



Province of
British Columbia
Ministry of
Forests and Lands

PEST MANAGEMENT PROGRESS

A summary of pest management activities in the
British Columbia Ministry of Forests and Lands.

Volume VII, Number 2 (File 190-4 PMP)

Fall 1988

Healthy Forests

Basic silviculture obligations in British Columbia have been concisely outlined in the new Silviculture Regulation (B.C. Reg. 147/88). The obligations include requirements to conduct surveys and to keep reports to enable all Forest Service (BCFS) district managers to "determine whether there is at least the minimum number of healthy, well spaced trees per hectare set out in the approved prescription." As well, the holder of a major licence who is required to carry out basic silviculture must disclose any failure "to establish at least the number of established healthy free growing well spaced trees per hectare.... set out in the approved prescription."

Critical for compliance with these basic and comprehensive obligations will be the quality of the silvicultural prescriptions. These documents must include a reasonable assessment of pest risks, if any, that exist currently and that may reasonably be expected to occur prior to the harvest of the next crop, and the actions, if any, that are proposed to deal with these risks that occur during the life of the prescription."

Concurrently (during 1988), the U.S. Forest Service (USFS) has published an interesting report "Forest Health Through Silviculture and Integrated Pest Management" (1988), which highlights current USFS concerns for forest pests. They apparently share our view of fundamental responsibilities and objectives to ensure healthy forests. Their objective is to enhance and maintain the health of their nation's forests by developing a strategic plan which deals with threats to management objectives. The report states that a "desired state of forest health is a condition where biotic and abiotic influences on the forest (i.e. insects, diseases, atmospheric disposition, silvicultural treatments, and harvesting practices) do not threaten management objectives for a given forest unit now or in the future.

I believe we have come a long way in developing and confirming forest pest management opportunities during the past decade in B.C. and elsewhere. It is now time to demonstrate the benefits, to fine-tune our roles, to extend our services and expertise, and to ensure the maintenance and survival of healthy, multi-purpose forests.

These progressive times will be challenging, exciting and rewarding for colleagues in the private sector especially. As stated by Bill Young (retired Chief Forester, BCFS) during an address at a recent convention "We may disagree now and then as to who should have the ball and bat, but we should be as one concerning the maintenance of the ball park." Let's make these accomplishments together, let's complete the prescription, let's maintain the ball park.

- R. F. DeBoo, Protection Branch, Victoria.

		<u>CONTENTS</u>	
<u>SUBJECT</u>	<u>PAGE NO.</u>	<u>SUBJECT</u>	<u>PAGE NO.</u>
Pest Management - General	3	Personnel	34
Forest Entomology	9	Meetings	37
Forest Pathology	21	Tabulations and Graphics	40
Pesticides	29	Publications and Reports	46

PEST MANAGEMENT PROGRESS

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PUBLISHER'S AND EDITOR'S NOTE

Pest Management Progress is intended to provide factual information on projects and proposals by Ministry staff.

Contributions labelled with an appropriate subject heading should be submitted to the Regional Protection Officer or Advisor who will edit and forward them to Protection Branch. PMP is submitted to the spring (May) and Winter (December) meetings of the B.C. Forest Pest Review 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.

PEST MANAGEMENT GENERAL

More on Forest Health Strategies. In British Columbia the recent Forest Act amendment and new Silviculture Regulation, specify that ensuring healthy forests is a responsibility of the forest industry in harvesting and regenerating forests.

Important pests such as dwarf mistletoes and root diseases must be recognized before harvest, and appropriate measures taken to prevent damage. At 3 to 10 years after harvest, the new forest is assessed according to prescribed standards that include pest damage, to ensure that a healthy forest has been established.

In the United States, the U.S. Department of Agriculture, Forest Service has established a Forest Health Strategy to address concerns and perceptions by politicians and other parts of the U.S. public. Apparently, the U.S. public perception is that widespread outbreaks of insects and diseases are the result of unhealthy forests because of either a lack of, or mis-directed forest management.

The major objective of the U.S. Forest Health Strategy is to show how pest management, fire management and silviculture will address the issue of forest health, and will integrate their efforts to grow and maintain healthy trees.

The U.S. Forest Pest Management program has received increased funding, and specialists are being established at zone offices, (roughly equivalent to Regional offices in B.C.), to provide expert advice in forest planning and site-specific forest management recommendations.

These initiatives in the U.S.A. are of considerable interest, because similar concerns or issues can be expected in British Columbia.

- J. Muir, Protection Branch, Victoria.

Pest Management Research and Training Workshop. Concern over the production and delivery of new information for pest management (insects, disease and small mammals) has been growing for some time. Questions regarding the adequacy and priority of pest management research and technical transfer have been raised by operational managers and Protection Branch staff. In response to this concern, and questioning, a cooperative review has been initiated by Research and Protection Branches and the Canadian Forestry Service (CFS).

In May this year, a think-tank was held comprised of Protection, Research, Forest District, CFS and University representatives to:

- Review the information needs in research and technology transfer of operational pest managers.
- Evaluate the adequacy of present research and technical transfer programs in meeting the need for pest management programs.
- Develop and implement a new coordinated strategy to improve both the production and delivery of pest management information.

The three day workshop clarified the role of the various agencies involved in pest research and their interaction with each other. It outlined a coordinated, interagency program strategy of pest management research. The strategy covered the definition and ranking of pest issues, identified roles and responsibilities and the ranking of pest projects. In the area of surveys the strategy called for the expansion of the History Record System and the Preharvest Silvicultural Prescription (PHSP), to contain data on the presence and identification of pests, emphasized a survey certification and training program.

In addressing training needs, the strategic plan provided the direction to ensure that field staff can apply the prescribed treatments according to given standards.

Although, the framework has been established, there is a considerable amount of work needed to identify and implement the decisions arrived at the workshop. This implementation will need strong co-operative effort on behalf of all agencies involved in research and a willing clientele to provide resources.

- M. Kovats, Research Branch, Victoria.

Registered Professional Biologists. Biologists belonging to the Association of Professional Biologists of B.C. are now formally designated as Registered Professionals and have exclusive right to use the "R.P.Bio" title. The Professional Biologists have a manual of disciplinary procedures and are very interested in demonstrating to the public that they are conducting themselves in a professional manner. To this end, the Association plans to offer formal comment on important social issues of biological significance. They will also be publishing position papers on various topics and reviewing text books.

The Professional Biologists have exclusive right to title as a result of a recent amendment to the B.C. Society Act. They do not have their own act as do Registered Professional Foresters. The significance of this distinction is unclear.

With regard to B.C. Government employees, biologists remain in the B.C. Government Employees' Union (BCGEU). The Professional Employees' Association (PEA) currently will not accept the Registered Professional Biologists without their own act. Nevertheless, the Professional Biologists are negotiating with the BCGEU and the B.C. Government to alter their classification to reflect their Registered Professional status.

By the end of this year, membership in the Professional Biologists Association will number about 500. The strength of the Association will always be in their membership numbers and professional conduct. Entry into the association as a Registered Professional requires a BSc in Biology, three years work experience as a professional, demonstrated ability to write a competent technical report, and references. Others may apply for membership and their credentials will be reviewed on an individual basis.

For information on the Association, please call Merris. Scott Hanna, RPBio, at 683-9141 or Brian Gates, RPBio, at 387-9657. Applications for membership can be acquired from the registrar, Mr. Don Benn, RPBio, 160 Beach Drive, Victoria, B.C., V8S 2L5, (598-8277).

- J. Henigman, Protection Branch, Victoria.

Prognosis for Pests. A project is continuing to implement the stand projection model PROGNOSIS for use in British Columbia.

The model has components for determining the effects of several pests including western spruce budworm, armillaria root disease, and laminated root rot on stand growth.

Initially, after some work to incorporate metric units and biogeoclimatic zone ecosystem units, the model should be useful for demonstrating or evaluating different management strategies for specific sites, stands and pest conditions.

Eventually, with further calibration to tree growth and pest dynamics in B.C., the model should facilitate site-specific prescriptions, and determination of the benefits of various pest treatments.

- J. Muir, P. Hall and P. Fuglem, Protection Branch, and
K. Richardson, Inventory Branch, Victoria.

FRDA Pest Control Projects. Under the Canada-British Columbia Forest Resource Development Agreement, approximately \$200,000 was spent this year on several pest control projects throughout the Province. The money was spent for provincial direct-delivery projects under the Intensive Forestry, Brushing Weeding and Pest Control Program. As in previous years, funding was directed to disease control, particularly root diseases and dwarf mistletoes, which is important to consider in backlog reforestation.

Projects included root disease surveys, a demonstration of the PROGNOSIS root rot model, trials of root disease, dwarf mistletoe and white pine blister rust control treatments, surveys of air pollution damage, and surveys and control trials for voles and porcupines.

Individual reports on these projects in this issue PMP have been prepared by Regional Protection staff.

- J. Muir, Protection Branch, Victoria.

Pest Tracking Prototype in the Kamloops Forest Region. The need for a system by which to record geographical pest information has long been required, especially when dealing with such wide spread and "mega project" pests as the mountain pine beetle. Together with regional inventory and the Merritt Forest District the existing inventory Interactive Graphic Design System, (I.G.D.S.), will be used to digitally map any pest occurrence and each polygon is then assigned an attribute listing. The power of this system is in its summary capabilities with other I.G.D.S. map user levels. The prototype will be tested in all Kamloops Forest Region District offices.

- H. Merler, Kamloops Forest Region, Kamloops.

Pest Management Training. Two pest identification training courses were held this summer, one in the Morice and the other in the Kispiox Forest District. All district office staff have now had an opportunity to obtain major pest I.D. training at least once.

- W. Martin, Prince Rupert Forest Region, Smithers.

Co-op Students Hired for Pest Management Projects at Protection Branch. Two Co-op students were hired for pest management projects during the summer. Some of the completed projects included a registration package for zinc sulphate, summaries of operational work on Velpar^R movement, management of bark beetles, and "PestTopic" production and updates. The students received valuable experience, while the Branch obtained excellent results. Currently, one Co-op student is hired for the fall term to assist in the acquisition of forest and pest management data in the Bowser Demonstration Forest Project, develop display material, and assist in the production of Chapter 18, Protection Manual. We recommend consideration of Co-op students in pest management assignments.

- S. Taylor, Protection Branch, Victoria.

Pest Management Displays. Three pest management displays (large-frame) have been developed as follows:

- one each for the dwarf mistletoe and porcupine, describing general biology, incidence, damage and control techniques, and
- one on pests of young managed stands, which illustrates the distribution of the top five pests in each Forest Region.

Individuals wishing to borrow these or any other pest management displays should contact the undersigned.

- P. Humphreys and S. Taylor, Protection Branch, Victoria.

Forest Nursery Pest Management Review. During the 1988 growing season, several new pests became notable problems. At a nursery near Prince George a canker rust was identified from the stems of container spruce seedlings. Apparently this is an unusual rust infection, the species is being identified, and the progress of infection is being closely monitored. Also in the Prince George area, several nurseries have had large infestations of the conifer root aphid, Asiphum tremulae. To date, control of root aphids has not been recommended because they do not appear to reduce growth and vigour of seedlings while in the nursery. There is some concern that they may stress seedlings in the planting sites, and we are hoping to address this question with several outplanting trials. Keitha blight of western red cedar has become a serious problem at one coastal nursery. The cool wet conditions during the 1988 growing season greatly enhanced the spread of this disease. Control programs are being developed.

Several surveys and trapping programs were conducted. Reforestation nurseries again co-operated in the province-wide gypsy moth trapping program. No moths were caught at any nursery. In co-operation with CFS, Forest Insect and Disease Survey, and B.C. Ministry of Agriculture and Fisheries, several

different pheromone lures for the European pine shoot moth were tested for their efficacy. Collembola or springtails were collected from most nurseries in the province and will be identified over the winter with the help of V. Marshall at Pacific Forestry Centre.

Trials to develop an effective control program for the balsam wooly aphid continued. Applications of Safers Insecticidal Soap^R were tested against summer and overwintering life stages. Under FRDA project NIFAC 1.47, the herbicides Goal^R (oxyfluorfen) and Devrinol^R (napropamide) were tested for weed control and crop tolerance, and the fungicide benomyl was tested for control of fusarium root rot in containers. Results for both herbicides are very promising. Goal is particularly effective against liverworts which are a major weed of container stock. Benomyl drenches were not effective for control of fusarium.

- G. Shrimpton, Silviculture Branch, Surrey.

Porcupine Tree Damage Assessment. During a week in October, second growth stands along the shores of the Portland Canal, North Coast Forest District, were surveyed for porcupine damage. The stands were between 15 and 25 years old, natural regeneration, and composed of western hemlock, Sitka spruce and western red cedar. Staff from Branch, Prince Rupert Forest Region and the Forest District took part in the survey.

Over the course of the week 42 permanent survey plots were established which will allow measurements of the damage caused by porcupines. The porcupine populations in these stands is obviously very high and during the winter months, particularly early spring, they feed on the bark of crop trees. They seem to have a preference for western hemlock, though they will also feed on Sitka spruce. The damage caused often results in girdled trees usually at the 3 metre height or above. The reason for the high population levels is unclear although it is likely contributed to by the favorable overwintering habitat and the small number of natural predators.

It is expected that within a few years we will come to know more about porcupine population dynamics and the relationship to damage levels. It is hoped that practical control measures can be developed to limit damage if we determine significant economic losses.

At this time, we are investigating the potential of further releases of fishers, a predator of porcupine, into isolated stands in the North Coast Forest District. Potential programs for porcupine control would also involve intensive hunting, altered crop selection and placement of physical barriers on trees.

