



Province of
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Ministry of
Forests

PEST MANAGEMENT PROGRESS

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

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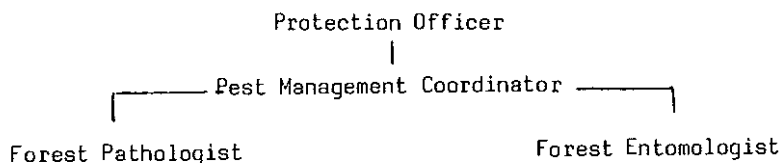
ENTOMOLOGISTS, PATHOLOGISTS AND THE CHIEF FORESTER

Although "down-sizing" and reorganization are ongoing in the Ministry of Forests, forest pest management continues to gain recognition as an essential forestry activity in British Columbia. In March, 1984, Minister Waterland endorsed the staffing of a forest pathologist and a forest entomologist at each of the Ministry's six regional offices. These staff will augment pest management capability significantly by providing professional expertise at key locations across the province. Thus, British Columbia will soon have a pest management capability unique in Canada, and equalled only by the U.S. Forest Service (e.g. Region 6) on the continent.

Recruiting should commence this summer and duties will include:

- Participation in Timber Supply Area planning and monitoring procedures
- Development and fine-tuning of regional-level guidelines
- Provision of regional expertise to Ministry and forest industry resource specialists
- Leadership in the implementation, conduct and analysis of pest management surveys, damage appraisals, operations and trials
- Preparation of training modules and extension information

The Regional reporting relationship will be:



In closing, pest management staff and associates throughout B.C. join me in wishing our "benefactor" and "chief booster," Bill Young, a long, productive and happy retirement. As Chief Forester, Ministry of Forests, and as Chairman, Forest Pest Review Committee, Bill was a double-barrelled promoter for pest management during its early growth period. His sage advice and encouragement to all involved will long continue to shape progressive forest pest management in B.C.

- R.F. DeBoo, 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

TSA - Pest Management Planning. An extensive draft compilation of pest impacts in each Timber Supply Area (TSA) was prepared and tabled at the December 1984 meeting of the Forest Pest Review Committee (FPRC), chaired by W. Young, Chief Forester, B.C. Ministry of Forests. This document was requested by W. Young to initiate planning for pest management in the TSA's.

Following a review of the document by FPRC member organizations in January, 1984, Branch and Regional Planning and Protection staff held a two-day session, discussed discrepancies and general methods, and proposed uniform methods to compile and calculate pest losses. These proposals were circulated and are being used by Regional staff to modify these estimates of pest impacts, where necessary.

Revised compilations will be forwarded to Protection Branch by May 11, 1984 for presentation to the Executive. These compilations, when approved, will be used by TSA steering committees to assist development of local programs.

Pest impacts and pest management plans will be developed in more detail during scheduled review, reanalysis and modification of individual TSA plans.

- J. Bullen and L. Pelchat, Planning Branch, and D. Ross and J. Muir, Protection Branch, Victoria

Pest Management Program Reviews. Five Regional Pest Management program reviews were conducted during 1983-84. The reviews concentrated primarily on objectives and accomplishments related to insect and disease surveys and control operations, funding and staffing problems, training needs and working relationships.

The program reviews will continue during 1984-85. These reviews serve to strengthen Branch-Regional office communication and procedural linkages in pest management. As programs mature and expand, the Reviews will be augmented by project-specific technical audits. Presently, only bark beetle management audits are being conducted.

- H.G. Doerksen, Protection Branch, Victoria

Provincial Protection Meeting. During a two-day meeting in April 1984 at Victoria, Protection staff from Regional offices and Protection Branch reviewed draft proposals to coordinate pest surveys and use of aircraft. Needs and roles of both the Canadian Forestry Service and the B.C. Forest Service were itemized in the draft documents and discussed.

Funding priorities were examined, and an evaluation of regional strategies were also addressed at the meeting. It was concluded that pest management operations must be adequately funded to be effective and that a combination of

commitment from annual budgets as well as considerable supplementary funding would be required to conduct a truly assertive program throughout the province.

- R. DeBoo, Protection Branch, Victoria

Glossary of Forest Pest Management Terms. Laura Doliner and John Borden of Simon Fraser University have completed the Glossary on behalf of the Forest Pest Review Committee. Publication is expected this summer, and copies will be available from Protection Branch.

- R. DeBoo, Protection Branch, Victoria

Vole Damage. Recent plantation inspections in the Chamiss Bay and Friell Lake areas of the Nootka TSA indicated that voles are damaging newly planted trees and well established regeneration. In one 10 year old plantation, 60% of the western hemlock was girdled. More intensive surveys are planned for the summer of 1984 to determine if follow-up treatment is required.

- F. Hamre, Campbell River Forest District, Campbell River

Forestry Theses on Pest Management. In cooperation with the Vancouver Region, three University of B.C. forestry students have completed bachelor of science in forestry theses on local pest management topics:

- (a) "The feasibility of the proposed Ministry of Forests white pine planting program to restock Phellinus weirii infection centers in the Vancouver Forest Region" - Alan Blattla.
- (b) "Influences of several physical site factors on the incidence of Sitka spruce weevil (Pissodes strobi) in Sitka spruce plantations in the Kingcome Timber Supply Area" - Bill Downing.
- (c) "Entomological implications of the 1982 Aug Fire in Strathcona Provincial Park, B.C." - Jeff Fournier.

Two master of science theses are also being prepared in conjunction with the Vancouver Region. Jerry Carlson (U.B.C.) has been working on pine oil to repel Sitka spruce weevil and on the detection of spruce weevil using aerial photography. Julie Brooks (Simon Fraser University) is developing a terpene assay method to detect spruce genotypes that might be resistant to Sitka spruce weevil.

- P. Wood, Vancouver Forest Region, Burnaby

Audits of District Pest Management Programs, Kamloops. Program audits were conducted during January and February. Many accomplishments were achieved despite the lack of District funding and the downsizing of staff.

A total of 2,597 days were spent on pest management work in many areas. Seventy-six hours of flying time were utilized for aerial survey of 279 000 ha. of forest; another 20 050 ha were surveyed on the ground.

A total of 21 183 ha. of new infestations, bark beetles and some defoliators were identified and, where warranted, action was taken. More than 1 800 000 m³ of infested timber with a stumpage value in excess of \$2,160,000 were harvested in the past year.

- R. Edward, Kamloops Forest Region, Kamloops

Policy Update. Pest Management Administration draft policy was reviewed and accepted by the Executive April 30, 1984. The document which establishes roles, responsibilities and major activities should be available for the MOF Policy Manual within the next few weeks. In the fiscal year 1984-85, we will develop more specific policies, including pesticides, research and dwarf mistletoe control.

- H.G. Doerksen, Protection Branch, Victoria

Reintroduction of Fisher to Control Porcupine in Khutzeymateen Inlet. In the North Coast Forest District, particularly at Khutzeymateen Inlet, 32 km northeast of Prince Rupert, porcupine (*Erethizon dorsatum*) have severely damaged 30-year-old hemlock stands. On an area of 1041 ha logged between 1947-54 and regenerated to an average of 6376 stems per ha (He 4013, Ss 625, Ce 910, Ba 828), surveys indicated 51% of the He and 5% of Ss were damaged, topped or killed, within the last ten years. Feeding last winter damaged another 1.5% of the He and 1.35% of the Ss.

Many trees were damaged by top breakage from a 1982 winter snow storm.

From 1978-1981 an adjacent area of 2000 ha was helicopter logged. This created optimum habitat for porcupine with ideal summer browse of shrubs, herbs and brush and tender young trees for winter feeding.

Current epidemic populations of this rodent, 5-10 per ha, are expected to increase because there are few natural controls in the area such as predators, highway mortality, winter kill or random killing by people.

Damage by the porcupines will totally preclude any stand management, i.e. sanitation spacing or thinning. Potentially, the allowable annual cut will be reduced by 4% resulting in stumpage revenue losses at rotation of \$6.3 million. Damage creates entry points for rots and decays and creates stand openings for brush invasion. Stand consistency has been disrupted to the extent that the stands will be unmerchantable.

Numerous control methods were considered such as poisoned bait, shooting, and trapping, but all were considered impractical for this area. However, one method used successfully in other provinces and the U.S.A. was to reintroduce

the fisher (martes pennanti), the primary predator of porcupine. The fisher was once indigenous to this area but is totally absent as a result of previous wolf poisoning programs and extensive trapping.

This District, in cooperation with Rick Marshall of Fish and Wildlife, is embarking on a program to reintroduce 10-12 fisher during the winter of 1984-85. Fisher will be purchased from trappers at going fur prices plus holding fees. Radio collars will also be used on some animals to monitor fisher ranges.

Permanent transects were established in four blocks to monitor porcupine populations and feeding activities.

- W. Jackson, North Coast Forest District, Prince Rupert

Nelson Regional Pest Management Summary. The pest management program in the Nelson Forest Region during 1983 continued to be directed mostly to bark beetle detection and sanitation or salvage harvesting.

A significant reduction in area of infestation was recorded in both mountain pine beetle (MPB), 39%, and spruce bark beetle (SBB), 59%. Part of this reduction was attributed to an aggressive and timely harvesting program in the infested areas, S.B.B. trap trees and M.P.B. cut and burn projects carried out for the past several years. Ground probes were conducted in 39,000 hectares of infested and susceptible pine and spruce stands to prioritize areas for bark beetle control programs.

Sanitation salvage harvesting was carried out on 5 500 hectares and 2,645 trap trees were employed in small spruce beetle infestations. Operational pheromone trials were conducted at 16 locations on 85 hectares to contain small mountain pine beetle outbreaks. More than 650 infested lodgepole pine were cut and burned in small mountain pine beetle infestations.

Ground surveys were also conducted on 12 000 hectares to determine the damage impact of root rot, dwarf mistletoe and defoliator insects. An operational stump removal trial to control Armillaria root disease was undertaken on 34 hectares. Dwarf mistletoe control through sanitation cutting was done in a number of infected stands during harvesting, stand tending and site preparation. White pine blister rust control through pruning of young white pine trees was done on 200 hectares in conjunction with juvenile spacing.

