



Province of
British Columbia
Ministry of
Forests

PEST MANAGEMENT PROGRESS

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



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"PMP" TO MEET LARGER READERSHIP DEMAND

This issue of "Pest Management Progress" has once again been prepared primarily for the information of colleagues and associates in British Columbia. However, the unexpected popularity of the first issue (ca. 325 copies), coupled with the hearty endorsement of the Ministry Executive, suggested our reports should be shared with friends in other provinces and states. Thus, we will expand circulation slightly and slowly abandon the "in-house only" approach of the first issue. But we do not intend to change the personal contribution style of the first issue. In fact, the personal touch and sincerity of our contributors are recognized as the key features which made the first issue so popular. Advisors and production staff join me in this statement of acknowledgement and appreciation.

Pest management, as a formal function of the Ministry of Forests, celebrated its second anniversary this summer. Those of us who joined in August and September of 1980 are convinced as much now as then that we are participants in an exciting and progressive period of British Columbia's forestry history.

- R.F. DeBoo, Protection Branch, Victoria

CONTENTS			
SUBJECT	PAGE NO.	SUBJECT	PAGE NO.
Pest Management, General	3	Pesticides	30
Forest Entomology	7	Personnel	34
Forest Pathology	22	Meetings	37
Forest Vegetation Mgmt.	26	Tabulations & Graphics	40
Range Pest Management	28	Publications & Reports	49

PEST MANAGEMENT PROGRESS

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Publisher's and Editor's Note:

To maintain the maximum input of information and opinion, authors of Pest Management Progress articles are being encouraged to give us the benefit of their knowledge and experience.

Pest Management Progress is intended to provide basic information on projects and proposals which may be of interest to colleagues and associates. Authors should be contacted for any further clarification as the contents of this report do not necessarily constitute official statements of the Ministry of Forests.

PEST MANAGEMENT GENERAL

Pest Management during Fiscal Restraint. It is extremely unfortunate but a fact of life that the vigorous development of some of our key pest management control programs coincided with a severe downturn in provincial revenue. This resulted in substantial budget reductions to our pest management control projects. We will continue to develop, with Executive approval, proposals and alternatives required for good pest management control projects.

In the meantime, every advantage and opportunity must be taken to promote pest management control programs which may qualify under any existing or new employment opportunities programs. We must also ensure to continue to plan and develop our programs with an optimistic outlook in order to be prepared for the economic recovery and improved budgets.

- H.G. Doerksen, Protection Branch, Victoria

Update on Pest Management Policy. After extensive review and several unexpected delays, revision of pest management policy is nicely underway once again. The master document - Pest Management Administration - will give particular attention to responsibilities and basic procedures. Separate policies will cover details pertaining to major pests, pesticides and other distinct elements of forest pest management. Circulation of both revised and new documents will start again during December.

- R.F. DeBoo, Protection Branch, Victoria

Pest Management Training. The second session of the "Advanced Pest Management" course was held at the Forest Service Training School in June. Instructor Norm Alexander spread the good word to about 50 students during the 2 segments of the course. Recent discussions with Forest Service staff and academic advisors suggest the need for a companion course on Forest Pesticides.

- R.F. DeBoo, Protection Branch, Victoria

Pest Management Guidelines. Three important chapters for the Ministry's Protection Manual have been developed and circulated for comment. Returns are being reviewed by John Muir who circulated mistletoe guidelines during the summer. Comments have been requested by Muir and Alex Molnar, authors of a portion of the Phellinus guidelines and a similar request has been issued by Peter Hall for the first sections of guidelines for major bark beetles. It is expected that these chapters will be revised and issued by spring, 1983.

- R.F. DeBoo, Protection Branch, Victoria

Pest Management Studies cover Broad Field. Several directed studies projects have been undertaken throughout the Prince George Region by district and regional staff members as part of the requirements of the Advanced Pest Management course offered at the Forest Service School.

General subject areas covered include effectiveness of the pheromone Frontalure on spruce beetle, site preparation techniques, pests of immature stands, various insecticides for trap tree treatment and a study concerning the western balsam bark beetle.

The Prince George East District was the location of a M.Sc. thesis project jointly sponsored by the region and Protection Branch. A graduate student working in the Faculty of Forestry at the University of British Columbia used low-level colour infra-red photography and normal colour photography to investigate methods of early detection of attack by spruce beetle in standing spruce trees. It is anticipated this work may lead to innovative methods of beetle detection and monitoring.

- R.S. Hodgkinson and R. Cozens, Prince George Region, Prince George

Pest Management Planning Specialist. Due to restraint measures, a Pest Management Planning Specialist has not yet been hired. Once employed, however, his major role will be to coordinate and implement pest management information aids.

- R.C. Sutton, Protection Branch, Victoria

Computer Applications. Several computer programs are being implemented to aid pest management staff, and computer access is now available for all branch and regional pest management personnel to the Hewlett-Packard micro-computers and the B.C. Systems Corporation mainframe, with support offered by the Protection Planning, Development, and Research Section.

Programs now being implemented on the IBM mainframe are as follows:

- a) Root Rot Survey Programs: In conjunction with the Vancouver Forest Region and PFCRC, a root-rot survey system (based on "A ground survey method for estimating loss caused by Phellinus weirii root rot," Bloomberg, Cumberbirch, and Wallis, 1980) has been implemented for regional use. It includes a data input program, the data analysis package and the root-rot modelling program. Vancouver Region will be actively testing and using the system during the fall of 1982.

- b) Spruce Beetle Susceptibility Model: This program, based on the publication "A computer program to calculate the susceptibility of spruce-fir stands to spruce beetle outbreaks," (Logan, Schmid, and Mehl, 1980), has been copied to the computer. The intention is to allow field staff the opportunity of evaluating the usefulness of such a tool and suggest areas for further development. Active use will likely be encouraged late in 1982.
- c) Mistletoe Models: In conjunction with calibration efforts of John Laut of Colorado, the LPMIST program described in "Simulating yields of managed, dwarf mistletoe-infected lodgepole pine stands," (Myers, Hawksworth, and Stewart, 1971) will be implemented for testing in December. With acceptance of the LPMIST program, subsequent models such as RMYLD ("RMYLD: Computation of yield tables for even-aged and two-storied stands," Edminster, 1978) will also be brought in.
- d) Timber Volume Calculator: A program to directly access inventory average volume line (AVL) formulae will be made available by November, 1982. It will allow regional staff to convert areas measured-off sketch maps to volumes of affected timber based on map label, region, and compartment, stand type, and affected species.

In addition to these mainframe developments, there are a number of useful packages for use on the regional Hewlett-Packard 85 personal computers, including:

- standard (Pac)
- basic training (Pac) (& supplement)
- basic statistics & data manipulation (Pac)
- general statistics (Pac)
- graphics presentations (Pac)
- surveying (Pac)
- regression analysis (Pac)
- financial decisions (Pac)
- linear programming (Pac)
- math (Pac)

In addition, the program offers capabilities for custom and personal programming.

(For further information and/or assistance, contact Dave Gilbert or Peter Fuglem at Protection Branch, Victoria, Tel. No. 387-5965).

- P. Fuglem, Protection Branch, Victoria

Initial Attack Experience Improves Capability. Most districts in the Cariboo Region, in attempting to maximize use of experience and dollars, are deploying

their initial fire attack crews under funding by fire management during the fire season and pest management during the winter and spring. This enables the districts to maintain economical and highly experienced crews for both fire and pest management.

- D. Doidge, Cariboo Forest Region, Williams Lake

Report Proposes Treatment of Lodgepole Pine Residual Stems and Patches on Clearcut Areas. Brian McNaughton, stand tending coordinator, proposes methods for dealing with the stems and patches left after clear-cutting an area. These proposals take into account damage caused by insects, diseases and rodents.

Specifically, a high density of residual and immature pine stems are being left standing in the forms of islands and peninsulas. These patches tend to act as infestation centers for a wide variety of insects, diseases and rodents which then spread into the newly established regeneration.

The paper defines a level of damage by a particular pest that would be either acceptable or unacceptable, depending on whether the stand is immature or non-merchantable.

Criteria for treatment decisions are very involved and depend on factors such as stand age, stand composition, residual patch size, stand stocking and many administration problems. For further information, contact Brian McNaughton at Cariboo Regional Headquarters (Telpak - 2,6 + 202).

- D. Doidge, Cariboo Forest Region, Williams Lake

Recreation Pest Contained. The Forest Service recreation site adjacent to Okanagan Lake, near Vernon, was infested with poison ivy. A permit to apply Amitrole-T on numerous spots over 3 ha was approved.

The area was treated July 6 and follow up indicated that this very nasty pest was successfully contained.

- R.E. Edward, Kamloops Forest Region, Kamloops

Public Enquiries. Each year, district and field offices, as well as the regional office, receive hundreds of calls from the public wanting to know what is damaging their trees and shrubs. Some form of aid was needed to enable field staff to diagnose the more common problems over the telephone as time was not available to investigate each enquiry in the field.

The result was the in-house publication "Pests of Ornamental Trees and Shrubs in the Kamloops Forest Region" by Cherri Campbell, pest management

specialist. This publication, along with a problem-solving questionnaire, has enabled district staff to provide a better, more efficient service to the public.

- R.D. Edward, Kamloops Forest Region, Kamloops

FOREST ENTOMOLOGY

Aerial Mapping Survey of Pest Problems. In 1982, the Cariboo Forest Region again conducted a comprehensive aerial sketch mapping survey of insect infestations in the region. The survey used the method developed by Stuart Taylor. The only modifications were use of colour copies of 1:40,000 maps. The survey is as accurate as possible, considering the difficulties - frequently weather and always navigation. All districts participated, some conducting their own flying program, as the Cariboo has developed trained and experienced observers throughout the region.

Problems: 1982

- a) Weather: Loss of approximately one month's flying time due to rain in July.
- b) Compilation: Area and volume calculations were very time consuming, and should be started as soon as the aerial sketch mapping begins. Three to five months work by two persons is required to survey infestations of the magnitude of those in the Cariboo.
- c) Funding: Approximately \$75,000, including \$50,000 for rental of aircraft and \$25,000 in wages.

The F.I.D.S., funded by the Cariboo Region, also conducts an overview sketch mapping survey of the region. This survey is used as a guide and also the F.I.D.S. ranger flies the parts which the Cariboo sketch mappers do not.

Inventory personnel in the region cooperate with pest management staff in the training and compilation aspects of the survey.

- D. Doidge, Cariboo Forest Region, Williams Lake

Pine Terminal Weevil Leader-clipping Project Trial. The Cariboo Region conducted a control project of pine terminal weevil (Pissodes terminalis) by leader clipping in July, 1982, to test the practicable and biological feasibility of controlling low-level Pissodes terminalis populations in lodgepole pine plantations by annual leader-clipping over a five-year period.

Two areas near Raven Lake, west of Williams Lake were selected for the trial. One area had 4.7 percent infestation level and the other had 2.8 percent weevil infestation. The area with 2.8 percent infestation level was clipped and the other left as a control. The two areas are approximately two kilometres apart and will be examined annually for the next four years, after which any new infested leaders in the clipped area will be removed.

