment needs. Forestry Canada's Forest Insect and Disease Survey (FIDS) program has contributed immensely to these needs but generally operates at an overview level that does not yet provide enough resolution to significantly affect forest level planning and pest risk assessments. The Ministry of Forests, Inventory Branch, has the potential to capture a significant amount of the information requirements for these management needs via the forest inventory, but at this time does not have an active forest inventory. It is also unknown whether the inventory will be of sufficient resolution to assess highly variable and dynamic pest damage conditions. Adoption of the 1993 Forest Damage Measurement Standards into the forest inventory, along with an intensive training process, would provide an enormous increase in the Ministry's ability to assess damage incidence and pest risk, as well as provide the necessary basis for planning. It is also important that appropriate damage measurement linkages be established with the Ministry of Forests, Growth and Yield programs (Research and Inventory Branches). As above, adoption of the 1993 Forest Damage Measurement Standards into the growth and yield programs would assist in determining damage incidence and impact and for development of growth and yield functions that reflect pest damaged conditions.

In 1990, the Forest Productivity Councils of British Columbia requested its Technical Advisory Committee to develop a Forest Damage Appraisal Strategy and Forest Damage Measurement Standards which together would integrate the measurement and application of forest damage conditions into the larger context of the provincial forest inventory and growth and yield activities. Although the Strategy and Standards are incomplete at this time, the Council has requested the Forest Health subprogram to pilot a forest sampling project to test out the field application and analysis of new damage measurement standards. Concurrently, the Forest Health subprogram was considering pest incidence and damage impact sampling from the data modeling and business area analysis context. As a result, a pilot pest damage measurement project, "Forest Level Multipest Survey", was conducted during the autumn of 1992 in the Arrow TSA, Nelson Forest Region. Analysis is currently underway. Data modeling of Forest Health entity and attribute requirements are being considered in the context of developing the Ministry of Forests corporate growth and yield data model--under direction from Information Systems Branch. A brief description of the Forest Level Multipest Survey goals are as follows.

Survey Goals:

1. To estimate pest incidence and severity by: Biogeoclimatic Ecosystem Classification Units (BEC's), Forest Inventory Type Groups (ITG's), Growth Type Groups (GTG's), tree species, site quality classes, age and diameter classes.
2. To estimate mortality rates and yield impacts for significant forest pests.
3. To test the feasibility of using the yield impact estimates as Operational Adjustment Factors to yield curves/tables produced by Ministry of Forests growth and yield prediction models for managed stands.
4. To check the prediction accuracy of combined growth and yield pest models.
5. To estimate tree and stand (ITG/GTG) hazard (susceptibility to infestation).
6. To estimate pest risk (probability of infestation and predicted damage intensity).
7. To estimate pest incidence-severity and pest incidence-intensity relationships.

Survey Methods:

The multipest survey method focuses on determining the damage agent or condition and damage severity on an individual tree basis in clusters of sample plots. Trees are sampled using both fixed and variable radius methods (fixed for < 12.5 cm @ dbh and variable for ≥ 12.5 cm @ dbh). Up to five damage agents can be recorded per tree. Tree volume estimates (height and diameter) are also recorded.

Plot clusters have been located randomly in selected polygons across all forest cover strata (using the FIR system). This year's pilot will locate clusters in polygons meeting certain pest risk criteria (again using the FIR system) and positioned in polygons to coincide with the Inventory Branch's new inventory systematic sampling framework.

Individual tree and plot volume estimates will be used to assess volume impacts--primarily related to mortality. It is not envisioned that accurate living tree growth reduction estimates will be detectable using a sampling method to investigate impacts.

Application and Use of Survey Results & Information:

Following from the Forest-Level Multipest Survey goals there are several very significant forest level planning and operational applications of the resultant survey data.

Forest Level Planning

- Damage incidence, severity, mortality rates and yield impacts (Goals 1 and 2), will provide broadscale unbiased estimates of damage conditions and volumetric impact estimates for a variety of forest strata for Timber Supply Area/Tree Farm Licence (TSA/TFL) planning and Silviculture-Forest Health planners. In a general way, this information will assist planners in designing healthier forests for all resource uses and in determining priorities for monitoring and treatment programs.
- Yield impacts translated into Operational Adjustment Factors (OAF's) (Goals 3 and 4), will enable incorporation of pest damage impacts into growth and yield prediction models (OAF's), and provide the basis for checking the prediction reliability of both growth and yield and growth and yield pest models. This information will assist TSA/TFL planners to design healthier forests, calculate Long Range Sustained Yields (LRSY's), determine Allowable Annual Cuts (AAC's) and, evaluate pest damage impacts and treatment program options. This information will also assist the Silviculture-Forest Health planners in determining priorities for monitoring and treatment programs at the forest level.
- The FLMPS will assist TSA/TFL planners (Goals 5 and 6) by providing pest hazard and risk information to improve the accuracy of Long Range Sustained Yield (LRSY) estimates, aid in determining Allowable Annual Cuts (AAC's) and, help silviculture forest health planners to design monitoring and treatment programs.

Stand Level Planning and Operations

- Goals 1 to 4 will assist silviculture forest health planners and silviculturists to determine stand tending and forest health treatment priorities and investment profitability.
- Goals 5 and 6 will help silviculture forest health planners, silviculturists and others to determine pest risk assessments for Preharvest Silviculture Prescriptions and stand tending activities.

Developments for 1993-94:

Nelson Forest Region will continue to sample the Arrow TSA which is comprised of Interior Cedar Hemlock (ICH) and Engelmann Spruce Subalpine Fir (ESSF) biogeoclimatic zones. Prince Rupert Forest Region will also be sampling an ICH variant in the Kispiox TSA.

A study, to be conducted through Inventory Branch, Growth and Yield Section, will further investigate the need and methods to estimate operational adjustment factors for both pest damage and the effects of silvicultural treatments. Silviculture Branch staff (stand tending and forest health) will be involved in this project.

For further information on this subject please call Jeff Beale (387-8739) or Val Fletcher (356-8763), Silviculture Branch, Forest Health Section.

- J. Beale and V. Fletcher, Silviculture Branch, Victoria.

Information Systems Update. The following are short descriptions of current and proposed information systems initiatives for 1993/94:

ISIS/Record PHSP:

Under the Record PHSP module of the Phase I release of ISIS (currently in pilot mode in selected districts) information on occurrence of insects and diseases can be recorded at any time in the life cycle of an opening. Information can be entered at both the opening and standard units level. "Free form" comment fields are also available at the opening level. In addition, the activity (e.g. type and method of survey) can be identified during which the observation was made, thus helping to assess it's reliability.

ISIS automatically calculates area affected (ha) based on a user entered percent incidence and level of detection (opening or standard unit), e.g. 12% incidence on 100 ha opening = 12 ha of area affected. Information entered in the Record PHSP module of ISIS will act as a "flag" for follow-up by a forest health specialist with the additional potential of built-in "threshold" action values.

Silviculture Geographical Information System (GIS):

Norman Helewa and Joanne Bowden (Silviculture Branch GIS foresters) have outlined in their *Silviculture GIS Tactical Plan* dated April 1993 the overall direction for the development of a Silviculture GIS system. The tactical plan views both short and long term client needs. Short term needs will be met by the development of map "viewer" software in which silvicultural spatial and associated attribute data could be displayed in an integrated manner by staff on a personal computer.

The long term plan has begun with the formation of a Silviculture GIS pilot team, with the subsequent formation of a user team of region and district Silviculture staff. District demonstration/consulting visits to develop the Silviculture spatial demonstration model and data flow diagrams are nearly complete. Feedback from these district demonstrations and branch consultations will lead to the development of a requirements document. A pilot district will then be chosen for development work with the findings of the project providing the foundation of the detailed requirements of a Silviculture GIS. The pilot project is slated for January through December, 1994.

What's Next:

A project will be initiated soon to re-visit and update the results of the Forest Health Business Area analysis (especially the Development Plan) with an emphasis on future integration with ISIS. In addition, it will help to clarify the issues the Forest Health subprogram needs to address in order to make progress in systems development such as the development of standard provincial operational sampling methodologies.

Please contact Val Fletcher or Patricia Humphreys, Silviculture Branch, Victoria, if you wish further information on the above topics.

- V. Fletcher, Silviculture Branch, Victoria.

Forest Health Provincial Training Update. In 1992 regional silviculture staff identified forest health training as a priority. The training needs of various audiences were identified through discussions with regional silviculture and forest health staff in late 1992 and early 1993. It was discovered that many initiatives already exist and can be adapted for a broader audience, others require development, and many opportunities exist for province-wide coordination.

As a result of provincial discussions a draft Provincial Forest Health Training Strategy has been developed by Kathy Hopkins, Training and Extension Section, Silviculture Branch, with substantial input from regional and branch forest health specialists.

The strategy includes the conversion of existing training initiatives into broadly applicable, easy-to-use modules, as well as the development of new materials where needed. The draft strategy was designed for in-service British Columbia Ministry of Forests staff, licensees and contractors who perform silviculture and forest health treatments on crown lands. The primary focus is on operations staff within districts. The strategy addresses specific job-related knowledge and skills needed by people who perform silviculture and forest health duties in the province. The recommendations within the strategy pertain solely to in-house Ministry of Forests courses, rather than college, university or professional association training.

A draft action plan for training module development was also included with the Training Strategy document. Highlights of this plan, for implementation in 1993, are as follows:

- advanced forest health training for district specialists, including an advanced forest health training course for the northern regions (Prince Rupert and Prince George), based on a Coastal pilot initiative which was delivered in March, 1993;
- bark beetle management training for district specialists and native audiences;
- root disease management (armillaria) for professional and technical staff;
- silviculture surveys forest health training;
- forest health training for PHSP's;
- forest health training for stand tenders;

If you have any questions regarding these training initiatives, please contact the undersigned.

- P. Humphreys and K. Hopkins, Silviculture Branch, Victoria.