- J. Henigman, Protection Branch, Victoria.

Action Plan for Porcupine Management in the Prince Rupert Forest Region. A five year action plan to reduce porcupine damage to conifers in the Kalum and North Coast Forest Districts has been developed. Objectives include: estimating extent and intensity of damage, impact assessment and evaluating prevention/control options. Projects and budgets to achieve the above objectives are included.

- W. Martin, Prince Rupert Forest Region, Smithers.

Vole Population Dynamics Studies FRDA 1.42 Update. Dr. Sullivan has a long-term contract to investigate the population dynamics of voles and lemmings and controls of damage to plantations in the Prince Rupert Forest Region. Accomplishments in 88/89 include establishing and monitoring sampling grids in forest plantations, unburned and burned harvested areas at three study areas in the Bulkley and Morice Forest Districts. In general, vole populations have been low over the summer in all areas after the crash in the spring of 88. However, populations of the long-tailed vole and red-backed vole have increased dramatically in late August and September at the Nanika River sampling area. Densities are currently around 25/ha which do not pose a threat to tree seedlings this winter. The long-tailed vole has a multi-annual cycle and could become a pest problem in 1989. Dr. Sullivan will also report on a Region-wide (interior districts only) survey of vole damage to identify what factors make certain plantations or geographic areas susceptible to serious vole attack. This survey included Dr. Sullivan, the B.C. Ministry of Forests and industry. The information will be incorporated into the forecast model currently being developed for the vole pest problem in the Prince Rupert Forest Region.

- W. Martin, Prince Rupert Forest Region, Smithers.

Mites as Forest Tree Pests. Over this past season pest management staff in most of the Forest Regions have conducted surveys of lodgepole pine plantations looking for evidence of mite damage. A mite species, Trisetacus camponodus, has been identified as causing damage to lodgepole pine seedlings in forest nurseries particularly on the coast. Commonly, damage is seen only on interior pine provenances grown on the coast. It is suspected that the mite could become established as a problem in the interior plantations following its introduction on nursery seedlings.

At this time, we cannot conclude that the mite is an economic pest of real concern or that successful establishment of the mite in the interior is confirmed. Based on the regional surveys, no mite damage has as yet been identified in plantations known to have been planted with stock likely infested with the mite. Analysis of pine samples for mites is not as yet complete.

More information on this mite survey will be available by the spring of 1989.

- J. Henigman, Protection Branch, Victoria.

Plantation Mite Survey in the Prince George Forest Region. A total of 17 lodgepole pine plantations were surveyed in 5 Forest Districts of the Prince George Forest Region in 1988 for the mite, Trisetacus camphodius. Several samples were sent to Protection Branch for confirmation of mite damage. Damage seedlings from a Vanderhoof plantation, not included in the original survey, were identified by the Canadian Forestry Service as having Trisetacus sp, damage. A more thorough survey of the latter plantation will be made in the spring.

- R. Hodgkinson, Prince George Forest Region, Prince George; and
G. Hess, Vanderhoof Forest District, Vanderhoof.

FOREST ENTOMOLOGY

Bark Beetle Program. 1988/89 represents the fifth year of the originally proposed five year bark beetle management program. Since its inception, approximately \$37 million have been allocated to bark beetle and related control activities. This program has shown considerable evolution over the five years and those directly involved at all levels of the Forest Service are to be commended for their efforts. The knowledge and capability to deal with problems such as mountain pine and spruce beetle now exist in most areas of the Province.

Mountain pine beetle infestations now cover approximately 67 000 ha as opposed to over 450 000 ha when the program was initiated in 1984. Although climate and other factors played a part in this decline, control actions implemented under this program should be given much credit. Expectations are that this successful program will be continued.

- P. Hall, Protection Branch, Victoria.

Bark Beetle Funding Process. The 1988/89 fiscal year is the first year that bark beetle funding has been allocated in a two-phase process. The first phase saw funding allocated to Forest Regions and Districts to cover necessary survey and control operations for the period April to September. Second phase allocations were made in September for the balance of the fiscal year to cover further control operations in priority areas as determined from summer surveys. This funding process was implemented to align resource allocation with beetle biology and operational need. Two phase funding has worked well in 1989/89. With it, virtually all funding needs were met even in light of budget reductions. This was made possible because of the flexible funding mechanism and the resultant re-evaluation of operation priorities based on current information.

- P. Hall, Protection Branch, Victoria.

Bark Beetle Funding - 1988/89. \$8.1 million was allocated for bark beetles and related pest management activities in 1988/89. This year was also the first year that these funds were allocated to Regions and Districts in a two-phase process. First and second phase funding levels to Regions are given below:

<u>Forest Region</u>	<u>Allocation</u>		
	<u>First</u>	<u>Second</u>	<u>Total</u>
Cariboo	88,835	433,600	511,435
Kamloops	1,367,460	1,206,800	2,574,260
Nelson	681,480	327,100	1,008,580
Prince George	644,665	640,090	1,284,755
Prince Rupert	344,555	747,700	1,092,255
Vancouver	17,000	0	17,000
Protection Branch*	1,611,715	0	1,611,715
Total	4,755,710	3,344,290	8,100,000

*Protection Branch funds include non-beetle management allocations to Integrated Resources Branch and Ministry of Environment, Recreational Fisheries and Wildlife Branches.

- P. Hall, Protection Branch, Victoria.

Prince George Forest Region Bark Beetle Special Funding and B.t. trails against Eastern Spruce Budworm. A total of \$1,284,755 has been allocated in the Prince George Forest Region in 1988-1989 for managing mountain pine beetle and eastern spruce budworm. Funding has been earmarked for aerial and ground detection, semiochemical baiting, MSMA application, monitoring, and single tree disposal. Projects are underway in four Forest Districts and in the Region. Regional activities include monitoring, semiochemical purchases and aerial photography. An aerial application project using Bacillus thuringiensis (B.t.) against spruce budworm was completed in June. As in last year's program, all activities will be monitored and audited by Regional staff to ensure cost-effectiveness of expenditures.

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

Bark Beetle Program Audit. Price Waterhouse, a management consultant firm, was contracted in the fall of 1988 to conduct a comprehensive technical and financial audit of the five year bark beetle program. The objectives of the audit are to determine what benefits have accrued to the Province as a result of control and management activities. Further, the audit is expected to make recommendations on the technical relevance and execution of the program, program administration, financial procedures, and expenditures. The final report is due at the end of November, 1988. It will make recommendations regarding the structure and direction of future such programs. The audit is viewed as important in establishing and continuing the capability and effectiveness of pest management programs.

- P. Hall, Protection Branch, Victoria.

Review of Beetle Management Practices. A review of management practices for bark beetles is being conducted by Dr. M. Shrimpton of the Canadian Forestry Service who has been seconded to Protection Branch for a one-year period. Dr. Shrimpton's review will be complimentary to the program audit being carried out by Price Waterhouse. Specifically, this review will assess: whether available knowledge has been applied; the adequacy of information regarding bark beetle management; technology transfer mechanisms and effectiveness; information gaps requiring further research and development; and, to review, in general, the consequences of current reforestation efforts on future bark beetle potentials. This report, coupled with the audit of the Ministry's operational beetle program, will form a sound basis for future beetle management efforts.

- P. Hall, Protection Branch, Victoria.

Mountain Pine Beetle Model. A spread model for mountain pine beetle has been developed by the Canadian Forestry Service. This model makes use of Forest Service inventory data at a compartment scale. With this model, it will be possible to estimate the course of an outbreak with and without management action. Currently, Protection Branch is inputting inventory information for a number of Timber Supply Areas in the Province. Once this has been done, it will be possible to evaluate various scenarios. Use of the model should be possible by mid-November.

The CFS is also developing other components to evaluate aspects of mountain pine beetle population dynamics and management.

- P. Hall, Protection Branch, Victoria.

1988 Aerial Pest Survey Results For the Cariboo Forest Region. The 1988 aerial survey of pest damage in the Cariboo Forest Region was flown from 15 July to 15 September. For the first time, contractors only were employed as surveyors and Forest Service participation was limited to contract administration. In addition, a significant proportion of the survey was supplemented by work done by the local FIDS ranger. The results are presented in the table below.

Pest	Area Infested (ha)	Volume killed (m ³)	Stand volume (m ³)
mountain pine beetle	1 444	27 410	242 564
Douglas-fir bark beetle	58	204	6 784
spruce bark beetle	42	1 527	19 035
balsam bark beetle	139	850	28 377
western spruce budworm	8 047	n.a.	n.a.
2-year cycle spruce budworm	40 215	n.a.	n.a.
forest tent caterpillar	462	n.a.	n.a.

Most of the new mountain pine beetle kill, about 1 300 hectares, is in the Chilko Lake area of Chilcotin Forest District. Some 61 attack polygons mapped outside the Chilko Lake area were ground-checked in August and it was determined that none of the damage was due to mountain pine beetle, however this is not expected to be generally true throughout the Region.

The area mapped as infested by Douglas-fir beetle was not significantly different from 1987. However preliminary ground work has revealed that much of the fir attacked in 1988 is turning colour already, and that mortality in some cases is up to 4 times as high that of 1987. This is thought to be due in part to increased stress induced by drought experienced in the Cariboo part of the interior Douglas-fir zone (IDF) over the past three years. Further work, including perhaps a resurvey of the IDF, is proceeding.

Some local outbreaks of spruce beetle were mapped in 1988, most notably on the north arm of Quesnel Lake.

Balsam bark beetle damage remains at a level similar to that observed in previous years.

Western spruce budworm occurred over a slightly smaller area this year compared to last. Damage was concentrated in the Viewland Mountain area of Horsefly; and defoliation observed near Big Bar Mountain in 1987 was undetected this year. Defoliation was light in all cases.

The area defoliated by two-year cycle spruce budworm expanded to about four times that mapped in 1987 this was the second year of the life cycle for most of the insects, so that this was not unexpected. Defoliation was light in all cases.

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

Chilko Lake Mountain Pine Beetle Outbreak. There has been an expansion of the Chilko Lake mountain pine beetle outbreak from 525 ha aerielly mapped in 1987 to over 1 300 ha in 1988. The infestation has moved east and north from the 1987 infestation centres at Franklyn Arm and Dorothy Lake. The Cariboo Forest Region's management strategy has been to use direct control methods to hold the outbreak to the area presently occupied: to this end some 720 trees have been baited and treated with MSMA and 500 trees have been felled and burned. This approach will continue to be employed as there are still large areas of susceptible pine in the area untouched in the 1973-1986 outbreak, as well as sufficient host material over the Chilcotin Forest District to carry a possible second outbreak.

- R. McKay, Chilcotin Forest District, Alexis Creek.

Mountain Pine Beetle Hazard Mapping in Prince George Forest Region. Detailed hazard mapping for mountain pine beetle has been completed for the Sustut portion of the Prince George Timber Supply Area in the Fort St. James Forest District. Inventory Branch has supplied 25 mapsheets on their B.C. Geographic System (BCGS), at a scale of 1:20,000 and 1:50,000 which color-code susceptible lodgepole pine stands by timber types and age classes. Additional

1:50,000 scale maps of TFL 42 and the area to the north have been completed by manual coloring to complement the BCGS series. Hazard mapping will assist protection, timber and planning staff in managing mountain pine beetle in the Sustut as major access routes are upgraded or developed.

- R. Hodgkinson and K. Magee, Prince George Forest Region, Prince George.

Fall and Burn Layout Contracts in the Prince Rupert Forest Region. Due to the recent emphasis on contracts, over half of the Prince Rupert Forest Region's beetle probe work for 88/89 has been contracted out. However, different formats are being used by Districts.

The Lakes and Morice Forest Districts have asked contractors to supply a price per tree bid based on the number of red trees detected on 1:10,000 or oblique colour photos. An estimate of the green versus red attack from the photos was used to predict the number of current beetle attacks associated with each red tree, thus a total price per site can be submitted. Once the contract is let, extra trees (current attack or red attack over the estimated number) will be paid for at the per tree bid price. A test of this system in the Bulkley area proved to be very successful mainly because there is a monetary incentive for the contractor to find extra trees and they will search farther than required. In case fewer trees are located than the estimate after following our probe standards, the contractor is paid the minimum price for that site (i.e. price per tree times the number of trees estimated).

The Bulkley Forest District introduced a new "multi-phase" day-rate contract where the contractor, following approval by a Forest Officer, will layout infested timber for logging if practical instead of preparing it for fall and burn. In another area, where fall and burn is the only prescribed treatment, "search and destroy" crews will begin each probe by carrying their chainsaws to the first site, probe the area and decide if there are more trees than can be felled and burned that day. If there are too many trees, the site is layed out for a fall and burn contract. This method has proved to be very efficient for widely scattered small infestations.

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

Probers Rave over Ribbon in Prince Rupert Forest Region. A plethora of ribbon in a multitude of different colours decorate many of our MPB infested stands. This myriad of ribbon was deposited over the past five years of the beetle program and from numerous other activities (i.e. inventory, cruising, engineering, timber, etc.). Consequently, the first task in the probing season is to decide on a colour of ribbon which is different from previous probe years and not utilized for other functions. Our solution was to order a special black-stripe on glo-colour flagging which is unique for probing. The 1987/88 probing program using an orange glo/black stripe proved to be highly successful. The new tape was durable, easily recognized and highly visible. If you do plan to order this tape, expect a wait of at least three months for delivery.