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

Sampling System for Weevil Attack Incidence. After examination of several proposed sampling systems, pest management personnel in the Vancouver Region, in conjunction with S.J. Raine (under contract to the Forest Service) have developed a comprehensive sampling system for Pissodes strobi.

Extensive field testing (2 500 ha) in the summer of 1982 has demonstrated that the system is simple to conduct in the field, provides data for at least three successive years of infestation and accounts for the frequently "clumped" nature of P. strobi attacks in spruce plantations.

The system has potential application for other pests of second-growth stands. A forthcoming Pest Management Internal Report will provide a full description.

- P.M. Wood, Vancouver Forest Region, Vancouver

Sitka Spruce Plantation Surveys for Weevil Attack. As part of the program for developing weevil (Pissodes strobi) management strategies, 2 500 hectares of Sitka spruce plantations have been mapped and surveyed in the Vancouver Region this summer. The remaining 2 500 ha will be surveyed in 1983 with a comprehensive analysis of the data to follow.

- E.M.J. Jeklin, Vancouver Forest Region, Vancouver

Sampling Pissodes Strobi. During the summer, plantations in the southwestern area of the Prince Rupert Region were systematically sampled for weevil damage in collaboration with staff from Smithers and Terrace. The incidence of attack and tree stocking were key factors recorded during these intensive cruises. Data accumulated to date should permit preliminary assessment of parameters for the development of an improved sampling technique for this important pest.

- R.F. DeBoo, Protection Branch, Victoria

Leader Clipping for Control of Pissodes Weevil. Initiated in 1979, leader-clipping trials were continued on Vancouver Island in August, 1982 on 2 000 hectares by Tahsis Co. and Forest Service personnel.

A detailed analysis of the efficacy of the clipping program will be compiled on termination of the trials in October, 1983.

Preliminary results indicate an average cost of under \$30.00 per hectare and infestation rates of well under one percent per year. An interim report is forthcoming this winter.

- E.M.J. Jeklin, Vancouver Forest Region, Vancouver

Leader Weevil Repellent Trial, Aerial Detection Survey and Dispersal Study. A small study on the west coast of Vancouver Island was conducted to investigate the effects of pine-oil as a weevil (Pissodes strobi) repellent and to investigate the use of colour and infra-red aerial photographs as methods for detecting and surveying infestations.

Another small study also was established at the U.B.C. Research Forest to investigate the fall dispersal and overwintering pattern of newly emerged adult weevils marked with fluorescent dyes.

The pine oil study consisted of three treatments on thirty-one 100 m² plots on two study sites. The treatments were: (1) direct topical application; (2) five absorbent pads, treated with pine-oil, evenly spaced within the plots; (3) one absorbent pad placed in the centre of the plots.

The aerial photography study consisted of stereo pairs of photographs (scale = 1:1,200) of the established plots. The study plots will supply the ground truth information on current and past attacks for comparison with the interpretation of the aerial photographs.

The dispersal study consists of a series of strategically placed, sticky traps for intercepting released weevils marked with fluorescent powders. The study site is an isolated stand of Sitka spruce, surrounded by non-host species. Weevil movements are to be monitored, by night observations using a U.V. lamp, up to the end of December or until it appears that all weevils have chosen an overwintering site.

The study was funded and supported by the Vancouver Forest Region, in the form of a contract to the University of B.C. as a Section 88 research project for the Tahsis Company. The project was designed and conducted by U.B.C. researchers, J. McLean, J. Carlson and J. Hackett. Data are currently undergoing analysis and interpretation.

- J.A. Carlson, University of B.C., Vancouver

Root Collar Weevil. The root collar weevil (Hylobius warrenii) normally kills small groups of reproduction lodgepole pine in burns, in logging areas, or along roadsides.

In the Quesnel Forest District, areas of red-topped mature lodgepole were observed during aerial surveys and were presumed to have been killed by mountain pine beetle. Ground checks revealed that the trees were killed by Ips sp.; however, they were infested secondarily by Ips, with Hylobius warrenii being the primary attacker.

It was presumed these were isolated incidences; however, random checks revealed the weevil to be very common on collars of mature trees, and in 1982 a discoloured area of 250 hectares was noted from the air near Baker Creek, west of Quesnel. Ground checks once again confirmed Hylobius as the culprit, only this time the Ips had not attacked the weevil-damaged trees.

Hylobius is not a major damaging pest in mature lodgepole forests. However, the weevil adults live up to four years and could present a problem when the logged areas are being reforested.

- D. Doidge, Cariboo Forest Region, Williams Lake

Insect Pests in B.C. Forest Service Seedling Nurseries. A program to identify insect pests and develop control measures through biological studies was initiated for B.C. Forest Service seedling nurseries in May, 1981. This program was to operate in conjunction with the identification service provided by Jack Sutherland and Walter Lock at the Pacific Forest Research Center. In 1981, five coastal nurseries were covered, and by 1982, the program included all 10 Forest Service nurseries in the province.

Traps utilizing pheromone, light and the pitfall design were used to monitor insect populations. All nursery staff personnel were requested to watch for insects and damage, and to collect samples.

Forest nurseries are a unique cultural situation and have their own complex of pests. Several species of cutworms are reoccurring problems in the nurseries, some are specific pests of conifers, but most are general feeders. The greatest losses probably are due to the strawberry root weevil. Much of the girdling on second-year bare-root stock that had previously been blamed on mice and weevils is due to a pyralid moth - the cranberry girdler.

Two entomological findings of major interest are: (a) two species of aphids of the genus Aphis have been found on conifers for the first time and samples have been sent to the British Museum, (b) an infestation of the zebra caterpillar (Ceramica picta) previously unrecorded in British Columbia, samples of which have been sent to the National collection in Ottawa.

These new insect pests will be monitored.

- G.M. Shrimpton, Silviculture Branch, Surrey Nursery

Douglas-fir Tussock Moth 1982 Situation. A variety of activities dealing with the tussock moth problems were carried out during 1982. The following reports have been received:

(a) Kamloops Forest Region Activities, 1982

- (i) A small-scale operational trial was carried out on the effectiveness of three concentrations of Nuclear Polyhedrosis Virus (NPV) to control the Douglas-fir tussock moth in the Veasy Lake area north of Cache Creek. Preliminary results of this co-operative project (CFS, Region, Protection Branch) indicate the lowest concentration (6.25×10 PlB/acre) of NPV was just as effective as the highest concentration (10^{11} PlB/acre) of NPV in reducing tussock moth populations.
- (ii) Efficacy data was collected on the ground application of Sevin XLR (carbaryl), Ambush (permethrin) and Dipel 88 (*Bacillus thuringiensis*), in the Pritchard area of Kamloops District. Preliminary results indicate the following decreasing effectiveness ranking: Ambush, Sevin XLR and Dipel 88 from larval mortality data collected four days after pesticide application.
- (iii) Technical advice and monitoring were supplied by the Forest Service for an aerial spray program of 300 acres of the Neskainlith Indian Reserve numbers 1 and 2 for the DFTM using the carbamate compound Sevin-4-oil (carbaryl). Sevin-4-oil proved to be effective operationally at 2.25 l a.i/ha (1 gal/in. by an acre). Ninety-eight percent DFTM population mortality was obtained 6-day post spray on IR No.2 and a 13 day post spray on IR No.1. Defoliation estimates of the sample trees at IR No.1 and IR No.2 were 7.6% and 0.66%, 20 days after spray application.
- (iv) A small scale NPV virus dispersal project was carried out in the Pritchard area of Kamloops District. Indications are that an epidemic was established in the center ground spray plot. There appears to be dispersal of NPV up to 40 meters from the center plot four weeks after spray day.
- (v) Technical advice was provided for the control of DFTM in the Stemwinder and Bromley Rock campsites. The resulting larval mortality, using Orthene (acephate) 85% forest spray concentrate, was 96.6% at Stemwinder and 92% at Bromley Rock.
- (vi) Finally, the areas of the Hedley project treated in 1981 with NPV were found to contain very few tussock moths, confirming the effectiveness of NPV as a control agent.

- (vii) Currently underway is a DFTM fall egg mass survey program for the entire Region (see below). Data collected in this survey will be used planning control alternatives for 1983. Initiation of a DFTM survey to identify susceptible vegetation zones was scheduled for this fall.

- R. Chorney, Kamloops Forest Region, Kamloops
- P.M. Hall, Protection Branch, Victoria

- (b) Tussock Moth Fall Survey Training Program. Intensive one-day training sessions on how to conduct a fall egg mass survey for the Douglas-fir tussock moth were given to the six districts within the region that have this pest problem.

This training will enable the staff to carry out this essential survey to determine the extent of expected damage this coming year and provide the necessary information to plan our strategy to combat this pest in 1983.

- R.D. Edward, Kamloops Forest Region, Kamloops

- (c) Nelson Forest Region Infestation

- (i) An infestation of Douglas-fir tussock moth on 20 ha of the Christina Lake Golf Course resulted in moderate to severe defoliation of approximately 50 trees. Egg mass surveys done by the Forest Service prompted the owners of the golf course to undertake an aerial application of Orthene at the early instar stage. Despite the spray, larval mortality was minimal and defoliation resulted. The absence of spray cards makes the causes for the failure difficult to determine, but weather conditions and application rates are probable causes. A comprehensive ground survey project is underway in the Boundary Forest District to identify areas of concern.

- D. Gray, Nelson Forest Region, Nelson

- (d) Priorization Based on Stand Values

A project was initiated to measure all multiple-use forestry values lost in 1982, and projected losses for 1983, to the Douglas-fir Tussock Moth (DFTM) near Kamloops. Costs and benefits of control options for 1983 will be estimated and compared with forestry values at risk.

The objectives of this project are:

- to determine factual resource information as a basis for 1983 DFTM control plans;
- to determine the magnitude of timber and non-timber values at risk to the DFTM, and

- to apply the methodology developed to other insect and disease infestations in the Province.

- S.P. Taylor, Protection Branch, Victoria

Cone and Seed Insects. Single-tree injections of systemic insecticides for Douglas-fir cone and seed insect control were conducted at various sites. Data are being analyzed, but the need for further testing is indicated because of low insect populations at the selected test sites.

Treatment, using Mauget Injectors, took about 7 minutes for the average-size interior Douglas-fir seed tree.

- D. Summers, Silviculture Branch, Victoria

Western Spruce Budworm Guidelines. To improve forest management decisions on harvesting budworm-damaged stands, guidelines are being written for 1983 spring operations. Damage evaluation, stand dynamics, economic impacts, and stand management practices are some of the factors to be incorporated in the guidelines. Rene Alfaro, P.F.R.C., has assisted in providing information and data analysis for this undertaking.

- E.M.J. Jeklin, Vancouver Forest Region, Vancouver

Emergency Bark Beetle Program. Economic restraint has halted this program for the present. At the time of suspension, nearly \$8 million of the original total of \$11.4 million had been spent on bark beetle control projects. Technical audits on selected projects will continue to be carried out in the coming year.

- P.M. Hall, Protection Branch, Victoria

Semiochemicals for Mountain Pine Beetle. Dr. J. Borden (Simon Fraser University) conducted further mountain pine beetle pheromone research in the Prince Rupert, Kamloops, and Nelson Regions in cooperation with the Protection Branch and regional staff.