- E. Morris, Nelson Forest Region, Nelson

Nelson Pest Management Technical Audits. A technical audit was again conducted on the pest management activity of the protection program in each of the seven Districts in the Nelson Region. The audit examined those activities covered under the regular Ministry account for the 1983 calendar year. The audit was broken down into four categories: detection, control, training/extension and other activities.

A total of 3549 man days were expended on these activities as follows: 1556 for detection, 838 for control, 379 for training/extension and 776 for other activities. For more information on the pest management technical audit for the Nelson Forest Region contact the undersigned.

- E. Morris, Nelson Forest Region, Nelson

Pest Management in B.C. Forest Service Seedling Nurseries. Several pest management programs are underway in B.C. Forest Service seedling nurseries.

- (1) Pheromone traps are used to predict damage from the cranberry girdler (Chrysoteuchia topiaria), a small Pyralid moth whose larvae girdle seedlings in the root collar area during the fall. An average count of 10 male moths per trap per week indicates that damage will be significant and a protective spray of diazinon is applied to susceptible stock.
- (2) Pheromone traps for the European pine shoot moth (Rhyacionia buoliana) are in place at all nurseries to determine if this pest is present. If moths are found, sprays are applied to reduce the spread of this imported pest to new areas of the province.
- (3) For the strawberry root weevil (Otiorhynchus ovatus), a chronic pest at Surrey Nursery, populations are monitored using weevil boards. These traps are used to determine duration of the adult emergence period, distribution of the weevils throughout the nursery and effectiveness of the control program.
- (4) The range of chemicals that are registered for use on conifer nurseries in Canada is limited. Work to gain label extensions through the minor use registration program is being emphasized. A Nursery Pesticide Committee was formed with representatives from Silviculture and Research Branches and Federal Forestry.
- (5) Trials with Belmark, one of the new synthetic pyrethroids, are planned to produce efficacy data for registration purposes. The insecticide, already used in the USA, shows great promise for the control of root weevil adults.
- (6) In conjunction with a research team headed by Dr. T. Rutherford, Simon Fraser University, a nematode biological control agent is being tested against the strawberry root weevil at Surrey Nursery. This nematode has proved to be particularly effective in container seedlings against root weevil larvae.
- (7) Oviposition, dispersal and bioassay studies were conducted with the strawberry root weevil at Surrey Nursery over the 1983 growing season. The intention of the study was to increase the effectiveness of the control program currently in use.
- (8) A literature search to seek alternative chemicals for Botrytis control in container production was completed. Tests to determine if Botrytis populations are resistant to the fungicides now in use are being planned.
- (9) Tarnished plant bugs, Lygus spp, were implicated in death of terminal leaders at several nurseries in the province. In the 1984 season, a

program has been initiated to determine the type of damage, develop an effective trap, identify the species present, monitor population migration and find a suitable insecticide for control.

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

Pre-Harvest Silviculture Assessment and Pest Management. Further to the article in the previous issue of PMP, draft PHSA forms, procedures and instructions were circulated in March 1984 to all Forest Regions, TSA Steering Committees (via the Regions) and to several Victoria Branches for review. Responses are now on hand, with numerous modifications suggested. Silviculture and Protection Branches are consulting regarding possible changes for wildfire, controlled burning and pest management.

Further review and consultation between Branches, Regions and industry are anticipated before the PHSA procedure is finalized.

- P. Diggle, Silviculture Branch, Victoria

FOREST ENTOMOLOGY

Technical Audits. Two technical audits of Regional bark beetle programs have been carried out to date. Such audits are intended to review the strategies and techniques being implemented for management to reduce losses from bark beetles and to ensure that actions taken or suggested are appropriate. Recommendations arising from the audits are intended to benefit subsequent programs.

Audits have been carried out in Prince Rupert and Prince George Forest Regions. Additional audits of programs are planned for Cariboo and Kamloops Forest Regions in 1984-85. Formats and questions will be developed.

- P. Hall, Protection Branch, Victoria

Prince Rupert Region Evaluation of Bark Beetle Control. A task force to assess bark beetle detection and control actions in Lakes, Morice and Bulkley Forest Districts was formed and a report was tabled at the Regional Pest Review Committee spring meeting. The report is being reviewed and a final version will be available later this year.

The following topics and points were covered in the report:

1. Status of the Region's bark beetle infestation.
2. Regional control priorities.
3. Long-term harvesting solutions, including the potential of increased harvest levels.
4. Long-term funding alternatives and the impacts of funding sealings.

Recommendations presented included the following:

1. A clear definition of management objectives is required such as creation of forest mosaics. Regional goals should be established and incorporated into Timber Supply Area (TSA) plans immediately.
2. Establish short term goals for dealing with infestations relating to clear cutting, application of effective holding actions, definition of tolerable level of bark beetle infestations, goals for bringing infestations to endemic level and a maintenance/sanitation program.
3. Priority must be given to development of a beetle management information system.
4. Air detection requires one party responsible, a fixed core budget, trained crews and proper timing.
5. Ground detection activities to include cruising, probes of priority beetle control units as listed in each district and training of MUF/industry crews.
6. Planned logging after full assessment should ensure a minimum block size to include as little unattacked timber as possible. Concentrate logging in beetle control unit (BCU) priority areas.
7. Holding actions which require early budget allocation on a forecast basis should concentrate on falling and burning in pine with only supplementary use of insecticides and use of spruce trap trees in low and medium infestations. Each single tree treatment will require two treatments during one flight period. Costs should be analyzed and regional standards developed. Concentrate holding action in priority BCU's.
8. To ensure expertise, personnel must be trained. Audits of performance should be conducted by an expert prober, cruiser and logging engineer. Following a final review by the task force committee, the final report will be distributed. Some of these recommendations are being implemented at this time.

- V. Barge, Prince Rupert Forest Region, Smithers

Funding for Bark Beetle Detection and Control in the Prince Rupert Forest Region. The approximate costs of bark beetle management in the 1983/84 fiscal year in the Prince Rupert Forest Region were:

Section 88	\$ 540,000	(Detection	\$150,000)
		(Single Tree Treatment	\$300,000)
		(Pheromone	\$ 90,000)
Ministry	\$ 300,000	(Detection	\$100,000)
		(Single Tree Treatment	\$200,000)
Ministry	\$ 85,000	Region Section Overhead	
	81,000	Overhead for Three Districts	
Total	\$1,006,000		

Section 88 expenditures included overhead (\$97,200).

In summary, expenditures were:

Detection	\$250,000
Holding Actions	\$590,000
Total	\$840,000 (excluding MOF overhead)

The above funding supported numerous detection and control actions. Detailed statements of activities for the Lakes, Morice, Bulkley, Kispiox and Kalum Forest Districts were prepared and are available from the undersigned.

- V. Barge, Prince Rupert Forest Region, Smithers

Mountain Pine Beetle Management Opportunity in the Cariboo Forest Region.

Until recently, the major infestation of mountain pine beetle in lodgepole pine was concentrated in an area of the Anahim, Tatla and Chilcotin Supply Blocks. Tree volumes lost in these infestations were not considered in annual allowable cut (A.A.C.) determinations. However, in the Quesnel TSA, the western supply blocks of South Kluskus, West and East Narcosli which contain a volume of 23 000 000 cubic metres of mature lodgepole pine are now at risk of infestation. These areas contain approximately 12 years of A.A.C. for the Quesnel T.S.A. The volume does not include the volume of other forest types contained in the stands that will become uneconomic to harvest if the pine component is lost.

The present epidemic of mountain pine beetle in the Cariboo Forest Region was noted in the early 1970's with moderate infestations mainly in the Tatla Supply Block of the Williams Lake Timber Supply Area. Recently, the infestation increased dramatically and spread northeastward to the western supply blocks of the Quesnel T.S.A.

There is no foreseeable collapse of the epidemic until all susceptible trees are killed. We predict that the above-mentioned volume will be destroyed or become non-merchantable within 5 to 10 years. Thus, steps must be initiated as soon as possible to harvest this timber.

Two management options are being considered: harvesting or not harvesting. The impact on associated values such as fish and wildlife, recreation, range and watershed is also being assessed. The end result with either option will be a reduction in available cut. However, by planning a harvesting program, overall losses should be minimized and programs for renewing the resource will follow progressively.

An immediate requirement is to develop road access to these supply blocks. Construction of roads was begun in 1981 under special warrant but further construction was prevented when funding was withdrawn. The current estimate for access development over the next three years is \$6 million.

Although development of the western supply blocks of this TSA would eventually take place, the beetle infestation necessitates the undertaking of harvesting and development programs in the very near future.

In an attempt to obtain funding, a brief outlining the current and projected effect of the pine beetle in the western half of the Quesnel TSA was presented to the Minister of Forests and the Forest Service Executive in March 1984. Further action depends on the Executive decision regarding allocation of funds for access development.

- D. Doidge, Cariboo Forest Region, Williams Lake

Rapattack Pest Management. The availability of rapattack crews to assist with pest management activities was warmly welcomed by Districts in this Region. A program was scheduled so that crews can work on numerous projects when they are available. The work includes trap tree felling, single tree disposal, helipad construction, and detection probes.

A training seminar will be conducted June 5 at Salmon Arm for the crews. The objectives include identification of bark beetles and action to take if they are encountered when crews are working on fires.

- R. Edward, Kamloops Forest Region, Kamloops

Bark Beetle Program in Merritt District. A concerted effort was made to determine the extent of spruce bark beetle activity in Lamont and Whippisaw Creek drainages by industry and Ministry staff. Priority of harvest was established and trap trees were felled involving 330 ha and 130,000 m³.

Two other major drainages will be examined later this spring using rappel crew, industry and Ministry staff.

Frontalin will be used to bait several areas for spruce bark beetle. Industry has purchased this chemical to see if it would prove less costly than trap trees.

Pheromone baiting for mountain pine beetle will be a major control effort this year. In a cooperative effort with industry, we plan to place 2,500 or more baits in several areas to contain this pest until we can harvest the attacked stands later in the year.