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

Princeton - Verbenone Trial. The Merritt Forest District assisted Phero-Tech Inc. in setting up and applying verbenone beads to approximately 30 ha. of beetle-threatened stands. Verbenone is an antiaggregant produced by the mountain pine beetle (MPB) and has been formulated to be used as a tree "bait" or as an ground-applied bead, with a slow release of the volatile component. Three blocks near Princeton, with moderate MPB attack were marked with balloons and photographed from the air, along with three adjacent check blocks, then treated with verbenone. The verbenone was applied using a fertilizer bucket from a 206 helicopter. Each block will be probed (100% assessment) in November, 1988, to assess the results. Additional blocks were being chosen for treatment in 1989.

- Tom Lacey, Merritt Forest District, Merritt and
L. Maclauchlan, Kamloops Forest Region, Kamloops.

Can MEIS II Detect Current Attached Pine? In August 1988, the Canada Centre for Remote Sensing (CCRS, Ottawa) flew areas in the Bulkley and Lakes Forests Districts with a combination of a multispectral scanner (MEIS II) and a colour infra-red camera. The objective was to determine if MEIS II imagery could detect slight variations in crown colour of currently mountain pine beetle attacked trees previously detected with colour infra red. It is believed by CCRS that MEIS II could do this task better than with film.

Unfortunately, two events this year prevented the tests successful completion. The first was a very late beetle flight which likely occurred too late for the MEIS II to show a colour change. Second, very few current beetle attacks were found in the study area when ground truthed.

It is possible that this study will be moved south where summer moisture stress is more likely and the level of attack is higher. A decision on this issue will be made soon.

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

Lindgren Funnel Traps to Protect Spaced Plantations from *Ips pini*. A cooperative trapping program was established with Phero Tech Inc. in a spaced lodgepole pine stand on the Palmer Lake Road in the Chicoutin Forest District. High *Ips pini* and *Pityogenes* spp. populations in the slash suggested that a trapping program to protect the plantation was warranted. The plantation was divided into 4 discrete units which were separated by leave strips. One hundred and nine Lindgren funnel traps baited with ipsdienol were deployed equally in 3 different configurations in three of the units and the fourth unit containing no traps, acted as the control. The three trap alignments were: 1) a line of single traps spaced 50 m apart running the length of the block; 2) a line of 3-trap groups spaced evenly through the length of the block; and 3) 6 groups of 6 traps each located equidistantly from each other around the perimeter of the unit. Moderate trap catches of *Ips pini* were obtained but differences between trapping methods have not yet been analyzed. The success of the trapping is inconclusive since there were no trees attacked by beetles, even in the control unit. Cool unseasonable weather during the summer may have slowed the beetles life cycle, thus preventing the expected massive population build-up which often leads to tree mortality in plantations.

- L. Rankin, Cariboo Forest Region, Williams Lake.

Kamloops Forest Region Western Spruce Budworm Program - 1988 Update. In addition to the 32 permanent sample plots (PSP) established in 1987 to monitor growth and impact, 28 additional P.S.P.'s were established throughout the Region. These plots were established in the interior Douglas-Fir (IDF), subzones: b, c and j, and in the interior cedar hemlock (ICH) biogeoclimatic zones in areas which were light to moderately defoliated in 1987 and were scheduled for B. t. treatment in 1988 as described in the following table:

Forest District	Plots	Treatment Area (ha)	Description
Lillooet	4 P.S.P.'s	110 95	recreation site and spacing area
Salmon Arm	4 P.S.P.'s	100	spacing area
Vernon (T.F.L. 49)	8 P.S.P.'s	200	pre-commercial thinning area
Penticton	12 P.S.P.'s	--	natural and spaced stands which were lightly defoliated in 1987.

Dr. Rene Alfaro at the Pacific Forestry Centre is developing preliminary spruce budworm loss factors for the Kamloops Forest Region from increment cores collected from the original 32 plots. Analyses were done to characterize the diameter distributions in each plot and in the spring of 1988, increment cores were collected from all typically uneven-aged stands (based on a portional sampling scheme). Approximately 440 cores were collected and measurement of annual increments is nearly completed. From these measurements, Dr. Alfaro will develop a growth equation for managed vs unmanaged stands in the IDF and IDF and make stand table projections.

Approximately 1 467 ha were treated with B.t. (Futura^R XLV) between June 2 - 19, 1988 in the Kamloops Forest Region, plus 100 ha in the Boundary Forest District on June 11th. Due to unsettled weather during this time period, some of the blocks were resprayed because of rain within 24 hours of the initial application. The population reduction in the 16 spray blocks ranged from 40 - 90% (measure in both larvae/100 buds and larvae/m²). Natural population reduction due to primarily weather and parasitism, was as high as 60% in some locations, thus confounding the effects of B. t. in the spray blocks.

1988 was the third consecutive year in which Paul Lake Park was treated. In, the check plot outside of the Park, the trees on average, were 75% defoliated, compared to less than 25% defoliation within the Park.

	Mortality (%)		Percent Live Crown
	Overstory	Understory	
Paul Lake Park	3	0	45
Check plots	60	3	30

Overall, defoliation was less than observed in 1987 in all original 11 spray blocks within the Kamloops Forest District. Defoliation (as determined in check areas) for the five additional spray areas was greater in 1988. The area of budworm defoliation in the region decreased from 820 000 ha in 1987 to about 360 000 ha in 1988, of which much of this area was light defoliation. Predictions for 1989, based on fall egg mass surveys, is light to moderate defoliation throughout this area in the Region, with increased defoliation occurring in areas of the South Okanagan and Lillooet.

A summary report of the 1988 WSB program will be available from the Kamloops Forest Region in December.

- L. Maclauchlan, Kamloops Forest Region, Kamloops.

Spruce Budworm Project in the Fort Nelson Forest District. In the Fort Nelson Forest District on June 12, 1988, aerial applications of Bacillus Thuringiensis, (B. t.) were made against spruce budworm, Choristoneura fumiferana, on three 50 hectare blocks. Mature spruce seed production stands and portions of 4 - 6 year old adjacent plantations were treated to reduce defoliation and cone damage. Since the mature canopy averaged 45 m in height, ground accessible sample trees of 5 - 8 m were chosen on the edges of the stands and included in the spray blocks. Prespray larval populations were considerably lower than in 1987 and averaged 6 - 8 larvae per 100 buds. Natural mortality of the larvae was 59% and the best larval reduction from treatment was 41%, adjusted for natural mortality. Defoliation on the check block, 35%, was significantly different than that on the treated blocks, 8 - 15%. This was the first time that B. t. has been used against eastern spruce budworm in B.C. A full report of the project including recommendations will be available in the spring.

- R. Hodgkinson, Prince George Forest Region, Prince George;
C. Vanderkwaak, Fort Nelson Forest District, Fort Nelson, and
S. Taylor, Protection Branch, Victoria.

Douglas-fir Tussock Moth - Trapping Results. Pheromone-based monitoring surveys for Douglas-fir tussock moth have indicated increasing populations in several spots for the past two years. Potential outbreak epicentres are located at from 3 to 7 sites in the Kamloops Forest Region. Pheromone trap sites were established in areas of historic hazard to tussock moth; traps were placed and monitored by both the Canadian Forestry Service and the B.C. Forest Service.

Egg mass surveys will be conducted in the fall and winter at potential outbreak locations. These surveys will evaluate the risk of outbreak and will delineate the possible outbreak centres.

If possible defoliation is predicted based on egg mass surveys, there will be an opportunity to apply the registered viral insecticide at an early stage, thereby terminating the outbreak and preventing damage. The Forest Service has adequate stocks of the virus available, should it be needed.

This system of pheromone trapping and virus application represents a good example of a useful management system. Because of it, tussock moth will likely cause far less damage than occurred in past outbreaks.

- P. Hall, Protection Branch, Victoria.

Douglas-fir Tussock Moth (DFTM) - Trapping Results. Based on the numbers of male Douglas-fir tussock moths caught in 236 pheromone-baited sticky traps put out by the F.I.D.S. rangers and Forest District staff, defoliation may occur in some areas in the Kamloops Forest Region in 1989.

The number of male DFTM caught in pheromone-baited sticky traps placed by F.S. staff, 1988 is as follows:.

Location	Total No. Moths	Average No. Moth/Trap
<u>Kamloops Forest District</u>		
North Thompson	31	10.3
- South Thompson, Duick		
- Range Road	33	5.5
- Campbell Cr. Road	72	10.3
- Barnhartvale Road	57	8.1
<u>Vernon Forest District</u>	69	3.5
<u>Merritt Forest District</u>	78	5.6
Total	340	7.2

The Forest Districts and CFS staff are conducting egg mass surveys in the Kamloops, Okanagan and Merritt TSA's in November. Pending results of the egg mass surveys, a spray program using the virus may be planned for 1989/90.

- L. Maclauchlan, Kamloops Forest Region, Kamloops.

Spruce Leader Clipping and Parasite Augmentation Trial - Vancouver Region. Field trials to test predator/parasite enhancement with leader clipping in P. strobi in sitka spruce plantations were continued this year in the Vancouver Forest Region. (previously reported PMP Vol VI, No. 2). This is a cooperative project between the CFS, BCFS, Canadian Pacific Forest Products, and MacMillan Bloedel. Canadian Forest Products have the lead research role. Although the results of this work have not yet been determined, there is concern that the apparent huge increases in the weevil populations on Vancouver island will confound the results. The impact of weevil infestations this year are the worst anyone has seen on the Island. In many plantations virtually 100% of the spruce leaders are attacked.

- D. Heppner, Vancouver Forest Region, Burnaby.

Spruce Leader Clipping and Parasite Augmentation Trial - Nelson Region. In August of 1987, a joint trial between Canadian Forestry Service and Ministry of Forests was conducted in the Golden Forest District to clip leaders infested by Pissodes strobi and allow the weevil parasites to escape. This trial was repeated again in August of 1988.

The technique involves clipping the spruce leaders attacked by weevils and placing them in screened containers. The screen is of a precise mesh size that allows the parasites to escape and retains the weevils. The containers are then left on the site till late next summer.

The project took five days to complete using a four person crew. A total of 2,292 leaders were clipped from a 65 ha block. In 1987 a total of 800 leaders were clipped. It is hoped that next year, we shall see a marked reduction in the weevil population.

- S. Moss, Golden Forest District, Golden.

Spruce Leader Clipping and Parasite Augmentation Trail - Cariboo Forest Region. Following the survey for Pissodes strobi, which indicated unacceptable levels of weevil attack, (P.M.P. May, 1988) it was decided to implement an operational clipping and parasite/predator augmentation trial. Although clipping has been applied in a number of Regions, no operational trials have been attempted in the Cariboo Forest Region.

A plantation near Antoine Lake in the Horsefly Forest District was the site selected for clipping of weeviled leaders in combination with parasite augmentation. The clipped leaders were placed into screened containers which prevent the weevil from emerging while allowing associated parasites and predators to escape to parasitize and prey on P. strobi.

Approximately 1,100 leaders were clipped from the Antoine Lake plantation and an additional 4,800 leaders were clipped from a plantation in the vicinity and placed in the Antoine site to augment the parasite/predator level. The clipping cost was \$402.14 per ha which could be reduced if plantations with low weevil populations were selected. To evaluate the effectiveness of the clipping and augmentation, permanent sample plots were established in the clipped plantation as well as in an unclipped plantation of similar age and site characteristics. The clipping will continue for at least 10 years and the permanent sample plots will be remeasured every 2 years. Permanent plots were also placed in a plantation in the Quesnel Forest District which had been partially brushed to monitor the effect of shading by deciduous trees on weevil damage.

- L. Rankin, Cariboo Forest Region, Williams Lake.

Pissodes strobi in Engelmann spruce on the coast. Coastal P. strobi will attack Englemann spruce when planted on the coast. Low levels of attack were detected this year in an approximately 2 ha area in the upper Artlish River drainage on Vancouver Island, which was planted in 1979 by CIP Inc. with Engelmann spruce to test its growth and survival. Although the initial growth was slow, the trees have now become well established, and are producing leader

growth of adequate size to attract weevils. Engelmann spruce is recommended as an alternative or minor species in some coastal biogeoclimatic zone variants, where it is not native. The P. strobi problem should obviously be a consideration when choosing this tree species for reforestation on the coast.

- D. Heppner, Vancouver Forest Region, Burnaby.

FRDA Weevil Survey to Calibrate SWAT Model. In addition to monitoring the annual level of attack in selected plantations, the 88/89 FRDA funded leader weevil (Pissodes stobi) survey will be used to obtain the data to calibrate Dr. Rene Alfaro's (CFS) SWAT (Weevil Attack Trial) model for the Kitimat Valley. This model provides the closest approximation of the volume lose from weevil attacks at certain intensities for a desired number of years. We wish to use the model to obtain a better estimate of the volume loss given the actual attack levels recorded over the last 5 years and the projected level of attack for the next 20 years.

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

Root Collar Weevils Infest the Hazelton Area. Serious damage by Warren's root collar weevil, Hylobius warreni, is anticipated in a number of 6 to 12 year old lodgepole pine plantations in the Hazelton area. The CFS Forest Insect and Disease Survey noted up to 100% of stems currently attacked by this weevil although few trees have died so far except in the younger plantations. It is predicted that since the level of current attacks has risen rapidly over the last two years, corresponding levels of mortality should be visible one or two years from now. If this mortality materializes, these currently well-stocked, free-growing plantations will become not sufficiently restocked.

To address this problem, a Px trial was established jointly by CFS and the BCFS to examine if screefing, and screefing and pruning can reduce mortality in attacked stems and protect currently unattacked trees. Replicates of this trial will be established this summer using Co-op students or other resources.

