



Province of
British Columbia
Ministry of
Forests

PEST MANAGEMENT PROGRESS

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

Volume V, Number 1 (File: 190-4 PMP)

May 1986

A Public Relations Initiative

Public understanding and support are recognized as critical ingredients for any successful resource management recipe. In the case of forestry, growing numbers of British Columbians are wanting to know more about pest management practices and the results of our efforts in protecting forest stands. The use of pesticides, particularly, has become a major question during the past few years.

Under the guidance of the B.C. Forest Service's Forestry Issues Steering Committee (FISC), citizens of the province will have greater opportunity to meet key staff and to know more about pest problems and treatment alternatives. The Committee has been directed to assist regional and district offices in providing valid and useful data, and in assisting interested persons in obtaining answers to their questions. These initiatives will include more:

- open house sessions
- demonstrations of pest problems and treatments
- background references (e.g., Office Information Centres)
- training for key staff
- communication with community leaders

Emphasis at this time will be on vegetation management problems and the use of the herbicide option to ensure the growth and survival of young conifers. Readers of "Pest Management Progress" are encouraged to offer suggestions and advice which might augment information flow.

- R.F. DeBao, Protection Branch, Victoria

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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 Pest Management Coordinator 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 further clarification as the contents of this report do not necessarily constitute official statements of the Ministry of Forests.

PEST MANAGEMENT GENERAL

Pest Management Progress Format Change. As mentioned in the last edition of Pest Management Progress, alternatives to the existing format are being examined. Please submit any suggestions that you may have to the undersigned.

- P. Hall, Protection Branch, Victoria

Forest Insect and Disease Impacts in Timber Supply Areas. This compilation has now been completed and distributed on a limited basis to key individuals including regional pest management coordinators and planning officers. This document represents 2.5 years of collaboration by numerous individuals and currently presents the best estimates of insect and disease impacts in British Columbia. This is particularly true of mistletoe and root rot estimates, as no previous attempt at impact estimation has involved such a thorough province wide collation of inventory data as part of the estimation procedure.

The distribution of this document does not represent the end of this project and comments are being solicited for future improvements. Future improvements envisioned include incorporation of new pest impact data, estimation of impacts other than timber, improvements to inventory data base collation procedures, a thorough review of the document's use in the T.S.A. planning process, and methodology improvements.

Current and upcoming pest incidence and impact surveys on mistletoes, root diseases and defoliators will dramatically improve the current estimates. The next update will occur in January, 1987, and comments on the current edition should be addressed to the Manager, Pest Management Section, Protection Branch, 1450 Government Street, Victoria.

- S. Taylor, Protection Branch, Victoria

TSA Planning. The recently approved Morice TSA plan contains pest management strategies designed for use in the Morice TSA. Future TSA plans throughout the province are expected to follow the Morice format and contain similar detail for pest management strategies.

- J. Crover, Planning and Inventory Branch, Victoria

FRDA Pest Control and Research Projects. In 1985-86, the first year of the Forest Resources Development Agreement, several pest control and research projects were completed. Reports have been distributed for review by Regional and Branch staff, and projects for 1986-87 should be underway soon.

Research projects under the cost-shared, backlog reforestation program included:

- 1.9 Pest damage surveys for young trees in northern B.C. undertaken by Industrial Forestry Service Ltd., Prince George.
- 3.7 Stem diseases of lodgepole pine in spaced stands, by Dr. B.J. van der Kamp, University of B.C.
- 3.8 Survey methodology for root diseases in interior forests, by M. Curran, Vancouver.

Pest control projects funded by provincial direct-delivery monies under the intensive forest management section included:

- PB-1 Mechanical de-stumping trials for root disease using an excavator with a clamp at Duncan, undertaken by Engineering, Silviculture, and Protection Branch staff.
- PB-2 Lodgepole pine dwarf mistletoe survey in the Prince George TSA undertaken by Industrial Forestry Service Ltd., Prince George.
- PB-3 Subalpine fir surveys in the Bulkley TSA, Smithers, undertaken by A.J. Stock Forest Management Services.
- PB-4 Sampling of residual roots in coastal areas de-stumped for root disease, undertaken by Sterling Wood Group Inc., Victoria.
- PB-5 Development of overview, root disease survey methodology for interior forests, by T.M. Thomson Ltd., Victoria.
- PR-1 Spruce leader weevil survey in the Kalum Forest District (Terrace) by District staff.
- PR-2 Development of a pest management information system for individual projects by Thunderbird Consulting, Smithers.

- J. Muir, Protection Branch, Victoria

FRDA Subalpine fir Survey. A contracted survey of suspected balsam bark beetle damage on the mature subalpine fir of two supply blocks in the Bulkley District revealed:

- 1. Previous surveys greatly underestimated the area of infestation (now approx. 43 000 ha);

2. Aerial detection and subsequent volume estimation are complicated by the diffuse pattern of attack. Estimating the age of attack is difficult because the needles are retained for more than three years; and
3. Tree mortality has been widespread and appears to have recently increased.

Permanent sample plots will be established this year and will be assessed each year for five years to determine:

1. Important causes of mortality;
2. Rates of pest caused mortality;
3. Pest influenced changes in species composition, diameter distribution and volume; and
4. Stand characteristics that influence susceptibility.

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

Review of Pest Management Training Needs. In 1984, a committee was struck on pest management training needs. Recently, the committee prepared an outline of training requirements for pest management, and a staff survey questionnaire to determine needs for specific course sections (modules). The outline and questionnaire will be circulated to staff for their comment and opinion.

Modules that are rated as a high priority by the survey will be outlined in more detail and then probably developed by a consultant or contractor.

- J. Muir, Protection Branch, Victoria, D. Gray, Nelson Forest Region, Nelson, and P. Wood, Vancouver Forest Region, Vancouver.

Pest Management Training in the Kamloops Forest Region. Since May 1985, the regional pest management specialists have trained 37 Ministry and industry staff. Training topics included pest management and the preharvest prescriptions, MSMA application, root rot surveys and pest identification and management.

- H. Merler, Kamloops Forest Region, Kamloops

Pest Management Information System - Update. The Prince Rupert Region's computerized Pest Management Information System has been quite successful in the past year. Five Forest Districts within the Region have used the system to record bark beetle or leader weevil information, and have found the system to be a considerable improvement over manual ledgers.

A contractor is presently modifying our dBase II program to incorporate bark beetle, leader weevil, and pathology information into a single, comprehensive system. For the user, this modification will make surprisingly little difference, since most of the information fields will remain the same. However, there will be greater flexibility than before, and a few more fields. The system will still be simple enough for computer neophytes to enter or edit data and to generate many different printed reports.

The Prince Rupert Region is planning to develop a standardized mapping procedure this summer, so that in the coming year we will have a combined ledger and map system for keeping track of pest management activities.

- K. Widen, Prince Rupert Forest Region, Smithers

Major Forest Pests of Prince George Forest Region. A compilation of the major forest pests of the Prince George Forest Region is underway, with an anticipated completion date in late summer of this year. This is intended to be a reference for field personnel to facilitate their identification of the common pests which they may encounter. There will be sections on diseases, insects, detection, and management alternatives. Separate discussions on each of about 20 pests will include descriptions of the pest and its life history, damage, control possibilities, and several selected references.

- R. Cozens and K. Lewis, Prince George Forest Region, Prince George

Pest Management Displays. Pest management displays are now available on six topics including mountain pine beetle, root rots, Douglas-fir tussock moth, general pest management, gypsy moth, and pesticides. These displays can be borrowed by any agency for use in British Columbia. Also, all regional protection offices have just acquired display systems compatible with the pest management panels, allowing for simultaneous uses at different locations. Agencies interested in borrowing these displays should contact S. Taylor, Ministry of Forests, Protection Branch, 1450 Government Street, Victoria (387-8743).

- S. Taylor, Protection Branch, Victoria

Pest Management for the Public. An eight panel display has been developed to cover the aspects of pest management specific to the Prince George Forest Region. Text and coloured photographs explain and describe the purpose of and reasons for pest management. Major pests of mature and immature stands, control methods and the anticipated benefits of pest management in the managed forest are also depicted. The first "showing" is scheduled for the Prince

George Forest Exhibition from 29 May to 1 June, with a second at an "open house" in the McBride Forest District shortly afterwards. We anticipate that such exposure will be beneficial in the education of the public to the workings of a managed forest.

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

Pest Management in Forest Nurseries. As well as the established nursery pest management programs, the following extra projects have been planned for the 1986 growing season.

At Chilliwack and Skimikin nurseries the herbicides MCPA and Goal will be tested against field horsetail Equisetum arvense. Trials in B.C. have been planned in conjunction with a herbicide specialist in Ontario who will be doing similar work. This project will continue for two years.

In the Prince George area, operational trials will be conducted at Red Rock and Summit nurseries to protect the 1+0 crop against damage from the Lygus bug. Cymbush, Orthene, Belmark and Thiodan will be tested. Cymbush and Orthene provided the best damage reduction during a screening trial in 1985. Thiodan has recently been recommended for Lygus control on strawberries in B.C. and Belmark is used to reduce Lygus damage in conifer seedling nurseries in Washington and Oregon.

There will be limited trial at Harrop nursery using Daconil as a pre and post-emergence treatment in different greenhouses to determine if Sirococcus infestations are reduced throughout the growing season. At the Saanich test nursery, three insecticides, Piromore, Cygon and Belmark, will be tested for effectiveness at controlling infestations of giant conifer aphids (Cinaria spp.). A trial in cooperation with the nematode research team from Simon Fraser University is planned to control black vine weevil larvae infesting container stock at Surrey nursery. Three insecticides and a nematode will be tested.