Management and Tracking of Forest Health Operational Projects. As was recommended by a 1992 Forest Health Project Management requirements analysis, Microsoft Project was tested and an attempt was made to create forest health specific entry screens with the assistance of district and region staff, Kamloops Forest Region, in 1992. Unfortunately, however, some serious bugs were discovered in this particular software package, which made it necessary for us to halt further attempts to customize the product.

As the basic overall capabilities of the product were well suited to identified forest health requirements, in 1993 we hope to resurrect it as it stands and test it at a district office on a trial basis. This will be done with the expectation that a "debugged" version of the software will be available in the next year or two, which then can be fully and adequately customized.

The most critical aspect of this project will be its eventual link to ISIS Phase II Plans and Goals. Any further development of the software will be carefully integrated with the ISIS initiative.

- P. Humphreys, Silviculture Branch, Victoria.

White Pine Stratification Trial. Surrey Seed Centre is conducting a number of trials to boost the germinancy rate of white pine. The present low germinancy rate (40-60%) prevents the operation from sowing container stock which, due to form and growth habits, are less susceptible to blister rust infection. The just completed density separation trial actually decreased the germinancy over that of conventional stratification techniques. Upcoming trials with extended soaks, extended stratification and seed coat sterilization are expected to improve germinancy success.

- J. Fournier and B. Broznitsky, Vancouver Forest Region, Burnaby.

Seed Pest Management Report - Spring 1993. The new Seed Pest Management lab, located at the Saanich Seed Orchard, is now open for business. In an effort to take up where Doug Ruth left off, we are inviting the submission of natural stand cones for damage assessment. This service is an expansion of our regular work with orchard grown cones and seeds. All persons involved in natural stand cone collection and interested in having potential crops assessed are invited to make use of our services. Call us or write for further information at:

Seed Pest Management Services
Ministry of Forests
Saanich Seed Orchard
7380 Puckle Road
Saanichton, British Columbia V0S 1M0
Phone: 652-7613, FAX: 652-4204

To aid us in our work this summer we have hired a research assistant, Delia Hill, and Jeff Lemieux, a co-operative education student. Their help is invaluable. Green Plan funded the hiring of Delia to work on a study of the biology of fir coneworm, *Dioryctria abietivorella*, in Douglas-fir seed orchards. We are cooperating with a national network of researchers involved in research on pheromones, morphology, life histories, and other aspects of the biology of these coneworm moths (see below). Jeff is building up our cone and seed insect reference and educational collection and assisting with our regular insect monitoring and trials work.

Current monitoring and trials:

Red cedar Cone Midge, *Mayetiola thujae*, and a potential new red cedar problem. This year the only intensive monitoring of red cedar cone midge took place at Western Forest Product's (WFP) Lost Lake Seed Orchard site. *Mayetiola* eggs began showing up in conelets in late March and by mid-April conelet infestation had plateaued in the two WFP orchards at 10% and 12%. An interesting sideline to this was the discovery

of a previously unknown midge in very young red cedar conelets at Lost Lake early in March. Of conelets sampled in mid-February, 10-20% had a single, late instar cecidomyiid larva filling a cavity occupying most of the conelet interior. Attempts to rear adults of this midge at the Seed Pest Management lab and Pacific Forestry Centre have not been successful and its identity remains unknown. By the time eggs of *M. thujae* had begun to appear in the Lost Lake orchards, the new midge larvae had mostly disappeared (presumably into the ground to pupate). Infested conelets did not appear different from uninfested ones until dissection when the larvae and the heavy internal damage associated with their presence was revealed. We think that infested conelets abort and drop to the ground at or about the time that the larvae are ready to pupate.

Douglas-fir Cone Midge, *Contarinia oregonensis*. A bumper crop of Douglas-fir cones is expected this year. Cones from all coast orchards actively managing this species were examined by late April. Cone midge was not found in appreciable numbers anywhere and consequently no control measures were taken this year.

Green Spruce Aphid, *Elatobium abietinum*. Populations of green spruce aphid were generally low in all spruce orchards except at Cobble Hill. Spot treatment with Safer's Soap was initially successful there but, in part because of the extended cool, damp spring, the population rebounded by early bud flush and required spot treatment with diazinon.

Hemlock Woolly Aphid, *Adelges tsugae*. A trial testing the efficacy of Enstar (kinoprene), an insect growth regulator, against this insect is being conducted at the Canadian Pacific Forest Products hemlock orchard in Saanichton. We are also looking at the effect of Enstar, Safer's Soap, and dimethoate on populations of two small but important predators of *A. tsugae*: a derodontid beetle and a chamaemyiid fly. At this orchard as well, Lee Humble (Pacific Forestry Centre) is studying the effects of these predators on their prey.

Larch Cone Woolly Aphid, *Adelges lariciatus*. Monitoring of this adelgid continues at the Kalamalka larch orchards. Chris Walsh's evaluation of the effects of *A. lariciatus* on larch seed grown last year suggests that this insect does not appear to affect the number of filled seeds per cone but does make seeds harder to extract from cones. Currently, biweekly conelet and branch samples are being examined to follow the development of the population through the 1993 growing season and identify potential times to exercise control. In early April, stem mothers (primarily found at the base of buds on two-year-old growth) had already laid copious numbers of eggs. By mid-April nymphs had begun hatching and many were already attached and feeding on developing cone scales and bracts.

Other Woolly Aphids, *Adelges cooleyi*, *Pineus similis*, *et al.* Interior seed orchard populations of other adelgids are very low this year. Very few individuals were noted in spruce surveys at Skimikin and Kalamalka in April. In natural stand spruce around Skimikin, very few galls were seen on the last two years' growth, suggesting that natural populations of these adelgids are also currently low. On the coast, Marian Sawchuk is beginning her second year of neem efficacy trials against *A. cooleyi* at the Saanich Seed Orchard. Her initial results this season are very promising. This work is jointly funded by the Ministry of Forests and the Graduate Research Engineering and Technology (GREAT) program.

Spruce Cone Rust, *Chrysomyxa pirolata*. A trial is underway at Skimikin testing metiram, triforine, and myclobutanil as less toxic, more user friendly alternatives to ferbam for the control of spruce cone rust.

Fir Coneworm, *Dioryctria abietivorella*. The Integrated Pest Management in Seed Orchards (IPMISO) Working Group has identified *Dioryctria* as one of the most important cone pest genera in North America. At least five species of *Dioryctria* coneworms are known in British Columbia. Two of these, *D. abietivorella* and *D. reniculelloides*, the fir and spruce coneworms respectively, have transcontinental distributions and feed on species of at least six genera of conifers. A prominent pest in British Columbia seed orchards, the fir coneworm is most troublesome on Douglas-fir and spruce but also occurs regularly on pine, larch, and hemlock, as well as in wild stands of true firs. All above ground portions of all ages of trees are susceptible to attack: cones, foliage, leaders, branches, and stems. Woody tissue is usually invaded secondarily. Cones and seeds can be seriously affected (50 to 100% have been destroyed at certain sites) and stems can break as a result of fir coneworm damage.

Basic biology and chemical ecology of the fir coneworm is poorly known and descriptions of such vary. This variability and the wide range of coneworm hosts suggest that a complex of cryptic sibling species may be unrecognized within the current concept of this species. Researchers at Simon Fraser University, the Forest Pest Management Institute, and Forestry Canada (in eastern Canada only--Pacific Forestry Centre is no longer pursuing cone and seed entomology) are working on these problems. Here at Seed Pest Management Services, Bev McEntire has commenced a two year study of the basic life history of *D. abietivorella*. Part of her job is to collect and rear material for the various pheromone and taxonomy studies in progress. Any help in locating significant populations of fir coneworm will be greatly appreciated.

Effective management of any insect is **only** possible with a good understanding of its basic biology and taxonomy. All good biology is rooted in good taxonomy.

- R. Bennett, Silviculture Branch, Victoria.

Nursery Pest Management Update. Work on *Cylindrocarpon* root rot of Douglas-fir in coastal nurseries is continuing in 1993. Stock adjudicators are becoming increasingly concerned with this disease, many individuals have specified zero tolerance, and whole seedlots are rejected if 10% or more of the seedlings are found to be infected during the audit. In 1993, a study to determine the threshold levels of disease that cause mortality in the field will be conducted. Approximately 9,000 seedlings with varying levels of disease will be planted at three sites near Pemberton and at one nursery. Levels of root rot and survival of the stock will be assessed for three years.

In 1986, the first major *Keithia* infestation of western red cedar container stock was recorded and resulted in severe site losses. Since then all coastal nurseries have recorded *Keithia* infestations primarily in 2+0 and transplant stock. This has resulted in significant culling of infested trees and reductions in anticipated request levels to the majority of Vancouver Forest Region districts. One problem faced by adjudicators and field foresters has been deciding on the degree of acceptable levels of *Keithia* infestation on stock. Due to the aggressive nature of the disease, and past planting failures, most field staff and administrators are recommending a zero tolerance. As a result, a major proposal has been put forward by Jack Sutherland and Harry Kope of Forestry Canada, in conjunction with Nursery Extension Services, to review the epidemiology of the disease and to evaluate the available registered fungicides. A spray program has been initiated but its success has yet to be fully evaluated. Also, the recommended product, Dithane, is currently under review by the Environmental Protection Agency and its registration may be dropped due to health concerns. Other products have been sprayed on trial plots and look promising but again have not been evaluated in the field. In addition, six outplantings were established in five districts in the Vancouver Forest Region. The sites were planted with seedlings having low, medium and high *Keithia* levels based on initial assessments of the stock prior to storage and outplanting. Degree of infection coupled with site characteristics appears to contribute greatly to the aggressiveness of the disease after outplanting. A one or two page handout detailing the biology, control and impact of this disease on western red cedar seedlings in nurseries and planting sites will also be produced.

Liverwort is the most serious weed problem of coastal reforestation nurseries. Many crops have been lost to liverwort directly, others are of poorer quality and produced at greater expense due to liverwort competition. Once liverwort is established in a facility it is very difficult to control, hand weeding is impossible and most applications of pesticide tested to date have been ineffective. Recently, a new method for controlling liverwort, without damaging conifer seedlings, has been developed by Glen Matthews.