- T. Ebata, Prince Rupert Forest Region, Smithers, and
B. Atherton, Kispiox Forest District, Hazelton.

Gypsy Moth Control in B.C. Sites in Colwood, Kelowna, and Parksville were treated with B. t. by Agriculture Canada in 1988 to eradicate small centres of gypsy moth. Both ground and aerial sprays were applied in Colwood and Kelowna; ground sprays only were applied in Parksville. All applications were repeated 3 times at approximately one week intervals. Trapping results indicate that eradication efforts were highly successful.

- P. Hall, Protection Branch, Victoria.

Gypsy Moth Survey Status. Approximately 6,000 pheromone traps for gypsy moth detection were placed throughout B.C. in 1988. The lead agency continues to be Agriculture Canada, Plant Health, with participation by the B.C. Forest Service and the Canadian Forestry Service. B.C. Forest Service placed about 2,000 traps in recreation sites and other high risk forested areas. Trap results indicate that eradication efforts were highly successful. No treatment programs are anticipated in 1989.

- P. Hall, Protection Branch, Victoria.

Black Army Cutworm and Ambush^R - Nelson Forest Region. Pheromone trapping in 1987 showed high numbers of moths indicating possible infestations in 1988. Almost all 1986 burns checked were found to be infested with cutworms. Minor to severe defoliation occurred on all of these blocks. An attempt was made to save some lodgepole pine and larch seedlings planted in 1987. Ambush was applied as a trial to 15.7 hectares. The insecticide was sprayed with a ground sprayer. A total of 800 ml of Ambush (permethrin) was used at a cost of \$289.80 per ha. It was felt that the use of Ambush was very effective as the cutworms were dying within a half hour after spraying. The only problems encountered were having to shut down one day's spray due to high winds and only being able to spray between the hours of 8 - 10 a.m. and 5 - 7 p.m.

Traps have been placed on most of the 1987 burns to help in predicting problems for the 1989 season.

- S. Moss, Golden Forest District, Golden.

Black Cutworm in the Cariboo Forest Region. Approximately 10 ha of Douglas-fir seedlings were defoliated by black cutworm, (*Agrostis ipsilon*), in a one year old plantation adjacent to Bootjack Lake in the Horsefly Forest District. This is a different insect than black army cutworm. This cutworm is a common agricultural pest distributed across Canada, though it is not believed to overwinter in the colder portions of the country. The cutworms may have originated from nursery stock since the outbreak was restricted to areas planted with one consignment of planting stock. To my knowledge this is the first time this cutworm has been implicated with damaging forest seedlings in B.C. Monitoring for this cutworm may differ from black army cutworm.

- L. Rankin, Cariboo Forest Region, Williams Lake.

Hemlock Looper in Jervis Inlet. No looper activity was detected this year in a 90 ha area defoliated in 1987 by the western hemlock looper, (*Lambdina fiscellaria lugubrosa*). No evidence of feeding, frass or insects could be found. It appears that the looper population, which was high enough to cause patches of severe defoliation in 1987, has completely disappeared. The cause of this dramatic decline is unknown. Although there was a fair amount of top kill, and some mortality in small clumps of immature hemlock, the overall impact of the defoliation was judged to be of little concern.

- D. Heppner, Vancouver Forest Region, Burnaby.

European Pine Shoot Moth (EPSM). The European Pine Shoot Moth Committee of the B.C. Plant Protection Advisory Council has developed suggested pheromone trapping standards whereby commercial nurseries in the U.S. can be deemed as EPSM-free for export purposes. These guidelines have been given to federal Plant Health officials for review and implementation if found satisfactory.

Recent surveys for EPSM in the interior of the Province indicate that small populations exist at traditional sites such as Kelowna. All attacks were associated with ornamental pines and there is no evidence that the range of this introduced pest has increased or that it has affected native pine species.

- P. Hall, Protection Branch, Victoria.

Satin Moth Defoliation in Hybrid Poplar. Satin moth, (*Stilpnotia salicis*), an introduced pest from Europe and Asia, heavily defoliated a 25 year old plantation of hybrid poplar near Chilliwack this summer. Also mixed in with this infestation was a high proportion of forest tent caterpillar, (*Malacosoma disstria*). The defoliation occurred during late spring/early summer, but by late summer the trees were again completely refoliated. Losses, therefore, are probably limited to a partial loss of this year's growth.

With the increasing areas being planted with various hybrid poplars within Scott Papers TFL along the Fraser River, it will be interesting to follow the activity of those defoliators. Because of the rapid growth and short rotations of hybrid poplars, a few years of defoliation may be significant.

- D. Heppner, Vancouver Forest Region, Burnaby.

FOREST PATHOLOGY

Mushroom Bonanza. A recent superabundance of mushrooms in British Columbia presented new economic opportunities and some concerns for Forest Service staff.

Prices for mushrooms were reported at over \$100 per kg for some species, with some individuals supposedly earning several thousand dollars per day. A negative consequence was that several people have been killed - not in British Columbia - or made seriously ill by eating poisonous species.

In recent years, Forest Service staff have received numerous requests for the location of recently burned-over areas which are favoured for picking. One staff member suspected that some fires have been deliberately set for the purpose of mushroom picking.

More recently a university professor expressed concerns that excessive mushroom picking was threatening the survival of several fungi, and affecting the growth of trees. Many of the fungi, such as the highly prized pine mushroom, are symbiotic with tree roots and form "mycorrhizae" - literally "fungal root." These concerns have been difficult to evaluate because of the lack of examples of harmful occurrences, and no data on mushroom abundance.

A recent task force report from the State of Washington stated that the recent apparent decline in mushrooms might be caused largely by recent drought. The State of Washington recently enacted legislation to license mushroom buyers and processors, and to obtain records on harvesting.

The State also is required to collect fees for commercial mushroom picking on trust lands, and further work is underway to develop the necessary procedures.

Interestingly, processors in Washington receive most of their supply of wild mushrooms from British Columbia.

Anyone with further information about the effects of mushroom picking in British Columbia is asked to contact Protection Branch or the Regional Forest Pathologist.

- J. Muir, Protection Branch, Victoria.

What's in a name? Recent numerous changes in names of fungi that cause tree diseases have foresters, pathologists and others shaking their heads. However, most of the changes are necessary because of recent research results or clarification.

Some of us remember when Phellinus weirii, the fungus that causes laminated root rot, was Poria weirii. However, another name change is imminent, because it originally was described from a fungus that causes butt rot on western red cedar, and that fungus is quite different from the one that causes laminated root rot on Douglas-fir. The most recent proposal is that the fungus on Douglas-fir be called Phellinus weiri (note: only one "i" ending) variety pseudotsugae.

Recently scientists at Pacific Forestry Centre and at other establishments determined that what appeared to be an extremely variable fungus "Armillaria mella" in North America was in fact eight (or more) distinct species or species groups. The one that causes armillaria root disease of conifers in B.C. is now called A. ostoyae. Five other species are known to occur in B.C. as pathogens on deciduous species, a colonizer of stumps, or saprophytes on recently killed trees. Some of these have yet to be described and named. Pathologists should be able to distinguish most of these species based on field occurrences, tree hosts, mushroom characteristics, and branching patterns of rhizomorphs on or under the tree bark.

The blackstain root disease fungus also was renamed Leptographium wagneri from Ceratocystis wagneri. The name for the conidial stage of the fungus remains as Verticicladiella wagneri. The annosus root disease fungus, formerly Fomes annosus, is now Heterobasidion annosum.

Many other fungi that cause wood decay also have been renamed. For example, Phellinus (Fomes) pini, Inonotus (Polyporus) tomentosus (also causes tomentosus root rot), Phaeolus (Polyporus) schweinitzii, Stereum (Haematostereum) sanguinolentum, and others.

Although the name changes will no doubt continue, the use of the standardized list of common names for tree diseases published by the Western International Forest Disease Work Conference will help to maintain stability of reference amid the confusion.

- J. Muir, Protection Branch, Victoria.

Enhanced tree growth from control of root rot. Several projects are underway as reported in this issue, to control root diseases in many areas of the Province.

Projects have been established in the Nelson, Kamloops, Vancouver and Prince George Forest Regions to determine the amount of timber volume that can be gained by control of several root diseases.

Twenty-year results of a root disease de-stumping trial established by the B.C. Forest Service and the Canadian Forestry Service near Salmon Arm indicated that not only was mortality due to root rot largely prevented, but tree height growth was 20% more on the de-stumped than on the untreated area. Similar results were reported from a trial in the U.S.A.

More efficient or effective methods of removing stumps and roots are being tested, including a French-made stump splitter, and whole-tree push-over logging.

Work is also underway by Inventory and Protection Branch staff to implement and refine the stand projection model PROGNOSIS that has a root disease component. A. Mitchell, Integrated Resources Management Branch, is developing specifications for a geographic Pest Management Information System for root rot and mistletoe that will facilitate planning in forest management, including harvesting and site treatments. D. Errico, research Branch, is analyzing the effects of root disease and forest pests on Timber Supply Area long-run sustained yields.

These and other projects will help demonstrate the benefits of controlling root diseases.

- J. Muir, Protection Branch, Victoria.

Discrepancy Site Mapping. Using the biogeoclimatic and inventory maps and the Nelson Forest Region's "Site Index by Tree Species by Ecosystem" data, sites not growing to potential were located within the Arrow Forest District. Field sampling was completed this summer and the results of the survey should be compiled and completed by mid December. Debriefing of the consultants in this pilot project appears to indicate that, in spite of the high proportion of errors in photo interpretation of polygon labels, this system can be used to detect, geographically locate and estimate pathological impacts on the forests on both a site specific and TSA wide basis. This in turn would allow benefits of pest treatments to be estimated, priorities established and treatments systematically and rationally applied. Further testing of this technique will be required before it can become operational.

- D. Norris, Nelson Forest Region, Nelson.

Pushover Logging. Evans Products Company Ltd., in co-operation with Golden Forest District and Regional Protection staff, conducted a stumping trial during a logging operation where conventional hand falling was replaced by a 235 Cat excavator to push trees over, uproot and shake off soil from the root ball and place trees into rows for skidding to the landing. Breakage was nil, root removal was very good and the block was left ready for planting. About 30% extra delivered volume, (over cruise estimates), was realized from the block. Further operational trials to refine this technique are planned. Pushover logging holds the promise of a "self funding" stumping technique which could be used to provide heretofore unattainable root disease control.

- D. Norris, Nelson Forest Region, Nelson.

Coastal Phellinus Management (CPM) Co-operative. This past summer saw the formation of an exciting new organization - the Coastal Phellinus Management Co-operative. The Co-op members are comprised of pest management and/or silviculture oriented foresters and researchers from the B. C. Forest Service, Canadian Forestry Service, MacMillan Bloedel Ltd., Canadian Pacific Forest Products, Fletcher Challenge, Greater Victoria Regional Water District and B.C. Research.

The objectives of this group are to:

1. increase awareness and concern about phellinus management,
2. cooperate in large scale studies on epidemiology, damage appraisal and disease control methods,
3. cooperate to facilitate consistent and effective funding of disease management research, and
4. to facilitate efficient transfer of knowledge between the cooperators.

If anyone is interested in participating in the CPM Co-op, or would like more information, please contact me.

- J. Beale, Vancouver Forest Region, Burnaby.

Evaluating MEIS-II for the Detection and Appraisal of Coastal Laminated Root Rot. In August a large block of coastal Douglas-fir forest was sampled along the east side of Okeover Inlet in the Powell River Forest District using the MEIS-II/Falcon jet remote sensing platform. The MEIS-II (or Multi-detector Electro-optical Imaging Sensor) is a high performance digital multispectral spectrometer.

Airborne sampling was done to provide two levels of spatial resolutions (4 m² and 1 m²) using the standard forestry optical light filters. Ground sampling for laminated root rot has already been completed (100% sketch map coverage) on about 500 ha of harvestable second growth forests.

Analysis of the digital remote sensing data will be done by Dr. Jim Lee at the Pacific Forestry Centre (CFS) during the winter, using the Perception Image Analysis System and Pamap Geographic Information System on an IBM microcomputer. Evaluations will include:

- i. root rot detection capability of MEIS,
- ii. correlation between the two spatial resolutions,
- iii. correlation between airborne MEIS and ground sampling methods, and
- iv. testing pest related forest inventory updating procedures using the results from the MEIS-II survey.

Results of this FRDA-sponsored project will be available in the spring of 1989.

- J. Beale, Vancouver Forest Region, Burnaby.

Western Gall Rust Studied in Prince George Forest District. During the summer of 1988 a study of the incidence and impact of western gall rust, Endocronartium harknessii (J.P. Moore) (Y. Hiratraka), in 20 juvenile spaced lodgepole pine stands in the southwest portion of the Prince George Forest District was conducted. The project was a cooperative venture between the B.C. Forest Service (regional pest management section) and the University of Victoria Department of Biology - Cooperative Education.

Overall, 17% of the trees were infected with western gall rust; 3% showed stem infections which would preclude their acceptance as crop trees. Half of the stem-infected trees had died presumably as a result of that infection, and mortality rates from other natural causes were determined to be 0.5%. Detailed growth impact studies were conducted in one of the surveyed stands, where 24 trees were sampled and analysis of radial growth was carried out. Bole infections were found to significantly decrease tree growth, branch infections were determined to decrease tree growth only when associated with stem infections.

The results of this brief study will have importance in the determination of a juvenile spacing prescription in areas where western gall rust is frequent. Furthermore, the selection of crop trees must consider the incidence of western gall rust infections, particularly on the stem of potential crop trees.