At Harrop nursery, a control program using chemical and cultural methods as well as several monitoring techniques will be conducted to reduce girdling from adult weevils. A pheromone trapping program for the Cranberry girdler will be initiated at Balco's Kamloops nursery to determine if this insect is girdling container Douglas fir and at World Silviculture a monitoring program will be initiated to determine the cause of girdling on stock.

- G. Shrimpton, Silviculture Branch, Victoria

Damage by Red Squirrels in Juvenile-Spaced Lodgepole Pine Stands in the Kamloops Forest Region. A total of 39 lodgepole pine stands ranging in age from 6-32 years were selected from a list of spacing projects to assess the incidence and magnitude of barking damage by red squirrels in the Kamloops

Forest Region. Twenty-one of the stands were of harvest origin (i.e., naturally regenerated following clearcutting). The remaining 18 stands originated from wildfire. All stands had been surveyed prior to 1984 (i.e., 1976-1980).

Results of the survey clearly demonstrated that red squirrels pose a significant threat to young stands of spaced lodgepole pine in the Kamloops Forest District. The relative absence of damage in other forest districts within the Region, however, does not give an accurate representation of damage potential.

Squirrels preferentially attacked the larger-diameter stems in damaged stands. Eleven of the 39 stands surveyed showed evidence of squirrel damage as average tree sizes within these stands were equal to or larger than an apparent "threshold" diameter of approximately 6.0 cm. Whereas hare damage to young lodgepole pine tree stems occurs close to the ground and timing of damage cyclic in nature (reflecting population cycles), red squirrel barking damage can occur anywhere on the stem of the tree with no cyclic nature in incidence of attacks. Squirrels inflict barking injuries during the early part of the growing season (i.e., May to July). It is generally believed they feed on cambium tissue not so much from preference, but because of an insufficient supply of alternative food. Unlike snowshoe hare, red squirrel population dynamics are not well documented.

Inability to accurately assess either squirrel damage potential or its impact on long-term growth and yield indicates that a conservative approach is necessary when spacing juvenile lodgepole pine. Critical evaluation of candidate stands during the pre-spacing survey, combined with a two-step spacing strategy, is recommended.

- R. Brockley, Kalamalka Research Station, Vernon, and E. Elmes, Kamloops Forest Region, Kamloops

Porcupine/Fisher Update. The Research and Protection sections, in cooperation with the North Coast District, recently completed a survey of porcupine damage in Khutzymateen Inlet. Six fisher (Martes pennanti) equipped with radio transmitters have been introduced in the last six months to the south side of the inlet, while the north side served as the control. One of two females introduced has since been found shot.

In the first winter introduction, percent attack on hemlock along two transects declined from 10.2 and 23.1 in 1985 to 2.8 and 7.7 in 1986. In contrast, percent attack in the check area increased from 14.1 in 1985 to 17.8 in 1986 along one transect, and remained constant at 3.4% along the other. It is premature to draw firm conclusions about the effectiveness of the fisher program in reducing porcupine numbers. However, if the trend continues, then

more definite conclusions can be made. It is hoped that an annual survey will be continued until such time that firm conclusions can be drawn.

- W. Martin, Prince Rupert Forest Region, Smithers

More on Unusual Pine Mortality. In the November/85 issue of "PMP" (IV:2), Hadrian Merler reported unusual circular patches of recently killed lodgepole pine in the Salmon Arm Forest District. As a result of Merler's report, George v. Westarp of MacMillan Bloedel has written: "Your readers may be interested to know that there are reports of this type of damage in the German literature.....The phenomenon has been referred to in the literature since the early 1700's and has led to several theories ranging from electrical fields to activation of bacteria which affect the moisture holding ability of the soil."

In a later note to me, George provided a copy of a report from South Africa which states: "Lightning strikes usually cause 2 to 10 trees to die within a month. On occasion, however, pine trees continue to die for up to two years, resulting in the death of 100 trees or more....." Reference for this report is Issue 4/85 from the "Forestry News" of the South African Forestry Branch.

See Allegemaine Forest Zeitschrift 47:1034 (1973) for details of the German theories.

- R. DeBoo, Protection Branch, Victoria

FOREST ENTOMOLOGY

Mountain Pine Beetle Control Activities, 1985/86. There were \$6.79 million allotted to the bark beetle program for fiscal year 1985/86. The allotments to each region have been itemized in the last issue of Pest Management Progress. In many cases, these allocations were augmented with funds from regional budgets. Projects funded included those for access development, ground surveys, and single tree treatments, among others. A partial listing of activities is shown below. Details from particular regions may be obtained by contacting the appropriate Regional Pest Management Coordinator.

<u>Activity</u>	<u>Forest Region</u>				
	<u>Cariboo</u>	<u>Kamloops</u>	<u>Nelson</u>	<u>Pr. George</u>	<u>Pr. Rupert</u>
Access (km)	147		41		
Bridges	1		3		
Ground probes (ha)	10,000		18,100	500,000*	5,295
Single tree trmnt (#)	8,086		1,400	13,000	21,402

*The figure from Prince George Region represents the total area of a susceptible timber type that has been partially strip-probed and is therefore not directly comparable to figures from other regions.

- P. Hall, Protection Branch, Victoria

Bark Beetle Funding 1986/87. This program will continue in the 1986/87 fiscal year with a provincial allocation of approximately \$8.2 million. As in past years, this amount will be distributed to the regions and districts and applied to beetle management projects for access construction, aerial and ground surveys, semio-chemical purchase and placement, single tree treatments, and other activities.

It should be noted that mountain pine beetle populations appear to have declined in some areas of the province as a result of climatic factors and control activities. These lower levels of beetle activity should provide an ideal opportunity to further reduce losses through the action of an aggressive program.

- P. Hall, Protection Branch, Victoria

Impact of Mountain Pine Beetle on Timber Supply. The AAC in both the Williams Lake and Quesnel TSA's have been increased to cope with the increased rate of harvest required to salvage mountain pine beetle attacked wood in the Cariboo Region.

Further the Lillooet TSA is undergoing a periodic reanalysis. As a part of this exercise, District and Regional staff have identified areas by inventory, region, and compartment which have been subjected to MPB attack and have estimated the areas and volume of pine lost. These lost areas have then been updated to reflect their current status--immature stocked, or DSD, and regen delay expected on DSD areas. This information will be used in the timber supply analysis.

- J. Crover, Planning and Inventory Branch, Victoria

Timber Harvested in 1985 as a Result of Mountain Pine Beetle. The infestations of mountain pine beetle throughout the province have necessitated the redirection of harvesting into areas with active beetle infestations. Harvesting of active infestations is the most effective way to reduce beetle populations and subsequent losses. As well, sanitation harvesting of infested stands ensures that wood values are recovered before the timber is rendered unmerchantable. In extreme cases, annual allowable cuts in some management units have been increased to deal with extensive beetle problems.

Timber harvested in 1985 in response to mountain pine beetle is summarized below. In the case of normal quotas, volumes are totals from all forest tenures including Tree Farm Licences, Timber Sale Licences (Major), Forest Licences, and the Small Business Enterprise Program. This is not the case for volumes sold over quota.

Mountain Pine Beetle-related volumes sold and harvested in 1985

Region	Volume Sold (m ³) over Normal Quota	Volume Harvested (m ³)	
		Normal Quota	Over Normal Quota
Cariboo	8,980,800 ¹	4,693,000	183,000
Kamloops	4,400	2,836,293	0
Nelson	Unavailable		
Pr. George	25,000	776,210	9,000
Pr. Rupert	828,068	2,195,457	0
Vancouver	0	77,700	
Total	9,838,268	10,578,660	491,017

1. To be cut over a 5-10 year period.

- L. Renshaw, Timber Management Branch, Victoria

Results of M.P.B. Semiochemical Assessment Study. The efficacy of commercially available semiochemical lures for containment of mountain pine beetle within infested lodgepole pine stands was assessed in a cooperative program involving industry and Ministry of Forests personnel in the Cariboo Forest Region during 1985. Eight stands operationally baited in either a grid or double perimeter line pattern were evaluated using an assessment system developed within the Region. The ratio between trees attacked in 1984 and 1985 in paired, baited, and control stands was used to determine the level of beetle containment achieved.

Both deployment systems effectively inhibited mountain pine beetle emigration from baited stands and the level of containment in all baited stands combined was significantly greater than in the controls. The 1985:1984 attack ratio was higher in the baited blocks for five of the eight study areas, and approximately equal in the remaining three. Overall, the 1985:1984 ratio in the baited blocks was 4.5:1 compared to 2.3:1 in the unbaited stands. It was thus recommended that semiochemical lures continue to be used operationally for beetle containment of mountain pine beetle in the Region. A full report will be available from the Cariboo Regional Office.

- R. Heath, Cariboo Forest Region, Williams Lake

Mountain Pine Beetle Semio-chemical Purchase. Over 63,000 pine beetle tree baits were purchased by the Ministry of Forests for use in 1986. These baits will be used to restrict beetle dispersal out of proposed cut blocks and to aid in the "mopping up" of residual beetle populations in single tree treatment sites. These aggregating semiochemicals have enhanced the effectiveness of the beetle management program.

- P. Hall, Protection Branch, Victoria

Fall and Burn Treatment - Does It Work? For many years, people have been falling and burning mountain pine beetle infested trees in an effort to control beetle populations, and for the same number of years people have wondered if the treatment works. Two new surveys in the Prince Rupert Forest Region suggest that the treatments have been successful.