Lindgren traps were purchased and will be used to monitor mountain pine beetle flight from decked logs in mill yard, and to monitor flights in infested areas to determine when hauling restrictions should be imposed.

A panel discussion on pests will be held on the local community cable TV channel, April 25. Dr. John Borden, industry representatives and T. Lacey will participate. We hope to increase public awareness and understanding of what is happening in our forests.

We are also working closely with the Merritt Timber Supply Area steering committee to develop an operational control maintenance strategy for pests. The strategy should be in place by the end of June.

- T. Lacey, Merritt Forest District, Merritt

Bark Beetle Surveys and Monitoring, Clearwater. All Clearwater Forest District staff recently blitzed the whole district with spruce beetle probes. Suspect areas adjacent to logged areas were walked and other areas were covered by snowmobiles. Suspect, inaccessible drainages were covered by helicopter.

Lindgren funnel traps for fir and spruce beetle were put out in various locations to monitor flight times and population levels. Thirty-two traps were put out in groups of four in areas of various conditions. Traps were hung between the trees, suspended on a rope at 6-12 feet off the ground. Traps are being monitored biweekly. All data are recorded per trap to determine the best conditions for use of the traps.

- B. Read, Clearwater Forest District, Clearwater

Space Shuttle Photography to Detect Bark Beetles. The space shuttle mission scheduled August, 1984 (STS-17) will include colour infra-red photography of three target areas in the Prince Rupert Forest Region. The colour infrared photography is part of an experiment sponsored by N.A.S.A. utilizing a new high-resolution, large-format camera. The camera, a precision wide angle, cartographic instrument, is capable of producing high-resolution, stereo photography of great geometric fidelity in multiple base-to-height ratios. The primary camera specifications are:

Focal length	30.5 cm
Aperature	f/6.0
Spectral range	400 to 900 nm
Image format	22.9 x 45.7 cm

The camera is mounted in the cargo bay of the shuttle aircraft. Photographs will be taken when the aircraft is in an inverted position in relation to the earth at both 225 and 296 km altitude. Scale of the photographs will be 1:970 000 at 296 km and 1:737 000 at 225 km. Enlargements will be available at 1:250 000 and 1:50 000.

N.A.S.A. invited the International Society for Photogrammetry and Remote Sensing to submit experimental proposals involving the use of the large format camera. Dr. Peter Murtha, Professor, Faculty of Forestry, U.B.C. and the Ministry of Forests, Prince Rupert Region, selected target areas at Hazelton, Babine Lake and Houston. These areas contain infestations of both mountain pine and spruce beetles.

The purpose of the experiment is to evaluate large format camera photography for the detection of bark beetle damage in North American coniferous forests. The U.S. Forest Service is actively involved in the experiment.

Dr. Murtha initially will evaluate the B.C. photos for bark beetle damage to both lodgepole pine and spruce forests. The Ministry of Forests, Prince Rupert Forest Region, will provide ground detection data to Dr. Murtha for use in his evaluation. The success of the experiment will depend on clear weather

conditions during the eight day mission and also on unforeseen circumstances and changes to the mission schedule.

The experiment does not require financial support from the Ministry of Forests or U.B.C. but there will be a nominal charge for photographic prints obtained for our use.

It is not certain how much useful information will result from the experiment. It is certainly a much needed step in the development of remote sensing as a tool for beetle detection.

- P. Pashnik, Prince Rupert Forest Region, Smithers

Mountain Pine Beetle Film. Subjects and schedules were outlined for a new film to illustrate recently improved strategies to mountain pine beetle management. In the coming season, we will attempt to get appropriate film footage to show the more common control activities.

- P.M. Hall, Protection Branch, Victoria

Mountain Pine Beetle in Manning Park. A joint Ministry of Forests-Ministry of Lands, Parks and Housing aerial survey of the Park for previously undetected green attack (now red) will be conducted this summer. This will be a follow-up to the control work that has been in progress within the Park over the past few years.

- D. Heppner, Vancouver Forest Region, Burnaby

Mortality of Mountain Pine Beetle. Recent mortality studies in Vernon District indicated that mountain pine beetle progeny have overwintered well with no significant mortality observed. The results generally showed an increasing population for 1984.

- E. Haupt, Vernon Forest District, Vernon

Overwinter Mortality of Mountain Pine Beetle. At this time, although overwintering mortality assessments have not been completed in the Nelson Region, good survival seems apparent in most drainages. Assessment in four drainages of the Cranbrook District showed mortality averaging 25.9% (range 11.3% - 40.5%) at breast height and 21.3% (range 12.9% - 30.0%) at stump height.

Additional results will be reported when available.

- D. Gray, Nelson Forest Region, Nelson

Operational Trial of Colour Infrared Photography to Detect Mountain Pine Beetle Infestations. An operational trial utilizing 70 mm colour infrared photography will be carried out in the Morrison Lake area of the Morice Forest District during August - September, 1984. The trial will be conducted by Raoul J. Wiart, R.P.F., as part of his Masters Degree studies in remote sensing directed by Dr. Peter Murtha, Professor, Faculty of Forestry, U.B.C. The project is jointly sponsored by the Ministry of Forests and Houston Forest Products Ltd., Houston, B.C.

The colour infrared research conducted by Alison Hobbs in completion of her Master of Science thesis in remote sensing, which deals with the change in spectral reflectants associated with dead and dying coniferous foliage, forms the basis of this operational trial.

The objectives of the trial are:

- To develop an operational aerial sampling strategy utilizing 70 mm colour infrared photography to detect mountain pine beetle infestations.
- Determine the effectiveness of 70 mm colour infrared photos based on 100% photo coverage to detect green-attacked trees.
- Determine the best timing and scheduling of the photography.
- Generate a finished map indicating plot centers and extent and percentages of green, red, and grey attack lodgepole pine.
- Outline procedures and set guidelines for the use of colour infrared photography in detecting mountain pine beetle infestations including timing of photography, interpretation of photographs, and training of photo interpreters.

The project will include the following activities:

- Final selection of study areas - 1000 ha of partly infested susceptible lodgepole pine.
- Overview sketch mapping of infestations in the study areas.
- Gathering field data including:
 - i) establishment of double sample plots on the ground
 - ii) establishment of pheromone traps to determine start and end of the 1984 beetle flight
 - iii) photography of a small 10 ha area with colour infrared film commencing 7-10 days after peak beetle flight and at intervals of 10 days thereafter for 12-14 weeks
 - iv) photography of main study area (1200 photos)
- Film development and photo analysis.
- Field validation of sample plots.
- Analysis of data and completion of technical report.

It is hoped that this operational trial will result in a major improvement in our ability to accurately detect the location of green attacked lodgepole pine stands.

- P. Pashnik, Prince Rupert Forest Region, Smithers

Aerial Reconnaissance for Mountain Pine Beetle. A one-day rotary-wing reconnaissance trip is planned for late May 1984 in the Prince George Region to assess possible mountain pine beetle incursion into the Region from the bordering Cariboo Region.

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

Spruce Beetle Overview, Prince George TSA. Planning Section, Prince George Forest Region, is preparing a discussion paper to examine present and potential future spruce beetle epidemics within the Prince George Timber Supply Area (TSA). The purpose will be to determine beetle management strategies for incorporation into the Prince George TSA plan.

A fundamental issue is an estimate of areas and volumes affected in the current epidemic (1977-83) as a basis of predicting spruce beetle impacts on future long-term yields. Annual Canadian Forestry Service survey mapping data were analyzed by infested timber type aggregations, and by operability class, to estimate volume losses under three categories: 1) Dead spruce volume in operable stands, 2) "Whole stand" losses which occurred when mortality reduced stand volume below minimum operability limits, 3) Dead spruce in physically or economically inoperable stands. Estimated volumes that were salvage-logged and predicted 1983 losses were included to complete the overview assessment of the current epidemic.

This systematic approach, using the most up-to-date inventory summaries, estimated the cumulative impact at roughly 207 000 ha attacked and 9.7 million cubic metres affected overall in the Prince George TSA. Included in this volume figure was approximately 3.3 million cubic metres of salvaged dead spruce.

Copies of the discussion paper will be available from the Prince George Regional Office, Ministry of Forests, in early May.

- M. Connor, Prince George Forest Region, Prince George

Spruce Beetle Probe Contracts. During the winter of 1983/84, twelve contracts totalling \$46,198.00 were awarded to seven contractors to probe for spruce beetle in areas of suspected infestation. Probes were conducted in McBride, Dawson Creek, Prince George East and Prince George West Forest Districts.

A total of 223 415 kilometers of probe line was established at an average bid price of \$206.78 per kilometer (range \$75.86-\$380.00). Areas where current beetle attack were identified will be dealt with by one of the several control options available.

- B. Noble and R. Cozens, Prince George Forest Region, Prince George

Spruce Beetle Hazard on Seismic Lines. At the request of the Fort St. John District (Prince George Region) and the Canadian Petroleum Association, regional pest management investigated potential hazards of spruce beetle on

seismic lines. On a field trip to Fort St. John in February 1984, a partial hazard was confirmed in some areas where large diameter slash contained a few beetles. Dawson Creek District indicated that previously some problems had arisen when oil exploration companies cut seismic lines in stands with endemic levels of spruce beetle.

The undersigned travelled to Calgary as a guest of the Canadian Petroleum Association to discuss with them spruce beetle and associated hazards. The session produced a good exchange of information and understanding.

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

Forestry Students Probe for Spruce Beetles. On April 9, 1984, 40 second-year students of the College of New Caledonia's forest resource technology program conducted a strip probe for spruce beetle in the Prince George East Forest District. This exercise was preceded by classroom instruction on spruce beetle biology, population dynamics and probing techniques. Field guidance was provided by Forest Service staff from two Districts and the Regional office. The stand probed in the exercise contained every conceivable type of spruce beetle attack and thus proved a "grim bonus" for the student exercise.

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

Spruce and Mountain Pine Beetle Pheromone. Protection Branch has acquired a limited supply of aggregation pheromones for management of these two beetles. See following articles for details of projects.