Chemicals were tested for attractiveness and stands were intensively baited to prevent the spread of mountain pine beetle to other, unknown areas. Good beetle aggregation was obtained when trans-verbenol + exo-brevicomin + myrcene were used. Results will be available in the near future.

- P.M. Hall, Protection Branch, Victoria
- V. Barge, Prince Rupert Forest Region, Smithers
- D. Gray, Nelson Forest Region, Nelson
- R.D. Edward, Kamloops Forest Region, Kamloops

Use of Colour Infrared (CIR) Photography for Spruce Beetle Detection. Dr. J. McLean and J. Churcher (University of British Columbia), in cooperation with Protection Branch and Prince George Forest Region, carried out a study to judge the feasibility of using large scale aerial CIR photography for early detection of spruce beetle infested trees. Photographs were taken in July, approximately three months after insect attack. Although there were fewer infested trees in the photo plots than hoped for, it should be possible to classify various stages of attacked trees. A full report is expected late this year or early in 1983.

- R. Cozens, Prince George Forest Region, Prince George
- P.M. Hall, Protection Branch, Victoria

Broadcast Burning for MPB Control. An exposed ridge, approximately 50 km north of Smithers, contained the largest (40 ha) attack centre on the leading edge of the major Harold Price Creek Mountain pine epidemic. The size and rough topography of the area precluded conventional beetle management techniques, (i.e. logging, fall and burn) so Bulkley District proposed using prescribed burning.

The core infestation (10 ha) was killed during the winter of 1981-1982. Fuel types on the hill also included windthrown spruce/pine/balsam and standing lodgepole pine. The burn was successful and beetle mortality in all but the standing fuel types was almost 100 percent. Costs were about \$36.00 per infested tree, compared to \$55.00 - \$75.00 per tree for conventional fall-burn treatments. This beetle management technique requires some further study, but the concept is sound and appears to have great potential.

- A.J. Stock and R.A. Gorley, Prince Rupert Forest Region, Smithers

Mountain Pine Beetle Log-hauling Ban. The Cariboo Forest Region instituted a ban on hauling infested lodgepole pine logs during the flight period of the mountain pine beetle. The ban, intended to reduce reinfestation, applied to roads along which the stands of lodgepole pine were deemed to be free of beetle infestation or in areas where there had been extensive control work.

Problems:

- (a) In the Cariboo Region, the 1982 beetle flight was longer than normal - probably due to a wet summer. For this reason, timing of the ban was not completely accurate.
- (b) Some licensees did not fully adhere to the restrictions. To rectify this problem will necessitate notifying each licensee of instructions pursuant to Section 125 of the Forest Act not to remove logs from the area on which they were cut. Although there were newspaper advertisements of the ban, these are considered to be information only and not an order in the legal sense.

An attempt to institute a more effective hauling ban will be made in the Cariboo Region in 1983.

- D. Doidge, Cariboo Forest Region, Williams Lake

Debarking "Tree Monkey" Prototype Tests. Stu Whitney, forest pathologist with the Canadian Forestry Service Pacific Forest Research Centre in Victoria, in cooperation with Pest Management personnel from B.C.'s Vancouver Forest Region, will be field-testing a prototype debarking "Tree Monkey" for control of the mountain pine beetle.

Originally of European design, a prototype suitable to B.C. requirements is being designed by P.F.R.C. and Forest Engineering Institute of Canada researchers.

Test areas proposed are in the Boston Bar and Squamish areas and there is keen anticipation of success based on cooperation by the regions and their districts involved.

- E.M.J. Jeklin, Vancouver Forest Region, Vancouver

MPB Satellite Imagery in the Cariboo. A joint project between the B.C. Ministry of Forests and the Canada Centre for Remote Sensing has been initiated to evaluate the feasibility of developing cost-effective procedures for detection and mapping of mountain pine beetle (Dendroctonus ponderosae) infestations using LANDSAT digital data.

Primary objective of the study is to determine the feasibility of developing procedures for mapping the extent, intensity and spread of infestations; for producing appropriate maps and statistics to be used in conjunction with existing techniques for estimating timber losses, and to aid in control measures.

Multi-phase sampling techniques are being used involving ground samples, 70 mm low-level colour photography, mid-scale colour and colour infrared photography, LANDSAT MSS (Multi-spectral scanner) data, and airborne MSS data.

Initial results have been promising, especially in detection of medium and high intensities of attack. Further refinements are being developed and results should be available in early 1983.

The project was initiated by Frank Hegyi, Director, Inventory Branch, and E.A. Godby, Director General, Canada Centre for Remote Sensing.

Participants include personnel from the Inventory and Protection Branches in Victoria, Inventory and Protection regional officer, the Pacific Forest Research Centre and the Canada Centre for Remote Sensing.

- R.V. Quenet, Inventory Branch, Victoria

Pest Management Rapattack 1982 Activities. To carry out pest management work in 1982, the Rapattack program got underway on March 1 - two months earlier than the usual start for the forest fire season.

The seven-man crew assigned to the pest management project concentrated on areas heavily infested by the mountain pine beetle and spruce beetle.

Activities included probe work, infested tree disposal, access, helipad construction, and spruce trap-tree felling.

The special capability of the rappel crews, operating from helicopters, provided access to infested areas extremely difficult for conventional ground crews to reach.

Rapattack '82 Pest Management Activities

Month	Helipads Built	Red Tops Felled	Green Infested Felled & Burned	Probes	Spruce Trap Trees Felled
March	13	15	60	13	214
April	24	14	17	9	369
May	11	80	20	3	0
August	1	0	4	0	0
Totals	49	109	101	25	583

- J.P. Dunlop and S.F. Westby, Protection Branch, Victoria

Bark Beetle Program Regional Roundup.

1. Kamloops Forest Region

- (a) Major Bridge Construction: Under the Emergency Pest Funding Program, a major bridge was constructed over the Pasayten River south of Princeton.

The bridge, designed and constructed by Ministry of Forests Engineering staff in Victoria and Kamloops, was completed in June 1982 and now provides access to large tracts of lodgepole pine that are threatened by the mountain pine beetle.

This is a permanent bridge with a life expectancy of 50 years, constructed with Glulam stringers providing a 33 m (109') clear span over the river. The cost of this project, including 1 km of road connecting with Hwy. 3, was \$280,000.00.

- R.D. Edward, Kamloops Forest Region, Kamloops

2. Prince George Forest Region

- (a) Forest Entomology - Control: Activities during the preceding six-month period included probing and detection activities for spruce beetle, continued aggressively until mid-August when they were severely curtailed due to budget cuts.

Since then, a skeleton crew has been probing throughout the region to determine harvesting priorities and trap-tree deployment for 1982-82 winter operations.

To date, excellent licensee co-operation has resulted in effective harvesting patterns.

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

- (b) Spruce Beetle Still Major Problem: Spruce beetle continues to be a significant pest, with the bulk of the infestation centred in the Prince George East Forest District.

There were heavy flights of the beetle in the southern half of that district which appear to have resulted in a coalescence of previous infestations.

Spruce beetle populations in the north half of the Prince George East, Prince George West, McBride and Fort St. James Districts appear to be either static or showing a slight increasing trend.

The Mackenzie District spruce beetle populations are in the static to slightly increasing stage and are being carefully monitored.

This year, the western portion of the Dawson Creek District showed evidence of spruce beetle attack. The infestations, while increasing, are relatively small at present and are generally able to be harvested as a control measure.

During the balance of the fiscal year, probing and detection programs will be based on F.I.D.S. mapping as a basis for development of harvesting schedules and operational trap-tree deployment.

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

Summary of Spruce Beetle Suppression with Felled Lethal Trap Trees in Prince George Forest Region.

(a) 1981 Herrick Creek

The arboricide Glowon^R (MSMA) was applied at the rate of 160 g/l to basal axe-frills on a total of 670 standing spruce in 72 locations along the Herrick Creek and its tributaries in May 1981. Trees were felled 2 weeks later, and were subsequently lethal to attacking spruce beetle. When assessed 3 months after treatment, Glowon^R had:

- i) reduced beetle gallery success by over 99%.
- ii) reduced main gallery lengths by 53%.
- iii) reduced larval success by 99%, and
- iv) killed at least 31% of parent adults which remained in treated trap trees.

Unfortunately, felled treated trap trees repelled 28% of attacking beetles from excavating entrance holes. Based on this, lower dosages of Glowon^R were recommended for testing in 1982.

Dursban-4E^R (2% A.I. in diesel oil) sprayed on untreated felled trap trees (checks) 5 months after beetle attack, fumigated 62-74% of parent adults and brood. It is assumed that if the high natural mortality of 26-30% had been lower, the Dursban would have killed a higher percentage of the beetles.

Spruce beetle attack densities in healthy standing spruce were 5.3 times higher and more severe in check areas of the drainage than in areas protected by felled lethal trap trees. Unfortunately, this could not be verified statistically because of the low level of spruce beetle attack density in the drainage in 1981.

(b) 1982 Herrick Creek

In the second year of the operational lethal trap tree program, a total of 480 standing spruce in 39 locations of the Herrick Creek and its tributaries were treated with Glowon^R (160 g/l) in May 1982. In addition, a research program was conducted at 5 other helispots where the replicated dosages included 80 g/l, 120 g/l, 160 g/l and checks.

Efficacy sampling occurred during August 30 - Sept. 3, 1982. One half of the untreated felled trap trees (checks) on the 5 research sites were sprayed with Dursban-4E on Sept. 20, 1982.

Probe line prism plots will be established in the drainage by mid-October, 1982.

Phloem samples from Glowon^R-treated and untreated trap trees from the 1981-82 projects are being analyzed for arsenic content by Dr. John McLean, Faculty of Forestry, University of B.C.

(c) Morkill River

At 3 sites along the lower Morkill River in the McBride Forest District, a total of 75 spruce were injected with Glowon^R at 160 g/l in early June 1982, and felled 2 weeks later.

(d) Additional Dursban^R Research

Bill Marshall (Regional Recreation Officer - Prince George Forest Region) recently completed a pest management project as a prerequisite for completing the Forest Service's course in "Advanced Pest Management" (Norm Alexander - Instructor).

The Marshall project was entitled "Comparative Efficacy of Dursban - 4E^R and Diesel Oil in Fumigating Spruce Beetle Adults and Brood in Spruce Bolts." The study revealed that there was no significant difference between Dursban-4E (2% A.I. in diesel oil) and diesel oil (alone) in fumigating spruce beetle parent adults and brood in 1 meter spruce bolts.

1983 Herrick Creek - (Future)

If adequate funding is available in 1983-84, the Prince George Forest Region hopes to complete final testing of the most effective dosage of Glowon^R for creating felled lethal trap trees for operational use against spruce beetle in B.C. Tentative plans also include injection and felling of lethal trap trees in the fall season - a strategy with promising logistical advantages which has not been tried in B.C.

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

Mountain Pine Beetle Limited Problem. The mountain pine beetle continues to be present in relatively low numbers in the Prince George Region. Populations generally are static throughout the region, with several new infestations being located. The western extreme of the Vanderhoof District now is showing some recent outbreaks - possibly resulting from an eastward migration of that beetle.