This appears to be the most successful application developed to date with liverwort obviously dead or dying within 24 hours. Extension services will be supporting Glen in further trial work to test observations made in pilot studies and expand the use pattern of the product to other species of conifers.

- G. Shrimpton, Surrey Nursery, Surrey.

Ecosystem Maintenance Burn. The Invermere Forest District, in cooperation with the Nelson Forest Region, has undertaken an ecosystem maintenance burn in the ponderosa pine and interior Douglas-fir ecosystems. The burn was a cooperative project involving Silviculture and Range Branches. The purpose of the project was to reintroduce fire to these ecosystems. Fire would naturally occur once every 5 to 20 years but due to our control efforts, it has been excluded for decades, thereby exacerbating insect and disease problems. We hope that this reintroduction will increase overall stand vigour and health and improve forage, fish and wildlife values and recreation opportunities. A research project has been initiated to gather information for future burns. For more information, contact Phil Burk, or Dave Gleave, Invermere Forest District.

- E. Begin, Invermere Forest District, Invermere.

Forest Health Program Planning. At a Forest Health Section staff planning session, the following were identified as the three most significant action items :

1. To improve communication, support and problem-solving with regional staff.
2. To hold an annual forest health provincial meeting to identify issues, action required, and progress, beginning in September, 1993.
3. To increase our monitoring activities with regional staff by requesting review sessions, participating in program audits, and making informal visits or field trips to work on specific projects or issues.

If you have any comments or suggestions, please contact the undersigned at 387-8740.

- J. Muir, Silviculture Branch, Victoria.

Forest Insect and Disease Survey Review. The Ministry of Forests and Forestry Canada have agreed to review responsibilities for delivering forest health surveys in the province. Initial discussions regarding the need for such a review were carried out by the Director-General, Pacific and Yukon Region of Forestry Canada, and the Chief Forester and Assistant Deputy Minister, Operations, Ministry of Forests.

The review will determine if overlap exists between surveys conducted by the Forest Service and those done by the Forest Insect and Disease Survey Unit of Forestry Canada (FIDS). The intent of the review is to enhance the efficiency of forest health surveys in general. Results from the review may also be used by Forestry Canada to restructure the FIDS organization to make maximum use of their available resources.

- J. Muir, Silviculture Branch, Victoria.

FOREST INSECTS

Gypsy Moth - 1993 Treatments. Several sites are to be treated to eradicate European gypsy moth in 1993. Sites are located in Hope, Burnaby, South Vancouver, Richmond, Salt Spring Island, and Victoria. Treatments will be varied and will include intensive trapping in the South Vancouver site, limited ground spray and intensive trapping on Salt Spring Island, and triple aerial applications of *B.t.k.* in Richmond, Burnaby, and Victoria. All treatments and subsequent trapping will be conducted by Agriculture Canada with limited support from provincial agencies such as Ministry of Forests and Ministry of Agriculture, Fisheries, and Food. No Asian strain gypsy moths were found in 1992 pheromone traps.

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

Gypsy Moth - Risk Assessment in British Columbia. Current opinion among many entomologists and pest management specialists in the province maintains that gypsy moth would be well able to become established in many areas of the province. Further, substantial impacts are predicted to a wide variety of resources should such an establishment occur. Resources considered to be at risk include: forests, agriculture, urban forests and aesthetics, and import/export opportunities. However, no studies or documentation have been assembled which delineate and quantify the potential risks associated with the introduction of gypsy moth into the province. In 1993, a contract will be tendered to develop a comprehensive risk assessment for gypsy moth in British Columbia. The risk assessment is expected to estimate the potential range of gypsy moth habitation in the province, the length of time after establishment to reach that range, the resources and values at risk, and the various stakeholders and their individual risks. The contract will be completed early in 1994.

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

Asian Gypsy Moth Compendium and Final Report. A final report on the Asian gypsy moth eradication project has been completed and will be available in the near future when final editing is completed. Also, all documentation on all aspects of the project has been assembled into a several volume set and copies have been lodged with Agriculture Canada, Ministry of Forests, and Ministry of Agriculture, Fisheries, and Food. This compendium will serve as useful background material for future large scale eradication programs should they be necessary.

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

Bark Beetles - Impact Study. In the aftermath of an infestation of mountain pine beetle, it is necessary to determine the future potential of affected stands. Affected

Bark Beetles - Impact Study. In the aftermath of an infestation of mountain pine beetle, it is necessary to determine the future potential of affected stands. Affected stands may have adequate understory or remaining unaffected trees to constitute a merchantable stand; conversely, stands may require substantial rehabilitation to return them to production. However, data is lacking for such stands to establish criteria for treatment.

Plots will be established in the 1993/94 fiscal year to determine the fate of stands where an infestation of mountain pine beetle has run its course. Stands will be selected across a spectrum of biogeoclimatic zones affected by pine beetle and will be established in a variety of beetle hazard classes as determined from stand conditions prior to the outbreak. Criteria for assessing the fate of affected stands will be derived from plot information.

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

Baiting Strategies for Mountain Pine Beetle. A guideline for the use of baits for management of mountain pine beetle has been produced and will be incorporated into the general strategies documents pertaining to mountain pine beetle. The guideline indicates general infestation situations and recommends the mode of bait deployment for each. The two baiting methods recommended for use in specific situations are spot baiting and grid baiting. Perimeter baiting of proposed cut blocks is not recommended for use except in small blocks or where beetle populations are low. Otherwise, beetles may overwhelm the perimeter and spread.

- P M. Hall, Silviculture Branch, Victoria.

Funding Levels for Bark Beetle Management. Bark beetle management programs for mountain pine beetle and spruce beetle continue to be major components in regional forest health activities. Funding levels for bark beetle treatment activities by region for the 1993/94 fiscal year are as follows. Allocations have been rounded to the nearest thousand.

FOREST REGION	ALLOCATION (\$'000)
Cariboo	902
Kamloops	583
Nelson	297
Prince George	1,049
Prince Rupert	593
Vancouver	4
TOTAL	3,428

Allocations include costs for treatments only (such as fall and burn, MSMA, trap trees, bait purchase and placement, etc.) and do not include allocated costs for aerial and ground detection and delineation surveys.

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

Bark Beetle Program Benefit/Cost Study. A cost/benefit evaluation of the mountain pine beetle management program was done under contract to Deloitte Touch Management Consultants and Phero Tech Inc. Economic and social values affected by the mountain pine beetle and by the management efforts were examined. Three scenarios were analyzed as follows: no management program; a management program equivalent to the current one; and, a somewhat enhanced management program which incorporated harvesting by hazard class in non-outbreak periods. Two Timber Supply Areas (TSA's) were examined in detail, one in the southern portion of the province (Merritt Forest District) where climate and host conditions are ideal for the beetle and a northern TSA (Morice Forest District) where beetle conditions are less than ideal. The results of the study show that there are significant benefits to be gained from an enhanced management program utilizing a coordinated application of available treatment methods.

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

Bark Beetle Funding Responsibilities. Several forest regions have established guidelines as to responsibilities for funding bark beetle related activities for the Forest Service and for licensees. However, these responsibilities have not, as yet, been standardized for the province. These funding responsibilities are based on the type of tenure and the long term responsibilities of the ministry and industry. An effort will be made this fiscal year to establish a provincial policy or standard for these responsibilities.

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

Economic Assessment of Western Spruce Budworm Control in B.C. Forests. This Deloitte and Touche economic assessment identified that the benefit/cost ratio for control of budworm with *B.t.k.* was between 2.3 and 5.2. These figures demonstrate that it pays well to control budworm with *B.t.k.* The report of this study is complete and copies are now available.

- J. Henigman, Silviculture Branch, Victoria.

"Supercool" Beetles in the Prince George Forest Region. The Prince George Forest Region experienced cold winter temperatures from late December 1992 to mid-January 1993. Temperatures were as low as -34°C in the Dawson Creek Forest District. Consequently, overwintering survival checks were made on both spruce beetle and mountain pine beetle above the snowline in infested trees in several districts in March, 1993.

For spruce beetle, a total of 27 trees in 13 locations in five districts were sampled. Some 1210 larvae, 91 pupae, and 674 immature adults were extracted and reared between moist paper toweling at the regional office for up to four days. Mean survival per tree was 57% for larvae, 0% for pupae, and 62% for immature adults.

For mountain pine beetle, a total of seven trees in four locations in two districts were sampled. Some 260 larvae, 8 pupae, and 179 parent adults were extracted and reared in the same manner as the spruce beetle larvae. Mean survival per tree was 71% for larvae, 0% for pupae, and 22% for late-developing parent adults.

As observed in previous cold winters, pupae of both species are considerably more susceptible to low winter temperatures than are larvae and immature adults. The severity and proximity of woodpecker damage to sample locations in cambium tissue was variable and undoubtedly reduced the insulative properties of infested trees. In fact, woodpecker damage to adjacent cambium may have been a more significant mortality factor than the cold weather alone. Since the winter had no significant impact on beetle survival rates, there will be no reductions in operational control or detection plans for 1993.

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

Ground-Detection Procedures for Spruce Beetle in the Prince George Forest Region. Probing procedures for ground-detection of spruce beetle attack in the Prince George Forest Region are being revised. Prince George regional and district staff are working with Val Fletcher at Silviculture Branch to update the existing standard operating procedure so that it satisfies changing operational needs of the 1990's. A draft revision of the bark beetle codes in the cruising manual will also be tested this year. For the sake of standardization, it is hoped that such procedures can eventually be agreed upon and adopted by other regions.