The first survey became possible because the Region has used colour air photographs for mountain pine beetle detection in the past two consecutive years. An area of fall and burn treatment was compared with an adjacent area of no treatment for the years 1984 and 1985, and the difference between the two areas was quite dramatic for the two years:

<u>Treatment</u>	<u>No. of Trees Detected</u>	
	<u>1984</u>	<u>1985</u>
Fall and Burn	48	7
No treatment	259	475

In the treated area, the number of visible red trees in the photographs decreased by a factor of nearly 7 in the second year, while in the untreated area, the number increased by a factor of 1.8.

The second survey used probe data, gathered by district crews during the past two years, to compare the ratios of 1984 attack to 1985 attacks for treated and untreated areas. The survey is not yet complete, but preliminary results are encouraging.

Using probe maps, 71 areas of fall and burn treatment were identified, and 70 areas of no treatment. In areas of no treatment, the number of current attacks was simply compared with the number of red trees, since the red trees represented last year's attacks. However in the fall and burn areas, since most of last year's attacks were destroyed by the treatment, it was necessary to consult last year's records to determine how many attacks there were last year.

The ratio is expressed as a percentage of 1985 attack compared to the total for both years. In the untreated areas, the average percentage of current year's attack was 38, while in the fall and burn areas, the percentage was only 17, indicating the success of the treatment.

- K. Widen, Prince Rupert Forest Region, Smithers

Skillhorn Road Mountain Pine Beetle Control Project, Bulkley Forest District. This past winter, an MPB control project was completed on 1200+ green attack lodgepole pine near Skillhorn Road at Telkwa, B.C. A D-7 cat and swamper were employed to pile and burn eight small patches of infested pine totalling 8 ha. The patches were traversed with boundaries ribboned prior to walking down the trees with the cat. Logging was ruled out as a treatment after extensive effort to find a small business market for the small, mistletoe infested pine failed.

Mechanical piling was chosen over conventional fall and burn techniques for three reasons. One, the infested patches were extremely compact. Two, the cat piling would not leave a slash hazard buildup under the canopy in an area adjacent to heavily treed private subdivisions. Finally, a cost analysis indicated the cat would be cheaper than falling and burning by hand.

The final cost per infested tree was \$7.87 compared to an estimated minimum of \$10.00 per tree to hand fall and burn.

- K. Bush, Bulkley Forest District, Smithers

Mountain Pine Beetle Insecticide Application. In May 1986, spray applications of the insecticide chlorpyrifos will be made on bolts of lodgepole pine infested with the mountain pine beetle. Bolts will be treated with: 1) chlorpyrifos and diesel oil; 2) diesel oil alone; or 3) left untreated to serve as checks. Bolts were cut from pine infested in Vanderhoof in 1985 and brought to Prince George for the treatments. Efficacy sampling in early June should reveal the relative effectiveness of the two treatments for post-attack applications. Further details will be available in mid-summer.

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

Bark Beetle Survey Methods. A proposed provincial standard for bark beetle ground surveys was developed by a small task force including staff from Branch, Regions, and Districts. The method is essentially a strip survey augmented with some mensuration information. The proposal is currently under review by Regions and Districts. An approved method, based on the reviews, should be forthcoming.

- P. Hall, Protection Branch, Victoria

Lodgepole Pine Beetle and Hylurgops Identified. In mid-winter, disposal crews in the Vanderhoof Forest District discovered substantial numbers of beetle larvae resembling mountain pine beetle beneath the duff line during sanitation operations. Canadian Forestry Service personnel visited the sites and subsequently identified the "culprits" as Hylurgops spp. and Dendroctonus murrayanae--neither presenting a potential for the mass attack of healthy lodgepole pine trees.

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

Spruce Beetle Status in the Prince Rupert Region. Spruce beetle populations in the Lakes, Bulkley, Morice, Kispiox and Kalum Districts are low and continue to decline due to prompt blowdown salvage, good utilization practices and host depletion. High populations of spruce beetle larvae were found in pockets of inaccessible blowdown in the Morice District. These area will be treated with lethal trap trees next spring to absorb these beetles.

- T. Ebata, Prince Rupert Forest Region, Smithers

A Test of Standing Lethal Trap Trees for Spruce Beetle. In the spring of 1985, a joint trial between B.C. and Alaska was conducted to test the efficacy of pheromone baited standing lethal trap trees for spruce beetle, Dendroctonus rufipennis. An effective standing lethal trap tree would eliminate one trip to the site for felling and so halve operational costs of such a program.

A randomized, complete block experiment with nine replicates (four in B.C. plus five in Alaska) of four treatments was used to test the relative efficacy. The four treatments were: felling; felling with pheromone baiting; standing; and standing with pheromone baiting. All trees were treated with one-quarter strength MSMA. Baiting was done with 0.5 ml of 1:2 frontaline: alpha-pinene in a 0.75 ml Beem polyethylene capsule.

Sampling was done at six positions spaced evenly from the butt to a 20 cm top on each of two trees per replicate. At each position, two 20 cm x 20 cm bark squares were removed to count the number of attacks.

Preliminary analysis indicates that felling is a requirement of lethal trap trees and pheromone baiting has no significant effect on either felled or standing lethal trap trees.

A complete report of the results is forthcoming.

- D. Gray, Nelson Forest Region, Nelson

Western Spruce Budworm in Kamloops Region. Western spruce budworm expanded dramatically in 1985 to become the largest outbreak on record (since 1909). This includes 180 000 ha. While no control action is planned to address this outbreak, the region is conducting an operational spray trial to gain experience within the Ministry in conducting a spray program. In addition, a damage appraisal program is being established to assess the impact this pest is having on our Douglas-fir stands.

- R. Edward, Kamloops Forest Region, Kamloops

Control Trial of Western Spruce Budworm. Western spruce budworm infestations are proposed for aerial spraying with the bacterial insecticide Bacillus thuringiensis (Thuricide® 48 L.V.). The B.C. Forest Service, Kamloops Region, applied for a pesticide use permit to treat not more than 100 ha in the Heffley Creek area. This proposed project will be managed as an operational trial to gain additional efficacy data and compare the B.t. to a similar treatment of the insecticide carbaryl (Sevin®). The Ministry of Lands, Parks and Housing plans to apply a similar B.t. spray to portions of Paul Lake Park.

- J. Henigman, Protection Branch, Victoria

Western Blackheaded Budworm in the Vancouver Forest Region. An outbreak of western blackheaded budworm, Acleris gloverana, has been detected in the Vancouver Forest Region in 1985, with 28 600 ha defoliated in the Queen Charlotte Islands and 2 000 ha of trace defoliation in the Maple Ridge Forest District. From historical patterns of blackheaded budworm outbreaks, and from egg surveys conducted last autumn, extensive and severe defoliation is expected in the Queen Charlotte Islands in 1986 and possibly 1987, whereas the Maple Ridge infestation will likely remain as trace defoliation.

The direct operational control of the current outbreak is not considered a viable option at this time largely due to the lack of sufficient damage appraisal information. However, a comprehensive damage appraisal study, continued detection surveys, and also the assessment of damaged stands for salvage and rehabilitation requirements after the collapse of the current outbreak, are being planned.

Additional information covering this outbreak can be found in Forest Service Internal Reports PM-V-8 and PM-V-9.

- D. Heppner and P. Wood, Vancouver Forest Region, Burnaby

Joint B.C.F.S.-C.F.S. Douglas-fir Tussock Moth Mortality Project. Preliminary results for this three year project indicate heavier Douglas-fir mortality than was previously anticipated. New mortality estimates, based on areas of repeat defoliation, are 0%, 30%, and 60% for areas attacked not at all, once, and two or three times, respectively. The old estimates were 5%, 15%, and 30% respectively for areas attacked once, twice, and three times.

These new estimates apply only to severely attacked areas, areas where 50% of the trees had 50% of their needles defoliated. Light to moderately attacked areas experienced negligible mortality. Top-kill was as high as 10% on severe areas attacked two or three times, but due to considerable variability, these data were not significantly different than the control plot estimates. Data analysis is underway and interim and final reports are expected soon.

- S. Taylor, Protection Branch, Victoria

Gypsy Moth Survey. The Ministry of Forests began actively participating in the pheromone survey program in 1985 when Ministry staff placed approximately 850 traps in the field. This program will be continued and increased in 1986. Approximately 1750 traps will be placed in forested areas by region and district personnel. Other agencies participating in the cooperative survey program are Agriculture Canada, Plant Health, and the FIDS unit of the Canadian Forestry Service.

- P. Hall, Protection Branch, Victoria

B.t. Spraying for Gypsy Moth in the Chilliwack Area. Agriculture Canada is again planning to carry out an aerial spray project utilizing B.t. to eradicate a small infestation of gypsy moth in the Chilliwack area. A 12 hectare area at the Canadian Forces Base Chilliwack is scheduled for three applications during the period of mid-May to early June, 1986. This is a reduction from the 80 hectares that were sprayed last year. Fourteen male moths were trapped in the area last summer.

No gypsy moths were captured after an intensive trapping program in the Courtenay area last summer. This area also received aerial applications of B.t. last spring after a small population of gypsy moths was detected in 1984. This population is now believed to have been eradicated.