Douglas-fir beetle and western balsam bark beetle attacks have been noted throughout the region but are considered to be generally non-significant at this time.

Table III (attached): (See table section)

R. Hodgkinson and R. Cozens, Prince George Forest Region, Prince George

3. Nelson Forest Region. Pest management activities within the Nelson Region continue to focus primarily on control of mountain pine beetle and spruce beetle through cut and burn projects, sanitation logging and trap trees. Within Top-of-the-World Provincial Park, 580 lethal trap trees were felled over 125 ha in May to control a spruce beetle infestation. Initial sampling indicates a high mortality of attacking adults and a comprehensive sampling project in November will examine adult catches, adult and brood mortality and the number of newly infested standing spruce trees. Ground surveys revealed that a sizeable flight will occur in 1983 and a second trap tree program will be required.

- D. Gray, Nelson Forest Region, Nelson

4. Vancouver Forest Region.

- (a) The Manning District of the Parks and Outdoor Recreation Branch (Ministry of Lands, Parks and Housing) has completed a control project on 40 hectares of mountain pine beetle attack at Eastgate in Manning Park. More than 5,000 beetle-attacked lodgepole pine were removed and their low cut stumps debarked. This control procedure apparently has contributed greatly to reduce intensity and extent of the infestation.

A post-control survey, however, has found 252 currently attacked trees in the area, with a number of other attacked trees about two kilometres west of the Eastgate infestation. These trees will be removed prior to next year's beetle flight (July, 1983).

- D. Heppner, Vancouver Forest Region, Vancouver

- (b) To date, only two minor spruce beetle outbreaks have occurred in the Vancouver Region (Chilliwack District) and sanitation logging operations have been completed to remove them. Felling of trap trees in the early spring of 1982, appears to have improved containment and reduction of these infestations.

Minor mountain pine beetle outbreaks continue in the Chilliwack and Squamish Districts, mostly in non-commercial pine types. Sanitation harvesting is being planned for the few outbreaks that are merchantable and/or potentially hazardous to adjacent commercial stands.

- P.M. Wood, Vancouver Forest Region, Vancouver

5. Cariboo Forest Region:

Single-tree treatment of mountain pine beetle infestation includes felling and burning and is being conducted for the second year on three areas in an attempt to slow advance of the infestation.

The areas are located east of Williams Lake, 100 Mile House-Lac La Hache, and near Clinton. The results are encouraging as attacks did not increase in these areas during 1982.

- D. Doidge, Cariboo Forest Region, Williams Lake

FOREST PATHOLOGY

Mistletoe Appraisal Techniques. J. Laut, a forest pest management advisor under contract to the Protection Branch, is evaluating a mistletoe appraisal technique (LPMIST) for use in interior B.C. lodgepole pine stands.

The model should enable site-specific evaluation of tree growth with varying levels of mistletoe, site quality, density, and management options. Approximately 100 plots were established in 1982 to obtain tree and mistletoe data which will be evaluated soon. If extensive revisions of LPMIST are not necessary, we should have a workable technique by the summer of 1983 to evaluate control options and to conduct district surveys of mistletoe growth impact.

- J.A. Muir, Protection Branch, Victoria

Root rot Survey. A root rot survey has been scheduled in the Kamloops Forest Region. Preliminary work will focus on utilizing existing data as much as possible before a ground survey takes place.

Plans also will be made for a research survey to monitor planting of western larch on Armillaria infested sites.

- R. Chorney, Kamloops Forest Region, Kamloops

Mistletoe Control Demonstration Area. A suitable area was selected with Edward Wilford, pathologist for the Cariboo Region. Plots and treatment units were laid out. Because of budgetary restraints, Cariboo regional staff performed the thinning and sanitation treatments.

- J.A. Muir, Protection Branch, Victoria

Cariboo Mistletoe Control Programs Continue. Dwarf mistletoe control programs are continuing, due to the efforts of licensees. Employment Bridging Assistance Program and Forest Act Section 88 projects are treating 1 512 and 565 hectares, respectively, for a total of 2 077 hectares; easily the best yearly effort, but still far short of current harvesting rates. There remains a substantial area of infested backlog requiring treatment.

- Edward Wilford, Cariboo Forest Region, Williams Lake

Diseases in Areas Harvested by Faller's Selection. At the request of Kamloops regional and district staffs, an evaluation was made of several areas harvested by faller's selection. Phellinus root disease appeared to be a significant problem in several areas. Surveys of root-disease occurrence, and trials to determine resistant tree species, and suitable control techniques are needed.

- J.A. Muir, Protection Branch, Victoria

Mistletoe Aerial Detection. Surveys to delimit dwarf mistletoe-infected stands and to classify them for treatment are prerequisite to proper management. Methods are needed to survey and appraise dwarf mistletoe infestations. Ground survey methods have been developed which can accurately assess infestations for silvicultural control. These methods are time-consuming and are costly if applied to extensive areas. Aerial photography and other remote sensing methods have shown promise.

Black and white, colour, and false-colour infrared 70 mm stereograms of lodgepole pine in the Cariboo Region, at various scales, were examined. Although aerial photography does not appear feasible for inventory purposes, it could be useful for assessing the intensity of attack and subsequent treatment of individual stands.

A report will be published if funds are available for production of colour plates.

- R. Leduc, Inventory Branch, Victoria

Assessing Low-level Photography in Detecting Root-rot Disease Damage. This investigation is a joint project of the Inventory Branch and the Pacific Forest Research Centre. Four experimental plots, two near Cowichan Lake and two in the Greater Victoria watershed, were selected in Douglas-fir stands having distinct Phellinus weirii root-rot centres. Photographic aspects were evaluated to determine the most effective film-filter-scale combination for detecting and mapping infested areas.

On July 9, 1982, under clear sky conditions, the areas were photographed at flying heights of 110 m, 152 m, 305 m, 610 m, and 1 524 m using 70 mm photogrammetric cameras mounted on a helicopter boom. Plots were photographed twice: the first pass used colour film in both cameras, providing stereo pairs; the second pass exposed false-colour infrared film through magenta filters, also in stereo format.

The photographs are being assessed.

- S. Ilnytzky, Inventory Branch, Victoria

E.B.A.P. Spacing in Lodgepole Pine. Quesnel Forest Products has initiated an E.B.A.P. request to space lodgepole pine west of Quesnel in the Cariboo Forest Region. Examination of the area revealed three major rust problems: -- Endocronartium harknessii, Cronartium coleosporioides and Cronartium commandrae.

Because of these diseases, the region requested a limited survey to determine levels of infection before spacing. Quesnel District staff will train Quesnel Forest Products personnel in identification of the rusts and will conduct a random survey.

Follow-up surveys will be conducted after completion of the project.

- D. Doidge, Cariboo Forest Region, Williams Lake

Stump-pulling Trial for Control of *Phellinus weirii*. A trial stump-pulling operation was conducted in the Squamish Forest District in May, 1982. This operation was intentionally staged in difficult terrain typical of many coastal sites where Douglas-fir is predominant. Results and conclusions are given in a comprehensive report by Alan Blattler, Pest Management Assistant, Squamish District.

The report makes strong recommendations regarding: (a) stumping limitations in heavy slash accumulations, wet soils, stump size, and steep sites; (b) the importance of synchronizing stumping with the harvesting operation; and (c) feasibility of stump-pulling on difficult terrain.

This report will be released in the Pest Management Internal Report series.

- P.M. Wood, Vancouver Forest Region, Vancouver

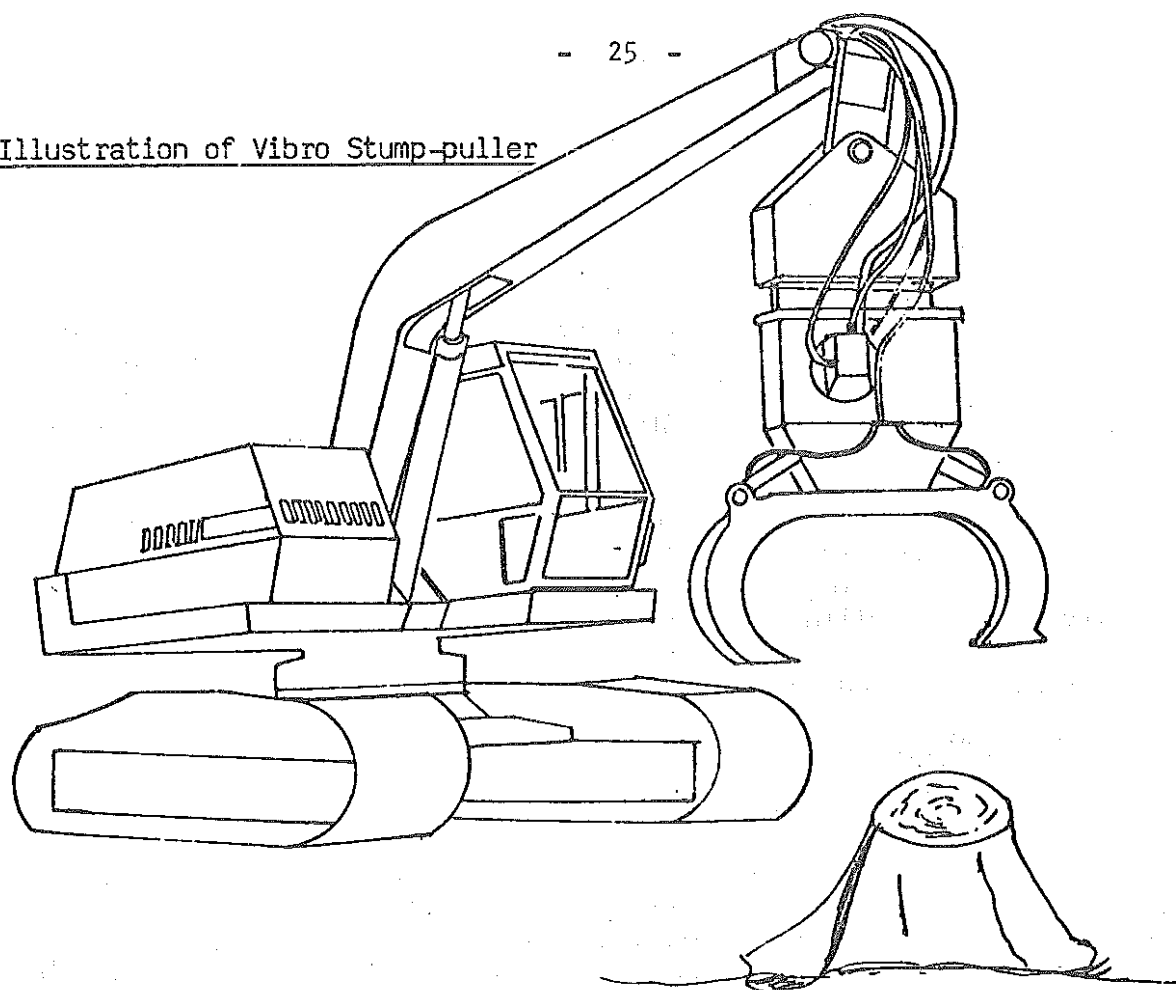
Proposal for Root-disease Control Trials Using Vibro Stump-puller Technique. A proposal to use the Vibro Stump-puller on treatment trials is being made to several Vancouver Forest Region districts. If approved, trials will be conducted in coastal, *Phellinus weirii*-infected second-growth stands in a variety of site and stand conditions. Interest in this type of treatment has been expressed by some licensees.