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

Biodiversity and Bark Beetles--Are Compromises Possible? A contract was completed in March 1993 that merged the Shore and Safranyik mountain pine beetle stand susceptibility rating with an inventory of habitat types in the Morrison Lake Timber Development Area in the Morice Forest District. This project is the first watershed-level inventory performed using the regional biodiversity guidelines developed by regional Wildlife Habitat Ecologist, Doug Steventon. The study provided forest managers in the District with a means of visually identifying impacts on wildlife that may occur if stands, particularly those infested with mountain pine beetle, are removed. For example, "critical" wildlife corridors, often containing stands of overmature lodgepole pine, were identified. These stands must be harvested using a partial cutting system or not cut at all. Thus, planning for either option can also be calculated.

The data is currently on mylar overlays and will be transferred to a geographic information system this summer. Presentations to district staff will also occur during May and June. This analysis presents the basic information required by forest managers to adequately perform integrated resource planning and demonstrates how the mountain pine beetle hazard rating can be incorporated into the planning process.

- T. Ebata, Prince Rupert Forest Region, Prince Rupert.

White Pine Weevil Hazard Rating Available for the Bulkley, Kispiox, Kalum and North Coast Forest Districts. Simon Fraser University co-operative education student, Larry Davis, successfully produced degree-day based hazard ratings for white pine weevil for the four most western districts of the Prince Rupert Forest Region. Although little weather station data was available for many parts of the biogeoclimatic subzones, Larry was able to extrapolate weather station data from more southern subzone variants to produce a rating. A local consultant has produced an Excel program to calculate and display the missing weather data from fire weather station data. This program will be used to improve the rating where the appropriate records are available. Summer students will be ground truthing spruce plantations in the northern parts of the Kalum and Kispiox Forest Districts this summer to validate the hazard rating.

Districts and licensees have been informed that they should utilize the hazard ratings during the preparation of Pre-harvest Silviculture Prescriptions (PHSP's) as described in the draft PHSP Forest Health Guidelines for Northern British Columbia.

- T. Ebata, Prince Rupert Forest Region, Prince Rupert.

Revision of Free-Growing Survey White Pine Weevil Damage Standard. An addition to the Free-Growing Survey Pest Damage Standards for Northern British Columbia was recently circulated to districts in the Prince Rupert Forest Region and is currently being reviewed for inclusion in the Vancouver, Cariboo and Prince George Forest Region standards. If a spruce stem has two or more weevilled leaders in the last five years of growth, the stem is considered unacceptable. The rationale behind this amendment was that if the rate of attack at free-growing age (ranging from 4 to 15 years) is high, it most certainly (based on observations of older plantations) will be subjected to intense levels of damage in the next 10 - 20 years. This projected level of damage is unacceptable, based both on observations of existing plantations, and volume estimates from Dr. Rene Alfaro's Spruce Weevil Attack (SWAT) model.

- T. Ebata, Prince Rupert Forest Region, Prince Rupert.

White Pine Weevil Leader Clipping - Experiences in the Vancouver Forest Region. An article by Leo Rankin about leader clipping to control white pine weevil in the Cariboo Forest Region from the last issue of Forest Health Progress spurred me to report my conclusions about clipping from the results and experiences in the Vancouver Forest Region. In summary, I agree with the conclusions reported in that article.

Leader clipping was first attempted in several ad hoc trials by a few forest licensees in the mid- to late 1970's. Most of these early attempts were abandoned after a couple of years due to the lack of obvious results. More involved trials were initiated by the Ministry of Forests in 1979 and were continued until 1984. These trials were actually serious attempts to control this weevil that was threatening thousands of hectares of young Sitka spruce plantations. As an experiment, they were not set up very well and there was a lot of 'learn as you go' and 'seat of the pants' type of activity. They were terminated due to a combination of reasons, such as lack of obvious results, restraint budgets, and crew burn-out. During this same period and continuing for a number of years afterward, Canadian Pacific Forest Products Ltd. (formerly Tahsis Co. Ltd.) also initiated a fairly substantial clipping program. These trials were also terminated for, more or less, the same reasons.

Beginning in 1987 and continuing for three years, additional clipping trials were started to test if natural predators could be utilized to help control weevil damage. Clipped leaders were placed into screened cages which allow the escape of the smaller sized predacious and parasitic insects, while holding the weevils. These trials were terminated due to inconclusive results, the work load involved, reassignment of Forestry Canada researchers, and a general loss of interest.

My conclusions from this work is that leader clipping, with or without predator/parasite enhancement, will work. A closer look at the results from the 1979-1984 trials show that weevil infestations can be kept at low levels, i.e. < 1% of trees attacked annually.

However, this requires certain circumstances and a serious, multi-year commitment that few people can maintain. To quote Leo Rankin, "The difficulties involved in mounting large scale clipping projects are daunting". Clipping must start as soon as a weevil infestation is detected. There must be no sources of weevil nearby (within 1 km). Clipping operations must be very thorough and, in the Vancouver Forest Region, carried out three times per year, in early August, mid-August, and early September. Once started, clipping must be continued for at least five years. In addition to this, clipping is labour intensive and physically demanding. It is ugly work that few people want to do twice. Maintaining a thorough, multi-year operation is not an easy task, especially once trees reach 5 m in height and branches intermesh. For these reasons, clipping will have limited uses at best. I have a report which summarizes the 1979-1984 trials.

- D. Heppner, Vancouver Forest Region, Burnaby.

Douglas-fir Tussock Moth and *B.t.k.* An infestation of Douglas-fir tussock moth at a Chilliwack golf course was treated with two applications of *B.t.k.* (Foray 48B®) last spring. The application rate was high and the applications were approximately two weeks apart. The first application occurred during the third and fourth instar larval stages, and the second during the fifth and sixth stages. Post-treatment weather was dry and warm. Although a thorough assessment of efficacy was not done, it appears that the treatments had only minimal effects. Although the timing of the treatments was late, I would have expected better results than those obtained, as scientific literature contains numerous descriptions of excellent control in the United States with this insecticide.

By the end of the season, a high incidence of virus occurred in the remaining Douglas-fir tussock moth population and few egg masses seemed to have been laid. We are expecting a greatly reduced population this year.

- D. Heppner, Vancouver Forest Region, Burnaby.

FOREST DISEASES

Validation of the TASS-ROTSIM Model for Prediction of Laminated Root Rot in Second Growth Coastal Douglas-fir. TASS-ROTSIM calibration efforts have been based on several large, long term root rot monitoring plots on the east coast of Vancouver Island. These efforts have been coordinated by Ken Mitchell of the Research Branch, Forest Productivity and Decision Support Section in cooperation with Silviculture Branch, Forest Health Section, and with consulting support from Bill Bloomberg. The next step in preparing model output tables is to validate projections for a variety of stand, disease and treatment conditions. Model validation is best done using an independent set of long term monitoring plots, for example inventory or growth and yield permanent sample plots known to be infected with laminated root rot.

Validation for TASS-ROTSIM is being conducted under a FRDA II, Protection/Research project. At this time, growth and yield permanent sample plots (PSP's), with a known history of laminated root rot, have been field-evaluated for tree and PSP damage severity and intensity. Infection conditions and old growth stand conditions, including stems/ha and species composition have been assessed within a 0.35 ha homogenous sampling area surrounding each PSP. PSP's have been selected from both Canadian Pacific Forest Products Limited and MacMillan Bloedel Limited private Managed Forest Unit tenures. The majority of PSP's have 20-40 years of growth measurements. Prior to purchasing PSP growth measurement data, the PSP's must be reviewed to determine their suitability for the proposed set of validation test conditions. A revised Forest Productivity Councils of British Columbia matrix reporting system will be used to assist selection of PSP's for the validation project. Validation of TASS-ROTSIM will be conducted by simulating the PSP data (using stand and infection conditions at establishment conditions as model inputs) and comparing the projections to the PSP growth and yield trends. Adjustments will be made to the model as appropriate, and limitations will be described.

Managed stand yield tables for coastal Douglas-fir stands infected with laminated root rot will be completed in late 1993, and ready for operational use in 1994. Managed stand yield tables are also planned for tomentosus and armillaria root diseases, and terminal weevils. For more information please contact Jeff Beale.

- J. Beale, Silviculture Branch, Victoria. and K. Mitchell, Research Branch, Victoria.

Implementation of the PROGNOSIS Model and Extensions. Cooperative work is continuing between the Silviculture Branch and Inventory Branch to develop an implementation strategy for PROGNOSIS models. It is expected that a strategy will be completed this year. Training has already been initiated in the Nelson Forest Region on the main model, while training on Western Root Disease submodel will take place later this fiscal year. Central to making the model more user-friendly, we have

developed a user interface (Windows and DOS versions) which simplifies developing run scenarios (includes "smart" file construction rules), reviewing model outputs (standard tables and new graphics), and easy output export features. The interface is the architecture in which the main model and the extensions reside. Presently the extensions available in the interface are Event Monitor, Thinning, Regeneration Establishment, Cover/Browse, Cheapo II Economic Analysis, and the Western Root Disease models. Forest Health is planning to imbed the following models in the interface: Western Spruce Budworm - Damage and Population Dynamics; Douglas-fir Tussock Moth; Mountain Pine Beetle; Dwarf Mistletoe; the Parallel Processor (for multiple stand runs); and a few others.

Further interface development work will likely continue within the context of a Graphical User Interface Cooperative to be formed between the B.C. Ministry of Forests, the U.S. Forest Service and other agencies later this year, but this cooperative is only in the discussion phase. Interface development will rely heavily on user-involvement and review sessions.

Information on training for the Western Root Disease model will be forthcoming this summer. The prime focus for training with this model will be stand level silvicultural prescription making for armillaria root disease. Development of training will be done in consultation with the respective training and extension staff of the Silviculture and Inventory Branches.

For further information, please contact Jeff Beale.

- J. Beale, Silviculture Branch, Victoria.

Armillaria Detection Methods Mushroom in the Robson Valley. This past spring, 1992 marked the return of two summer students working in the Robson Valley Forest District on armillaria root disease. Some of the activities included establishment and remeasurement of rate-of-spread plots, assessment of other researchers' plots, inventory and growth and yield plots for armillaria, and young stand surveys. Tim Qureshi, a fourth year University of British Columbia forestry student, is completing an undergraduate thesis testing the application of large scale photography for detection of armillaria under Dr. Bart van der Kamp. The results are very promising. Tim and Josie will be back for a third season in 1993. We look forward to another productive summer.