- D. Heppner, Vancouver Forest Region, Burnaby

Pheromone-based Surveys for Black Army Cutworm. The Canadian Forestry Service deployed 42 pheromone-baited traps at 16 proposed planting sites to monitor adult black army cutworm populations in the Horsefly area during 1985. A cooperative program to develop correlations between adult trap catches and subsequent larval populations is planned. Larval samples will be collected in May at each of the trapping sites using a modified soil washing technique and their numbers related back to the trapping results.

It is hoped that a sampling system can be developed which will allow early detection of the pest and give silviculturalists sufficient lead time to modify their planting programs.

- R. Heath, Cariboo Forest Region, Williams Lake

Black Army Cutworm Expected to Continue. Black army cutworm (*Actebia fennica*) has been a significant factor in the establishment of plantations in the Prince George Forest Region for the past three years. Baited trap surveys conducted by the Canadian Forestry Service indicate a continued infestation of this pest in the Bowron River drainage, where several thousand hectares of plantations are scheduled for this spring's planting.

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

Black Army Cutworm Studies in the Prince George Region. A draft internal report has recently been prepared entitled "A preliminary assessment of the impact of black army cutworm in the Prince George Forest Region." Defoliation to newly planted seedlings in 1984, as measured in 1985, caused reductions in leader and overall seedling heights, leader and seedling mortality and leader deformations. At five infestations inspected in 1985, densities of 1-13 larvae or pupae per m² resulted in 0-71% of the seedlings being defoliated.

Succulent herbaceous vegetation such as Indian hellebore, *Veratrum viride*, were preferentially defoliated by larvae over other vegetation. Natural mortality of black army cutworm at four locations ranged from 44-54%. Development of a reliable and operational defoliation hazard index will require further field sampling in many locations. A copy of the final report will be available from the regional office of the Prince George Forest Region.

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

Pissodes strobi Planning Group. It is intended that a multi-agency task force be convened to discuss matters relating to the management of leader weevils. This group will address such topics as: identifying specific research needs for coastal and interior situations; problems associated with damage appraisal; and development of consistent provincial management/treatment guidelines based on existing information.

- P. Hall, Protection Branch, Victoria

Leader Weevil Survey in Kalum Forest District (FRDA). A district wide weevil survey of spruce plantations in the Kalum Forest District was carried out during winter 85/86 under the Forest Resource Development Agreement (FRDA). Ten metre-wide strip transects spaced 100 m apart were used to survey 43 plantations.

The survey showed that the weevil is present throughout the district, but at levels generally below 5% current attack. The lower Kitimat Valley and a few plantations east and west of Terrace along the Skeena River had the highest incidence of current attack.

The 85/86 survey data were combined with earlier Kitimat Valley surveys and provided a total of four years of repeated survey data, some from plantations that were clipped twice. These results, including an assessment of clipping efficacy, will be summarized in a report to be completed in May.

- T. Ebata, Prince Rupert Forest Region, Smithers

Silvicultural Control of Spruce Weevil. A trial to study the effect of shading by a naturally-occurring deciduous overstory upon the damage caused by leader weevil (Pissodes strobi) have been established in a 16 year old interior spruce plantations. The site, 50 km east of Prince George, is typical of spruce plantations in the southern portion of the Prince George Forest Region and has a recent history of weevil attack. In addition to relating the annual number of attacked trees to the treatment, temperatures (ambient, duff, under-leader) and solar radiation will be recorded and analyzed.

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

Root Collar Weevil Trapping. Warren's root collar weevil (Hylobius warreni) is a potential problem in the successful development of lodgepole stands beyond the pole stage in many areas of the Prince George Forest Region. Spread from infested trees is relatively slow, since these weevils are flightless. Their method of host selection is not totally known, but may be a response to host volatiles. A series of pitfall traps (baited [alpha-pinene and ethanol] and unbaited) will be placed in an area of known infestation to test their efficiency in trapping the root collar weevil.

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

FOREST PATHOLOGY

A Possible Nematode Problem in B.C. Reports of a nematode in B.C. similar to the pinewood nematode, Bursaphelenchus xylophilus, have raised concerns about B.C. softwood exports to Scandinavian and other countries. Several

informative meetings and discussions have been held recently on the status of the nematode, and current activities by Canadian Forestry Service - Forest Insect and Disease Survey, Plant Health and Quarantine, and Simon Fraser University.

Nematodes are small, 0.3-1 mm length, transparent "worms" that are ubiquitous, wherever there is moisture. Several are associated with insects, and some are pathogens of insects and plants. B. xylophilus is associated with cerambycid beetles, commonly Monochamus spp. (sawyer beetles), and causes a damaging disease, pine wilt, of black pine in Japan. It occurs at endemic levels of incidence throughout a wide region of the United States, but here usually only occasional, stressed trees are killed. In 1985 the same nematode was found in southeastern Ontario on pines.

In October 1985, a similar nematode was discovered in a pile of wood chips at North Vancouver destined for export to Finland. Finland required that the chips had to be certified free of the pinewood nematode. T. Rutherford, a graduate nematologist at Simon Fraser University, sampled the chips and found a nematode, Bursaphelenchus sp., that he was unable to distinguish from B. xylophilus. Therefore, the shipment could not be certified free of the nematode. More recently a shipment of chips received in Sweden was found to contain the similar Bursaphelenchus species.

A crucial but unresolved issue is the identification and nature of the nematode. The nematode in B.C. has a pointed "mucronate" tail, whereas B. xylophilus has a round tail, except for a location in Japan where there is a mixture. B. xylophilus appears to be vectored only by one species of sawyer beetle, M. caroliensis, and the nematode is pathogenic to pine. The other nematode appears to be vectored by other beetles and to be non-pathogenic on spruce, true fir species (Abies), and possibly other species. Simon Fraser University recently was awarded a contract to develop a rapid, nematode identification method based on DNA analyses to resolve these differences.

Several other activities are underway or planned. These include:

- Federal trade missions to European and Scandinavian countries to define standards for certification of wood products imports,
- Surveys of chip piles and trees in B.C. and elsewhere to determine the source and distribution of nematodes,
- Pathogenicity tests and other research to determine the status of the nematode(s).

Protection Branch personnel will maintain contact with the agencies, and provide liaison and assistance to resolve this problem as soon as possible.

- J. Muir, Protection Branch, Victoria

FRDA Disease Research Projects. In 1985-86, three research projects on diseases were completed in the cost-shared, backlog-reforestation, research program of FRDA.

In project 1.9, Industrial Forestry Service reviewed the survey methodology available, and current surveys undertaken, for pest damage of young, northern interior trees. Several methods for individual pests have been used but not integrated as a single method. Several surveys currently undertaken would be desirable to use for determining pest damage, but only a few have accommodated pest damage to a limited extent. The contractor recommended expanding these surveys to include pests, and developing a uniform pest coding system for Canadian Forestry Service and Ministry surveys.

In project 3.7, Dr. B.J. van der Kamp, University of B.C., remeasured several permanent sample plots established in spaced, and nearby unspaced, stands of lodgepole pine. He found that after five years, the incidence of stem diseases increased both in spaced and unspaced areas. Only stalactiform rust increased more in spaced areas than in unspaced areas. Approximately 60% of the trees in the spaced areas were free of stem diseases.

In project 3.8, Ms. M. Curran and associates investigated root disease survey methods in interior stands. In one area of young Douglas-fir trees potentially suitable for spacing, infection centers of Armillaria root disease were relatively discrete, and the line intercept survey method appeared most suitable. In another with laminated root rot and recent logging, centers were diffuse or not apparent, and a strip tally of trees was recommended. This work is to be extended to backlog areas in 1986-87. A similar research project is being developed for coastal backlog areas to determine how much of backlog areas are infested with root disease pathogens.

- J. Muir, Protection Branch, Victoria

Lodgepole Pine Dwarf Mistletoe Survey. A lodgepole pine dwarf mistletoe survey, funded under the FRDA agreement, was conducted in the southwest portion of the Prince George Forest Region during the past winter. All roads that were open were travelled and subjected to roadside surveys. Variable radius plots were established at five kilometre intervals to complement the roadside survey. Data collected from the survey was used to estimate the distribution and intensity of the mistletoe in that portion of the region.

Mistletoe was found most commonly in the Westlake, Nechako, Kluskus, Crooked River, and Ootsa Public Sustained Yield Units (PSYU) in descending order of incidence. Problem areas were outlined and identified for the Districts, along with summaries of the percentage of road kilometres (Pl major) with mistletoe by mapsheet and PSYU. The percentage of kilometres with infected trees ranged from 8 to 87.

- K. Lewis, Prince George Forest Region, Prince George

Impact of Lodgepole Pine Dwarf Mistletoe Studied. Plot data from a winter FRDA survey of lodgepole pine stands in the southwest portion of the Prince George Forest Region were analyzed to determine the impact of dwarf mistletoe upon these stands. Variable radius plots were established 50 metres into the stand at five kilometer intervals during roadside surveys.

Variables studied were: total height as a function of diameter; diameter as a function of age; and, radial increment as a function of age. The data was stratified by dwarf mistletoe rating (Hawksworth), site class and timber type.

Initial analysis indicated significant differences in height growth between infected and healthy trees, but more data are required before volume losses can be determined and applied to the roadside survey data.

- K. Lewis, Prince George Forest Region, Prince George

Tomentosus Root Disease Spacing Trial Established. In cooperation with Northwood Pulp and Timber Limited, a trial area to evaluate the effect of the root disease Polyporus tomentosus in spaced and unspaced stands was established. A portion of a stand classified as SF-320M was spaced in the winter of 1985/86.