Requests for pheromones should be submitted to P.M. Hall via the Regional Pest Management Coordinator and should include a description of the proposed use.

- P. Hall, Protection Branch, Victoria

Pheromone Lures for Mountain Pine Beetle. Mountain pine bark beetle continues to be a major pest in the Vernon Forest District. Populations increased significantly in 1983 with new infestations developing sporadically in vast areas of lodgepole pine in the Grizzly Hills area. Logistics will not permit harvesting control of all infestations prior to 1984 beetle flight. Lack of pest management funding for single tree disposal has hindered control action to some extent.

Pheromone lures will be placed in the field this spring to contain or reduce the spread of mountain pine beetle until harvesting control action can be completed. About 1,000 lures will be deployed and monitored. Industry staff will assist with the placement of lures in the field.

- E. Haupt, Vernon Forest District, Vernon

Pheromone Baiting for Mountain Pine Beetle. Pheromone baiting for mountain pine beetle will be conducted on an operational scale in at least four districts within this Region in the coming season.

The objectives are to contain the beetle in areas that cannot be harvested until after the flights have taken place; and to become familiar with the use and limitations of this new technique.

- R. Edward, Kamloops Forest Region, Kamloops

Trials of Pheromone Containment of Mountain Pine Beetle. In 1983 the Nelson Region attempted to contain ten mountain pine beetle (MPB) infestations by the use of synthetic aggregation pheromone baits.

Cut blocks designed to eliminate an MPB infestation are often not logged prior to beetle flight and are therefore ineffective since attacking beetles have emigrated outside the cut block boundaries. Our primary objective was to ensure control effectiveness of these cut blocks by using pheromone baits to prevent the emigration of attacking beetles from the cut block area. A secondary objective was to attract additional nearby attacking beetles into the baited cut block.

We expected that newly attacked trees outside a baited block could result from either 1) a failure in our primary objective, i.e. no containment, or 2) success in our primary objective but partial success in our secondary objective, i.e. beetles were attracted towards, but not completely into, the baited block.

Therefore, we needed an assessment method that would indicate the overall direction of movement of attacking beetles in relation to our cut block and developed the following method.

1. Each stand was divided into three areas:
 - (a) Baited cut block (Area A)
 - (b) 50 m wide band surrounding A (Area B)
 - (c) 100 m wide band surrounding B (Area C)
2. Within each area a 100% survey was used to determine:
 - (a) dbh of red trees
 - (b) dbh and attack density of green trees
3. We assumed that each square metre of surface area of a red tree gave rise to a constant number of attacking beetles.
4. If there were no migration of attacking beetles from one area to another, the ratio of fresh attacks surface area of red trees within each area would be constant. However, if beetles emerged from a tree in Area B and attacked a tree in Area A, there would be more fresh attacks in A than expected on the basis of number of red trees in A, i.e. the ratio in Area A would be increased. Also there would be a corresponding decreased ratio in Area B.
5. We compared ratios in Areas A, B and C to determine overall beetle movement.

Three containment sites were assessed by this method and results were as follows:

1. At Cavan Creek: Ratios in Areas A, B and C were 380.9:86.9:75.5 or 5:1:1.
2. At Mitchell River: Ratios were 911.1:315.2:106.8 or 8:3:1.
3. At Steamboat Mtn. data are not yet compiled.

We believe that these data indicated containment of beetles within baited blocks and a definite movement of beetles towards and into our baited blocks.

On the basis of this and previous work, we feel confident in encouraging the use of pheromone baiting in conjunction with sanitation logging to control MPB infestations.

Additional details are available from the undersigned.

- D. Gray, Nelson Forest Region, Nelson

Spruce Beetle Pheromone Assessment. Northwood Pulp and Timber Ltd. proposed a cooperative project with the Ministry of Forests to determine the efficacy of using spruce beetle pheromones (frontalin and alpha pinene) to limit dispersal of emerging beetle populations in proposed cut blocks. The pheromone was applied to replicated blocks of mature spruce by Northwood staff. Depending on availability of staff and funds, the resultant beetle distribution within check and treated stands will be determined by Ministry personnel.

If this technique, which is similar to that used for mountain pine beetle management, is successful, it should provide an additional tool for pest management. However, it must be emphasized that pheromone usage is not a panacea and must be integrated with other appropriate beetle control strategies.

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

Douglas-fir Beetle Infestation following the Aug Fire in Strathcona Provincial Park. The history of the current beetle population within the fire damaged stand has been documented in a University of British Columbia thesis (see "Forestry Theses on Pest Management," and PMP 2(2):17). As a follow-up to this thesis, the area will be surveyed this summer (1984) for green attack trees. This information will provide useful information about Douglas-fir beetle population dynamics in coastal forests.

- D. Harris, Campbell River Forest District, Campbell River

Sitka Spruce Weevil Surveys, Campbell River Forest District. In the spring of 1984, extensive surveys will be conducted on 2300 ha of Sitka spruce plantations in the Nootka Timber Supply Area to determine the suitability of

Sitka spruce for the site, the intensity of Sitka spruce weevil infestations and the stocking of suitable alternative species.

The results of these surveys will determine which portion of the District's Sitka spruce leader clipping project will be continued. A management plan will be drawn up for those areas requiring treatment or site rehabilitation.

- D. Harris, Campbell River Forest District, Campbell River

Spruce Weevil Surveys in the Kitimat Valley. A resurvey of valuable spruce plantations in the Kitimat Valley was completed during the winter of 1983 for spruce weevil (*Pissodes strobi*). A total of 2600 ha were resurveyed using the same survey system used in 1982. An additional 900 ha in the Exstew area west of Terrace was surveyed for the first time.

Data on the effectiveness of 1983 leader clipping will be available soon and will be presented in the next issue of Pest Management Progress.

- B. Simpson and V. Barge, Prince Rupert Forest Region, Smithers

Control Trials for Root Collar Weevil. Root collar weevil (*Steremnius carinatus*) destroyed newly planted seedlings of amabilis fir, western hemlock and Sitka spruce on northern Vancouver Island. Average damage levels near Holburg were approximately 15% of planted stock. Some plantations were 50%-100% destroyed.

To control this pest, an operational trial using two methods of pine oil application and "screefing" - removal of duff layer around each seedling - was set up on Tree Farm License 6 near Holburg. Amabilis fir seedlings (1+0) were planted prior to treatment and will be monitored for damage for two years.

- P. Wood, Vancouver Forest Region, Burnaby

Abies Mortality Study. A one-week preliminary ground survey was undertaken in January 1984 in the Prince Rupert Region in an area of infestation noted by aerial survey, near McKendrick Pass, to determine the incidence of western balsam bark beetle (*Dryocoetes confusus*). Approximately 10% of the stems were recently attacked, and an additional 14% were killed previously. Further surveys are planned and plots will be re-examined in summer 1984 to determine stand or site factors associated with the mortality.

- P. Hall, J. Muir and S. Taylor, Protection Branch, Victoria, and A. Stock, Regional Entomologist, Prince Rupert Forest Region, Smithers

FOREST PATHOLOGY

Demonstrations of Disease Control Options. Late in 1983-84 fiscal year, two demonstrations of control of lodgepole pine and larch dwarf mistletoes were established at Invermere and Cranbrook. Objectives were to show how much control and possible increased tree growth could be obtained from juvenile spacing (thinning to waste) treatments with and without cutting of trees more severely infected by dwarf mistletoe.

Another area near Invermere was designated a mistletoe control area as it shows results of several treatments following harvesting to deal with mistletoe-infected pine. Revelstoke Lumber Co. Ltd. prescribed and undertook the treatments.

Depending on funding allocations for 1984-85, monitoring plots and signs will be established in the demonstration areas.

One or two new areas are proposed including a trial at Golden to remove stumps infected by Armillaria root disease and to test several tree species for their resistance to the disease.

- J. Muir, Protection Branch, Victoria

Evaluation of Lodgepole Pine Dwarf Mistletoe Appraisal Technique. John Laut, under contract with Protection Branch, evaluated a computer-based, lodgepole pine mistletoe technique known as "LPMIST" or "RMYIELD" for use in British Columbia. Field data collected in 1982 from measurements of more than 4000 trees in 114 plots were analyzed.

The conclusion of the study was that the technique does not accurately predict yields for B.C. lodgepole pine. Volume growth is underestimated, apparently due to underestimated diameter growth and overestimated tree mortality.

Apparently, to apply the technique to B.C. conditions, new growth curves will have to be inserted in the program. Depending on availability of funds, further work to develop a suitable appraisal technique will be undertaken in 1984-85.

An internal report summarizing these results will be available from the undersigned in June 1984.

- J. Muir, Protection Branch, Victoria

Section 88 Mistletoe Eradication. In 1980-83, approximately 728 ha of lodgepole pine stands were eradicated. There was concern about treatment of the infected fringe area. We are working with Protection Branch and Nelson Regional pest management on the effect of mistletoe on the free-to-grow state of a stand and what level of infestation, if any, can be accepted. This information should be related to stand age and site. A workshop on this topic is planned for late July.

Although most of our mistletoe is Arceuthobium americanum, we recently found one location of larch mistletoe (A. laricis) on ponderosa pine.

- E. Begin, Invermere Forest District, Invermere

Stump Removal for Control of Phellinus weirii. A 20 ha stand of second growth, Phellinus weirii-infested Douglas-fir in the Sayward Forest is scheduled to be clearcut this year. Prior to logging, the infection centers will be marked, and following logging, the stumps will be removed, in a trial operation, using a backhoe excavator.

- D. Harris, Campbell River Forest District, Campbell River

Defining Infection Centers for Root Disease Control. One approach to root disease control is to treat individual infection centers. Treatments could include mechanical stump removal, or planting species resistant to the disease. In order to maximize control and minimize the area of treatment, a study is being initiated to better define the total infected area of individual pockets beyond what is visibly infected. The study is planned for immature and mature Douglas-fir stands in two Vancouver Island districts.

The extent of the area infected beyond visibly infected trees will be estimated from the occurrence of stain in stumps. From these results, a factor or ratio will be defined to adjust visible infection center boundaries to direct treatment operations.