- R. Cozens, Timber Harvesting Branch, and
J. Muir, Protection Branch, Victoria.

Western gall rust, Endocronartium harknessii. Last winter Quesnel Forest District indicated that they intended to space a lodgepole pine stand near Cuisson Lake that had a high incidence of western gall rust. Cariboo Forest Region decided to take advantage of this opportunity and obtained some data on the effect of the gall rust on the lodgepole pine in a spaced stand over time. The average stocking level, based on pre-typing, (not plots), was 5,133 stems per hectare. The stand was spaced to 2,200 stems per hectare. The District reserved two 0.5 hectare areas in the stand for the research trial. Surveys in these reserve areas using randomly selected plots, (3.99 metre radius) were conducted prior to and after spacing. Information collected included; numbers of healthy trees, (no galls), trees with stem galls (could also have branch galls), and trees with branch galls only, (no stems galls). The following table summarizes collected data:

Pre-Spacing

Healthy
60%

Stem Galls
31%

Branch Galls
9%

Post-Spacing

73%

10%

17%

Permanent plots will be established during the winter of 1988/89 to track the infection over time. The area was fertilized in October 1988 as well.

- D. Doidge, Cariboo Forest Region, Williams Lake.

Scleroderris canker of pines. Prevention of pest outbreaks is one of the most effective measures to control pests. Scleroderris canker of pines potentially is a very damaging disease of lodgepole pine in British Columbia. An indigenous strain of the canker-causing fungus has been found a few times in Alberta and British Columbia, where it had infected a few small understorey trees.

However, in eastern North America, another strain, called the european race, which is not present in B.C., has caused very damaging outbreaks. Currently, there is an outbreak of the canker disease in lodgepole pine plantations in Sweden. An indigenous race and several other similar species also occur in eastern Canada and United States, which complicate field identification and control. However, extensive survey programs and nursery spray programs for the disease are underway in eastern Canada. So far, all outbreaks appear to have been suppressed or possibly eradicated by control treatments.

Protection staff have been active in the B.C., Plant Protection Advisory Council Committee on scleroderris canker and have recommended measures to prevent introduction of the european race into B.C. The most likely means of introduction of the disease to B.C. is infected conifer ornamentals or Christmas trees from previously infested areas. These trees pose a risk to commercial forest nurseries. Movement and outplanting of infected nursery seedlings could spread the disease widely and quickly in B.C. Steps are being taken to monitor nurseries, seedlings and plantation trees for the disease, in cooperation with the Canadian Forestry Service and Agriculture Canada, Plant Protection.

Recently a workshop was held by Plant Protection in Ottawa, and with input from B.C. Forest Service staff, other provincial agencies, and the Canadian Forestry Service, a national policy to prevent further spread of the disease was drafted.

- J. Muir, Protection Branch, Victoria.

Pinewood Nematode. The issue of pinewood nematode is still simmering, and remains a concern to British Columbia lumber producers. Several countries in the European Economic Community (EEC) have proposed quarantine restrictions on B.C. lumber shipments to the EEC, including the United Kingdom, to prevent what is perceived to be a threat to their forests.

Other countries including the United Kingdom have supported the Canadian position that the lumber poses little, if any, threat. The proposed quarantine restrictions are currently on hold, pending the results of further research studies. However, the situation has been very changeable, and uncertain. Canadian industry and government representatives are very actively pursuing the problem in recognition of the importance of B.C. lumber exports to the national economy.

- J. Muir, Protection Branch, Victoria.

Tomentosus Spacing Trial and CFS Sanitation Spacing Trial Reassessment. Pathocon has been awarded two FRDA pest control projects to be completed prior to March 31, 1988. One project will examine juvenile spacing options in a tomentosus infected 60-year age spruce stand. The other project will assess the effectiveness of a sanitation spacing and pruning trial established by Larry Weir in the 60's. The stand had a combined disease incidence level of about 25% for western gall rust, cronartium rust, and atopellis canker at the time of treatment.

- W. Martin, Prince Rupert Forest Region, Smithers.

Lodgepole Pine Dwarf Mistletoe Spacing Trials in Prince George Region. Spacing trials in dwarf mistletoe infested lodgepole pine were established in the Prince George Forest District in 1986. The purpose of the trials was to determine the effect of spacing in a heavily infested stand and a lightly infested stand. In September 1988 the first of the plot remeasurements was performed by a FRDA contractor. The preliminary data reveal that spacing has caused a greater increase in mistletoe infection in heavily infested stands. Changes in tree growth and stand productivity due to the spacing treatment are not yet evident. Overall productivity and tree growth is reduced in the mistletoe infested blocks in proportion to the level of infestation. Remeasurements of these stands will be undertaken at appropriate intervals.

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

Low Branch Pruning for White Pine Blister Rust. A study was initiated in 1983/84 to evaluate the efficacy of two-pass low-branch pruning for control of white pine blister rust in three naturally regenerated, mixed species stands in the Vancouver Forest Region. The results following the first remeasurement of the first pass indicate variable but positive success. Stand and site conditions, blister rust site hazard, blister rust levels associated with tree age, (height) at pruning and the proportions of pine crowns removed varied widely and have significantly affected trial results. Overall, pruning success decreased dramatically from a young 1.8 m tall, low rust hazard stand to an older 3.2 m tall, high rust hazard stand. The frequency, height and

rate of lethal cankering was substantially affected by the Ribes spp. cover. Ribes spp. cover is hypothesized to be a stronger determinant of rust site hazard than slope and thus should be considered in probabilities of pruning success.

Pruning of managed plantations is estimated to provide much better results, especially if pruning is initiated when the stand is 1.5 - 2.0 m tall. The efficacy of pruning will increase as the blister rust site hazard decreases.

A paper on the subject will be printed in the Proceedings of the Western White Pine Management Symposium, Nakusp, B.C.; May 3 - 5, 1988.

- J. Beale, Vancouver Forest Region, Burnaby.

Rhizina Root Disease. In the wetter interior cedar hemlock (ICH) and the Englmann spruce, subalpine fir (ESSF) biogeoclimatic zones, Rhizina undulata, the tea break or campfire fungus, has become a very serious killer of seedlings in 1988. Typically the problem of poor survival has been mistakenly attributed to poor seedling stock quality or poor planting but in reality seedling mortality was caused by this fungal equivalent to the black army cutworm as the fungus is most severe soon after broadcast burning. Approximately one block in four will require replanting unless planting is delayed for two growing seasons after burning. Reconnaissance surveys done this fall indicate that control may also be effected by burning only at certain indices.

- D. Norris, Nelson Forest Region, Nelson.

Evaluation of Sulphur Dioxide Related Forest Damage. Determining the extent and severity of airborne pollutant damage on forest resources is a complex and difficult task. This is because a wide variety of damage symptoms can result from multi-source, mixed pollution types, and marking and tracking single source pollutants are impossible. In B.C. one such single source sulphur dioxide source exists where a damage appraisal study could easily be done at Port Alice on northern Vancouver Island.

A multidisciplinary, international co-operative study was conducted at Pt. Alice this past August. The co-operators included the B.C. Forest Service; B.C. Ministry of Environment; University of B.C.; University of California, Davis, and the University of Colorado, Boulder.

The objectives were to determine the extent and severity of SO₂ related damage as defined by the correlation of three remote sensing methods and ground based dendrochronological estimates.

The remote sensing methods used were (a) the Landsat Thematic Mapper, (b) the MEIS - II at 5 m² and 1 m² spatial resolution and (c) the spectroradiometer. The spectroradiometer is being used to correlate dose in foliar spectral reflectance measurements with varying chlorophyll levels. Chlorophyll levels vary with degree of pollutant damage. Further use of the spectroradiometer will be to calibrate spectral estimates from Landsat and MEIS results.

Seven ground sample plots were established in second growth western hemlock (minor component Douglas-fir or sitka spruce) stands in three visible damage zones (high, moderate and nil). Plots were located to maximize ecological and mensurational similarity. Standard dendrochronological methods were carried out on about 25 trees per plot. The tree ring analysis is being carried out in cooperation with Dr. Rene Alfaro of the Pacific Forestry Centre (CFS).

Although no results are available yet, distinct differences in tree diameters, visible ring widths and tree crown health classes were observed between ground samples. Also, it was observed that Douglas-fir appeared to be more susceptible to damage than western hemlock.

A general technical report will be available in the spring of 1989. Further scientific articles will be published on several specific evaluations of remote sensing methodologies and on dendrochronology results.

Provincial direct delivery FRDA funds supported the MEIS-II data acquisition and data preparation steps for the tree ring analyses. The other cooperators have contributed funds and/or services in kind.

- J. Beale, Vancouver Forest Region, Burnaby.

PESTICIDES

A New Position Paper Entitled "Use and Regulation of Pesticides in British Columbia Forest Management Practices." This new position has been prepared for the Pesticide Advisory Committee of the Ministry and will soon be submitted and hopefully accepted by the Ministry Executive. In the paper are the following sections:

- an overview of forest pesticide use in B.C.,
- pesticide use in vegetation management,
- pesticide use in insect pest management,
- pesticide use in forest nurseries,
- pesticide use in seed and cone pest management, and
- pesticide use in range management.

The paper should be useful in discussions with the public and with other resource agencies.

- J. Henigman, Protection Branch, Victoria.

Forest Pesticide Application Course Schedule. Forest Pesticide Applicator Courses will again be conducted throughout the province over the forth coming spring. The course shall be offered by contract teachers using the same format as in previous years.

The tentative schedule available at this time is as follows:

<u>Forest Region</u>	<u>Course Location</u>	<u>Timing (1989)</u>
Cariboo	Williams Lake	Late February - April
Kamloops	Kamloops Kelowna	January - February January - February
Nelson	Castlegar Cranbrook	November (88) - February November (88) - February
Prince George	Prince George	November (88), March - April
Prince Rupert	Terrace	March
Vancouver	Campbell River or Nanaimo Vancouver area	January - March January - March

In addition to the standard four day course, we have asked the contractor to also conduct one day review sessions for individuals previously certified and who wish some refresher tutorial assistance. These will likely be offered at or about the same time as the standard courses.

Costs for the standard course will be about \$145.00 per student, total cost. We assume that the one day session cost will be nominal.

If you wish information on the course or a more specific schedule, please contact Mr. Barry Manfield at 392-6899 in Williams Lake.

- J. Henigman, Protection Branch, Victoria.

Clarification of the Responsibilities for Pesticide Research. Following a perceived need to quicken the pace of study and data collection for the registration of the herbicide Garlon clarification was sought on the responsibilities for research of unregistered pesticides. This aspect is covered by the Ministry's Pesticide Use and Regulation Policy.

Following the meeting, it was confirmed that all studies involving unregistered products containing active ingredients which are not contained in any registered product in forestry be conducted as research (EP) projects. These studies will need full evaluation by Research Branch staff.

While this decision will not likely speed up the research process, it will ensure a high level of research quality and should save money and effort in the long term.

Some minor exceptions to this clarification are apparently still acceptable. Where the pesticide product involved is seen by Research Branch and the Pesticide Control Branch as of minor consequence ad hoc field trials may be approved. Examples of such products may include encapsulated pesticide injection systems or selectively applied animal repellents.

- J. Henigman, Protection Branch, Victoria.

Pesticide use Permit Application Operational Guidelines. Cariboo Forest Region has developed a series of operational guidelines and procedures for ensuring that all Pesticide Use Permit applications sent to the Pesticide Control Branch for approval have been thoroughly reviewed for technical quality, compatibility with resource management objectives, and suitability for the Region's pest management and brushing programs. A copy of the guidelines are available upon request.

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

MSMA Efficacy Project. The data collection for this project is now complete and the results are being analyzed. A total of 395 trees (lodgepole and western white pine) treated in 1987 with MSMA (monosodium methane arsenate) were sampled, including check trees with the breakdown as follows:

<u>Forest District</u>	<u>Total Trees Sampled</u>
Kamloops	78
Vernon	60
Penticton	40
Merritt	185
Lillooet	32
Total:	395

The data collected is as follows:

- dbh, total height, height to live crown; height to last attack,
- 20 x 20 cm bark samples were taken from N and S aspect of each tree and number of emergence holes recorded; average gallery length; average larval gallery length; other species present,
- the circumferential colonization of the ceratocystis fungus was measured, and
- bark and foliage samples are being analyzed for arsenic content, (plus bark and foliage from untreated trees).

The trees chosen for evaluation were from a range of treatment dates in 1987 and were scattered randomly throughout each Forest District.

Results to date from this project suggest that a re-evaluation of how and when MSMA should be used, be clearly recorded. It appears that improper application techniques, excessive and prolonged treatment are contributing to a low success rate.

Complete and summarized results of the project will be available early in 1989 from Kamloops Forest Regional Office.

- L. Maclauchlan, Kamloops Forest Region, Kamloops.

Prince Rupert Forest Region MSMA Program Report. MSMA was used on a large-scale in the Morice and Lakes Forest Districts this summer. The strategy was to treat chronic problem areas primarily on ridge tops which constantly re-infest the valleys below them. These ridge tops are generally too heavily infested and inaccessible to be efficiently treated by fall and burn but are ideal for treatment with MSMA after being heavily pheromone baited.

In the Morice Forest District, a total of 1,723 trees were treated by Forest Service and contract crews at an average price per tree of \$23.21 and \$47.11, respectively. An efficacy assessment is forthcoming.

The Lakes Forest District treated 297 trees in several small but concentrated patches, (all helicopter accessed). A recent evaluation revealed nearly 100% mortality of brood and parent adults despite the prolonged and late flight experienced this summer following a cool and wet development period.