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

***Inonotus circinatus*: New Kid on the Block?** Although *Inonotus circinatus* had been collected from four locations in the Prince George Forest Region in the late 1940's and early 1950's no new collections had been made until the 1990's. A second recent (March 1993) collection of *I. circinatus* was made in the Prince George Forest Region. The site was an armillaria rate-of-spread plot, 15 km south of Valemount in the Interior Cedar Hemlock Subzone of the Robson Valley Forest District. The first collection, made in the fall of 1991, came from a pine progeny trial in the Sub-Boreal Spruce Subzone of the Prince George Forest District, 200 km away. Both collections were found in large stem-mapped plots in plantations and this will enable long term monitoring. Both basidiocarps were laterally substipitate, one at the base of a spruce stump, the other at the base of a pine stump. These recent findings suggest *I. circinatus* may be more common than suspected.

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

Pre-Stand Tending Rust Surveys in the Vanderhoof Forest District. Two brave students faced waves of incessant biting flies, long dusty roads, and dense pine stands to survey 1200 hectares of naturally regenerated pine stands last summer. Both students were from the B.C. Institute of Technology and demonstrated that technical schools produce some of the finest summer students. Results of the surveys assisted Silviculture's prioritization of stand tending activities for 1994 and 1995, as well as increased the growing data bank on rust distribution and severity. The rusts of concern were western gall rust and comandra blister rust. Stalactiform blister rust was far less common, as is typical in young stands throughout the region. Many thanks to Tamara Bandola and Lorraine Rugg for their excellent work.

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

Armillaria Sketch Mapping in the Robson Valley Forest District. Direct benefits of armillaria sketch mapping in the Robson Valley Forest District include successful planning and execution of silviculture activities, prediction of stands predisposed to Douglas-fir beetle and much more. Low level sketch mapping of armillaria distribution was recorded on 1:20 000 forest cover mapsheets that included a 100 m contour overlay. Several thousand hectares along Kinbasket Lake were aerially surveyed, and then extensively ground surveyed.

Both elevation and aspect appear to be important factors in predicting occurrence. Although the occurrence of a susceptible host did not diminish with increasing elevation, occurrence of armillaria did. Extensive areas of severe damage were common between 800 m and 1000 m above sea level, but much less damage was found between 1000 m and 1200 m, and virtually no infection was found above 1200 m. Armillaria was found at 1400 m on southwest facing aspects, but was not found above 1000 m on northeast facing aspects.

More work will be done this summer to further delineate infected areas, and elucidate some of the ecological variables involved in this apparent relationship of armillaria occurrence with elevation and aspect.

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

White Pine Blister Rust - Introduction. An inspection of three exotic white pine plantations in the Queen Charlotte Islands, found that white pine blister rust is decimating a 7-year-old plantation of candidate rust resistant white pine from Idaho, and the coastal and interior regions of British Columbia. The pine appear to be the offspring of trees selected according to the old vertical resistance selection criteria. The infected plantation will be analyzed and eradicated this summer. The rust appears to have been brought in on commercial nursery stock, but, because there are no native soft pine stands, does not threaten local ecosystems.

- J. Fournier, Vancouver Forest Region, Burnaby.

White Pine Stock Production Trials. An upcoming trial will investigate the potential for reducing the infection levels of white pine blister rust on commercial white pine nursery stock. Five seed lots from the Texada Island Seed Production area and two common seedlots will be evaluated in the trial. Infection levels of the seedlots will be compared for stock grown as 2+0 PSB 415B and 1/2+1/2 PBR 313B in an interior location (Osoyoos) and coastal location (Surrey). Stock will also be manipulated to encourage the production of secondary needles over the more rust-susceptible primary needles. Final trial results will be available in 1997.

- B. Broznitsky and J. Fournier, Vancouver Forest Region, Burnaby.

Tree Max Pop-up Spacer. Preliminary data indicates that the cost of pop-up spacing is reasonably comparable to chain saw spacing, ranging from \$800-1200/ha. As is the case with all new devices, costs are high at the beginning of the learning curve. Stems handled by the pop-up spacer range from 40 cm dbh. Root removal using the pop-up spacer is very good. Temperatures below -15°C cause smaller stems to become brittle and break and snow deeper than 150 cm slows the excavator too much.

The Tree Max has been used to selectively log a mixed lodgepole pine, yellow pine and Douglas-fir stand near Rock Creek. A group selection procedure was used, which left all yellow pine and Douglas-fir in a stand containing mountain pine beetle and armillaria root disease. The leave stems ranged in size from 2-3 cm dbh to 50 cm dbh.

These smaller stems and stumps were left on site for wildlife. The costs of logging, coarse woody debris retention and site preparation costs will be developed from volume and machine cost records.

Limited testing of the Tree Max as a brushing method indicated a great deal of promise both in the efficiency of removal and cost.

A final report will be produced in June 1993.

- D. Norris, Nelson Forest Region, Nelson.

MAMMAL DAMAGE

Mammal Damage. Initiatives to monitor and control mammal damage are being undertaken with voles, red squirrels and porcupines.

Contracted research studies are underway to develop an operational vole population monitoring method. This method will be used to annually monitor vole populations in known problem areas in order to predict future population levels. It is expected that seedlings planted during periods of low vole numbers would have time to establish and be able to survive subsequent vole feeding.

Lodgepole pine thinning and pruning studies are being conducted in the Kamloops Forest Region to determine ways to reduce red squirrel damage in managed stands. Initial results suggest that by opening up the canopy the reduced cover will cause the squirrels to avoid the stands. Squirrel damage monitoring projects are being initiated in a number of Nelson Forest Region districts.

Projects to monitor porcupine damage have been underway for some years in the Prince Rupert Forest Region, North Coast and Kalum Forest Districts. New damage monitoring projects are being considered for a number of districts in the Nelson Forest Region.

- J. Henigman, Silviculture Branch, Victoria.

PESTICIDES

Pesticide Applicator Course. There have been some new developments to the pesticide applicator course.

Cindy Pearce, of the Forestry Continuing Studies Network (FCSN) received approval to deliver the pesticide applicator courses for the province. The FCSN will organize, advertise, register, hire "approved trainers" and arrange facilities for courses.

The FCSN has contacted the stand tending foresters in all forest regions to identify needs for courses. FCSN will also contact various industry representatives.

FCSN will hire only those instructors which the ministry approves. Also, only ministry approved course information will be used and student course evaluations will be made. FCSN is determining the unit cost of the course. Although students must pay for the course, ministry staff could invoice district or regional offices.

If you have any comments or concerns, please contact the undersigned.

- J. Henigman, Silviculture Branch, Victoria.

The Forest Pesticide Applicators' Course Instructors Manual and Equipment and Teaching Aids Kit. For the Pesticide Applicators' Course both an instructors manual and a teaching aids kit are now available. Any teacher with a background in silviculture should be able to use the manual to offer the course and ensure continuity with courses offered by other teachers. The manual assists the teacher, step-by-step, in reviewing the course information and clearly outlines learning objectives.

The equipment and teaching aids kits are boxes containing equipment used in pesticide application which can be demonstrated at applicator courses. In addition, in the kits there are brochures and videos showing pesticide application techniques.

The manuals and kits will be maintained in Victoria, Silviculture Branch and will be signed out to teachers each season.

- J. Henigman, Silviculture Branch, Victoria.

Registration Status of Fenitrothion Insecticide. The insecticide, fenitrothion, has been used in eastern Canada, mainly New Brunswick, to control eastern spruce budworm. As a result of on-going concerns about the environmental impact of fenitrothion, a great deal of research has gone into evaluating the chemical in the last few years. Detailed studies of both the environmental impact and economic value of the insecticide have been completed. Agriculture Canada is now requesting comments on a discussion paper entitled *Registration Status of Fenitrothion Insecticide*. Copies of the discussion paper are available from the author or from Agriculture Canada, Plant Industry Directorate, Ottawa.

- J. Henigman, Silviculture Branch, Victoria.

AWK Oil Against Mountain Pine Beetle in the Prince George Forest Region. Agriculture Weed Killer No. 1® (AWK oil) is a selective, low-aromatic content, mineral oil herbicide registered for agricultural use in Canada against weed pests of carrots, parsnips, parsley, dill, celery, cranberries, and asparagus. In a small-scale operational research trial in 1988, topical applications of AWK oil killed 93% of new mountain pine beetle adults prior to their emergence from infested lodgepole pine bolts. AWK oil alone was just as effective as chlorpyrifos (5% a.i.) in AWK oil. In a further test in June 1991, AWK oil killed at least 71% of immature adults prior to their emergence from infested lodgepole pine bolts. Several Forest Service districts within the Prince George Forest Region have also tested it successfully on mountain pine beetle-infested stumps.

AWK oil is considered non-toxic to mammals but may cause some eye and skin irritation in the absence of protective equipment. The acute LD₅₀ for "mineral spirits" is 30 ml per 70 kg human.

In early June, 1993, a series of mountain pine beetle-infested lodgepole pine in the Vanderhoof Forest District will be treated with AWK oil. These lodgepole pine were baited with semiochemicals in 1992 and used as check untreated trees in boron-injection trials. A maximum of 54 felled lodgepole pine in each of two areas will be delimbed and the branches will be pulled away from the infested portions of the boles. Infested portions of each tree will be treated to the drip-point with AWK oil applied from backpack sprayers with fan nozzle heads. Low tank pressures and coarse droplets will help to minimize spray drift. AWK oil will penetrate into bark crevices and kill beetles by contact and/or through fumigation. A minor-use registration of AWK oil against mountain pine beetle will be sought in the near future.