- J. Beale, Vancouver Forest Region, Burnaby

Commercial Sanitation Thinning of Diseased Stands. Coastal second growth Douglas-fir stands which commonly are infected with Phellinus weirii (reference PMP 2(2):23), often lose considerable volumes of wood from the disease in the last few years prior to harvest. Much of this lost volume is potentially merchantable.

Many forest product companies in the western United States recover these potential losses during combined commercial thinning/sanitation thinning operations. These operations remove infected stems surrounding P. weirii pockets and thin the stand at the same time.

There are several advantages of this system. Not only are wood volumes recovered that would otherwise be lost, but the remaining stems grow faster. If second growth stands are harvested on a technical rotation (average piece size) rather than physical rotation (culmination of mean annual increment), this system could be a better management strategy. It could also be an additional opportunity for small business operators.

A major drawback to implementing this system in B.C. is the economic viability of harvesting the small diameter wood that would be removed. In this regard, the Duncan Forest District is exploring the operational and

economic feasibility of using Radio-Tir Logging Winches for this purpose. Results of preliminary trials should be available for the next issue of Pest Management Progress.

- P. Wood, Vancouver Forest Region, Burnaby

Phellinus weirii Root Rot Control Project. A joint, root-disease control project was undertaken by Canadian Forestry Service, Ministry of Forests, and Crown Forest Industries Ltd. in the Naswhito Creek drainage area of Tree Farm Licence No. 9 within Vernon Forest District.

Beetle reconnaissance flights in fall 1978 indicated recent mortality in the area in Douglas-fir and lodgepole pine timber types at elevation of about 1160 m. Subsequent ground reconnaissance by Crown Forest Industries personnel in the winter 1978-79 confirmed the presence of active mountain pine beetle as well as mortality due to Phellinus, Armillaria and blackstain root rots. Canadian Forestry Service personnel determined that the root rots, particularly Phellinus weirii, were causing the greatest mortality.

A grid-line survey of the area with mapping of the root rot centers determined that 70% of the area was covered by Phellinus root rot centers.

Clear cut harvesting was undertaken in January 1980 and stump removal with root raking was proposed.

Post-treatment root rot control was undertaken under Section 88 in September 1980. Two different treatments were undertaken. One area was de-stumped, piled and root raked to remove larger roots from the soil. The second area was de-stumped and piled only. A control area was left adjacent to each treatment.

A total of 24 hectares was treated using two D8H dozers equipped with Beale brush blades. Machine productivity was 0.129 hectare per hour and costs averaged \$677.12 per hectare. The windrowed slash was subsequently burned in October 1980.

The area was planted in May, 1982 by Crown Forest contractor with Douglas-fir and lodgepole pine. Spacing was 3 x 3 metres.

In 1981, Canadian Forestry Service undertook soil compaction studies and at the time of planting established nine experimental plots for monitoring purposes. Canadian Forestry Service also will monitor differences in controlling the root rot.

Survival of the planted trees in the CFS experimental plots ranged from 83% to 97%. Survival plots established in fall 1983 by Crown Forest for the whole area indicated 83% survival for Douglas-fir and 100% for lodgepole pine.

Although as with most forestry research projects, it will take several years to determine results, it is hoped that the project will provide useful data. There has been very little root rot control work undertaken in the interior to date.

- E. Haupt, Vernon Forest District, Vernon

White Pine Pruning. Branch pruning of white pine trees to control blister rust was conducted by a Canada Works crew on a 44 ha block in the Beavertail Lake area. Prior to treatment, seven 0.02 ha control plots were established for a total of 100 tagged trees. Post treatment plots will be established to monitor the success of the project. A further 100 ha is scheduled to be pruned later this year utilizing Project 2000 crews.

- D. Harris, Campbell River Forest District, Campbell River

Monitoring White Pine Blister Rust Pruning Projects. Three permanent sample installations have been established for monitoring the efficacy of pathological branch pruning: two on Texada Island (reference PMP 2(1):22) and one more recently pruned in the Sayward Forest.

The objective in all cases was to maintain stocking levels of white pine on a variety of sites that would otherwise be considered not satisfactorily restocked (NSR).

The pruning guidelines used in these projects are as follows:

<u>Tree Height (m)</u>	<u>Pruning Treatment</u>
Less than 1.0	None. Minimum tree height for treatment is 1.0 m (usually 2.5 m).
1.1 m - 3.7	Prune to leave 1/3 live crown ratio, or three (3) branch whorls.
Greater than 3.7	Prune to 2.5 m, or higher if branch and threatening cankers are visible and/or if bole quality is a consideration.

Minimum height of a prunable tree was usually set at 2.5-3.0 m, with a first pass pruning to 1.4 m height. In the Federal NEED programs in early 1984 at Sayward Forest, the minimum height of a prunable tree was reduced to 1.0 m. A second pass which will be required to prune the shorter trees to a height of 2.5 m will be scheduled when mean tree height is greater than 3.7 m.

Percent infection levels at the establishment of each installation are shown in the following table.

<u>Location</u>	<u>Slope</u>	<u>Percent Trees with:</u>			
		<u>Mean Tree Ht. (m)</u>	<u>Stem Cankers</u>	<u>Threatening Cankers</u>	<u>No Cankers (healthy)</u>
Sayward Campbell R.	0-10%	1.84	5	9	86
Angel Lk. Texada Is.	0-10%	2.94	50	20	30
Breaker Hill Texada Is.	50%	3.05	12	22	66

Trees infected with stem or threatening cankers will likely be killed before next harvest.

The data suggested a relationship between level of infection and height or age.

These control/treatment plots will be useful for monitoring blister rust development and determining efficacy of pruning as a control treatment in natural regeneration of white pine.

- J. Beale, Vancouver Forest Region, Burnaby

FOREST VEGETATION MANAGEMENT

Salal Control Trial, Port Renfrew. In May 1982, Roundup, Garlon 4 and Tordon 22K, at three rates (none exceeding 2500 g a.i.) were sprayed on salal. All treatments were applied in a water carrier using Ultra Low Volume sprayers.

An assessment was made 15 months following treatment. None of the three herbicides tested adequately controlled salal under the conditions of the trial. Tordon 22K reduced percent cover of salal to the greatest extent but the results were erratic.

Details are presented in trial report SX 82506Q (Silviculture Branch, Victoria).

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

Release of Conifers from Grass, Fort St. John District. During July, 1981, Roundup was applied to Calamagrostis spp. to improve survival and growth of grassed-in, young spruce.

A survival and growth assessment at 25 months after treatment showed no seedling mortality. During the three growing seasons, 1981-83, mean growth of seedlings was significantly higher in the treated area (40.45 cm) than in the control area (35.34 cm). Most of the difference in growth occurred during the 1983 growing season. There was no difference in the treatment year and only a slight (non-significant) difference in 1982.

Details are presented in trial report SX 81408Q (Silviculture Branch, Victoria).

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

Aerial Spray Project. The Campbell River District is planning an extensive aerial spray program in the Call Inlet, Fullmore Lake area, in late August or early September 1984. The objective is to eliminate an overstory of red alder and deciduous brush such as salmonberry.

Approximately 1200 ha will be treated with Roundup using a helicopter with an attached spray boom. Application rate will be at 1.8 kg a.i. per ha. The understory consists of planted coastal Douglas-fir, natural western red cedar and western hemlock. Efficacy data will be collected during the following growing season.

- R. Woodside, Campbell River Forest District, Campbell River

Forest Vegetation Management in B.C.: Problem Analysis. Increased request for research on vegetative competition in B.C. forests prompted Research Branch to investigate the need and possible basis for a comprehensive program of forest vegetation management research in B.C. Dr. Susan G. Conard was retained on contract October 1982 to March 1983 to prepare a problem analysis of this important issue to facilitate discussion and cooperation between resource agencies, private industry and academic institutions.

This problem analysis, to be published under the new "Research Report" series, represents the first overview of general problems of forest vegetation management in B.C. It contains recommendations for research, education and training which should be carefully considered by the relevant institutions. Some follow-up action is already underway and further cooperative initiatives will be explored by Research Branch in the near future.

- H. Benskin, Research Branch, Victoria

Update on Canada-B.C. Herbicide Research and Development Subcommittee. Under the auspices of the Canada/B.C. Joint Forest Research Committee, comprising senior representatives of the Ministry of Forests and Pacific Forest Research Centre, a Herbicide R & D Subcommittee was established June 6, 1983, to prepare a problem analysis of herbicide use as a component of forest vegetation management in B.C.

Subcommittee members H. Benskin (MUF, Chairman), Dr. J. Manville (PFR), A. Gardner (PFR), C. Edwards (PFR), Dr. J. Boateng (MUF), Dr. R. DeBoo (MUF) and D. Handley (Council of Forest Industries) are nearing completion of this assignment, and a final report is expected to go to the parent Committee by the end of June.

The report will contain quantitative estimates of productivity losses due to vegetative competition, description of problematic vegetation complexes, a review of treatment options, an assessment of obstacles to forestry use of herbicides and recommendations for coordinated research, development and demonstration.

Project teams will be established by the Canada/B.C. Joint Forest Research Committee to address the problem analysis recommendations following completion of the report.

- H.J. Benskin, Research Branch, Victoria

Standard Protocols for Forest Vegetation Control Trials and Operational Monitoring. In an effort to develop more effective forest vegetation control strategies, researchers and operations staff are actively planning and implementing trials to compare treatments and their effects on crop tree growth (see Tabulations and Graphics Section for list of projects).

The quality and usefulness of the resulting data base can be substantially improved through the adoption of standard procedures for trial design and assessment. Data from trials which include a herbicide treatment option can also contribute to product registration provided that certain technical standards are followed. Similarly, uniform, well-designed surveys and records of operational treatments are important information sources for improving future prescriptions for forest vegetation control.

The development of standard protocols for trials and operational monitoring is being undertaken by L. Herring, J. Pollack, Dr. J. Boateng and Dr. S. Conard. The work is expected to be completed by the end of June, and testing and demonstration will follow.