Further participation in this trial by other B.C. Forest Service regions and licensees would be useful for determining the efficacy and cost-effectiveness of this root-disease treatment technique.

Trial operations are being planned for August-September, 1983. An internal report is available on my assessment of the Vibro stump-puller as seen in action in south central Washington. (see following illustration).

- J.D. Beale, Vancouver Forest Region, Vancouver

Illustration of Vibro Stump-puller



Restraints Delay Root-disease Control Evaluations. Due to budget restraints, proposed root-disease control evaluation, reported in the previous issue of PMP, could not be initiated in 1982.

- D. Heppner, Vancouver Forest Region, Vancouver

Vancouver Region Root-disease Survey. The Vancouver Forest Region root-disease survey, reported in the May issue of PMP, is nearing completion with approximately 3 100 ha of field assessment completed by mid-October. Data are being filed for processing, and analysis should be well under way by this winter.

Protection Branch is transferring the Canadian Forestry Service root-rot analysis program to the B.C. Forest Service computer system.

Preliminary examination of the data shows an unexpectedly high number of Armillaria mellea infection centres. Phellinus weirii was, as expected, the predominant cause of disease in the Douglas-fir while Fomes annosus was a major pathogen of Hemlock.

- J.D. Beale, Vancouver Forest Region, Vancouver

VEGETATION MANAGEMENT

Coast and Interior Girdling Trials. Most juvenile spacing in British Columbia is done by chain saw. Rising equipment, fuel and maintenance costs, and concern for operator safety have fostered investigations into alternate spacing methods. Consequently, the potential of the North Star Tree Girdler, one option for spacing Coastal and Interior stands, was examined.

Based on a visual assessment of degree of needle browning, mortality, in all crown classes of all species treated, including Douglas-fir, western hemlock, lodgepole pine, and larch, was acceptable three years after girdling.

Most (87.5%) girdled red alder (near Gold River) were dead one year after treatment. Girdling has some advantages over the use of powersaws or chemicals. A report is available from Silviculture Branch.

- G.C. Ackerman, Silviculture Branch, Victoria

Trials and Equipment Development. Since 1974, the Silviculture Branch has tested various herbicides to determine their potential for brush control. In conjunction with the Engineering Branch, modified ground-spray application equipment is being developed, including ultra-low volume spray units and a herbicide lance.

Results (under SX numerical designations) are available on request. Current results of a few SX Trials are outlined below.

- J.R. Gilmour and G.C. Ackerman, Silviculture Branch, Victoria

Control Problems. Phase 1 of this task is nearly completed. Estimates of brush problems expected under the annual denudation (in the next five years) have been calculated for each Forest Region in the Province. Within each region, the magnitude of the problem has been identified for each district, biogeoclimatic subzone and forest inventory type.

If we have the resources, 14 441 hectares are expected to be brush-treated annually in B.C. for the next five years under the current rate of denudation.

There already are estimates of the extent of the problem in the backlog NSR, recently disturbed (current NSR), and NC Brush areas. Estimates, based on the good and medium site classes, indicate 864 049 ha may be involved.

The next phase will be calculation of the economic impact of non-treatment of these brush areas.

- J. Boateng, Silviculture Branch, Victoria

Major Weed Species and Associated Crop Species. From forest type and biogeoclimatic sub-zone information, a rough estimate will be provided on the major weed species and associated crop trees. We hope to check our list with people working in the areas involved.

- J. Boateng, Silviculture Branch, Victoria

Stem Rust Herbicide Control Tested. Five herbicides were tested in 1982 against the alternate host of stalactiform stem rust at the Red Rock seed orchards south of Prince George.

This rust affects the growth of lodgepole pine. Applications of 2,4-D, mecoprop, M.C.P.A., Roundup, and a combination of 2,4-D, mecoprop and dicamba all significantly reduced numbers of Indian paint brush (Castilleja sp.) in treated plots. Further monitoring will determine long-term effects.

These herbicides could be useful tools in pine seed orchards if rust infected Castilleja is a problem.

- D. Summers, Silviculture Branch, Victoria

Blue River Herbicide Trial. Roundup and Krenite were applied to woody and herbaceous vegetation, using conventional low volume sprayers (Knapsack) and the Ultra-low Volume (U.L.V.) sprayer. Two years after treatment, Roundup proved most successful in controlling vegetation at rates as low as 500 g a.i./ha (U.L.V. treatments).

Krenite is satisfactory at higher rates (e.g. 4800 g a.i./ha) than those tested but, compared to Roundup, is not cost-effective at that rate.

J.R. Gilmour and G.C. Ackerman, Silviculture Branch, Victoria

Salal Control Trials. The herbicides Roundup, Garlon and Tordon 22K were applied, at three rates, to determine efficacy and amounts necessary for control of salal on Coastal sites.

Five months after a May, 1982 treatment, all herbicides have had only a minor effect on salal (browning and leaf mottling) while displaying good control on other vegetation (salmonberry and Vaccinium spp.).

A final assessment is expected by June 1983.

- G.C. Ackerman, Silviculture Branch, Victoria

Herbicide-use Decisions. As of October 6, 1982, there have been 14 decisions on herbicide use in the Prince Rupert Forest Region. Status of these proposals is as follows:

Withdrawn	1	22.0 ha
Appealed	3	81.0 ha
Approved	3	92.9 ha
Completed	2	35.7 ha
Refused by Fed. Gov't.	1	30.0 ha
Refused by P.C.B.	4	<u>225.0 ha</u>
		485.7 ha

(Of the five permits refused, four were refused by the Provincial Pesticide Control Branch because the applications involved use of 2,4,5-T. The fifth permit was refused by the Federal Government because the application involved use of "Krenite.")

- J.R. Gilmour and G.C. Ackerman, Silviculture Branch, Victoria

RANGE PEST MANAGEMENT

Responsibilities in Knapweed Control. Responsibility of the Forest Service for proper range management extends over Crown range. Tenures on Crown range include grazing permits, grazing licenses and grazing leases.

The Forest Service has both administrative and management responsibility over grazing permits and licenses. In the case of grazing leases, while the Service has management responsibility, administrative responsibility rests with the Ministry of Lands, Parks and Housing.

To date, weed control on grazing leases and private land has been the responsibility of the rancher.

The Forest Service has hired personnel with applicators' licences to spray noxious weeds on Crown land - excluding grazing licences.

All knapweed spraying by government agencies is coordinated by the Knapweed Action Committee.

Knapweed control by chemical means is a containment program and is not considered a long-term solution. The biological control program requires long-term research to develop control agents for knapweed. Some significant success has been evident with this research program. An extended discussion of the biological control program will be given in a later issue.

It is important that ranchers become aware of knapweed control problems and contribute by making the participants in the Knapweed Action Program aware of opportunities for spraying on Crown range.

Extent of weed spraying by the Forest Service is shown in the following table. Weed control in general is a containment program and there are numerous sites covered by the reported acreage (data on sites is available). Through the Knapweed Action Committee the efforts of other Government agencies and other institutions are coordinated. The accelerated Knapweed program for the province approved by Cabinet in the Spring of 1981 has facilitated the distribution of chemicals to ranchers. The program includes equipment for distributing the chemical. For further information, contact E. Jenson - 387-6656 (Victoria).

Range Management Weed Spraying

Weed spraying by the Forest Service during Fiscal 1981/82
on Crown range under Licence and Permit Grazing Authorization¹

Weed Control

Species (ha)

<u>Region</u>	<u>Knapweed</u>	<u>Thistle</u>	<u>Other</u>	<u>Total Area (ha)</u>
Cariboo	20.3	9.5	4.5	34.3
Kamloops	265.3	0.0	0.0	265.3
Nelson	30.0	0.0	7.0	37.0
Prince George	0.0	64.0	216.0	280.0
Prince Rupert	0.0	0.0	0.0	0.0
Vancouver	0.0	0.0	0.0	0.0
Totals	315.6	73.5	227.5	616.6

(1) Source: 1981/82 Annual Report

- E.A. Jenson, Range Management Branch, Victoria

Cariboo Noxious Weed Control Program. The Cariboo Forest Region Range Section operated a noxious weed control program aimed at preventing spread as specified in the Weed Control Act.

The knapweed species are the principal targets, with lesser attention given to thistles, and the other noxious weeds. Picloram (Tordon 22K) is used on a spot treatment basis.

1982 Summary

Two spray crews operated within the region. One crew concentrated on the knapweed infestations south of Clinton. The other crew operated through the rest of the region.

Control appears to have been effective where implemented. However, decisions must be made concerning the use of picloram in relation to the extensiveness of infestations if the program is to have a significant impact on the spread of noxious weeds in the Cariboo.

The following table summarizes, by species, the area treated in 1982.

Area treated with picloram by species in the Cariboo Forest Region, 1982

Canada thistle	19.2 ha
diffuse knapweed	18.8 ha
Dalmation toadflax	7.1 ha
spotted knapweed	4.9 ha
bull thistle	2.2 ha
burdock	0.9 ha
Russian knapweed	0.8 ha
Houndstongue	0.7 ha
nodding thistle	0.6 ha
leafy spurge	0.6 ha

55.8 ha

G. Leroux, Cariboo Forest Region, Williams Lake

PESTICIDES

More Insecticide Control for Douglas-fir Tussock Moth. Additional insecticides will be available for control of the Douglas-fir tussock moth in the 1983 season.

Along with formulations of the insecticides, Orthene^R and Sevin^R, two additional insecticides including Ambush^R (permethrin) and nuclear polyhedrosis virus, (N.P.V.) probably will be available for operational use in 1983.

It is expected that formulations of Sevin and Orthene will be considered for both aerial and ground use to control the moth in fir trees of significant aesthetic value. Permethrin may be used to treat valuable trees using ground equipment. The virus, depending on its availability, will be applied or seeded to speed the collapse of the infestation but will not necessarily guarantee the protection of current foliage.

- J.F. Henigman, Protection Branch, Victoria

New Forestry Herbicides. Two new forestry herbicides probably will be available for use in 1983.

The herbicides Roundup^R and Velpar^R are expected to be registered in forestry woodlands for operational use in the 1983 season. This will be a most welcome relief to Silvicultural personnel responsible for brush control. The Protection Branch recommends that R.O. Silviculture personnel consider submitting pesticide-use permit applications for use of Roundup to control brush or grass for the 1983 season. While Velpar also is likely to be registered, it is recommended, in most cases, that operational trial projects be considered to more clearly assess the usefulness of this chemical new to B.C. forestry.

Development of brush control projects using these or other herbicides, should be considered and evaluated carefully. Individuals planning to supervise such projects should seek expert assistance and get a depth of experience. Pesticide applicator certification does not necessarily imply experience and competence.

- J.F. Henigman, Protection Branch, Victoria

Pesticide Storage Needs Upgrading. Pesticide storage facilities within some regions and districts are in need of upgrading.