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

Boron Rod Efficacy Evaluation. This June, an evaluation of the efficacy of Impel® boron rods will be made in the Telkwa River study sites. As described in the last issue of Forest Health Progress, a pre-attack and post-attack treatment was performed on over-mature lodgepole pine last summer. For each treated tree, egg galleries will be uncovered and larval mortality will be assessed. Randomly selected trees, three for each treatment, will be felled and wood samples will be taken from various points above and below the rod insertion points. These wood samples will then be analyzed for elemental boron to determine if any translocated during the year. A report on the results will be presented in the winter issue of Forest Health Progress.

- T. Ebata, Prince Rupert Forest Region, Prince Rupert.

Boron for Mountain Pine Beetle Control in the Prince George Forest Region. Boracol liquids, 20% and 30% a.i., are clear, colourless, odourless formulations of disodium tetrahydrate which have been widely used as remedial and preventative treatments against wood boring beetles since the 1960's. The inert ingredient in Canadian formulations is propylene glycol (approximately 60% and 70%) which gives the borates better penetration into wood. Treated wood is protected against termites, beetles, carpenter ants, and fungi. Impel® rods--a solid formulation (anhydrous disodium octaborate--100% a.i.) is registered in Canada (P.C.P. No 21324) and the registration for the liquid boracols is pending.

Borates occur naturally in orange juice, carrots, raisins, bread, and other foodstuffs. There is a large margin of safety with chronic dosages. Dogs fed daily low doses (525 ppm; 0.5 g in 1 kg of food) of boric acid for two years showed no toxic effects. Its safety as an insecticide rests on its low mammalian acute toxicity. The oral LD₅₀ in rats, depending on the species and sex, ranges between 3160 and 4080 mg/kg - which is less than the acute toxicity from table salt.

There are very few allergic responses from the application of boric acid to skin. It is also not mutagenic, and a two-year feeding study in mice showed no evidence of cancer.

Some researchers maintain that young mountain pine beetle adults must ingest blue stain fungi in order to successfully mature in infested lodgepole pine. Borates may prevent the establishment of the blue stain fungi and thus prevent the maturation of mountain pine beetle adults.

Trials conducted in 1992 in conjunction with the Prince Rupert Forest Region, tested pre-attack injection of boron rods and post-attack injection of Boracol 30® on semiochemical-baited lodgepole pine. Efficacy sampling will be conducted in late May and early June, 1993.

Treatments in 1993 will test pre-attack applications of Boracol 20 and 30. The two main objectives of this year are to determine if mountain pine beetle adults will readily attack Boracol-treated lodgepole pine without being repelled, and to test the efficacy of Boracol in preventing maturation of new beetles in attacked trees. A series of lodgepole pine at two or three locations in the Vanderhoof Forest District will be baited with semiochemicals in late May. In mid-June, treatments will be applied to a proportion of the baited trees in each area as per the following regime: 1/3 Boracol 20, 1/3 Boracol 30, and 1/3 checks (untreated).

All treatments will be made by first cutting a shallow continuous axe-frill in the cambium tissue around the lower bases of selected lodgepole pine. One of the Boracol liquids will be applied from an application bottle directly to the axe frill. Red water-soluble food colouring will be added to the formulations to improve the accuracy of application. It is anticipated that the formulations will rapidly diffuse into the cambium tissue and be translocated up the boles of each tree prior to the mountain pine beetle flight.

Efficacy sampling will be conducted in the late spring of 1994 to assess Boracol toxicity to mountain pine beetle parent adults, larvae, pupae, and immature adults. Cambium and foliar samples will be taken from various portions of treated trees to assess boron residues and mobility. For further information, contact the undersigned.

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

MSMA. As a result of a pesticide permit appeal decision involving the use of MSMA for beetle control in Smithers last year, we have developed a working agreement with the Pesticide Management Branch on our continued use of MSMA. MSMA is a very old pesticide and many of the basic studies that would normally be required for federal registration have only recently been completed and they have not as yet been reviewed by Agriculture Canada.

We have agreed with the Pesticide Management Branch and with the registrant company, United Agri Products, to summarize the background information on MSMA, to provide information on recently completed toxicological studies, and to describe the economic value of the product to control bark beetles. This package of information will be reviewed by the Pesticide Management Branch and their advisory committee. With their concurrence, the Forest Service will continue to use MSMA in a carefully regulated manner. The package of information on MSMA should be completed in one month. It will be submitted to Ministry of Environment, Lands and Parks once completed.

- J. Henigman, Silviculture Branch, Victoria.

PERSONNEL

SILVICULTURE BRANCH

John Muir	Manager, Forest Health	Victoria	387-8740
Peter Hall	Forest Entomologist	Victoria	387-3842
John Henigman	Pesticide Specialist/ Vertebrate Pest Specialist	Victoria	387-8738
Val Fletcher	Forest Health Research Forester	Victoria	356-8763
Jeff Beale	Forest Pathologist	Victoria	387-8739
Vacant	Forest Health Officer	Victoria	387-8743
Pat Humphreys	Forest Health Technician	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 Operations Forester	Victoria	387-8912
Don Summers	Manager, Nursery and Seed Culture Extension	Surrey	660-8855
Bev McEntire	Pest Management Biologist, Seed Production	Victoria	387-8938
Michelle Schmidt	Pest Management Biologist, Seed Production	Victoria	652-5413
Gwen Shrimpton	Nursery Pest Management Officer	Surrey	576-9161
Dave Trotter	Nursery Pest Control Officer	Surrey	576-9161
Robb Bennett	Seed Orchard Pest Manager	Victoria	387-3931

CARIBOO FOREST REGION

Regional Staff

Hugh Freeman	Protection Officer	Williams Lk.	398-4445
Mark Hamm	Pest Management 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 Forester	Williams Lk.	398-4400
Chris Easthope	Range Agrolgist	Williams Lk.	398-4396

District Staff

Doug Harris	Resource Officer, Silviculture	Chilcotin	394-4215
Troy Hromadnik	District Silviculturist	Chilcotin	394-4215
Glen Burgess	Resource Assistant Protection	Chilcotin	394-4215
Derek Poole	Forest Health Technician	Horsefly	620-3200
Brad Powell	Resource Assistant Protection	Quesnel	992-4433
Wayne Hendy	Resource Officer Protection	Williams Lk.	398-4341
Von Vickers	Forest Health Technician	Williams Lk.	398-4690
Mel Dodge	Resource Officer Protection	100 Ml. House	398-3812
Don Wright	Forest Health Technician	100 Ml. House	395-3812
Charles von Hahn	Resource Officer Silviculture	Quesnel	992-4457

KAMLOOPS FOREST REGION**Region Staff**

Lorraine MacLauchlan	Forest Entomologist	Kamloops	828-4177
David Calder	Forest Health Forester	Kamloops	371-3707
Ron Gray	Stand Tending Forester	Kamloops	828-4163
Phil Youwe	Range Resource Agrologist	Kamloops	828-4097
Hadrian Merler	Research Associate	Kamloops	828-4176

District Staff

Mike Hall	Resource Assistant	Clearwater	674-2265
Brent Olsen	Resource Officer-Silviculture	Kamloops	378-5832
Joan Demale	Resource Clerk-Silviculture	Kamloops	372-5832
Dave Piggin	Forest Health Officer	Kamloops	372-5832
Margo Hollinger	Forest Health Officer	Lillooet	256-7531
Tom Lacey	Resource Officer, Protection	Merritt	378-9311
Harry Spahan	Forest Health Officer	Merritt	378-9311
	Forest Health Officer	Penticton	492-8721
Murray Henry	Forest Health Technician	Penticton	492-8721
Dave Procter	Resource Officer, Protection	Salmon Arm	832-7153
Jim Wright	Resource Assistant, Silviculture	Salmon Arm	832-7153
Eric Haupt	Forest Health Officer	Vernon	542-0264

NELSON FOREST REGION**Region Staff**

Art Stock	Forest Entomologist	Nelson	354-6633
Rick Stewart	Forest Health Forester	Nelson	354-6144
Don Norris	Forest Pathologist	Nelson	354-6143
Gerald Reichenback	Stand Tending Forester	Nelson	354-6280
Don Gayton	Range Officer	Nelson	354-6244

District Staff

Dan Reiben	Forest Health Officer	Arrow	365-2131
Ross Elliott	Forest Health Officer	Boundary	442-5411
Andrea Inwards	Forest Health Technician	Boundary	442-5497
Liz Goyette	Forest Health Officer	Cranbrook	426-3391
Al Pollard	Resource Officer - Silviculture	Golden	344-7539
Kevin Edquist	District Silviculturist	Golden	344-7500
Emile Begin	Forest Health Officer	Invermere	342-4200
Doug McMullin	Forest Health Officer	Kootenay Lk	825-1100
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	Stand Tending Forester	Pr. George	565-6191
Ken Long	Range Officer	Pr. George	565-6138
Bruce Johnson	Range Development Coord.	Pr. George	565-6139

District Staff

Bob Richards	Resource Officer - Silviculture	Pr. George	565-7100
Bruce Doerksen	Forest Health Technician	Pr. George	565-7100
Barbara Koch	Forest Health Technician	Pr. George	565-7156
Norma Stromberg	Resource Officer - Silviculture	McBride	569-3714
Dave Kraby	Resource Assistant - Silviculture	McBride	569-3748
Greg Rawling	Resource Officer - Silviculture	Vanderhoof	567-6363
Dave Banham	Forest Health Technician	Vanderhoof	567-6363
Lance Mitchell	Resource Officer - Protection	Ft. St. James	996-7131
Carl Hovey	Resource Assistant - Protection	Ft. St. James	996-7131
Andy Pakrastins	Resource Officer - Silviculture	Mackenzie	997-2200
Chris Broster	Forest Health Technician	Mackenzie	997-2200
Cal Wilson	Resource Officer - Silviculture	Dawson Creek	784-2350
Sherilyn Smith	Resource Assistant - Silv.	Dawson Creek	784-2350
Brian Wesleyson	Resource Officer - Silviculture	Ft. St. John	787-5628
Steve Lindsay	Resource Officer - Silviculture	Ft. Nelson	774-3936
Mark Greene	District Silviculturist	Ft. Nelson	774-3936