- H. Benskin, Research Branch, Victoria

Research on Reducing Vegetative Competition with Crop Trees. A list of active Ministry of Forests research projects, including industry studies funded under Section 88 of the Forest Act and operational trials, was assembled to demonstrate the extent and diversity of investigations which either directly or indirectly address problems of repetitive competition. (The list is presented in the Tabulations and Graphics Section.)

Successful reforestation begins with a pre-harvesting assessment, including an interpretation of the basic ecological characteristics of a site. Further refinement of the biogeoclimatic classification system to address seral vegetation, its characteristics and development is in progress. This information should assist the field practitioner to design harvesting and forest renewal strategies which reduce or avoid problems with competing vegetation.

Research is being conducted to develop high quality planting stock which, when matched to site, is able to grow rapidly and resist competing vegetation. However, conifer growth may be inherently slow on some sites, and even a doubling or quadrupling of growth rate may not permit crop trees to grow freely without intervention. Therefore, besides investigating ways of increasing seedling stress resistance and avoidance, research is also directed at effects of reducing a variety of site stresses including vegetative competition.

Treatments such as prescribed fire, mechanical site preparation, manual brush control, herbicide application and sowing of cover crops are all under investigation, either individually or in comprehensive experiments which consider planting stock-treatment interactions. For further information on these MOF research activities, please consult the 1982-83 Research Review.

- H. Benskin, Research Branch, Victoria

Characterization of Vegetative Competition in the Nelson Region. Two vegetation management-related projects were initiated in 1983 by the Nelson Ecology/Pedology Section.

One project involved determining criteria to identify brush-prone sites, establishing a list of "target" weed species and determining length of time between disturbance and brush reinvasion in the Wet Interior Cedar-Hemlock (ICHb) biogeoclimatic subzone.

The other project, utilizing objective analytical techniques, developed a preliminary classification of seral vegetation in areas cutover from five to fifteen years ago in the Moist Southern Interior Cedar-Hemlock (ICHa) subzone. The influence of site preparation and environmental features on the seral vegetation was noted.

Both projects will be continued this year, with the former being extended to other brush-prone subzones.

- T. Braumandl, Nelson Forest Region, Nelson

RANGE PEST MANAGEMENT

Noxious Weed Control - Cariboo 1984. In 1984 in the Cariboo Forest Region, one spray crew will treat knapweed infestations. As in the past, most treatments will be done in the southern portion of the region.

In recent years, numerous new knapweed infestations have been recorded and treated, primarily along transportation corridors. Infestations along Highway 97 throughout the region are a responsibility of the Ministry of Highways. The Forest Service treats small infestations on many secondary roads in the region.

Over the past winter we improved operational recordkeeping of treatments and mapping of knapweed infestations. This data base should help us to quickly answer queries, produce summaries, retrieve previous treatment information on individual sites, plan crew activities and tie-in with range inventory in the future.

Besides knapweed, nodding thistle continues as a threat in the Alexis Creek area. Crown lands are treated and now the primary problem occurs on private land and the Anahim Indian Reserve. It is planned to continue treatment of nodding thistle on Crown land in 1984.

The summer of 1984 should be a successful treatment season. In the Cariboo, knapweed is being contained. Only continued, vigilant effort by all parties will ensure that this situation persists.

- G. LeRoux, Cariboo Forest Region, Williams Lake

PESTICIDES

Velpar Herbicide Registration. Recently, Velpar liquid was registered for use in forestry. Registration covers ground-only application of the herbicide to

many of our problem vegetation species, particularly those in the interior of the Province. Some operational projects will be conducted with Velpar this season.

Dupont Co. expects to extend the registration to include aerial uses and additional target species as soon as possible. Velpar labels and related information are available from Protection or Silviculture Branch, Ministry of Forests.

- J. Henigman, Protection Branch, Victoria

Roundup Herbicide Registration. Roundup herbicide is now registered in forestry. Registration covers ground and aerial application of the herbicide to all of our problem vegetation species. We expect that several Roundup treatment projects will be initiated this year.

Roundup labels and other related information are available from Protection or Silviculture Branch, Ministry of Forests.

- J. Henigman, Protection Branch, Victoria

Forest Pesticide Certification Course. Certification courses for forestry personnel using pesticides are being conducted by the Ministry of Forests in conjunction with other agencies. These agencies include B.C. Ministry of Environment, Pesticide Control and Fish and Wildlife Branches, Workers' Compensation Board, and Crop Care Aviation.

Each four day course includes one and one-half days instruction on pesticide regulation, legislation, mathematics, environmental and personnel safety concerns; one day instruction on the prescribed use of either herbicides or insecticides; one day of field demonstration on pesticide treatment equipment and methods and an examination for one-half day. A similar certification course is available for forestry nurseries.

Three forestry certification courses have been conducted. Additional courses will be held this spring at Prince George, Smithers and Castlegar. Two nursery courses - Mesachie Lake and Vancouver - will also be conducted this spring.

- J. Henigman, Protection Branch, Victoria

Forest Pesticide Handbook of B.C. The Forest Pesticide Handbook of B.C., a co-sponsored publication of the Ministry of Forests and Council of Forest Industries, is nearly completed. Individual volumes will be available within the next six months. Volume One, which outlines how to undertake a pesticide project, public involvement, safety and emergency information, is complete and will be available shortly.

Volume Two on registered pesticides and Three on application techniques should be completed within a few months.

These volumes will be maintained and updated annually or semi-annually by the Ministry.

- J. Henigman, Protection Branch, Victoria

Audio-Visual Slide Show for Forest Pesticide Training. A three-part slide show summarizing forestry pesticide use information was completed under contract from Protection Branch. This show consists of three 15 minute presentations on pesticide control and regulations, herbicides and insecticides.

Part 1 on control and regulations was completed and was shown at pesticide training courses around the Province. Parts 2 on herbicides and 3 on insecticides will be completed in the summer of 1984.

These shows were designed for both pesticide training (MJF and industry) and general public information.

- S. Taylor and J. Henigman, Protection Branch, Victoria

FLULC Subcommittee on Pesticides. The Forest Land Use Liaison Committee recently reviewed a draft consensus paper on the use of pesticides in forest management. The paper was the result of discussion and agreement of a subcommittee composed of representatives from forest industry, Fish and Wildlife Branch, Fisheries and Oceans Canada, Society Promoting Environmental Conservation (SPEC), and the Ministry of Forests. Chaired by Terry Simmons, representing the B.C. Outdoor Recreation Association, the group expects to complete the assignment this summer.

- R. DeBoo, Protection Branch, Victoria

CCREM Task Force Winds Up. During the two years of its existence, the Canadian Council of Resource and Environment Ministers' Task Force on Forest Pesticides contributed to the processing of nine insecticides and herbicides for Canadian registration, including permethrin and glyphosate. The Task Force also supported the continued registration and availability of 2,4,5-T, and has recommended that provincial authorities in Ontario, Saskatchewan and B.C. discuss issues preventing use of this herbicide within these jurisdictions.

At the February meeting in Quebec City, the Task Force members felt that most of the realistic and attainable objectives had been achieved, and that the Task Force should be dissolved within the next six months. Unfinished business, as well as new assignments, could be handled by the proposed Canadian Pest Management Advisory Committee. A formal proposal for this new national group will be made at the June meeting of Forestry Deputies and Chief Foresters.

- R.F. DeBoo, Protection Branch, Victoria

Forestry Pesticide Use Information. The 1982 report on forestry pesticide use by the Ministry of Forests and forest industry was published by Protection Branch. Some of the figures on pesticide use are shown in the "Tabulations and Graphics" Section.

Information in the report includes pesticides used, areas treated, purposes of control and methods of application.

The 1982 report is part of an ongoing project to produce annual use statistics. Some of this information will be incorporated into the Ministry of Forests Annual Report.

- P. Humphreys and J. Henigman, Protection Branch, Victoria

An Update on the Use of 2,4,5-T Herbicide in B.C. The herbicide 2,4,5-T, though much maligned in recent years, has so far endured all scientific scrutiny concerning potential toxicological hazard. The herbicide remains of great value for forestry brush control across Canada, including British Columbia. The following points are offered on the 2,4,5-T issue in British Columbia:

Use: 2,4,5-T applied as an aerial or ground spray or hack and squirt treatment will effectively control all B.C. deciduous, woody, brush species.

Currently, 2,4,5-T (@ ca. \$11.50/l) is one of the least expensive herbicides available to foresters. In addition, 2,4,5-T is supported by 30 years of data on use, toxicology and environmental considerations.

Alternatives: Although there are several alternatives available, not all offer the same range of effectiveness. In addition, potential use patterns and dosage range are incomplete for some of these.

Supply: Available Canadian products, in addition to those produced by Dow Chemical, include:

- (1) Union Carbide: Weedone I.B.K., PCP #15308 (2,4-D and 2,4,5-T), and
- (2) Vertac Chemical Corp.: Vertac Brush-RHAP, LV6T, PCP #16733 (2,4,5-T).

Both Union Carbide and Vertac Chemical Corp. advise that their products can be supplied through Standish Brothers Ltd. in Quebec. Future supplies are expected to come from New Zealand or France. However, supplies for the 1984 season may be limited, at least temporarily.

Status in Other Countries: Other than in the U.S.A. and Sweden, 2,4,5-T continues to be available for forestry use. Many countries, including Australia, Britain, New Zealand and Germany have formally reviewed the herbicide and have found it acceptable for use.

The U.S.A. halted all forestry uses of 2,4,5-T in 1979 although they did continue to allow its use on rice and range for a period thereafter. The suspension decision made by the U.S. is considered politically motivated (see the Nova Scotia court case ruling by Judge Nunn, p. 169).

Sweden halted all uses of phenoxy herbicides based on advice of their toxicologists. Most reputable toxicologists from other countries do not concur with the Swedish position.

Status in Canada: 2,4,5-T, with the concurrence of the Department of Health and Welfare, remains fully registered for forestry use in Canada. Since 1979, 2,4,5-T has been used in Newfoundland, Quebec, Nova Scotia and New Brunswick and to a smaller extent in Alberta for brush control.