Local Wildlife Branch biologists have requested an evaluation of the exposure risk to woodpeckers which feed on mountain pine beetle larvae from unsuccessfully treated trees, (i.e. trees treated outside of the three-week pest attack window). Samples of larvae will be analyzed at Simon Fraser University using X-ray fluorescence spectroscopy to determine the average arsenic content of treated versus untreated larvae. From this analysis, Wildlife Branch will assess the hazard. Results of this study will be reported in future issues of Pest Management Progress.

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

Pre-attack Injection of MSMA against Mountain Pine Beetle. Twenty healthy lodgepole pine trees at each of three locations of the Vanderhoof Forest District were baited with mountain pine beetle semiochemicals in late May, 1988. At each location, 15 of these trees were randomly chosen and injected with 1/4 strength MSMA (80 g/L Glowon^R) on either June 20, June 28 or July 6. The remaining 5 baited trees at each location were left untreated to serve as checks. The objectives of the trial were twofold: 1) to determine if mountain pine beetle would attack treated trees and not be repelled, and 2) to determine if 1/4 strength MSMA would successfully prevent brood maturation. Plot trees were examined for pitch tubes weekly from mid-July until the termination of the adult flight. Egg and larval galleries were

examined in late September for a partial determination of treatment efficacy. Although the data has not been analyzed to date, early indications are that 1/4 strength MSMA was not repellent towards attacking adults in 2 of the 3 blocks. If successful, this strategy could extend our "window" of MSMA applications by 3 - 4 weeks in the summer. A final report on the trial will be available in the spring.

- R. Hodgkinson, Prince George Forest Region, Prince George; and
M. Pritchard, Vanderhoof Forest District, Vanderhoof.

Velpar Herbicide Movement Update. A survey of all Velpar^R L operational treatments conducted in the province to the end of the 1987 treatment period has lent support for the dependability of the Ministry guidelines to prevent overground movement of Velpar. The guidelines were originally published by M. Geisler and F. Newhouse in 1987 in a report entitled "Preliminary Observations of Velpar L Movement within the Prince Rupert Forest Region," (B.C. Forest Service Int. Rept. PM-PR-9, 34 p.). The summary of all operational treatments has been drafted by a coop student Mr. Ben York in an unpublished report entitled "Summary of Velpar L Movement with British Columbia."

In addition to the guidelines and field summary, Mr. P. Beaudry, Research Branch, Prince Rupert Forest Region has completed most of his studies into Velpar movement. He will conduct some more work in the 1989 field season. Once complete, the study will be published as a report entitled "Down Slope Movement of Hexazinone in the SBS Zone," (FRDA project 1.21).

- J. Henigman, Protection Branch, Victoria.

Zinc Sulphate Registration Package. Thanks to the efforts of Ms. Sara Booth, a Simon Fraser University Co-op student, we have a completed registration package for zinc sulphate as a stump treatment for Heterobasidion annosum (Fomes annosus). Following some additional minor editing, we expect this package to be sent to Agriculture Canada, for review very soon.

- J. Henigman, Protection Branch, Victoria.

PEST MANAGEMENT PERSONNEL
Forest Service Personnel fully or partly committed
to forest pest management activities

Protection Branch

R.F. (Bob) DeBoo	Manager, Pest Management	Victoria	387-8740
P.M. (Peter) Hall	Forest Entomologist	Victoria	387-8742
J.F. (John) Henigman	Pesticide Specialist	Victoria	387-8738
J.A. (John) Muir	Forest Pathologist	Victoria	387-8739
S.P. (Stuart) Taylor	Pest Management Technician	Victoria	387-8743
P.J. (Pat) Humphreys	Pest Management Technician	Victoria	387-8737

Silviculture Branch

M. (Mike) Wyeth	Silviculturist	Victoria	387-8922
J. (Jacob) Boateng	Brushing and Weeding Specialist	Victoria	387-8905
G. (Gord) Ackerman	Technician-Stand Tending	Victoria	387-8912
D. (Don) Summers	Seed Production Pest Management Officer	Victoria	387-3931
B. (Bev) McEntire	Seed Production Pest Management Technician	Victoria	387-8938
G. M. (Gwen) Shrimpton	Nursery Pest Management Officer	Surrey Nursery	576-9161

Cariboo Forest Region

Regional Staff

M. W. (Mark) Hamm	Pest Management Forester	Williams Lk.	398-4441
L. J. (Leo) Rankin	Forest Entomologist	Williams Lk.	398-4439
D. F. (Don) Doidge	Specialist, Forest Pathology	Williams Lk.	398-4442
J. (Jane) Perry	Stand Tending Forester	Williams Lk.	398-4400
C. (Chris) Easthope	Range Agrologist	Williams Lk.	398-4396

District Staff

R. (Richard) McKay	Resource Officer Protection	Chilcotin	394-4215
J. (John) Hoyrup	Resource Officer Protection	Horsefly	620-3417
D. (Dennis) Asher	Resource Officer Protection	Quesnel	992-4400
W. (Wayne) Hendy	Resource Officer Protection	Williams Lk.	398-4341
A. (Alec) Wallach	District Pest Management Coord.	Williams Lk.	398-4341
M. (Mel) Dodge	Resource Officer Protection	100 Mile House	395-3812

Kamloops Forest Region

Region Staff

L. (Lorraine) MacLauchlan	Forest Entomologist	Kamloops	828-4177
H. (Hadrian) Merler	Forest Pathologist	Kamloops	828-4176
R. (Ron) Gray	Stand Tending Forester	Kamloops	828-4163
R. (Rick) Tucker	Ranger Planning Agrologist	Kamloops	828-4582

District Staff

M. (Mike) Hall	Resource Assistant	Clearwater	674-2265
D. (Dave) Piggan	Resource Assistant	Kamloops	372-5832
M. (Margo) Johnson	Resource Assistant	Lillooet	256-7531
T. (Tom) Lacey	Resource Officer Protection	Merritt	378-9311
H. (Harry) Spahan	Resource Assistant	Merritt	378-9311
J. (Jim) Mottishaw	Resource Assistant	Penticton	492-8721
D. (Dave) Procter	Resource Officer Protection	Salmon Arm	832-7153
E. (Eric) Hampt	Resource Assistant	Vernon	542-0264

Nelson Forest Region

Region Staff

E. (Ernie) Morris	Pest Management Specialist	Nelson	354-6144
D. (Don) Norris	Forest Pathologist	Nelson	354-6143
G. (Gerald) Reichenback	Stand Tending Forester	Nelson	354-6280
R. (Bob) Drinkwater	Range Officer	Nelson	354-6245

District Staff

D. (Dan) Reiben	Pest Management Officer	Arrow	365-2131
B. (Ben) Zuber	Pest Management Officer	Boundary	442-5411
S. (Steve) Byford	Pest Management Officer	Cranbrook	426-3391
L. (Larry) Hewlett	Resource Officer - Protection	Golden	344-7500
S. (Emile) Begin	Pest Management Officer	Invermere	342-4200
J. (Jim) Schafthiezen	Pest Manager Officer	Kootenay Lk.	825-4415
A. (Archie) McConnachie	Resource Officer - Protection	Revelstoke	837-7611

Prince George Forest Region

Region Staff

R.S. (Bob) Hodgkinson	Forest Entomologist	Pr. George	565-6122
(Vacant)	Pest Management Forester	Pr. George	565-6122
(Vacant)	Forest Pathologist	Pr. George	565-6122
(Vacant)	Stand Tending Forester	Pr. George	565-6122

District Staff

P. (Paul) Gevatkoff	Resource Officer - Protection	Dawson Cr.	784-2350
R. E. (Roy) Simpson	Resource Officer - Protection	Ft. Nelson	774-3936
G.H. (Gerry) Vanderkwaak	Resource Assistant - Protection	Ft. Nelson	774-3936
L. (Lance) Mitchell	Resource Officer - Protection	Ft. St. James	996-7131
A.R. (Al) Kneeland	Resource Officer - Protection	Mackenzie	997-3310
J.B. (Brian) Kempf	Resource Assistant - Protection	Mackenzie	997-3310
R.G. (Roger) Wiltsie	Resource Officer - Protection	McBride	569-2265
A.D. (Dale) Cinnamon	Resource Assistant - Protection	McBride	569-2265
F.L. (Fred) Turner	Resource Officer - Protection	Pr. George	562-4121
B.L. (Bruce) Doerksen	Resource Assistant - Protection	Pr. George	562-4121
M.F. (Mike) Dittaro	Acting Resource Officer - Prot.	Vanderhoof	567-6363
M.B. (Mike) Pritchard	Resource Assistant - Protection	Vanderhoof	567-6363

Prince Rupert Forest Region

Region Staff

M. (Mike) Geisler	Acting Protection Officer	Smithers	847-7477
T. (Tim) Ebata	Forest Entomologist	Smithers	847-7479
W. (Wayne) Martin	Forest Pathologist	Smithers	847-7478
F. (Fred) Newhouse	Stand Tending Forester	Smithers	847-7514
D. (Don) Russell	Range Officer	Smithers	847-7443

District Staff

W. (Bill) Jensen	Resource Officer - Protection	Bulkley	847-7555
G. Gordon Munroe	Resource Officer - Protection	Cassiar	771-4211
J. (Joe) Katasonoff	Resource Officer - Protection	Kalum	638-3302
K. (Kas) Kopec	Resource Assistant - Protection	Kalum	638-3290
B. (Brian) Atherton	Resource Officer - Protection	Kispiox	842-6581
W. F. (Bill) Davidson	Resource Officer - Protection	Lakes	692-2223
B. (Brian) Simpson	Resource Officer - Protection	Morice	845-6288
S. (Steve) Mitchell	Resource Assistant - Protection	Morice	845-7712
W. T. S. (Bill) Jackson	Resource Officer - Protection	North Coast	627-0457

Vancouver Forest Region

Region Staff

D. G. (Don) Heppner	Specialist - Forest Ent.	Burnaby	660-7653
J. D. (Jeff) Beale	Specialist - Forest Path.	Burnaby	660-7654
M. (Mel) Scott	Stand Tending Forester	Burnaby	660-7579

District Staff

T. (Terry) Preston	Resource Officer - Protection	Campbell River	286-3282
T. (Tim) Ewart	Resource Assistant - Protection	Campbell River	286-3282
G. (Greg) Hemphill	Resource Officer - Protection	Chilliwack	794-3361
G. (Grant) Preston	Resource Assistant - Protection	Chilliwack	794-3361
W. (Willie) Giesbrecht	Resource Assistant - Protection	Chilliwack	794-3361
P. (Pat) Hayes	Resource Officer - Protection	Duncan	746-5123
D. (Dennis) Tippie	Resource Officer - Protection	Mid Coast	982-2621
W. (Wade) Matheson	Resource Assistant - Protection	Mid Coast	982-2621
D. (Dan) Powell	Resource Officer - Protection	Pt. Alberni	724-9205
D. (Doug) Walker	Resource Assistant - Protection	Pt. Alberni	724-9205
A. (Al) Cottini	Resource Assistant - Protection	Pt. Alberni	724-9205
C. (Clarence) Friesen	Resource Officer - Protection	Pt. McNeill	956-4416
T. (Tim) Neal	Resource Assistant - Protection	Pt. McNeill	956-4416
B. (Barry) Millar	Resource Officer - Protection	Powell River	485-9831
R. (Ron) Diprose	Resource Assistant - Protection	Powell River	485-9831
D. (Debbie) Anderson	Resource Assistant - Protection	Powell River	485-9831
(Vacant)	Resource Officer - Protection	Qn. Char. Is.	559-8447
K. (Keith) Davis	Resource Officer - Protection	Squamish	898-9671

MEETINGS

Pest Damage Appraisal Advisory Committee (PDAAC). On September 14, 1988, this committee met to review two subcommittee reports and initiate further action. A high level of enthusiasm was generated amongst the participants and, results and plans were as follows:

- 1) Old Business - The Priority Establishment and Growth and Yield Subcommittee Report were reviewed and yielded the following:
 - A list was developed of B.C. forest pests requiring damage appraisal (the top twenty);
 - Fourteen forest stand and tree models available for damage appraisal of forest pests were reviewed and summarized;
 - Significant progress was made towards ensuring the consistent collection of pest data in future permanent sample plots (PSP); and
 - work progressed on the growth and yield model Prognosis.
- 2) New Business - future plans were developed as follows:
 - A new subcommittee, chaired by M. Kovats (Research Branch), was established to identify and prioritize the specific damage appraisal needs of various pests (the top twenty). Recommendations will be presented to PDAAC by February 15, 1989, and will include mechanisms to facilitate an annual review of needs;
 - The Growth and Yield Subcommittee was retained to continue work with PSP establishment procedures, examine ways to collect pest data on previously established PSPs, and further review and make recommendations for the future development of damage appraisal models;
 - The terms of reference for PDAAC will be reviewed in light of its more clarified role.

Please contact the undersigned for additional information concerning this committee.

- S. Taylor, Protection Branch, Victoria and
D. Hutcheson, Kamloops Forest Region, Kamloops.

Western Spruce Budworm Symposium. The association of B.C. Professional Foresters and British Columbia Forestry Association held a Symposium on the western spruce budworm in Kamloops on October 19 - 20. It was attended by approximately 75 government, industry and university representatives. Topics discussed at the meeting included budworm biology and dynamics, economics, stand modelling and various methods of management and control.

- L. Maclauchlan, and T. Blom, Kamloops Forest Region, Kamloops.