PRINCE RUPERT FOREST REGION**Region Staff**

Neil Endacott	A/Silviculture Officer	Smithers	847-7511
Tim Ebata	Forest Entomologist	Smithers	847-7479
Stefan Zeglen	Forest Pathologist	Smithers	847-7478
Vacant	Forest Health Forester	Smithers	847-7477
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

Jane Lloyd-Smith	Resource Officer-Silviculture	Bulkley	847-7624
Bill Camenzind	Audit Forester	Bulkley	847-7628
Larry Michaelsen	Resource Officer-Silviculture	Cassiar	771-4211
Glen Buhr	District Silviculturalist	Cassiar	771-4211
Bob Wilson	Resource Officer-Silviculture	Kalum	638-3290
Rocky Chan	Invremental Forester	Kalum	638-3290
Rod Meredith	District Silviculturalist	Kalum	638-3290
Janice Bianco	Resource Officer-Silviculture	Kispiox	842-6581
Paul Hanna	District Silviculturalist	Kispiox	842-6581
Dave Nakashoji	Forest Health Technician	Morice	845-6200

Debbie Janning -Stewart	Resource Officer-Silviculture	Morice	845-6200
Mike Grainger	Resource Officer-Silviculture	North Coast	627-0462
Alex Gauld	Incremental Forester	North Coast	627-0475
Terry Chow	District Silviculturist	North Coast	627-0475
Wayne Martin	Resource Officer-Silviculture	Lakes	692-7515
Terry Thrower	Resource Assistant-Silviculture/Protection	Lakes	692-7515

VANCOUVER FOREST REGION

Region Staff

Don Heppner	Forest Entomologist	Burnaby	660-7653
Jeff Fournier	Forest Pathologist	Burnaby	660-7654
Mel Scott	Stand Tending Forester	Burnaby	660-7579

District Staff

John Ingram	Resource Officer - Silviculture	Campbell Rv.	286-9300
Lucy Stad	District Silviculturist	Chilliwack	794-2100
Brenda Koro	Forest Health Technician	Chilliwack	794-2100
Rob Furness	District Silviculturist	Duncan	746-2700
Nancy McCrea	Silviculture Planner	Mid Coast	982-2000
Mark Palmer	District Silviculturist	Pt. Alberni	724-9205
Chuck van Hemmen	Resource Officer - Silviculture	Pt. McNeill	956-5034
Carol Reagon	District Silviculture Planner	Pt. McNeill	956-5033
Ron Diprose	Forest Health Technician	Sunshine C.	485-0730
Mark Salzl	District Silviculturist	Qn. Char. Is.	559-8447
Earl Spielman	District Silviculturist	Squamish	898-2100

MEETINGS

Western Forest Insect Work Conference. The 1993 Work Conference was held during the first week of March in Sacramento, California. The conference program dealt primarily with urban and introduced pests and included a discussion of gypsy moth programs in the western United States and Canada. The conference was attended by approximately 150 people from government, industry, and academic organizations involved with management of forest insects.

The 1994 meeting will likely be a joint meeting with the Western Forest Disease Work Conference (WFIWC) and will be held in Albuquerque, New Mexico. Other tentatively scheduled meetings of the WFIWC are as follows:

- 1995 Black Hills, Colorado
- 1996 Texas (a national meeting of all regional insect work conferences)
- 1997 British Columbia (location to be determined)

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

Pest Control Forum. The 20th annual pest control forum was held November 16-18, 1992, in Ottawa with additional meetings of the Forest Insect and Disease Survey Units, Pheromone Trapping Working Group, Semiochemical Research Working Group and the Forest Protection Technology Committee.

Some highlights of the forum were as follows:

Pest reviews presented on the first day of the forum clearly indicated a major drop in populations of eastern budworm, gypsy moth, jack pine moth etc. In many eastern provinces and states, defoliator population levels are the lowest since the 1950's, and conducted or planned sprays are comparably low. Pesticide company representatives expect that *B.t.k.* sales will drop from approximately \$12 million to \$2 million. Industrial support to research will likely drop accordingly.

U.S. Forest Service representatives noted that parts of six central states have been quarantined due to recent findings of *Tomicus*, the pine shoot beetle. They also announced that *Western Forest Insects* has been reprinted (but not revised), and is again available.

Agriculture Canada representative, Marcel Dawson, in response to issues raised last year by the Forum, reviewed actions taken to protect Canada's forests related to phytos, inspections, Asian gypsy moth and Tomicus. Discussions with the U.S. Forest Service have occurred on gypsy moth but the draft gypsy moth policy is not yet ready for review.

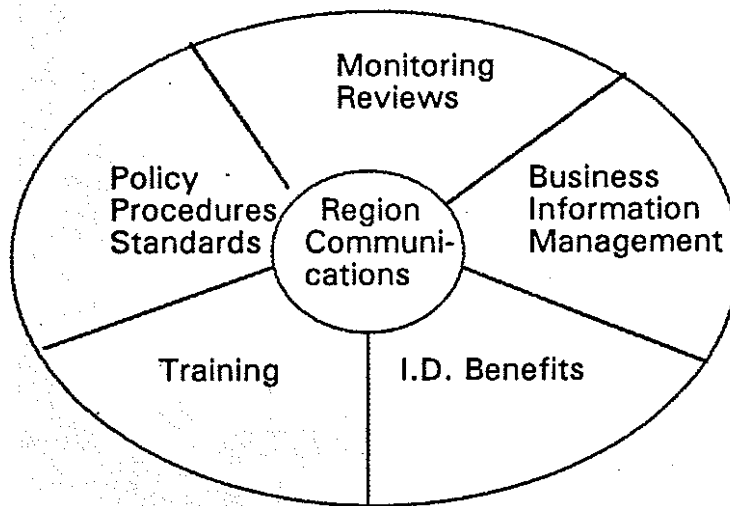
The Pheromone Trapping and Semiochemical Research Working Groups reviewed national pheromone trapping results. Douglas-fir tussock moth is still the only really operational monitoring system. Results from British Columbia indicate that the Black Army Cutworm (BAC) lure, produced by New Brunswick Research and Productivity Council, will be a suitable substitute for the one no longer available from Raylo.

Twelve proposals for Green Plan funding of pheromone research were reviewed. Three British Columbia projects, involving confusion trials for the Douglas-fir tussock moth, BAC lures and the development of a monitoring system for western hemlock looper will receive at least partial funding in 1993.

- P. Humphreys, Silviculture Branch, and A. van Sickle, Forestry Canada, Victoria.

TABULATIONS

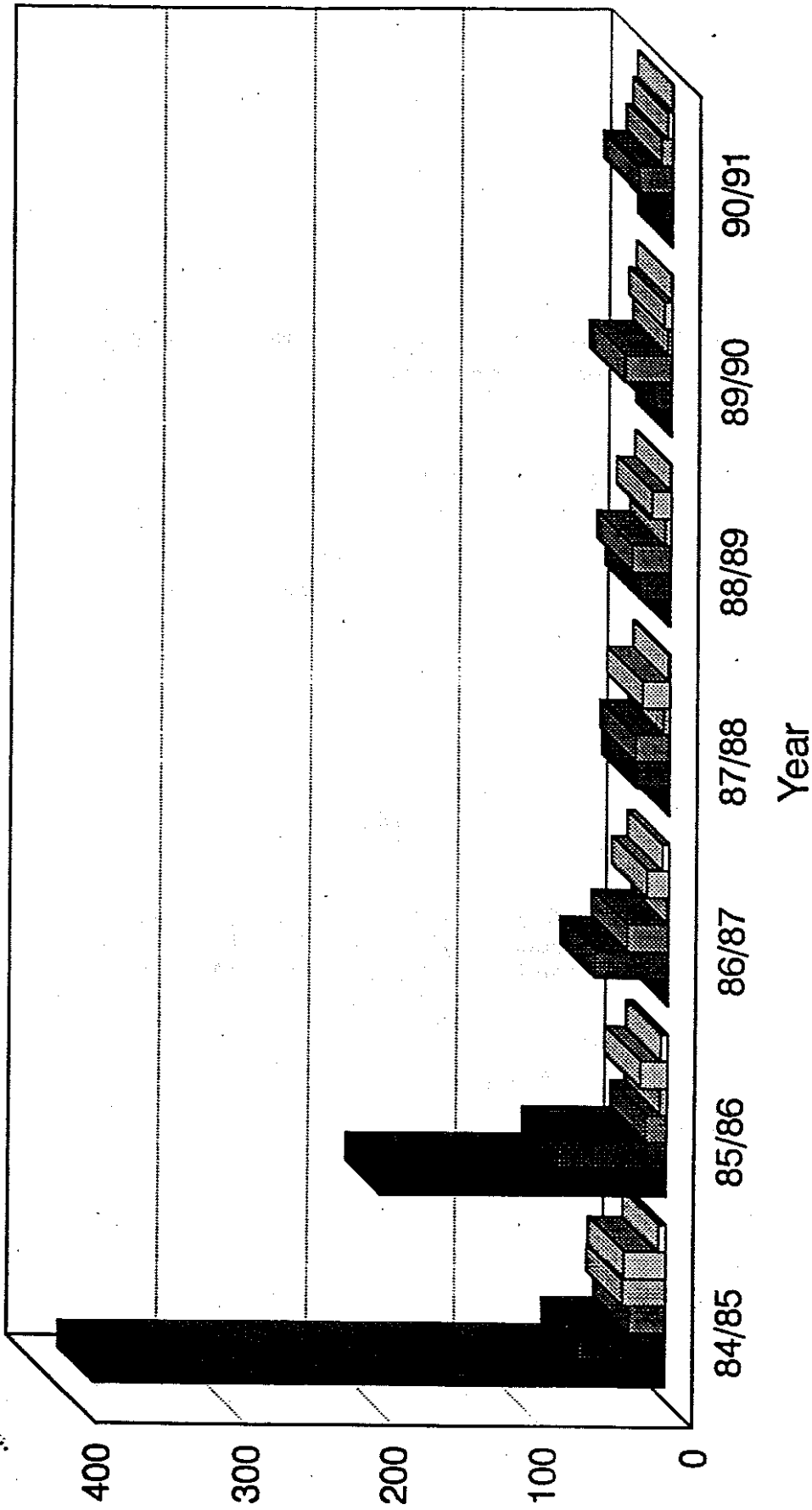
The Forest Health Section met on May 3, 1993 to develop the 1993-94 program (see p.18). Key action items were identified as shown on the chart below:

FOREST HEALTH 1993-94 PRIORITIES**FIDS
REVIEW****RESEARCH
STRATEGY****STAFFING
ISSUE**

Area Under Attack by Mountain Pine Beetle

1984 to 1991

(000's of Hectares)

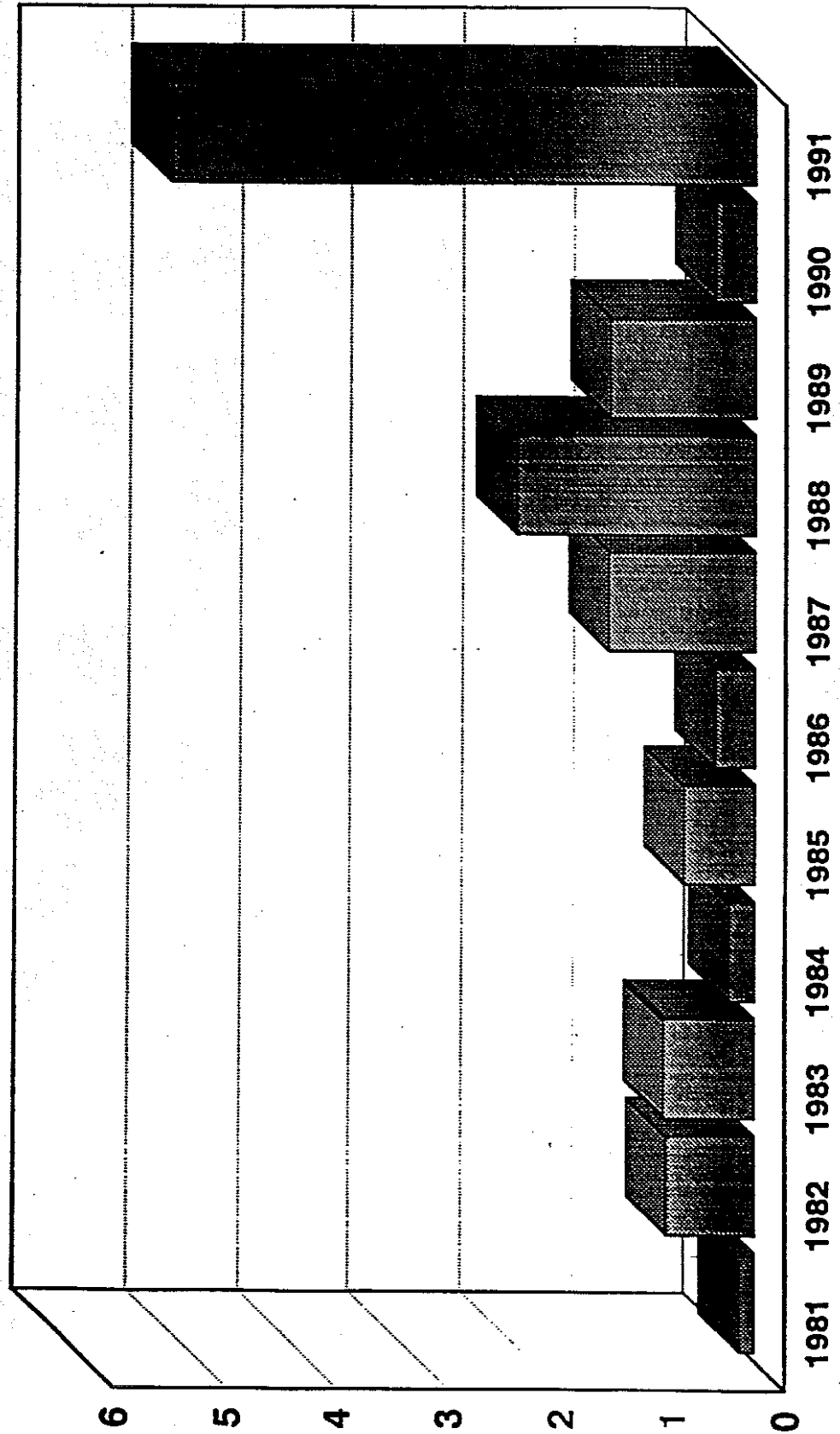


Cariboo ■ Kamloops ■ Nelson ■ Pr. George ■ Pr. Rupert □ Vancouver

Area Treated with Insecticides

for Forestry Purposes, 1981-1991¹

Thousands of Hectares Treated



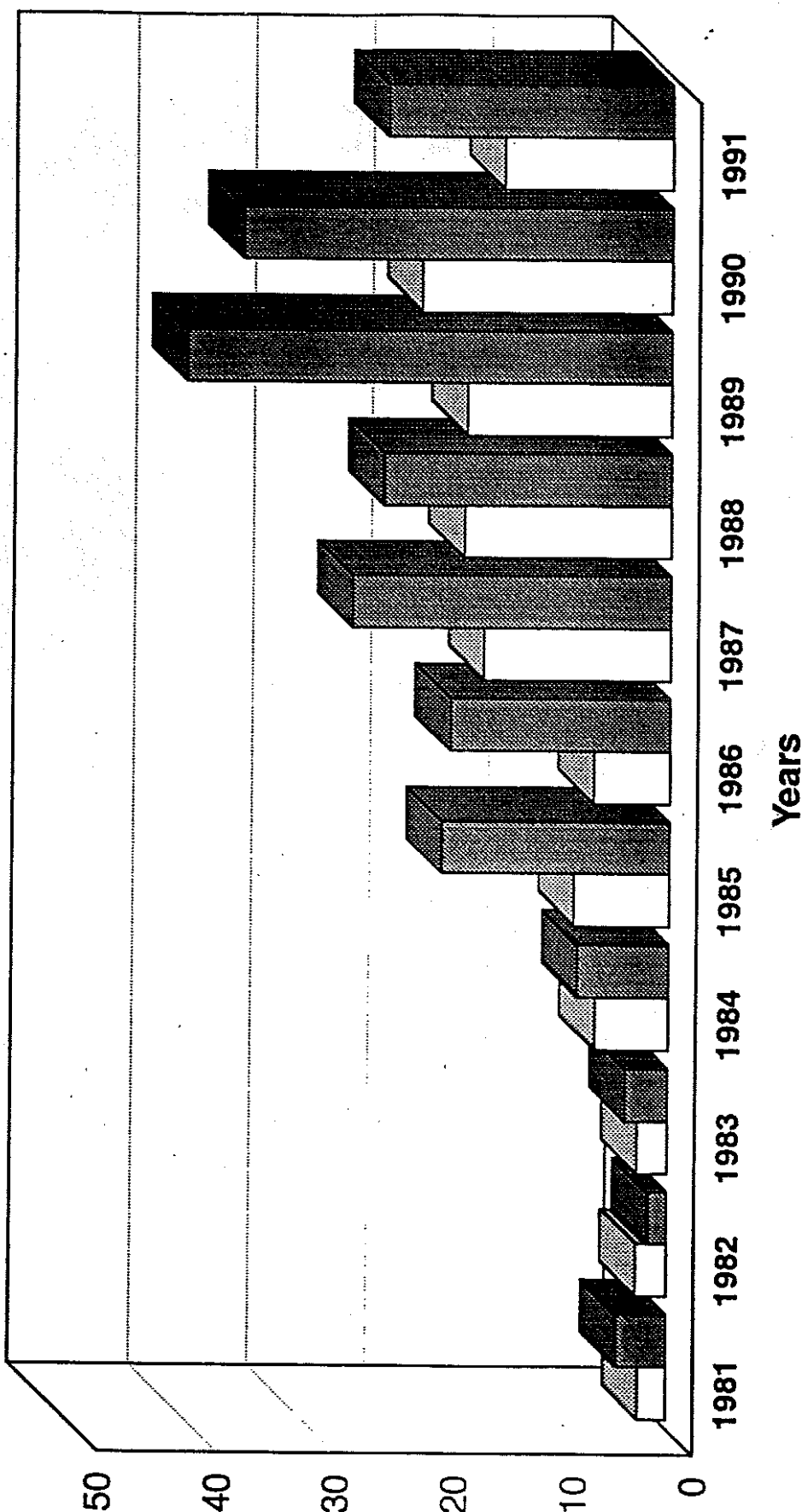
Years

¹ B.C. Forest Service & Industry Combined

Area Treated with Herbicides

for Forestry Purposes, 1981-1991

Thousands of Hectares



□ B.C.F.S. ■ Forest Industry

PUBLICATIONS AND REPORTS

- Phero Tech Inc. and Deloitte and Touche. 1993. A Socio-Economic Analysis of Mountain Pine Beetle Management in British Columbia. British Columbia Ministry of Forests. Victoria, British Columbia. In press.
- Powell, W.G. 1993. Asian Gypsy Moth Eradication Project. Greater Vancouver, British Columbia. 1991-92. The British Columbia Plant Protection Advisory Council. Richmond, British Columbia. In press.
- Humphreys, P. 1992. Pesticide Use in British Columbia Forestry, 1991. British Columbia Ministry of Forests, Silviculture Branch. Victoria, British Columbia. FH-SB-1
- Silviculture Branch, B.C. Ministry of Forests. Summary of Forest Health (Pest Management) Projects Conducted Under the 1985-1990 Forest Resources Development Agreement. FH-SB-02.