Three provinces - B.C., Ontario and Saskatchewan - have curtailed the use of 2,4,5-T. No technical validation has been presented by these provinces to support their actions. Of the three provinces, only B.C. has a defined need for 2,4,5-T in brush control. British Columbia forestry agencies (Ministry of Forests, Council of Forest Industries) have recently requested reconsideration of this provincial decision.

Health Issues: Although health issues and 2,4,5-T will certainly be debated for years by lay people, toxicologists in Canada and most of the world, including in the U.S.A. (American Council on Science and Health), conclude that the use of 2,4,5-T poses the public no unreasonable hazard. A summary of this assessment is found in the Nova Scotia court case summary and decision by Judge Nunn.

Environmental Issues: Based on available data, 2,4,5-T appears to pose no significant hazard when product label and provincial permit requirements are followed. It is acknowledged that 2,4,5-T is toxic to fish. As with other herbicides, this situation can be adequately handled by herbicide free zones maintained around water bodies.

Dioxins: The herbicide 2,4,5-T will always contain a very small amount of the contaminant 2,3,7,8-T.C.D. Dioxin, which is a very hazardous substance. The 2,4,5-T products sold in Canada cannot contain TCDD in excess of 0.1 ppm. Health and Welfare Canada consider this level to pose no risk to the public or applicators. Current suppliers must meet this standard.

News Media: The recent worldwide review of 2,4,5-T and the 2,4,5-T issue in the Viet Nam War have been very newsworthy. Regardless of technical considerations, we believe that the news media will almost certainly react antagonistically to any renewed use of 2,4,5-T in B.C. presumably because an antagonistic message would foster controversy.

- J. Henigman and R. DeBoo, Protection Branch, Victoria

Pesticide Storage Facility. The construction of a new pesticide storage facility was completed. This facility meets all the requirements stipulated under the regulations with holding tanks, divided storage, and mixing area. This much needed facility became operational in March 1984 and was put to use immediately.

- R. Edward, Kamloops Forest Region, Kamloops

Forest Pesticide Certification Course. A forest pesticide certification course will be conducted by the Ministry of Forests in cooperation with the Pesticide Control Branch June 18-22 at Smithers. The course will consist of classroom instruction plus one day of practical instruction in the use of helicopter, hack and squirt and spray equipment.

This course will be delivered to 35 participants with another 20 applicants scheduled for a course to be presented at a later date. There appears to be a substantial demand for this type of certification course within the Prince Rupert Forest Region.

- V. Barge, Prince Rupert Forest Region, Smithers

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
S.P. (Stuart) Taylor, Pest Management Technician, Victoria, 387-5965
P.J. (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
D.R. (Derek) Poole, District Pest Management Coordinator, Horsefly, 620-3327
K.J. (Kevin) Lukes, District Pest Management Coordinator, 100 Mile House, 395-3844
J.D. (Dave) Peterson, District Pest Management Coordinator, Alexis Cree, 394-4215

Kamloops Forest Region

R. (Ron) Edward, Pest Management Coordinator, Kamloops, 374-7741
E. (Eric) Haupt, Pest Management Officer, Vernon, 542-0264
W. (Wayne) Langlois, Pest Management Officer, Salmon Arm, 832-7153
B. (Job) Read, Protection Resource Officer, Clearwater, 674-2265
J. (Jim) Mottishaw, Protection Technician, Penticton, 492-8721
T. (Terry) Watson, Protection Technician, Penticton, 492-8721
T. (Tom) Lacey, Protection Resource Officer, Merritt, 378-6171

Nelson Forest Region

E. (Ernie) Morris, Pest Management Coordinator, Nelson, 354-4181
D. (David) Gray, Regional Forest Entomologist, Nelson, 354-4181
S. (Steve) Byford, Pest Management Officer, Cranbrook, 426-3391
E. (Emile) Begin, Pest Management Officer, Invermere, 342-9257
L. (Larry) Price, Pest Management Officer, Golden, 344-5991
H. (Hugh) Kingwell, Pest Management Officer, Revelstoke, 837-6111
D. (Dan) Reiben, Pest Management Officer, Arrow, 365-8402
B. (Ben) Zuber, Pest Management Officer, Boundary, 422-2766
M. (Mike) Pascuzzo, Pest Management Officer, Kootenay, 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
F.L. (Fred) Turner, Resource Officer Protection, Prince George West, 564-6634
G.E. (Gerry) Magee, Resource Officer Protection Prince George East, 562-4121
R.G. (Roger) Wiltsie, Resource Officer, Protection, McBride, 569-2265
S.V. (Sam) Campese, Resource Officer Protection, Vanderhoof, 567-9281
J.A. (John) Reid, Resource Officer, Protection, Ft. St. James, 996-7131
J. (James) Jones, Acting Resource Officer, Protection, Mackenzie, 997-3310
D.E. (Doug) Swaffield, Resource Officer, Protection, Dawson Creek, 782-8195
W. (Walter) Johnston, Resource Officer Protection, Ft. St. John, 785-8177
R. (Roy) Simpson, Resource Officer Protection, Ft. Nelson, 774-3936

Prince Rupert Forest Region

V.G. (Vern) Barge, Pest Management Coordinator, 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
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, Burnaby, 299-9151
J.D. (Jeff) Beale, Forest Pathology Specialist, Burnaby, 299-9151
D.G. (Don) Heppner, Pest Management Assistant, Vancouver, 299-9151
D. (Dave) Hames, Protection Resource Officer, Chilliwack, 794-3361
L. (Lance) Mitchell, Protection Resource Assistant, Squamish, 898-9671
R. (Ron) Diprose, Protection Resource Assistant, Powell River, 485-9831

MEETINGS

Monsanto Seminar on Forest Use of Roundup : Monsanto Canada Inc held two half-day seminars on forestry uses of Roundup at Prince George, March 27, 1984 and at Parksville, March 29, 1984. The agenda included:

Welcome and Introduction - Bill Wallace, Monsanto Canada

Forestry Label and Recommendations - Dr. Bill Hamman, Monsanto

Safety and Environmental Impact - L.W. Taylor, Monsanto

Roundup Uses in Washington Forests - Doug Belz, Washington Department of Natural Resources

In panel discussion at Prince George on use of Roundup in B.C., topics and speakers included:

Application Permits, Routing Procedures - R. Hodgkinson, B.C. Min. of Forests

Roundup Use in Pr. George Region - W. Williams, B.C. Min. of Forests

B & W Agricultural Services - W. Johnson

Okanagan Helicopters Ltd. - W. Palubiski

The seminar was followed by a Monsanto-hosted "happy hour" and excellent meal. Attendees from government, industry and the private sector were able to

meet, interact and exchange ideas. Prince George Forest Region wishes to thank Monsanto for hosting this very informative seminar.

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

U.S.-B.C. Pest Management Meeting. Pest Management staff from the U.S. Forest Service at Portland (Region 6) and from Protection Branch met at Surrey for a review and comparison of programs of mutual interest. The meeting, held in mid-April, provided an excellent opportunity for staff specialists in pathology, entomology and pesticide use to discuss a wide variety of strategies and issues related to forest pest management.

As a result, staff of both organizations will endeavor to exchange information on a regular basis, offer constructive review of procedural and guideline documents, collaborate in the preparation of training materials, where feasible, and provide advice and guidance on new techniques and equipment for operational use.

- R.F. DeBoo, Protection Branch, Victoria

Western International Forest Disease Work Conference. The next meeting of this working group will be held at Taos, New Mexico, September 24-28, 1984. Agenda items include root disease and dwarf mistletoe management. For further details, contact the undersigned.

- J. Muir, Protection Branch, Victoria

Annual Meeting of the Professional Pest Management Association of B.C. Staff of the Ministry of Forests actively participated in a panel during the 4th Annual Meeting of the PPMA at Vancouver. Hank Doerksen of Protection Branch presented a paper entitled "The 1980's: The Decade of Key Progress in Integrated Forest Pest Management in British Columbia," and Paul Wood of Vancouver Regional office discussed "Pest Management: Its Contribution to the Future of Forest Management in B.C." These papers are included in an Internal Report (PM-PB-12) available from the undersigned.

- R. DeBoo, Protection Branch, Victoria

Associate Committee on Agricultural and Forestry Aviation. This Committee of the National Research Council (Ottawa) sponsored a 2-day symposium on the future role of aviation in agriculture at Saskatoon. Most of the invited papers addressed aerial spray concerns of direct interest to foresters in B.C. A post-symposium critique by ACAFA members suggested:

- the key to "integrated" pest management is pest monitoring, a labour-intensive activity at present;
 - broad-spectrum pesticides should only be used when required; pest-specific materials will be preferred in future operations;
 - aerial application techniques have not changed significantly during the past 25-30 years;
 - spray drift remains as the most serious concern;
 - air regulations in Canada may be leaning towards the U.S. system (considered as positive by ACAFA);
 - Canada is a world leader in aerial surveying and remote sensing;
 - agencies in Canada should be encouraged to collaborate, and coordination of R & D effort, especially for precision in aerial application, is recommended.
- R. DeBoo, Protection Branch, Victoria

Prince Rupert Pest Review Committee Meeting. The spring meeting of the Prince Rupert Forest Region Pest Review Committee was held on March 29, 1984, with 35 participants from industry, MOF Region and Districts, Canada Dept. of Fisheries and Oceans, Min. of Environment, Fish and Wildlife Branch, and Environment Canada, Canadian Forestry Service.

Updates and accomplishments of each TSA were presented by a TSA steering committee member elected to make the combined industry and Ministry of Forests updates.

Updates on proposed infrared photography research projects were given by P. Pashnik, Protection Officer.

L. Unger, Canadian Forestry Service, outlined CFS projects underway and a proposed 1984 summer schedule for the Prince Rupert Region.

Terms of reference for the Pest Review Committee were reviewed and updated. W. Jackson reported on porcupine damage in the North Coast District and T. Maher, Northwood Pulp and Timber Ltd., reported on arsenic residue in monosodium methanearsenate (MSMA) treated spruce trees.