The objective of this trial is twofold: to provide a demonstration area for forest managers; and to study the growth and development of spruce and the fungus in spaced and natural stands. Detailed stem mapping, root excavation, and sampling within plots is scheduled for this summer.

- K. Lewis, Prince George Forest Region, Prince George

Tomentosus Root Disease Survey Methodology Development. A pilot study was initiated to test a survey technique for Polyporus tomentosus root disease of interior spruce.

Trees within one metre transect lines were mapped and tagged. Their root collars were sampled with a 1/2-inch auger attached to a chainsaw (chips extracted). Stand openings and crown symptoms were also mapped. Each sample of chips was rated for stain or decay. After the eight hectare area was spaced, tagged trees were relocated and, if cut, the stump was examined for stain or decay.

Data from the auger samples were found to be reliable indicators of decay at the root collar level. Crown symptoms alone were found to be unreliable indicators. This study presents background information for a proposed survey method for Tomentosus root disease which will include recommended sample sizes and areas of the tree to sample.

- K. Lewis, Prince George Forest Region, Prince George

Tomentosus Root Rot. On March 13, 1986, the Northern Silviculture Committee (NSC), Smithers Section, spring meeting focused on tomentosus root rot and FRDA funding. Guest speakers on root rots included John Muir and Paul Wood (MOF), Bill Bloomberg (CFS), and John Schulting (UBC).

The audience which was made up of a cross section of industry, Ministry, and private consulting personnel numbered about 80 and asked numerous questions about the disease. Based on the present lack of information, tomentosus root rot may be one of the most important pest problems in our region.

A survey of pests in both young and mature stands in each of the districts is scheduled for this summer. This will provide some indication as to the incidence and potential impact of this disease in the Prince Rupert Forest Region.

- W. Martin, Prince Rupert Forest Region, Smithers

Planting Western White Pine in Root Disease Areas. Dr. R. Hunt of the Canadian Forestry Service has offered assistance in planting western white pine into Phellinus weirii root disease areas. The purpose is to assess white pine's susceptibility to the root pathogen and to measure blister rust aggressiveness given variable genetic white pine stock, and the particular environment. A field visit is scheduled for July.

- H. Merler, Kamloops Forest Region, Kamloops

Selective Logging and Laminated Root Rot. The effects of selective logging on a yellow laminated root rot infected dry-belt Douglas-fir stand will be monitored by a 15 hectare operational trial in Spences Bridge. By removing symptomatic trees, the rates of spread and the consequence of such logging practice will become evident.

- H. Merler, Kamloops Forest Region, Kamloops

Mechanical Destumping Trials for Root Disease. As reported briefly in the December 1985 PMP, a test of the Vibro Stump-Puller was considered unsuccessful due to the machine's inability to budge Douglas-fir stumps larger than 45 cm diameter. Further information regarding this trial is available from J. Muir, Protection Branch.

Following this trial, a Caterpillar 235 excavator with a hydraulic clamp (thumb) on the bucket was tried on a 30 ha cutover area from December 1985 to February 1986. Productivity of the machine was determined during operations, and a report on machine productivity was prepared. Site conditions and number of stumps per ha were determined to be significant variables.

Stumps and roots were piled in windrows about 15-20 m apart. Results of a preliminary trial indicated that it was more time-consuming to not pile stumps and leave them overturned where they were situated. Planting costs were reduced on the cleared site and costs of any further operations such as spacing or weeding should be relatively cheaper.

An evaluation of the site disturbance by Dr. R. Smith, Pacific Forestry Centre, indicated that 80-90% of the site was disturbed but mostly to a very limited depth. Most of the relatively undisturbed area was covered by the piles of stumps and roots. Probably much less disturbance would result from operations in the summer or autumn. However, the overall impact by the excavator was believed to be minimal.

The de-stumped site also was sampled to determine how much infected root material was left behind. Using the bucket and clamp, the excavator operator was able to remove very small roots. The sampling confirmed that relatively few infected roots remained after de-stumping.

Results of 1985-86 trials and possible future work will be evaluated by Silviculture, Engineering, and Protection staff prior to 1986 projects. Probably the excavator will be tested on one or more interior B.C. sites.

- J. Muir, Protection Branch, Victoria

VEGETATION MANAGEMENT

Release Damage to Conifers. A report prepared for the Ministry of Forests and the Canadian Forestry Service presents data from two conifer release study areas: the University of British Columbia Research Forest (Haney, B.C.) and Okeover Inlet (Powell River, B.C.). It was found that timing of treatment and type of release method (manual cutting vs. chemical) have a considerable influence on the initial growth of Douglas-fir (Pseudotsuga menziesii [Mirb.] Franco) saplings following their release from red alder trees (Alnus rubra Bong).

Following a release treatment, the previously suppressed conifers require an intermediate environment of "shelter" to protect them from the newly created micro-environment. Shelter is needed to allow the conifers, especially those which were severely suppressed, to become acclimatized to the increased light and moisture. It was reported that dead alder canopies resulting from stem girdling or herbicide treatments (e.g., hack and squirt or broadcast spray applications) can provide the needed protection for the released conifers. On the other hand, manual removal (cutting) of alder trees can expose conifers to the sudden environmental changes which may result in their mortality. Risk of manual (cutting) release damage to conifers appears to increase with the length of time under which the conifers were suppressed and the intensity of light and moisture demand during the summer following the release. The study recommended that manual release of suppressed Douglas-fir saplings should be avoided when hot weather is expected.

The report, entitled "The Effects of Season and Treatment on the Release Response of Suppressed Douglas-fir Saplings," is authored by R.E. Bigley and J.P. Kimmins.

- J. Boateng, Silviculture Branch, Victoria

Ground Spraying Demonstration Area at Devick Lake (Sx 84710Q). A visual assessment was taken on August 14, 1985, one year following ground (backpack) application of Roundup® (glyphosate) at 1.5 kg a.i./ha in 54 L solution per hectare at Devick Lake, near Kamloops.

About 75% of the target vegetation was eradicated. Generally, it appears that the Sitka alder (*Alnus sinuata*) was more susceptible to the treatment; the majority of the willow (*Salix* spp) showed only partial control. Poor coverage due to the height of the target vegetation and possibly the low application rate are believed to be the major factors resulting in the relatively low level of control obtained. Excellent control was achieved in portions of the block where vegetation was less than 1.5 metres.

- G. Ackerman, Silviculture Branch, Victoria

Field Test of Two Injection Systems (Sx 84711Q). During early August 1984, two stem injection systems, developed by Ministry of Forests, Silviculture Branch, were tested on aspen (*Populus tremuloides*) under near operational conditions to determine their suitability for operational use. Approximately 112 ha were treated using Roundup (glyphosate) applied using the two injection systems.

Although slightly higher production was achieved using the lance injection, the "Punch and Fill" was preferred by the workers. The lance was heavy, awkward to maneuver within the stand, and incapable of delivering consistent amounts of chemical.

Excellent results were achieved using the "Punch and Fill" technique. Mortalities using this technique for stem diameter (D.B.H.) classes up to 25 cm, 25-30 cm, and 30 cm+ were 100%, 90%, and 63% respectively.

On the other hand, poor results were achieved with the lance injector (avg. 46% mortality). Only stems less than 15 cm dbh showed 100% mortality. Trees with stems larger than 30 cm D.B.H. were not killed.

- G. Ackerman, Silviculture Branch, Victoria

Cottonwood Injection Trial (Sx 84709Q). In early August 1984, 25 mature cottonwood trees (40-60 d.b.h.) on a cutblock southwest of Prince George were injected with the herbicide Roundup (glyphosate). Application was made using the Ministry of Forests "Punch and Fill" injection system. The system consists of a sailmakers punch attached to a hatchet. The punch is used to create a cavity (rather than using the hatchet blade to create a frill) for the chemical. Treatment of these stems, with thick furrowed bark, proved relatively easy using the "Punch and Fill" technique.

Stems were observed to determine efficacy at one year following the treatment. Although all stems had been felled approximately two weeks prior to this first assessment, many of the treated cottonwoods were located on the ground. The stems showed no signs of leafing out during 1985 indicating mortality shortly after treatment. Resprouting was not noted.

Due to the small size of this trial and the accidental felling of the stems, similar (but larger scale) studies should be initiated to:

1. Compare production and efficacy of the Punch and Fill technique with other chemical and non-chemical techniques (e.g., conventional hack and squirt, cutting, girdling).
2. Test various rates of application - both lesser injections per stem and use of diluted chemical.
3. Determine efficacy at various seasons of treatment by method of application.

- G. Ackerman, Silviculture Branch, Victoria

Aspen Control Trial (Sx 84704Q). In early August 1984, a trial was established to obtain efficacy information for Roundup (glyphosate) and Forestamine (2,4-D amine), using the "Punch and Fill" injection technique for pre-harvest treatment of aspen (Populus tremuloides) stems. The trial was located in an area consisting of approximately 2500 aspen stems/ha. The average age, height, and diameter (D.B.H.) of the aspen trees were 25 years, 14 metres, and 17 cm, respectively.

A total of 180 stems were treated: 60 stems with each herbicide, plus 60 untreated control stems.

The rates of application for stems less than 20 cm d.b.h. were:

Forestamine - 1 ml product for every 3 cm dbh
Roundup - 1 ml product for every 5 cm dbh

For stems greater than 20 cm dbh, the following rates of application were tested:

Forestamine - minimum 7 injections (each with 1 ml product) with an extra injection for each 1.5 cm dbh beyond the 20 cm dbh size.
Roundup - minimum of 4 injections (each with 1 ml product) with an extra injection for each 2.5 cm dbh beyond the 20 cm size.