A survey of pesticide storage facilities in Forest Service regions, including districts, has indicated a need for some upgrading. An action committee, composed of representatives from Protection, Silviculture, Technical Services, Range and Personnel Branches will address this issue in the near future.

Storage facilities must be secure against theft, fire, and spill contamination. Chemicals must be maintained above freezing. Personnel using the facilities must understand the potential hazards of pesticide concentrates, and have emergency shower and wash up facilities immediately available.

It is planned to establish Ministry guidelines as soon as possible for construction and maintenance of pesticide storage facilities.

- J.F. Henigman, Protection Branch, Victoria

MSMA Registration Expected for Spruce Beetle Control. As a result of field trials conducted by Robert Hodgkinson, Protection Entomologist at Prince George Forest Region, there now is effective information for application to Agriculture Canada for registration of MSMA insecticide (trade name Glowon^R) for spruce beetle control. This will complement the existing registration for pine beetle control.

MSMA should be used operationally in 1983 to kill spruce beetles infesting trap trees which have been set up to impede the spread of infestations in isolated forest areas.

- J.F. Henigman, Protection Branch, Victoria

Technical Audit of Herbicide Spray Completed. Following complaints to the Forest Service concerning a project involving aerial application of the herbicide 2,4-D ester, an internal technical audit of a spray project conducted near Pemberton was recently completed.

Assessment of this project should allow Forest Service officials to more accurately identify deficiencies and pitfalls currently hampering herbicide treatment projects.

Greater understanding of aerial spray technology and equipment, such as booms, nozzle, droplet sizes and spray height is particularly recommended.

- H.G. Doerksen and J.F. Henigman, Protection Branch, Victoria

Silviculture Herbicide Tests. Trials are specific to older lodgepole pine and are intended to define the lowest volume of injected herbicides, specifically MSMA and glyphosate, required to kill trees in the 10 cm d.b.h. class.

Results will help the Silviculture Branch determine calibration and capacity requirements of a proposed injector type lance. Fall MSMA injections are faster acting and reach higher mortality percentages sooner than identical rates of MSMA applied in the spring. A single injection of 2.5 ml product will eliminate 10 cm pine trees within 3 years, if the material is applied in the fall and kept intact within the stem.

Glyphosate consistently kills trees at rates lower than MSMA (between 11.0 - 2.5 ml) but, above 2.5 ml, differences level off when the herbicides are injected in the fall.

Spring treatments using glyphosate are much faster acting than any spring or fall MSMA injections.

- G.C. Ackerman and J.R. Gilmour, Silviculture Branch, Victoria

Registration Nearly Completed. Minor registration for woodlands use of dimethoate (Cygon 480^R) for spruce cone and seed insect control are almost completed.

Cyanamid Canada were to present the proposed label and their supporting documents to Agriculture Canada in October.

Dimethoate is the only insecticide registered for cone and seed insect control at this time and its use has been limited to Douglas-fir.

- D. Summers, Silviculture Branch, Victoria

Use of Frontalure and Sevin to Create Standing Lethal Spruce Trap-trees. Bryon Creek (near Fulton Lake) is undergoing severe spruce beetle attack but, because of the nature of the terrain, there are logging constraints along the creek. It was proposed that an attempt be made to reduce spruce beetle populations by using Frontalure, in combination with a spray of Sevin (WP), to attract and kill beetles. Northwood Pulp and Timber Ltd. agreed to the proposal and cooperated fully whenever necessary. Although data analyses is incomplete, two obvious conclusions can be made:

- (a) Sevin appears to be very effective in preventing establishment of beetles in treating standing trees.
- (b) These projects, which actually are "research", should not be designed with an "operational" objective, since they will not be cost effective.

- A.J. Stock, Prince Rupert Forest Region

PEST MANAGEMENT PERSONNEL
(Forest Service Personnel fully or mostly committed
to forest pest management activities)

Protection Branch

R.F. (Bob) DeBoo, Manager, Pest Management Victoria, 387-5965
P.M. (Peter) Hall, Forest Entomologist, Victoria, 387-5965
J.F. (John) Henigman, Pesticide Specialist, Victoria 387-5965
J.A. (John) Muir, Forest Pathologist, Victoria, 387-5965
Vacant, Pest Management Planning Specialist, Victoria 387-5965
D.W. (Doug) Ross, Acting Pest Management Forester, Victoria, 387-5965
S.P. (Stuart) Taylor, Pest Management Technician, Victoria, 387-5965
P. (Pat) Humphreys, Pest Management Technician, Victoria, 387-5965

Silviculture Branch

D. (Don) Summers, Seed Production Pest Management Officer, Victoria, 387-1191
J. (Jacob) Boateng, Brushing and Weeding Specialist, Victoria, 387-1191
G.M. (Gwen) Shrimpton, Nursery Pest Biologist, Surrey Nursery, 576-9161

Inventory Branch (partial involvement)

D.M. (Doug) Fligg, Manager, Depletion and Update, Victoria, 387-1345
B.M. (Brian) Hall, Depletion Officer, Victoria, 387-1814
J. (John) Kiss, Decay and Waste Officer, Victoria, 387-6729
S. (Steve) Ilnytzky, Depletion Coordinator, Victoria, 387-1814
R. (Ray) Leduc, Depletion Coordinator, Victoria, 387-5436
R.E. (Rick) Woods, Depletion Coordinator, Victoria, 387-1814
K.S. (Ken) Richardson, Decay and Waste Coordinator, Victoria, 387-6729
L.E. (Lloyd) Wilson, Decay and Waste Coordinator, Victoria, 387-6729

Cariboo Forest Region

D.F. (Don) Doidge, Pest Management Coordinator, Williams Lake, 398-7121
E.H. (Ted) Wilford, Forest Pathologist, Williams Lake, 398-7121
M. (Mark) Hamm, Pest Management Technician, Williams Lake, 398-7121
R.M. (Ralph) Kossinn, District Pest Management Coordinator, Quesnel, 992-2147
A.A. (Alex) Wallach, Pest Management Technician, Williams Lake, 398-7121
D.R. (Derek) Poole, Pest Management Technician, Horsefly, 620-3327
K.J. (Kevin) Lukes, Pest Management Technician, 100 Mile House, 395-3844
J.D. (Dave) Peterson, Pest Management Technician, Alexis Creek, 394-4215

Kamloops Forest Region

R.D. (Ron) Edward, Pest Management Coordinator, Kamloops, 374-7741
R.J. (Rick) Chorney, Forest Entomologist, Kamloops, 374-7741
L. (Laurie) Friskie, Specialist, Tussock Moth Field Investigations, Kamloops, 374-7741

J. (Janna) Kumi, Forest Pathologist, Kamloops, 374-7741
T. (Tom) Lacey, Resource Officer, Protection, Merritt, 378-6171
E. (Eric) Haupt, Pest Management Officer, Protection, Merritt, 378-6171
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J. (Jim) Paynter, Pest Management Technician, Penticton, 492-8721
M. (Monika) Fuchs, Pest Management Technician, Princeton, 295-6988
K. (Ken) Brewster, Pest Management Technician, Princeton, 295-6988
E. (Earl) Holly, Pest Management Technician, Lillooet, 256-7531

Nelson Forest Region

E. (Ernie) Morris, Pest Management Coordinator, Nelson, 354-4181
D. (Dave) Gray, Forest Entomologist, Nelson, 354-4181
D. (Steve) Byford, Pest Management Officer, Cranbrook, 426-3391
D. (Dunc) Hamilton, Pest Management Officer, Invermere, 342-9257
L. (Larry) Price, Pest Management Officer, Golden, 344-5991
A. (Archie) McConnachie, Pest Management Officer, Revelstoke, 837-6111
D. (Doug) Fellman, Pest Management Officer, Arrow, 365-8402
L. (Larry) Larsen, Pest Management Officer, Boundary, 442-2766
K. (Ken) Jardany, Pest Management Officer, Kootenay Lake, Creston, 428-2030

Prince George Forest Region

R.D. (Russ) Cozens, Pest Management Coordinator, Prince George, 564-0778
R.S. (Bob) Hodgkinson, Forest Entomologist, Prince George, 564-0778
D.J. (Duke) Sample, Pest Management Technician, Prince George, 564-0778

Prince Rupert Forest Region

V.G. (Vern) Barge, Pest Management Coordinator, Smithers, 847-4511
A.J. (Art) Stock, Forest Entomologist, Smithers, 847-4511
R.P. (Bob) Rowsell, Bark Beetle Field Specialist, Smithers, 847-4511
W.F. (Bill) Davidson, Protection Resource Officer, Burns Lake, 692-7515
A. (Al) Hunter, Protection Resource Officer, Houston, 845-7712
D. (Dave) Nelson, Protection Resource Officer, Smithers, 847-2631
N.J.L. (Nils) Andersson, Protection Resource Officer, Hazelton, 842-6581
J. (Joe) Katasanoff, Protection Resource Officer, Terrace, 638-8541
W.T.S. (Bill) Jackson, Protection Resource Officer, Prince Rupert, 624-6848
D.E. (Denis) Tippie, Protection Resource Officer, Bella Coola, 799-5352
K. (Ken) Brahniuk, Protection Resource Officer, Queen Charlotte City, 559-4476
W.D. (Bill) Harvie, Protection Resource Officer, Dease Lake, 771-4141

Vancouver Forest Region

P. (Paul) Wood, Pest Management Coordinator, Vancouver 299-9151
J.D. (Jeff) Beale, Forest Pathologist, Vancouver, 299-9151
E.M.J. (Eric) Jeklin, Pest Management Forester (Entomology), Vancouver, 299-9151

D.G. (Don) Heppner, Pest Management Assistant, Vancouver, 299-9151
S. (Stuart) Haywood-Farmer, Pest Management Resource Assistant, Chilliwack,
792-8664
L. (Lance) Mitchell, Protection Resource Assistant, Squamish, 898-9671
R. (Ron) Diprose, Protection Resource Assistant, Powell River, 485-9831
W. (Bill) Loughheed, Pest Management Resource Assistant, Duncan, 746-5123
D. (Doug) Harris, Pest Management Resource Assistant, Campbell River, 287-2194
R. (Rob) Furness, Protection Resource Assistant, Sechelt, 885-5174

MEETINGS

Cariboo Region Management Tour. To promote better understanding of pest, silvicultural and research field problems, a management team field tour was conducted in July.

Members of the team making the tour included the regional manager, finance and administration manager, forestry manager, district managers, timber officers, silviculture officer, research officer and other experts such as the pest management coordinator, regional pathologist, stand tending coordinator and a silviculture resource officer.

Theme of the tour was "Forestry", stressing how to maximize the application of real forestry instead of the deadly game of paper forestry.

The tour was very well received by the "team" and the problems encountered by field personnel now are better appreciated.

- D. Doidge, Cariboo Forest Region, Williams Lake

"Competitors in our Forests". The silent service speaks up. During the last week of October, news media presentations were held in Kamloops and Kelowna. Representatives from local newspapers, the Vancouver Sun, television, as well as two foresters from Crown Zellerbach Ltd. were in attendance.