Western Forest Insect Work Conference. The 1989 meeting of this conference is planned for September, 1989, in Bend, Oregon. This will be a joint meeting with the Forest Pathology Work Conference and, therefore, should provide an excellent opportunity to discuss most facets of forest pest management.

- P. Hall, Protection Branch, Victoria.

World Entomology Congress. The XVIII International Congress of Entomology was held in Vancouver on July 3 to 9, 1988. This congress was well attended by over 3 000 entomologists from around the world and had several sessions relating to forest entomology. These sections were convened by Dr. J. McLean (U.B.C.). Those interested in further information about the congress or proceedings should contact Dr. McLean.

- P. Hall, Protection Branch, Victoria.

Forest Disease Work Conference. The 36th Western International Forest Disease Work Conference was held September 19 - 23, 1988, at Park City, Utah. Jim Space, Director of the U.S. Dept. Agriculture, Forest Service, Forest Pest Management, outlined their recent initiatives in establishing a forest health strategy, and re-organizing their staff into zones (approximately equivalent to Forest Regions in British Columbia).

Several speakers addressed the issue of how pest management and forest pathology are perceived by various people, and what we could do to increase support for our programs. The conference established an action committee to work with entomologists and prepare recommendations for the next joint conference September 11 - 17, 1989 at Bend, Oregon.

Technical sessions included use of ethephon as a ground spray to remove and suppress aerial shoots of dwarf mistletoe, and aerial surveys for dwarf mistletoe on jack pine in Manitoba.

Reports on new projects and people in the B.C. Forest Service, recreational tree hazard management (with K. Joy, Ministry of Parks), and the dwarf mistletoe committee report were presented.

- J. Muir, Protection Branch, Victoria.

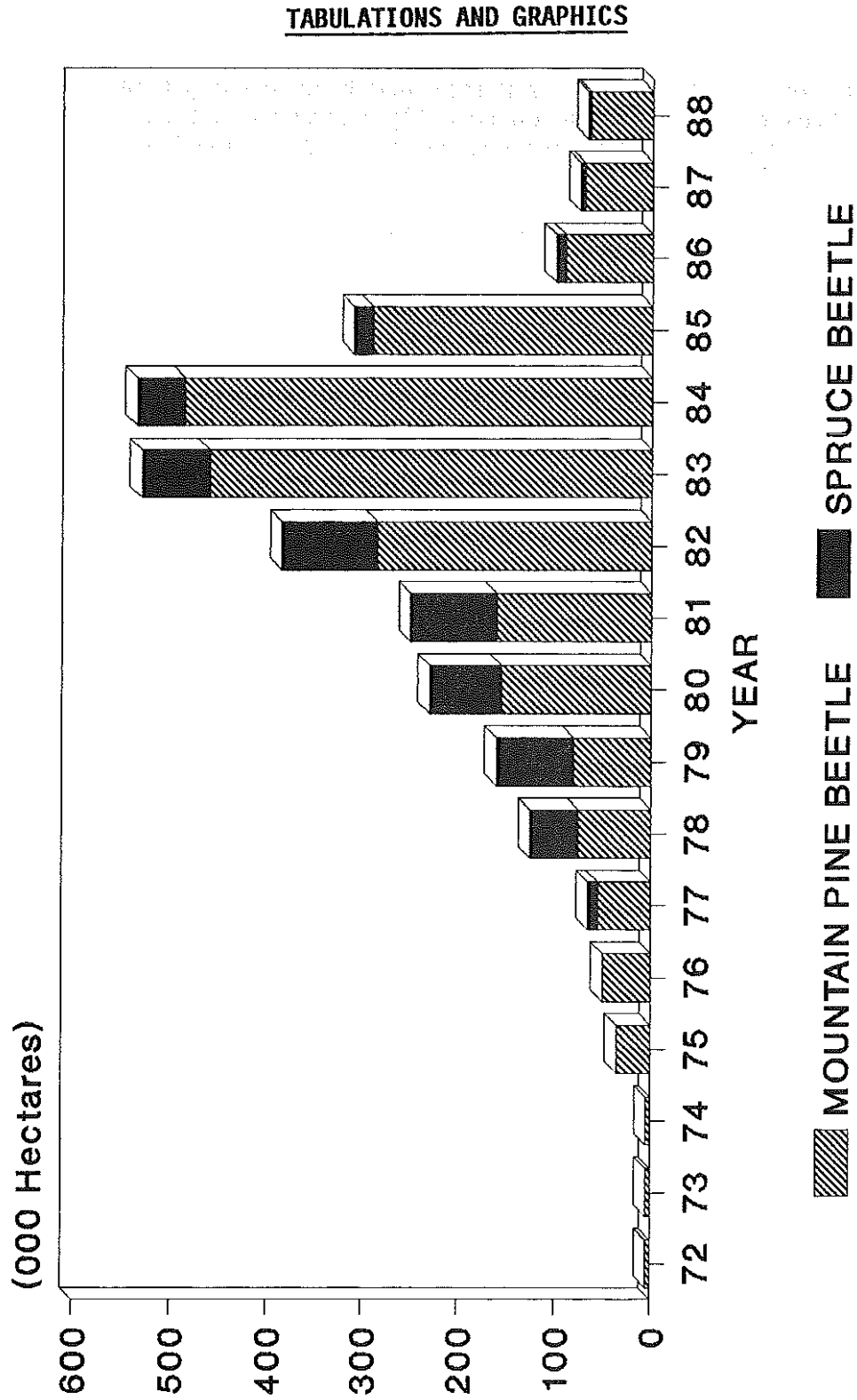
IUFRO Butt and Root Rots. A meeting August 8 - 16, 1988, of the Working Group on Butt Rots and Root Rots, International Union of Forest Research Organizations (IUFRO) was held at Vernon and Victoria. The meeting was organized by D. Morrison, Pacific Forestry Centre, and attended by several Forest Service staff.

A large part of the conference was devoted to genetics and taxonomy of Armillaria species and Heterobidion annosum (Fomes annosus). A model developed in Great Britain to show the economic benefits of treating Sitka spruce stumps for annosus root disease was shown. Chloropicrin has been registered as a fumigant for control of laminated root rot in the United States. In subtropical areas of New Zealand, a researcher has found several

fungi that deteriorate stumps in six months and thus are a potential biological control of root disease on recently harvested sites. Several of the results or procedures, with some refinement, appear promising for use in B.C.

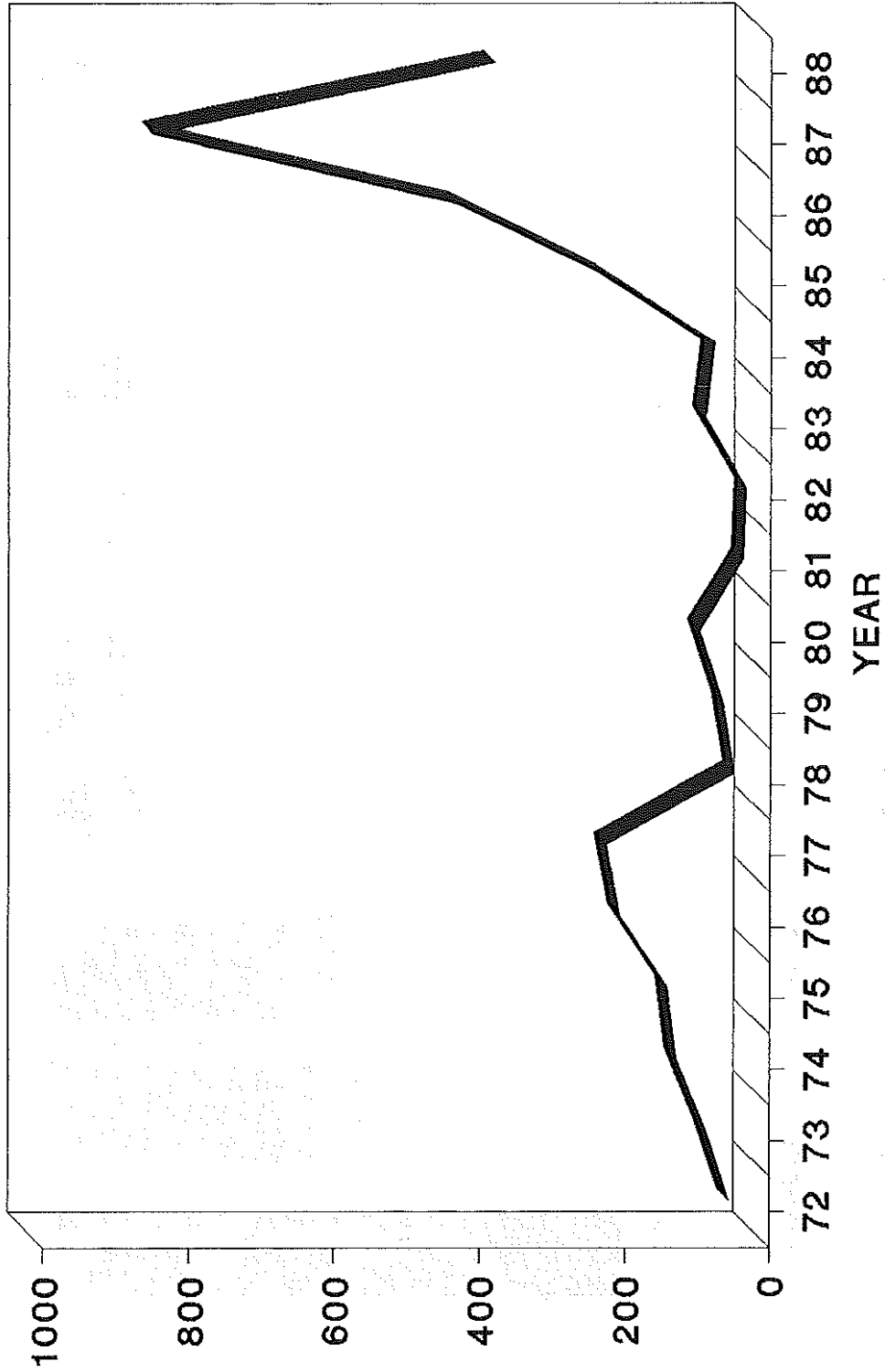
- J. Muir, Protection Branch, Victoria.

AREA UNDER ATTACK BY BARK BEETLES 1972-1988



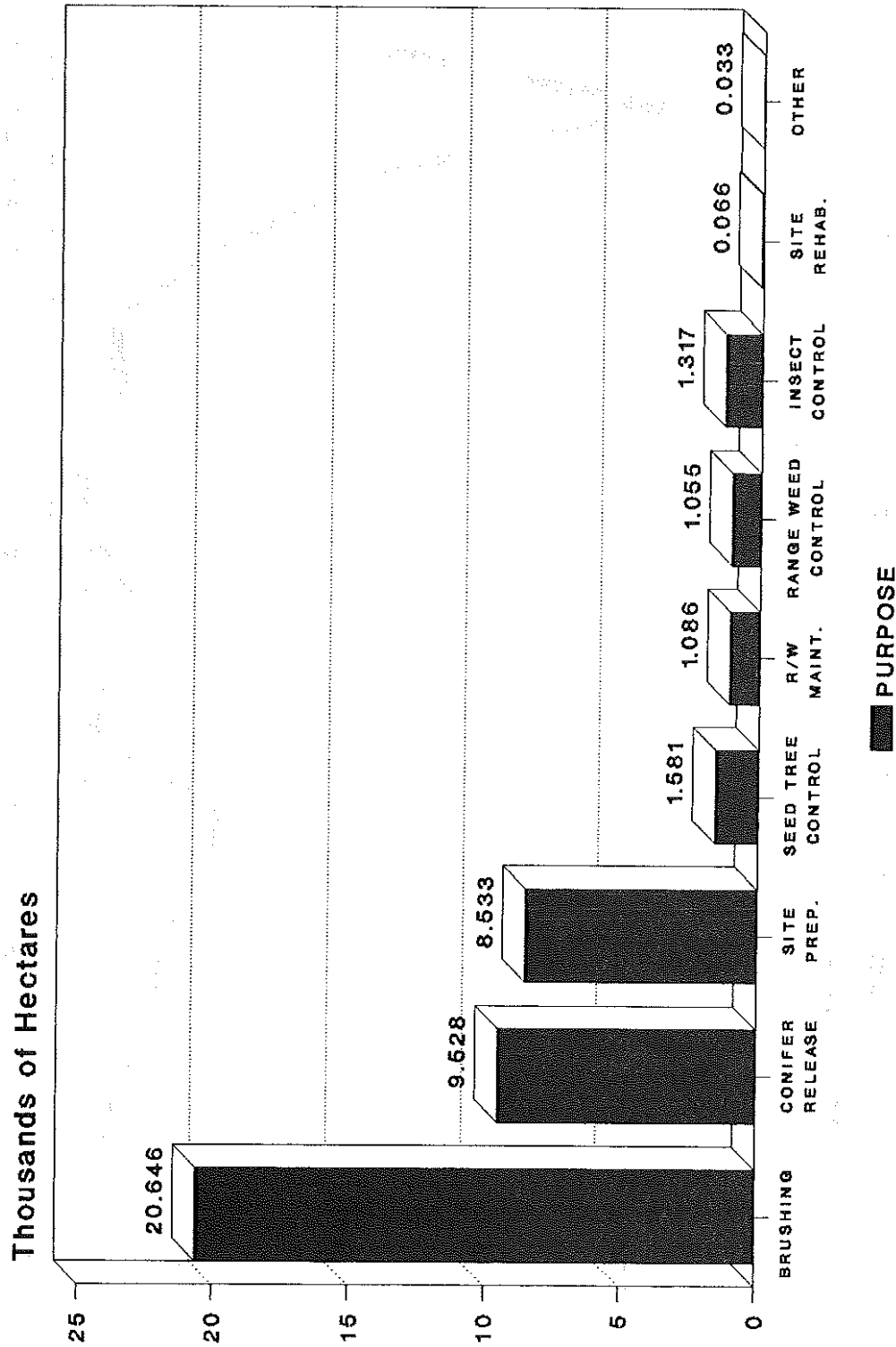
Prepared by P. Humphreys, Protection Branch, Victoria