One year post treatment assessment showed excellent control (100% defoliation) of all the trees treated.

- G. Ackerman, Silviculture Branch, Victoria

Layout of Buffer Zones on Operational Aerial Herbicide Projects. The following practical, yet novel, approach to the layout of buffer zones for aerial herbicide spraying projects was passed to the Branch by the Silviculture office at Smithers.

Some difficulty in reaching agreement between the various agencies involved has been noted in relation to layout of pesticide free zones and associated buffer zones. On many sites, streams and water bodies are often obscure and usually weather dependent, sometimes to the point of being non-existent during mid-summer at time of treatment.

One way to address the issue of climatic and scheduling uncertainties between the time of layout and the time of treatment is to mark the appropriate areas for both high and low water levels. Reaching agreement during the field inspections will allow spraying of a greater area if water levels are low or non-existent at time of treatment.

- G. Ackerman, Silviculture Branch, Victoria

RANGE PEST MANAGEMENT

Knapweed Biological Control Research Program. Several species of knapweed were introduced into North America from Europe about the turn of the century. The natural predators were not introduced with the knapweed seed. Diffuse and spotted knapweed (centaurea diffusa Lam. and C. maculosa Lam.) have invaded large areas of semi-arid rangeland in the southern interior and now pose a serious threat to the livestock industry, wildlife habitat, newly forested areas, and recreation.

A cooperative, jointly funded knapweed biological control research program was initiated by the B.C. Ministry of Forests, B.C. Ministry of Agriculture and Food, and Agriculture Canada. The B.C. component of the research program is administered by Range Management and Research Branches of the Ministry of Forests.

Current research emphasizes the screening, rearing, and pre-operational distribution of biocontrol agents. Additional studies focus on the effects of the biocontrol agents on knapweed populations and competitive interactions between knapweed and native plant species. There is a cooperative arrangement with the United States to exchange information. Mutual agreement to introduce each biological control agent to North America is required.

Other components of the overall British Columbia knapweed containment and control program include chemical containment and operational biological control. Information on these components is available upon request.

Several research projects were undertaken in fiscal 1985/86 and the results to the end of March, 1986, have been reported. There are individual reports on each project as well as a research summary which includes all projects. These publications are either available or will shortly be made available.

The Commonwealth Institute of Biological Control has collected and screened several insects from Europe for control of knapweed species including: Terellia virens on C. maculosa seed heads, Larinus minatus on C. diffusa seed heads, Cyphocleonus achates on knapweed roots, Pterolonche inspersa on roots, Chaetorellia jaceae on C. maculosa.

Agriculture Canada provides liaison with CIBC and provides research facilities at Kamloops and Summerland Research Stations. Larvae of Agapeta, Pelochrista, and Pterolonche have been maintained in quarantine and are being established in Canada.

In B.C., insects previously released including Agapeta, Pelochrista, Urophora, Metzneria, and Sphenoptera were reevaluated at the release sites. The extent of biological control also was assessed for several insects. Several other projects, including surveying infestations by remote sensing, were undertaken and details are available from the authors.

- B. Wikeen, Research Branch, Victoria, and E.A. Jensen, Range Management Branch, Victoria

PESTICIDES

Abandonment of Appeal. Canadian Forestry Service headquarters has advised that the Kitsumkalum Band has agreed to abandon their appeal (in the Court of Appeal for B.C.) concerning the proposed Garlon® herbicide research following cancellation of the project by the CFS. This action follows two years of planning, discussion, and pest establishment work by CFS researchers and associates.

- R. DeBoo, Protection Branch, Victoria

FLULC Consensus Statement on Pesticides. Copies of this consensus statement on pesticide use in B.C. forest management are available from the Council of Forest Industries (attn: Brian McCloy). The statement is the result of three years work and about 15 drafts. Co-chairmen Devitt and Chambers of the Forest Land Use Liaison Committee, and Dr. Terry Simmons, Chairman of the Working Sub-committee, are to be congratulated especially for this timely contribution.

- R. DeBoo, Protection Branch, Victoria

Changes Called for in the Pesticide Permit Application Process. A number of forest regions have expressed concern about the way that pesticide permit applications are reviewed. In particular, the formal referral process does not offer a dependable method of detecting and resolving land use conflicts. An example of this shortcoming was seen this spring in the plans of interior silviculture people who wished to treat forest sites which are also used for range. In some cases, the cattlemen were unaware of these plans. The formal referral process also does not allow for interagency field assessment prior to application. This poses an excessive workload on field staff who are faced with a rapid turnaround time for the comments.

In the near future, Ministry of Forests pesticide use policy may be changed to allow forest districts and regions to evaluate permit proposals more fully prior to the applications being brought forward to the Pesticide Control Branch. Individuals having an interest in such proposed changes should make their views known to the Ministry of Forests, Protection Branch.

- J. Henigman, Protection Branch, Victoria

Forest Pesticide Applicator Certification Courses. During this spring, courses have been offered in Surrey, Campbell River, Nanaimo, Kelowna, Kamloops, Castlegar, Prince George, and Smithers. Two additional courses in Williams Lake and in Surrey for nurseries will complete this season's pesticide applicator training.

Starting with the new fiscal year, the courses are being managed by a contracted course coordinator. The vegetation management portion of the course is also now contracted. This situation appears to be working out well with little problem caused to students. The Ministries of Forests and Environment will still maintain full control of course content and examination requirements.

- J. Henigman, Protection Branch, Victoria

Garlon® Herbicide Environmental Impact Studies. Studies have been initiated to assess the environmental impact of Garlon 4 ester. Dow Chemical Canada Inc. has contracted D. McLeary and Associates Ltd., Vancouver, to pursue these studies within the U.B.C. Research Forest in Maple Ridge. Pesticide use permits have been applied for to the Pesticide Control Branch. The following are the study objectives:

1. To monitor the concentration of Garlon 4 in forest foliage, litter, soil, soil water, stream water, and streambed sediment for a 52-week period following an aerial spray application;
2. To monitor meteorological and hydrological conditions within the study area during this period;

3. To determine and describe the decay rates and times to steady-state concentrations for this herbicide in each substrate;
4. To assess down-slope movement of sprayed chemical;
5. To examine the concentrations of Garlon 4 in a coastal stream following direct overhead spraying and chemical inflow from subsequent storm events; and,
6. To provide meaningful technical data for future modelling studies designed to predict the fate of Garlon 4 if aerially applied to other Canadian forest ecosystems with differing site characteristics and climatic conditions.

- J. Henigman, Protection Branch, Victoria

Proposed Pocket Guide on Pesticides. The Ministry of Forests' Public Relations Committee has proposed the creation of a "Pocket Guide to Pesticide Use and Regulation in B.C." to be sponsored by the Forest Pest Review Committee (FPRC).

The purpose of such a handbook would be to provide useful information to those involved in using pesticides for forest management when dealing with members of the public.

The content would be in a summarized table and graph format, and might include such information as: the federal registration/provincial regulation process; pesticide regulation process; pesticide handling and safety; selection and calibration of pesticide application equipment; criteria for, and timing of, treatments; and the properties of major forest pesticides used in B.C.

Pending approval by the FPRC, a steering committee will be formed by June 15, involving representatives from Protection and Silviculture Branches and others.

- P. Humphreys, Protection Branch, Victoria

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(Forest Service Personnel fully or partly committed
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Vancouver Forest Region

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S. (Steven) Schmidt, Resource Officer-Protection, Campbell River, 286-3282
W. (Bill) Hardy, Resource Assistant-Protection, Campbell River, 286-3282
S. (Stan) Gripich, Resource Officer-Protection, Port McNeill, 956-4416
D. (Denis) Tippie, Resource Officer-Protection, Mid-Coast, 982-2621
B. (Brian) Simpson, Resource Officer-Protection, Queen Charlotte Islands, 559-8447

MEETINGS

East Kootenay Insect and Disease Control Committee. The East Kootenay Insect and Disease Control Committee met on March 13, 1986, for the first time in two years. Working groups from the Golden, Cranbrook, Invermere, and Kootenay Lake T.S.A.'s made presentations and a resolution was passed which will see the structure of the Master Committee modified to a format which will allow more immediate resolution of administrative problems relating to bark beetle control. The committee is scheduled to meet again in September to review performance under the new format.

- S. Byford, Cranbrook Forest District, Cranbrook

"Weevil Day" in Terrace. A morning field trip and afternoon office presentation to Forest Service staff and local licensees in Terrace on April 28, 1986, highlighted the current status of weevil management in B.C. Representatives from Vancouver and Prince Rupert Regions discussed the results of survey and clipping trials. Dr. Rene Alfaro of PFC, Victoria, presented research results on the weevils' long-term effects on wood quality and tree form. More research is required in assessing the weevil's impact on lumber resources and merchantability.

In comparison to the Vancouver Region, the weevil problem in Kalum appears to be less severe. However, the weevil is still considered to be a major threat to sitka spruce sawlog production in the Kitimat Valley.

- T. Ebata, Prince Rupert Forest Region, Smithers

Forest Pest Survey Planning Committee. The BCFS-CFS/FIDS Committee met several times to discuss and coordinate pest survey projects. Recent items included a review of survey methods for bark beetles to standardize approaches (BCFS, CFS), a project to prepare insect specimen display boxes, and a listing of proposed activities by both organizations to determine possible joint or cooperative endeavors. Minutes of recent meetings were circulated to pest management coordinators at regional offices.