The object of these information sessions was to highlight some of the major insect and disease pests in the Kamloops Forest Region. Emphasis was placed on the mountain pine and spruce beetles as well as mistletoes and root rots. The presentation commenced with a slide show on some common pest problems and then focused on the mountain pine beetle and mistletoes. A question and answer period took place followed by a field session.

The reporters were all impressed with the magnitude, diversity and complexity of our forest management problems in dealing with insects and disease. In order for them to assimilate all the information, they were supplied with press kits containing information sheets, photos and names of Forest Service personnel.

Media coverage at time of writing was encouraging. A very favourable and thorough television story appeared on the news the following day and was scheduled for rebroadcasting some days later. Several newspapers also presented articles. It is as yet too early to fully assess our impact, but initial response has been very good.

- R.D. Edward, Kamloops Forest Region, Kamloops

Ad Hoc Committee on Forest Pesticides.

March, 1982: All members remain satisfied with their position papers on the use of pesticides in forestry. The I.W.A. is now a member of the Committee, being represented by Clay Perry.

June, 1982: The terms of reference for the Committee were agreed to. The purpose of the Committee is to provide an informal forum for members to discuss problems, make recommendations and suggest solutions to forest pesticide issues and to allow members to exchange information on forest pesticide use and regulation.

October, 1982: A discussion of pesticide use and, in particular, public involvement and land use occurred with the Committee members and Mr. R. Nixon of Greenpeace. A greater involvement with the public appears necessary to help resolve the conflict over pesticide use.

Canadian Council of Resource and Environment Ministers' Task Force on Pesticides in Forestry

September, 1982: A review of the pesticide registration priority list suggests that needed pesticides are becoming available to forestry. Orthene (acephate) and Sevin (carbaryl) should be available for use against the Douglas-fir tussock moth and Roundup (glyphosate) and Velpar (hexazinone) herbicides have been designated as priorities for registration in 1983.

Forest Pest Review Committee:

March 1982: During this field trip meeting in Smithers, the Committee was shown examples of spruce and Dryocoetes beetle damage in spruce and fir. Salvage logging and trap tree projects were also reviewed. Salvaged beetle killed logs present a milling problem to sawmills because of wood checking and low wood moisture content.

July, 1982: This special meeting of the F.P.R.C. in Duncan was held to discuss forestry pesticides with Ottawa representatives of Agriculture Canada and the Department of Health and Welfare. The meeting was attended by several of the B.C. forestry company chief foresters. A greater understanding of the needs and concerns of both B.C. and Ottawa was achieved.

B.C. Pesticide Control Committee

June, 1982: Issues reviewed which were of interest to forestry included the rescheduling of 2,4,5-T, federal research permits, captan, 2,4-D use in Powell River and MSMA relating to environmental concerns.

September, 1982: Issues reviewed which were of interest to forestry included more on 2,4,5-T, federal research permits and MSMA as well as a review of the Douglas-fir tussock moth, Krenite, pesticide free zones, wildlife habitat in Pall Burn herbicide treatments and the forestry aerial spray at Pemberton.

Weed Advisory Committee:

April and October, 1982: This committee, composed of agriculture, forestry, industry and academia, has been reactivated in order to help develop use pattern information for herbicides and to develop weed control methodology in general for B.C. Recommendations for weed control in the various disciplines should be forthcoming in 1983.

B.C. Plant Protection Advisory Council:

February, 1982: An emergency meeting was held to develop recommendations for the hemlock seedling blight. John Muir chaired the sub-committee on this issue.

March, 1982: At this regular meeting, the hemlock seedling blight and nursery seedling certification were discussed.

September, 1982: An emergency meeting also discussed gypsy moth detection.

November, 1982: At this regular meeting, the results of the gypsy moth detection were presented. Lumber exports and certification was also discussed.

Western International Forest Disease Conference:

September, 1982: The annual meeting was held at Stanford University camp at Lake Tahoe, California; several topics of interest to forest pathologists in B.C. were on the agenda and will be included in the forthcoming proceedings.

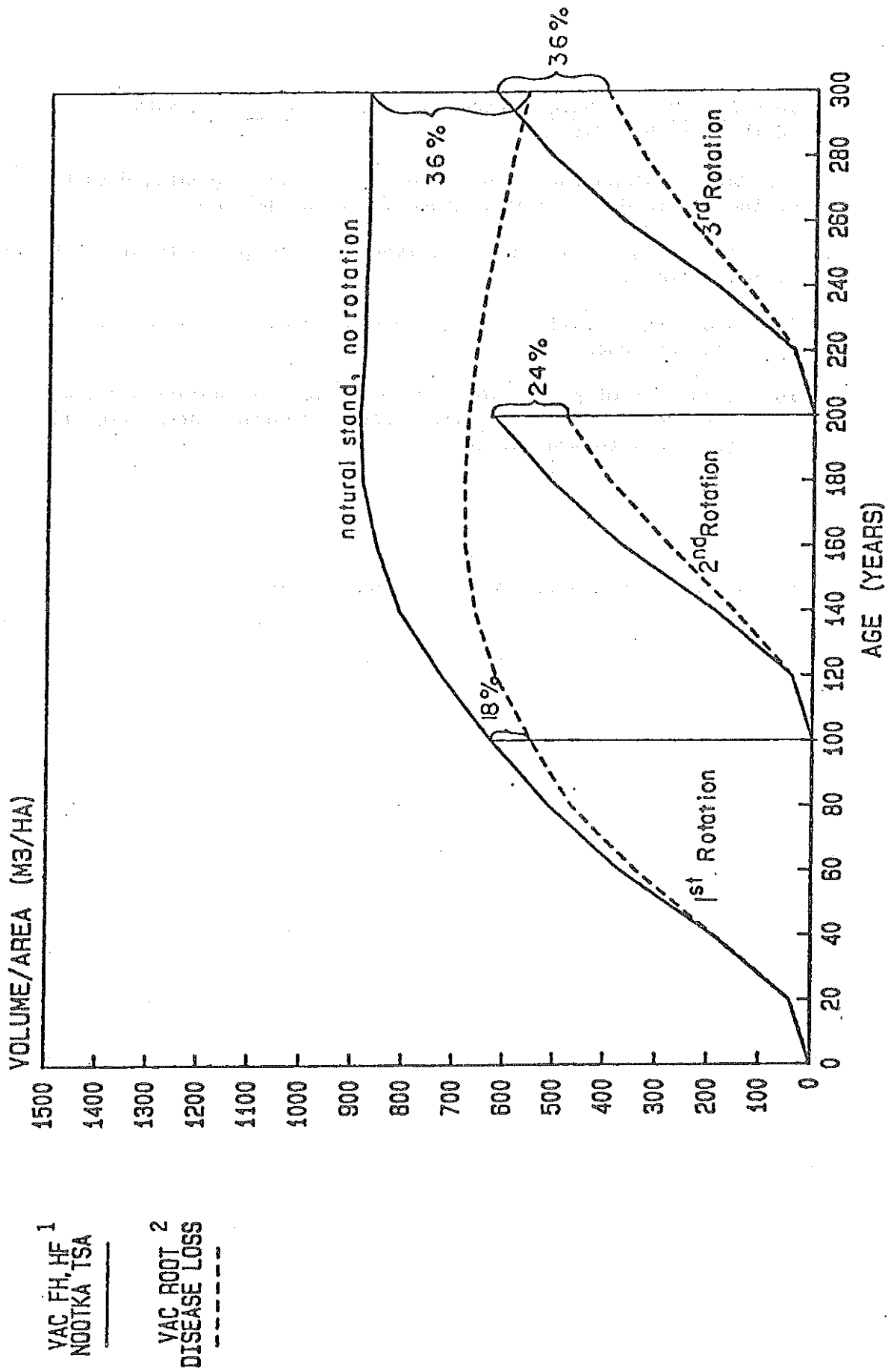
Annual Canadian Pest Control Forum:

November, 1982: Will be held in Ottawa and will involve a review of pest control activities across Canada. Eastern spruce budworm control will, no doubt, occupy much of the agenda.

Western Forest Insect Work Conference:

March, 1982 Was held in Montana and involved discussion of various topics on forest insect pest control including management and current research. The next meeting will be in March, 1983.

VOLUME/AGE CURVE ESTIMATED LOSSES TO ROOT DISEASE



1. Volume over age curve, FH, HF, Nootka T.S.A., Planning Branch, B.C.M.F.
2. Preliminary volume over age curve, as above, minus root disease losses as estimated from Root Disease Analysis Surveys, Vancouver Forest Region, Pest Mgmt., 1982. (See Pest Mgmt. Progress Vol 1.1, p.12, May 1982)

THE VOLUME OVER AGE CURVE DEMONSTRATING THE ESTIMATED LOSSES TO ROOT DISEASE
ARE DERIVED AS FOLLOWS:

1. The Natural Stand VAC is produced from the MOF Planning data base of the combined FH, HF type groups, T.S.A. specific.
2. The Root Disease Loss VAC is derived from the products of the below listed factors.
 - (a) preliminary estimate of the proportion of the stands infected by root diseases.
 - (b) areas out of production were based on extrapolation estimates by researchers at the Pacific Forest Research Centre, Victoria, (personal communication).

- J.D. Beale, Vancouver Forest Region, Vancouver

TABLE 1. PEST MANAGEMENT AIRCRAFT UTILIZATION, 1982
(Prepared by I.A. Morrison and S.P. Taylor, Protection Branch, Victoria,
with the Collaboration of Regional Air Coordinators)

	Vancouver			Prince Rupert			Prince George			Kamloops		
	Fixed Wing Hrs	Rotary Hrs	Wing Cost	Fixed Wing Hrs	Rotary Hrs	Wing Cost	Fixed Wing Hrs	Rotary Hrs	Wing Cost	Fixed Wing Hrs	Rotary Hrs	Wing Cost
Pesticide Application												
Insecticide	-	-	-	-	-	-	-	-	-	4	-	1,075
Herbicide	20	5,630	36	18,360	-	-	-	-	-	-	-	-
Forest Pest Surveys	17	3,790	19	9,420	-	-	10	2,190	6	2,956	70	3,470
General Reconnaissance	-	-	-	-	45	10,950	6	1,260	1	318	9	1,560
Beetle Operations	-	-	-	43	10,025	255	54,590	11	2,500	32	45,230	-
TOTAL	37	9,420	55	27,780	48	10,978	27	5,950	89	48,504	83	6,105
											15	6,870

TABLE 1. (continued) PEST MANAGEMENT AIRCRAFT UTILIZATION, 1982
(Prepared by I.A. Morrison and S.P. Taylor, Protection Branch, Victoria,
with the Collaboration of Regional Air Coordinators)

Pesticide Application	Nelson				Cariboo				Total (Province)			
	Fixed Wing		Rotary Wing		Fixed Wing		Rotary Wing		Fixed Wing		Rotary Wing	
	Hrs	Cost	Hrs	Cost	Hrs	Cost	Hrs	Cost	Hrs	Cost	Hrs	Cost
Insecticide	-	-	-	-	-	-	-	-	4	1,075	-	-
Herbicide	-	-	-	-	-	-	-	-	20	5,630	36	18,360
Forest Pest Surveys	13	1,575	6	2,730	327	35,710	26	11,400	437	46,735	71	32,996
General Reconnaissance	40	5,525	82	34,000	11	1,115	3	1,420	71	10,413	132	47,068
Beetle Operations	-	-	36	15,500	3	687	16	6,990	57	13,212	389	122,360
TOTAL	53	7,100	124	52,280	351	37,512	45	19,810	589	77,065	628	220,784

TABLE 11. CONTROL OF SPRUCE AND MOUNTAIN PINE BEETLE - KAMLOOPS REGION*
JANUARY - OCTOBER 1982

	DISTRICT							
	Kamloops	Clearwater	Merritt	Lillooet	Penticton	Vernon	Salmon Arm	Totals
<u>Control</u>								
(1) Harvesting (Infestations) ¹								
Area Infested	1,060	1,477	N/A	1,300	30,550	730	530	35,647 ha
Area Harvested	325	277	210	65	970	326	515	2,688 ha
Area to be Harvested	220	500	N/A	125	1,700	N/A	15	2,560 ha
Area lost - inaccessible	Nil	700	N/A	1,401	27,380	20	Nil	29,710 ha
(2) Volume (Infestations) ²								
Harvested	46,350	70,000	4,952	19,000	291,000	122,000	153,380	706,682m ³
Lost	Nil	65,000	Minor	205,000	2,936,698	5,000	Nil	3,211,698m ³

¹ Area in hectares $2 \text{ Volume in cubic metres}$

N/A Not available (Data being compiled)

*The data represented here are estimates.