**TRENDS IN VISIBLE DEFOLIATION OF DOUGLAS
FIR CAUSED BY THE WESTERN SPRUCE BUDWORM
IN BRITISH COLUMBIA (YEARS 1972-1988)**
(000 Hectares)



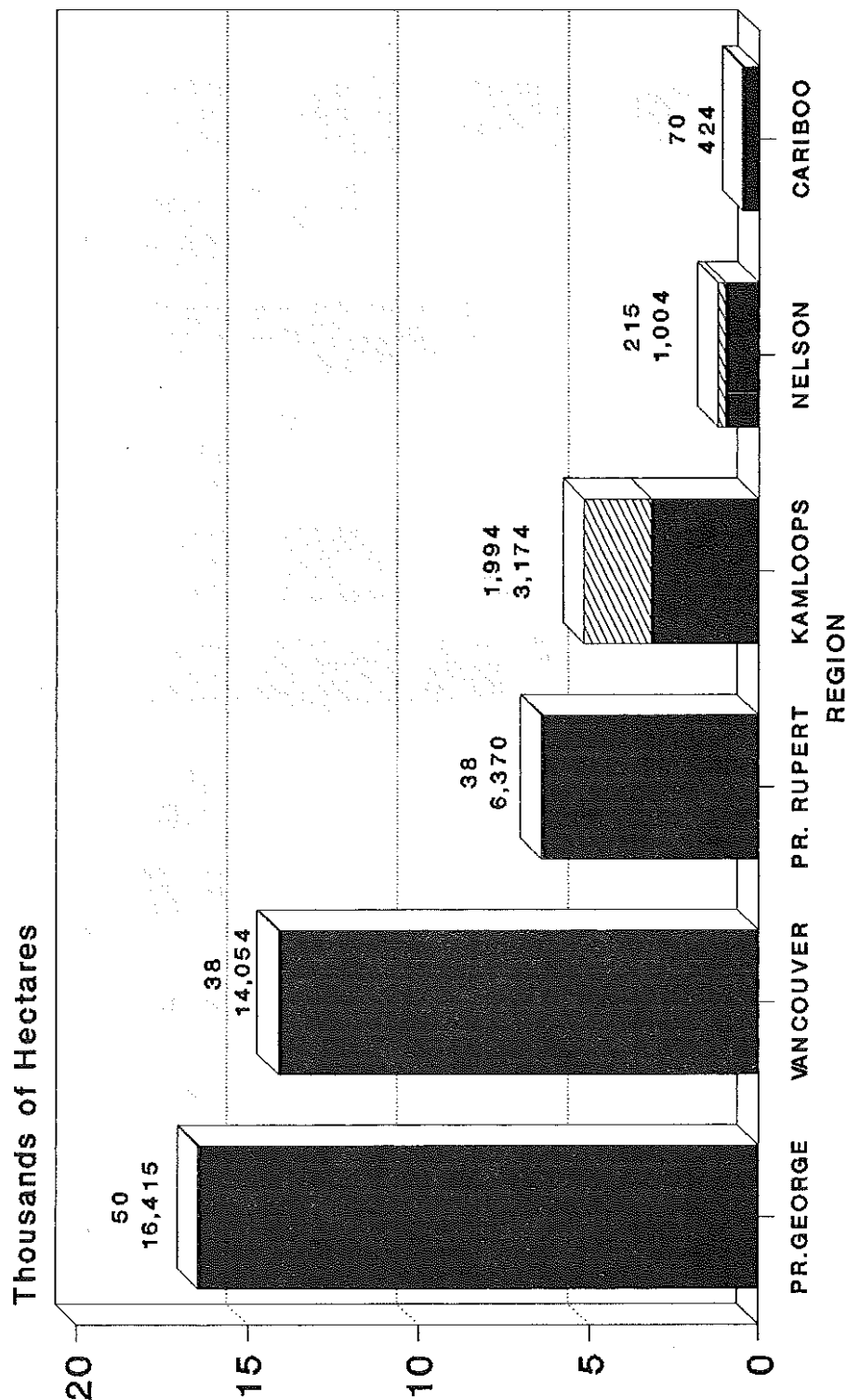
Source: CFS (FIDS) Prepared by P. Humphreys, Protection Branch, Victoria

PROVINCIAL SUMMARY OF AREA (ha) TREATED WITH PESTICIDES BY CONTROL PURPOSE, 1987¹



1 B.C. FOREST SERVICE & INDUSTRY COMBINED

AREA TREATED WITH PESTICIDES PROV. SUMMARY BY FOREST REGION 1987

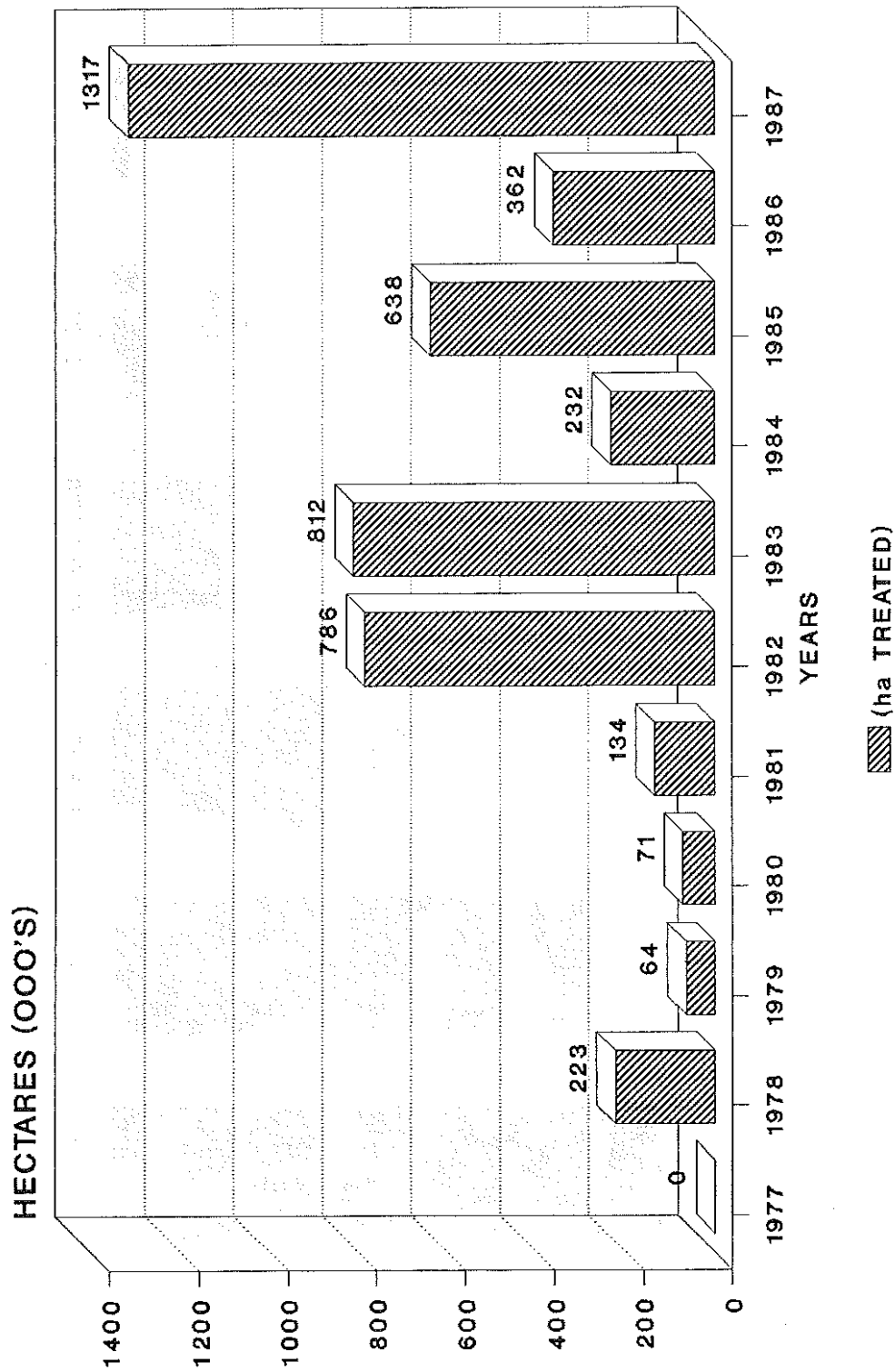


■ VEGETATION MANAG. ▨ INSECT, RANGE & OTHER

1 B.C. FOREST SERVICE IND. COMBINED

Prepared by P. Humphreys, Protection Branch, Victoria

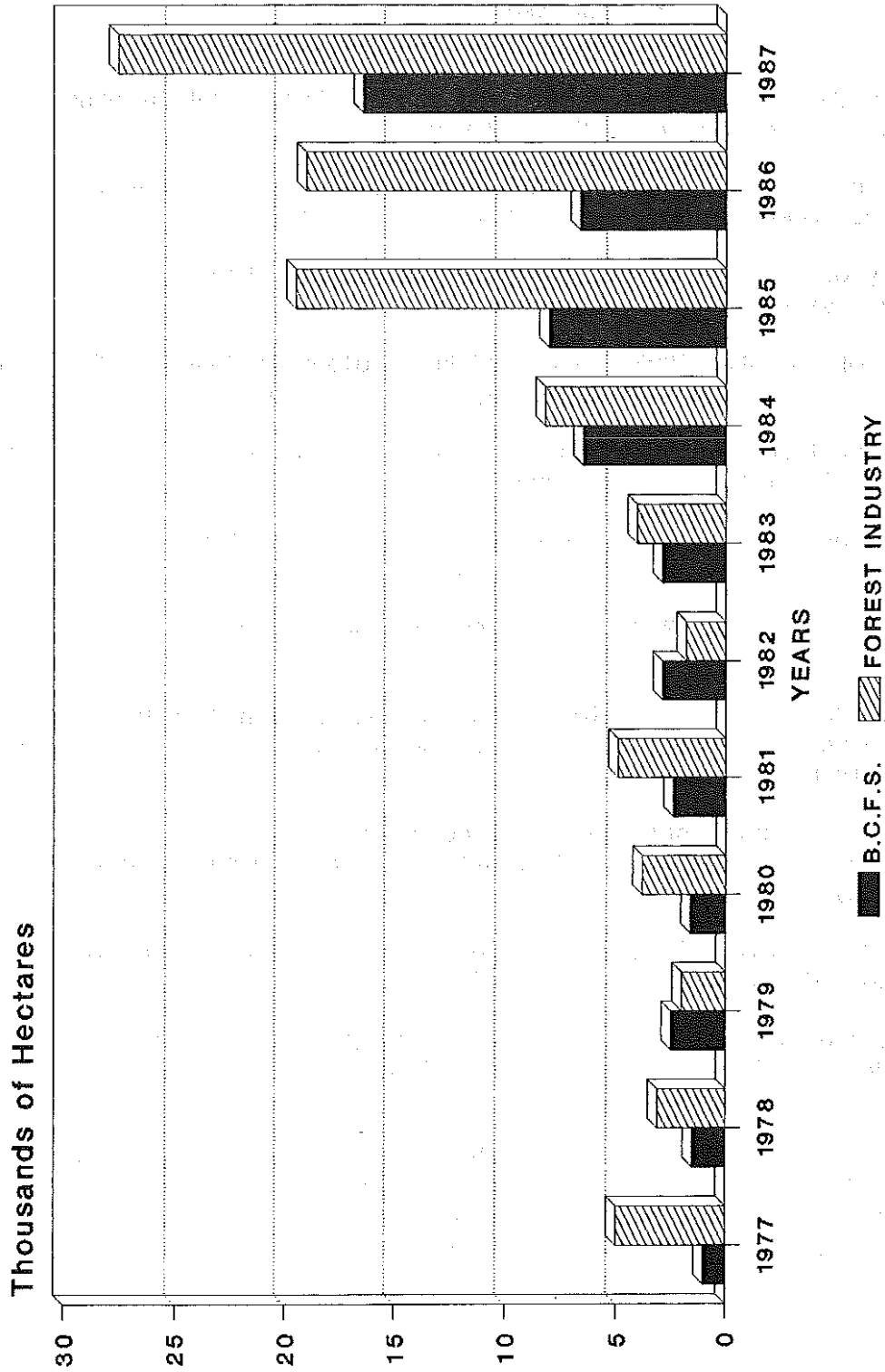
AREA TREATED WITH INSECTICIDES FOR FORESTRY PURPOSES 1977-1987 ¹



¹ B.C. FOREST SERVICE & IND. COMBINED

Prepared by P. Humphreys, Protection Branch, Victoria

AREA TREATED WITH HERBICIDES FOR FORESTRY PURPOSES 1977-1987



Prepared by P. Humphreys, Protection Branch, Victoria

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- B.C. Ministry of Forests. 1988. Insect Semiochemicals: Perfumes with a Purpose. Pestopic No. 12. Victoria, B.C., Revised.
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