- J. Muir, Protection Branch, Victoria

Western Forest Insect Work Conference. The 1986 conference was held in Victoria at the Empress Hotel during the first week of March. The session was well attended by more than 150 Canadian and U.S. specialists. Topics discussed ranged from direct control of insects to host/pest interactions. Please contact the undersigned for details. The 1987 conference will be held in Utah.

- P. Hall, Protection Branch, Victoria

Western International Forest Disease Work Conference (WIFDWC). The annual meeting of the WIFDWC is scheduled September 8-12, 1986, at Juneau, Alaska.

Discussion and workshop sessions are being arranged on dwarf mistletoes, root diseases, and stem rusts. These sessions will emphasize practical aspects of detection, surveys, and control.

The workshop atmosphere and the friendly exchange of opinion and information make WIFDWC meetings of considerable value, not only to forest pathologists but to all pest management staff.

- J. Muir, Protection Branch, Victoria

Plant Health Session, Vancouver. In a one-day session on April 9, Ministry staff and G. Burton, Council of Forest Industries, met with Ottawa and Burnaby staff of Agriculture Canada to discuss B.C. concerns with action on new or introduced pests. AgCan staff outlined their organization and responsibilities, and discussed the draft emergency procedures manual. Ministry and COFI staff outlined the importance of forests and the forest industry, and discussed some recent events such as gypsy moth, hemlock seedling blight, and nematodes. The session should help to encourage cooperative work on several important pest problems.

- J. Muir, Protection Branch, Victoria

Associate Committee on Agricultural and Forestry Aviation. A.C.A.F.A. had its annual national meeting in Campbell River on May 7 and 8. The Ministry of Forests was represented by Dr. R.F. DeBoo. This Committee makes recommendations on the funding of research to the National Research Council, particularly in the area of aerial pesticide spraying.

Just prior to the A.C.A.F.A. meeting, a workshop was held, sponsored by the B.C. Ad hoc Committee on Forest Pesticides, on the technology of aerial herbicide spraying. The recommendations of this Ad hoc workshop were presented to A.C.A.F.A. in the hope that studies of particular interest to B.C. forestry on aerial herbicide spraying may be addressed in research.

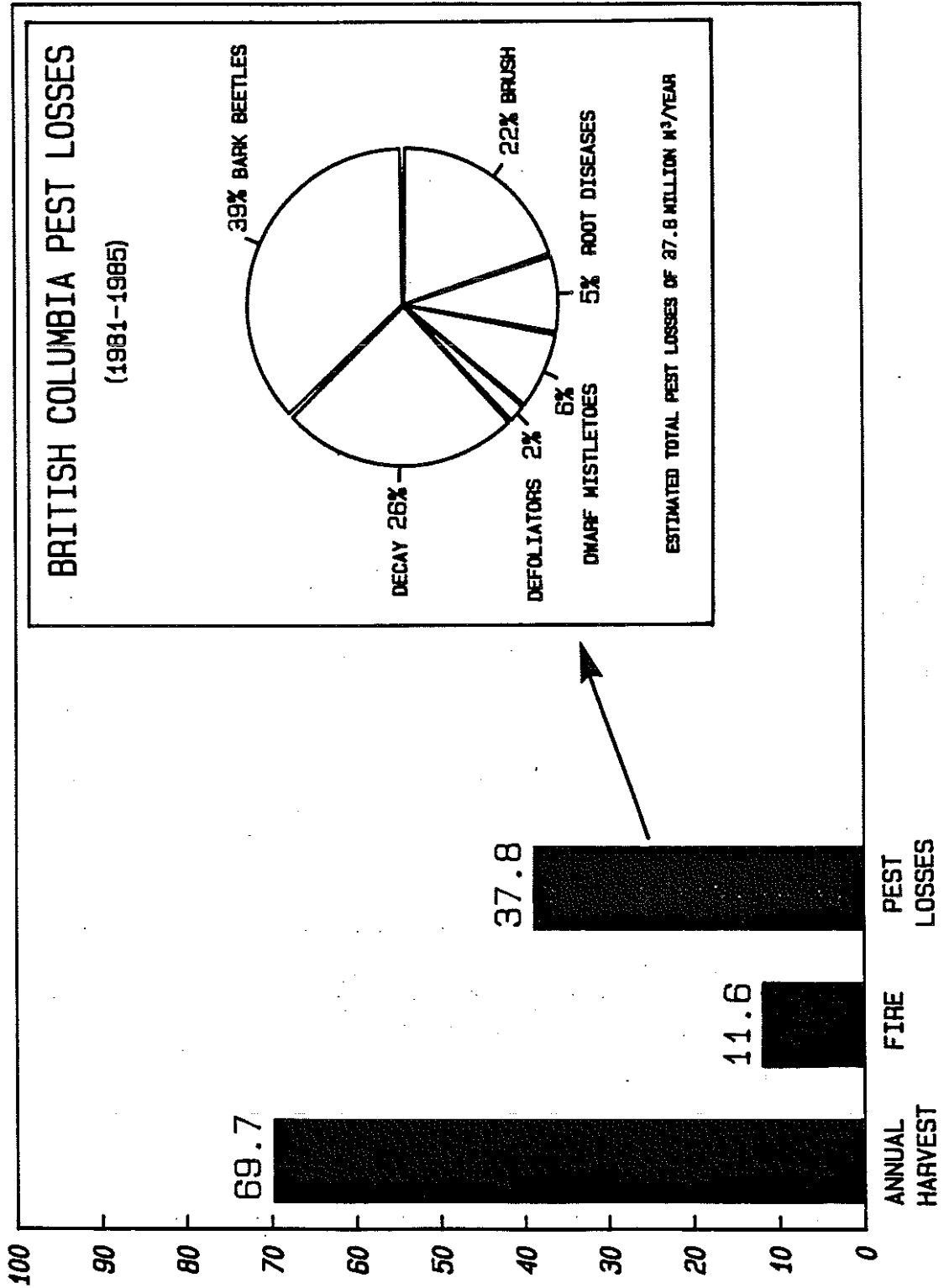
A summary of both the proceedings of the A.C.A.F.A. meeting and the Ad hoc workshop will soon be available from Bob DeBoo or John Henigman.

- J. Henigman, Protection Branch, Victoria

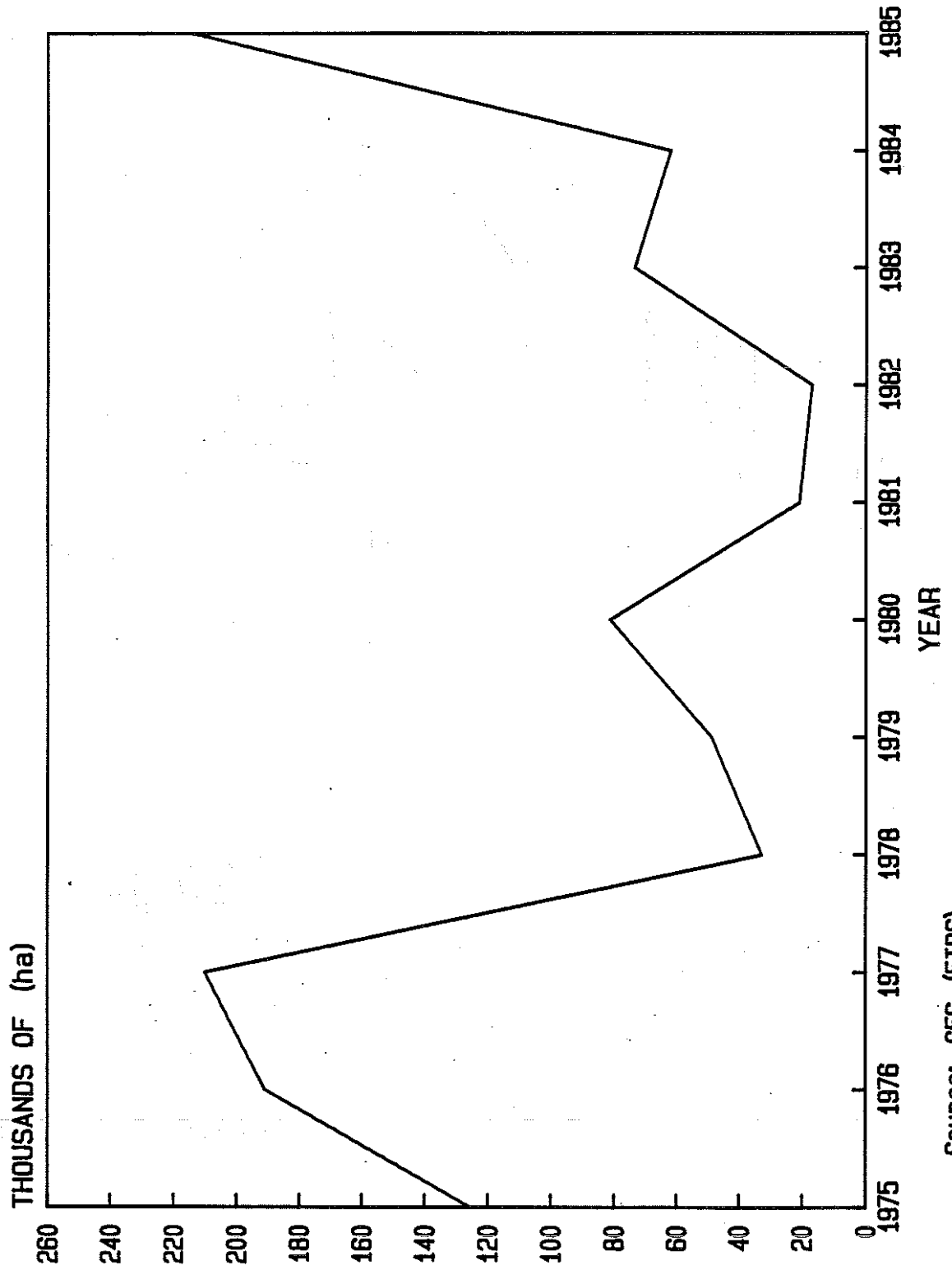
TABLATIONS AND GRAPHICS

BRITISH COLUMBIA

EST. ANNUAL TIMBER HARVEST, FIRE & PEST LOSSES
(GROSS), 1981-1985
(1 000 000's
OF M³/YEAR)