TABLE III. Control of Dendroctonus Beetles - Prince George Forest Region
(prepared by R.S. Hodgkinson and R. Cozens, Prince George Forest Region, Prince George)

Forest District

	P.G. West	P.G. East	McBride	Vanderhoof	Ft. St. James
Area Infested (ha)	4,500	47,000	3,500	40	8,505
Volume Infested (m ³)	1,282,500	12,000,000	471,000	1,000	2,723,120
Area Harvested (ha)	1,600	9,000	125	Nil	925
Volume Harvested (m ³)	456,000	2,700,000	24,000		296,600
Area Planned for Harvest (ha)	560	11,500	50	Nil	2,230
1 yr	560	11,000	400		3,130
2 yr	560	11,000	400		1,220
3 yr					
Volume Planned for Harvest (m ³)	168,000	3,500,000	10,500		713,920
1 yr	168,000	3,345,000	66,500		1,001,600
2 yr	168,000	3,345,000	66,500		391,000
3 yr					
Area "Lost" (ha)	600	4,500	400	Nil	1,000
Volume "Lost" (m ³)	180,000	1,350,000	53,000		320,000
Trap Trees 1981/82**					
Locations	15	161	15	Nil	25
Volume (m ³)	1,980	6,700	2,100		2,730
Trap Trees 1982/83**					
Proposed Locations	3	133	13	4	Nil
Volume (m ³)	400	6,500	2,100	250	

**Includes Regional Lethal Trap Trees

TABLE III. (continued) Control of Dendroctonus Beetles - Prince George Forest Region)
(prepared by R.S. Hodgkinson and R. Cozens, Prince George Forest Region, Prince George)

Forest District					
	Mackenzie	Dawson Creek	Ft. St. John	Ft. Nelson	Totals All Districts
Area Infested (ha)	2,750	3,720	Nil	Nil	70,015
Volume Infested (m ³)	783,000	934,000			18,194,620
Area Harvested (ha)	370	260	Nil	Nil	12,280
Volume Harvested (m ³)	129,500	69,000			3,675,100
Area Planned for Harvest (ha)	450	1,310	Nil	Nil	16,100
1 yr	840	1,610			17,540
2 yr	325	800			14,305
3 yr					
Volume Planned for Harvest (m ³)	130,500	428,600			4,951,520
1 yr	243,600	385,100			5,209,800
2 yr	94,250	120,000			4,184,750
3 yr					
Area "Lost" (ha)	170	722	Nil	Nil	7,392
Volume "Lost" (m ³)	49,300	166,700			2,119,000
Trap Trees 1981/82**					
Locations	3	37	Nil	Nil	256
Volume (m ³)	1,250	2,000			16,760
Trap Trees 1982/83**					
Proposed Locations	10	70	Nil	Nil	233
Volume (m ³)	4,100	3,000			16,350

**Includes Regional Lethal Trap Trees

TABLE IV FOREST HERBICIDE APPLICATION IN BRITISH COLUMBIA:
NUMBER OF HECTARES TREATED 1979-81

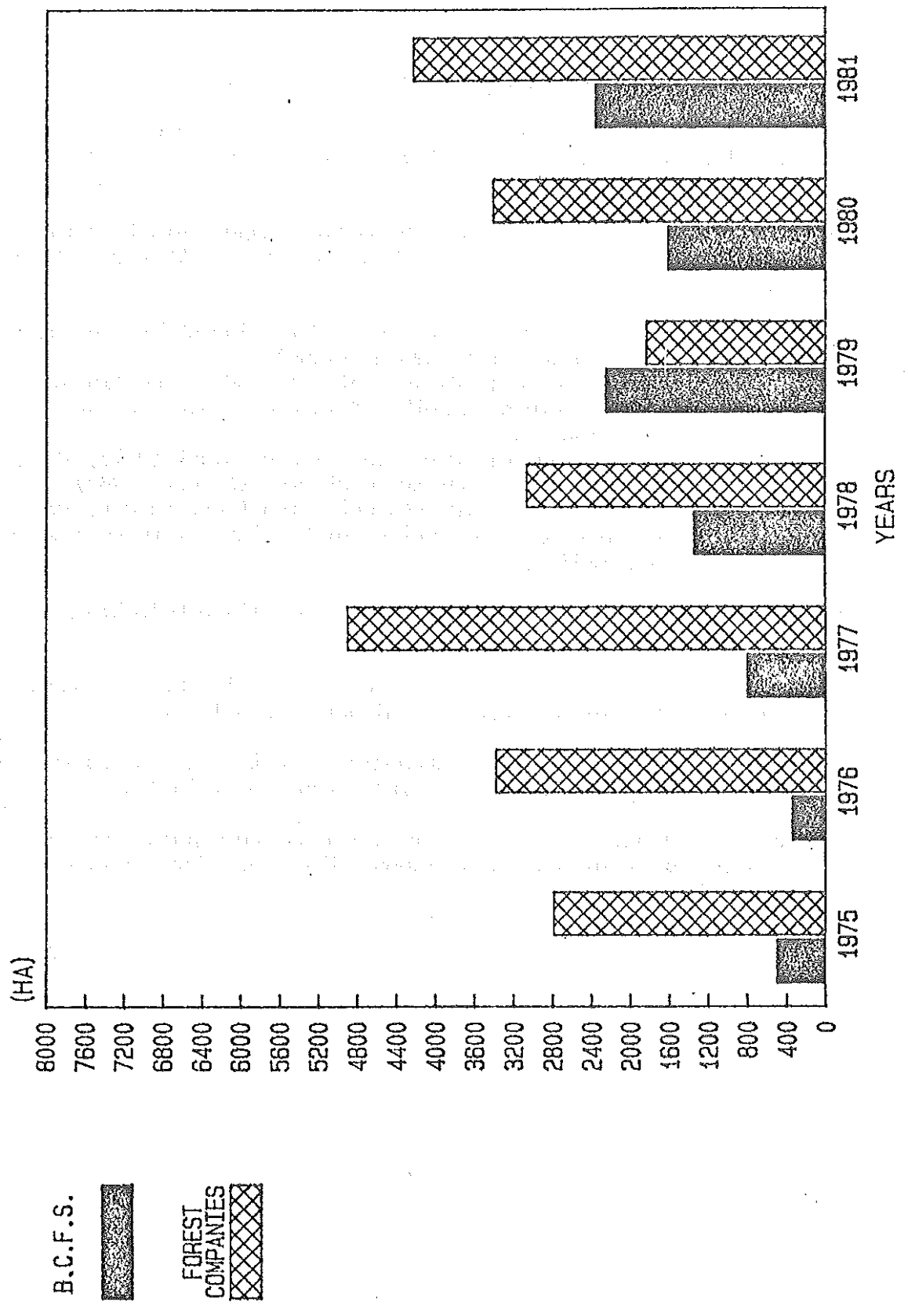
<u>HERBICIDE</u>	<u>1979</u>		<u>1980</u>		<u>1981*</u>	
	<u>MOF</u>	<u>INDUSTRY</u>	<u>MOF</u>	<u>INDUSTRY</u>	<u>MOF</u>	<u>INDUSTRY</u>
2,4-D Amine	1101	1279	325	2690	152	1912
2,4-D Ester	-	244	-	-	-	-
MSMA	1	46	111	-	-	1373
FOSAMINE	481	52	489	648	1753	780
GLYPHOSATE	33	10	84	74	29	66
PICLORAM	522	209	594	-	352	-
OTHERS	118	-	11	-	75	101
TOTAL	2256	1840	1614	3412	2361	4232

*Estimates as of November 2, 1982 prepared by J. Henigman and P. Humphreys,
Protection Branch, Ministry of Forests, Victoria.

FIGURE 2

TOTAL HECTARES OF LAND TREATED WITH HERBICIDES FOR FORESTRY PURPOSES
(PREPARED BY P.J. HUMPHREYS AND J.F. HENIGMAN, PROTECTION BRANCH, VICTORIA)

1975 - 1981



PUBLICATIONS AND REPORTS

- Kennedy, D., P. Willis and C. Young. 1982. The great herbicide debate. In ForestTalk Resource Magazine 6(3): 22-29.
- Miller, G.E., and D.W. Hutcheson. 1981. Aerial spraying for control of the spiral spruce-cone borer, Hylemya anthricina (Diptera: Anthomyiidae). J. Ent. Soc. B.C. 78: 3-6.
- Ministry of Forests. 1982. The Real Enemy. Major forest pests of British Columbia. Inf. Serv. Br., B.C. Min. of Forests, Victoria, Publ. No. G-30-81082, 21 pp.
- Ministry of Forests. 1982. PestTopics (Information sheets on important forest pests and pest management recommendations)
- No. 1. The bark beetles: Killers of pine and spruce (in preparation)
 - No. 2. Douglas-fir tussock moth: A menace to B.C. forests (in preparation)
 - No. 3. Phellinus root disease: The hidden threat (July, 1982)
 - No. 4. All is not well under the mistletoe (August, 1982)
 - No. 5. Tussockosis: The tussock moth itch (Rev. August, 1982)
 - No. 6. Recommendations for control of Douglas-fir tussock moth, 1982 (June, 1982)
- Ross, D.W. 1982. Forest pest management on British Columbia parklands. B.C. For. Serv. Int. Rep. PM-PB-6, in press.
- Rowell, R.P. 1982. Bark beetle detection manual - Prince Rupert Forest Region. B.C. Min. of Forests, Smithers, unpubl., rep.
- Stock, A.J., and J.H. Borden. Secondary attraction in the western balsam bark beetle, Dryocoetes confusus Swaine. Can. Ent., in press.
- Taylor, S.P. 1982. Procedures for aerial sketch mapping and volume determination of forest insect infestations. B.C. For. Serv. Int. Rep. PM-PB-4, 25 pp.