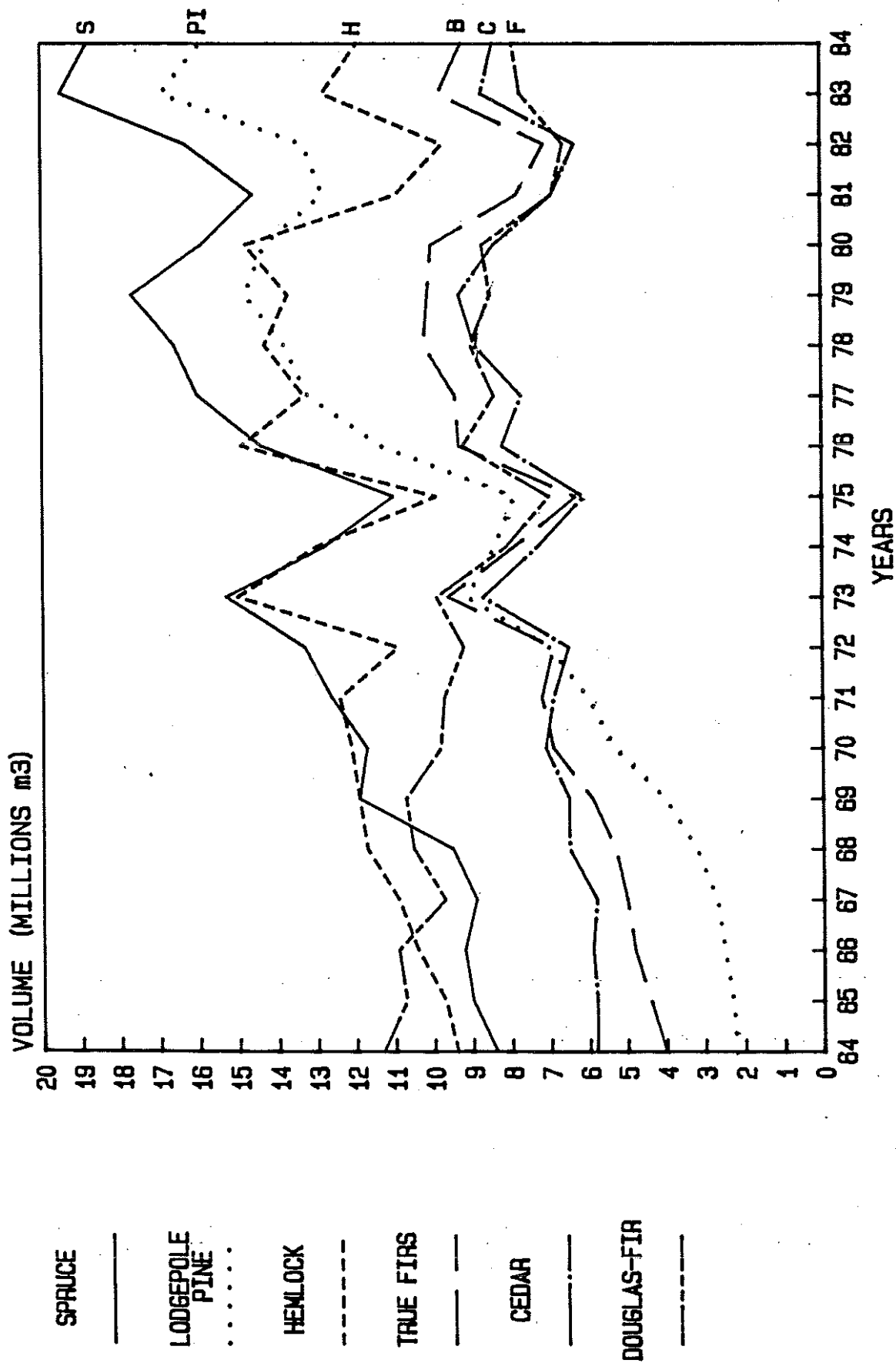
TRENDS IN VISIBLE DEFOLIATION OF DOUGLAS-FIR
CAUSED BY THE WESTERN SPRUCE BUDWORM IN
BRITISH COLUMBIA (YEARS 1975-1985)



Source: CFS (FIDS)

(Prepared by P. Humphreys, Protection Branch, Victoria)

TRENDS IN SPECIES CUT IN BRITISH COLUMBIA 1984-1984 (CALENDAR YEAR)



SOURCE: BCFS
(Prepared by P. Humphreys, Protection Branch, Victoria)

PUBLICATIONS AND REPORTS

- Alexander, B.L. 1985. Pest management rapattack. An operational and cost-benefit evaluation in the Merritt and Invermere Forest Districts, 1985. Min. of For. Int. Rep. PM-PB-21, 18 pp.
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- Heppner, D.G. and P.M. Wood, 1986. Blackheaded budworm in the Vancouver Forest Region: Current Control Options. B.C. For. Serv. Int. Rep. PM-V-9, 28 pp.
- Murtha, P.M. and R.D. Cozens. 1985. Color infrared photo interpretation and ground surveys evaluate spruce beetle attack. Can. Jour. Remote Sens. 11(2):177-187.
- Swanson, D. 1986. Public information on pesticides: suggested guidelines and a review of available publications. Min. of For. Int. Rep. PM-PB-22, 38 pp. (in press).
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- Wood, P.M. and D.G. Heppner. 1986. Blackheaded budworm in the Vancouver Forest Region: 1985/86 Situation Report. B.C. For. Serv. Int. Rep. PM-V-8, 37 pp.

The Authoritative Source of Pesticide Technology, Application and Legislation in British Columbia Forests

Provides detailed information and working guidelines for operational foresters and other pesticide users in British Columbia. Published by the B.C. Ministry of Forests and the Council of Forest Industries, the seven volume handbook contains:

Volume 1. How to Handle a Forest Project Using Pesticides

Outlines the procedures and safety practices involved in a pesticide use project.

Volume 2. Pesticides Used in B.C. Forests

Lists currently registered pesticides of interest to foresters. Includes toxicological information, cautions, decontamination, disposal, symptoms of poisoning, and first aid.

Volume 3. Pesticide Application Techniques

Describes aerial and ground pesticide application techniques.

Volume 4. Equipment Used in Pesticide Applications

Describes pesticide application equipment and its use.

Volume 5. Administrative Aspects of Forest Pesticide Use

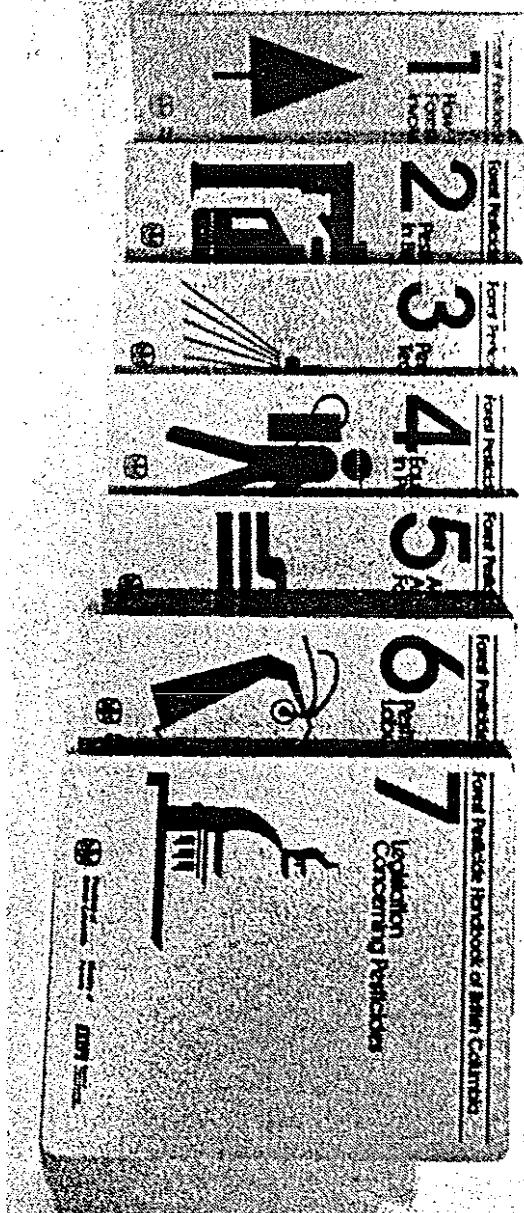
Contains information about pesticide registration, the forest pesticide applicators certificate course, permit appeal procedures, and policy positions of the Ministry of Forests and the Council of Forest Industries. Includes a glossary of terms and bibliography.

Volume 6. Pesticide Label Catalogue

Contains reproductions of pesticide labels.

Volume 7. Legislation Concerning Pesticides

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