The sub-regional control strategy report was tabled at the meeting and presented by B. Downie and G. Hynd. J. Muir, Protection, Victoria, presented an update of Branch projects.

A meeting with news media followed the business meeting. This media meeting will be continued in the future and each TSA steering committee will elect one industry and one Ministry representative to attend with the media to answer specific questions regarding their respective TSA's.

- V. Barge, Prince Rupert Forest Region, Smithers

TABULATIONS AND GRAPHICS

Aerial Applications of Roundup
Proposed for Prince George Region in 1984

<u>MOF</u> <u>District</u>	<u>Location</u>	<u>Target</u>	<u>Treatment</u> <u>Area</u>	<u>Application</u> <u>Method</u>	<u>Dosage</u>
Pr. George East	Dome Cr.	Herbs Brush	134 ha	Helicopter	2.25 kg/ha a.i.
Ft. St. John	Paint Pot	C. <u>Canadensis</u>	82 ha	Helicopter or fixed wing	2.25 kg/ha a.i.
Pr. George West	TSL A09638	Brush	52	Helicopter	2.00 kg/ha a.i.
	TSL A04498	Brush Grasses	74	Helicopter (and hack and squirt)	2.50 kg/ha a.i.
McBride	Dave Henry Creek	Brush Grasses	64	Fixed Wing	2.00 kg/ha a.i.
	Valemount (48 km)	Brush Grasses	122	Helicopter	3.00 kg/ha a.i.
<u>Licensees</u>					
Northwood	CP-5	Brush Herbs	111 ha	Helicopter	2.24 kg/ha a.i.
The Pas	CP-54 Blk. 4 (only)	Conifer Release	149 ha	Helicopter	2.25 kg/ha a.i.
BCFP	Mackenzie	Aspen	150 ha	Helicopter	2.00 kg/ha a.i.
Finlay	Mackenzie	Aspen Twinberry	102 ha	Helicopter	2.00 kg/ha a.i.

Research Branch Experimental Projects on or Related to Vegetative Competition with Crop Trees.

<u>Experimental Project</u>	<u>Title</u>	<u>Investigator</u>
E.P. 885	Development of vegetation management techniques for Coastal alluvial sites .01 Herbicide trials .02 Case history studies on brush development .03 Prescribed fire trials .04 Trials with large planting stock .05 Seeding with a grass/legume cover crop	J. Pollack
E.P. 841	Development of silvicultural prescriptions for drybelt Douglas fir sites in the Cariboo Forest Region .03 Effect of vegetation control on survival and growth of planted Douglas fir	A. Vyse
E.P. 859	Early growth and survival of interior spruce stock types .06 Effect of planting recently burned sites with stock receiving minimal handling .09 Plantation performance studies in the Cariboo Forest Region .10 Hot planting interior spruce plugs on freshly burned sites .11 Response of interior spruce to long delays between planting and burning	R. van den Driessche A. Vyse
E.P. 741	Biological effectiveness of equipment tested in silvicultural mechanical site preparation trials	R. McMinn L.J. Herring
E.P. 789	Growth enhancement options for dense immature lodgepole pine stands .02 Machine and powersaw density control .03 Density control through toxic applications of fertilizer .04 Juvenile spacing and fertilization .05 Herbicidal density control .06 Nitrogen fertilization and juvenile spacing	L.J. Herring
E.P. 800	Evaluation of drag scarification treatments in the Prince George Forest Region	L.J. Herring

- | | | |
|----------|---|--|
| E.P. 933 | Planting site and stock treatments for brushfield conversion | L.J. Herring |
| E.P. 590 | Compatibility of tree and grass seeding in the Kamloops Forest Region | M.B. Clark |
| E.P. 970 | Forest vegetation management in B.C. | |
| | .01 Forest vegetation management in B.C.: a problem analysis | S.G. Conard |
| | .02 Standard protocols for field trials | L.J. Herring
J.C. Pollack
J. Boateng |
| E.P. 971 | Biological stress concepts in white spruce reforestation | |
| | .01 Problem analysis: the use of biological stress concepts in forest regeneration research | D. Draper |
| | .02 Evaluating the reproducibility of six operational spruce stock types over a three year period | D. Draper |
| | .03 Site stress x stock type stress resistance interactions on a mid-elevational spruce site in the Prince George Forest Region | D. Draper |
| E.P. 972 | The biological effectiveness of site preparation in the Bowron River valley | |
| | .01 The biological effectiveness of mounding and herbicide treatments at km 3-104 on the Coal Mine Road | L. Herring
D. Draper |
| | .02 The biological effectiveness of the Bräcke moulder and related site treatments at km 3-105 on the Coal Mine Road | D. Draper
L. Herring |
| | .03 The biological effectiveness of prescribed fire at km 3-103 on the Coal Mine Road | D. Draper
L. Herring |
| E.P. 973 | A demonstration of managed species productivity | |
| | .01 Species productivity trials: a problem analysis | D. Draper |
| | .02 Bowron species productivity trial | D. Draper
L. Herring |

E.P. 966	Ecophysiology of Interior spruce (Joint project with Tree Physiology and Ecology/Earth Sciences Sections)	D. Draper W. Binder D. Spittlehouse R. Fahlman D. Lousier
E.P. 889.02	Nutrition of planted white spruce	T. Ballard
E.P. 855	Development and evaluation of forest water balance models for use in stand management	T.A. Black
E.P. 822	Ecosystem classification program	D. Meidinger D. Lousier
E.P. 969.01	Studies of nitrogen fixation in forest ecosystems in the Prince George Forest Region: Sitka Alder	C. Delong A. McKinnon G. Hope
E.P. 963	Quantification of soil nutrient regimes in the Prince George Forest Region	G.D. Hope A.J. McLeod
E.P. 943	Soil moisture and temperature investi- gations in the Kamloops Forest Region	R.D. Winkler
E.P. 957	Forest nutritional research in the Prince Rupert Forest Region	D. Yole
E.P. 953	Prescribed fire ecology studies	A.M. Macadam
E.P. 920	Investigations of soil temperatures in ecosystems of the Prince Rupert Forest Region	R. Trowbridge
E.P. 868	Ecologic investigations of wildfires in northern B.C.	D. Meidinger J. Pojar R. Trowbridge
E.P. 693	Testing selective herbicides for bareroot and container nurseries	R. van den Driessche
E.P. 737	Cold storage physiology of conifer seedlings	W. Binder
E.P. 786	Nursery seedbed density and seedling spacing	R. van den Driessche
E.P. 836	Nursery cultural treatments for enhanced stock quality at interior nurseries	D.G. Simpson
E.P. 858	New methods for the production of forest planting stock	A.N. Burdett

E.P. 859	Early growth and survival of interior spruce stock types	R. van den Driessche A. Vyse
E.P. 928	Quality control in the production of nursery planting stock	A.N. Burdett
E.P. 946	Improving early growth after outplanting	R. van den Driessche

LICENSEE RESEARCH PROJECTS (SEC. 88)

Western Forest Products Ltd.

25-001	The assessment of re-establishment techniques for high-site cutover land.	J. Barker
25-002	Re-establishment techniques for the SI Ecosystem of the CWHe, RFL 25 Block 4.	J. Barker
6-001	Establishment regimes for high-site brush susceptible sites, TFL 6 - Holberg.	J. Barker

MacMillan Bloedel Ltd

314-2	Salal removal and its impact on crop tree performance	G. Dunsworth
491-2	Operational brush control trial	G. Dunsworth
552-9	Interaction of alder and Douglas-fir	D. Binkley
555-4	Experimental (legume) interplanting trials	H. Kibbey
555-5	Effects of naturally occurring legumes on conifer growth and productivity	H. Kibbey
555-6	Management of legumes in forestry: experimental planting trials - green manuring	H. Kibbey
555-7	Legume - conifer - wildlife interaction study	R. McLaughlin

Weldwood

C8004	The effect of the C & H plow on survival and growth performance of interior spruce	
C8102	Stock trials for brushy sites	

ACTIVE OPERATIONAL TRIALS

SX 83701 V	Effect of timing on the success of mechanical control of red alder	F. Pendl
Sx 82704 R	Operational trial of Roundup herbicide at Hell's Bells	J. Pollack
Sx 82703 R	Operational trial of Roundup herbicide at the Paul Fire	J. Pollack
Sx 82702 N	Field trial of chemical brush and weeding	T. Persson
Sx 83601 Q	Evaluation of simazine and glyphosphate application rates for weed control in an interior spruce seed orchard	P. Birzins
Sx 79602 Q	MSMA Injection trial	G. Ackerman
Sx 79601 Q	Blue river herbicide trial	G. Ackerman
Sx 82510 Q	Trial of tiller-trencher	H. Sanden
Sx 82508 V	Ploughing as a method of site improvement on northern Vancouver Island	F. Nuszdorfer
Sx 82506 Q	Salal control herbicide trial	G. Ackerman
Sx 81513 Q	Leno scarifier high lead trial	S. Lam
Sx 81512 Q	Martini plow scarification	D. Brewis
Sx 81511 Q	Herbicide trial at Red Rock Seed Orchard	D. Summers
Sx 81510 Q	Grass control trial	G. Ackerman
Sx 81509 Q	Brush control trial - ULV application of glyphosphate	G. Ackerman
Sx 81508 Q	Site preparation of brushy sites by JLV ground application of glyphosphate	G. Ackerman
Sx 81507 Q	Trial with Leno scarifier	D. Brewis
Sx 81502 Q	Trials with modified beales plow	G. Ackerman
Sx 81500 Q	Ground spray application of glyphosphate for site preparation of grassy cutovers	G. Ackerman

Sx 83405 G	Use of glyphosphate for control of calamagrostis	L. Herring G. Ackerman
Sx 83404 G	Evaluation of 2,4-D Amine and glyphosphate for hardwood control using two, single tree application methods	L. Herring G. Ackerman
Sx 83401 Q	Alder control trial	G. Ackerman
Sx 82405 Q	Velpar gridball stem injection trial	G. Ackerman
Sx 82401 C	Strip thinning of juvenile lodgepole pine	J. Perry
Sx 81408 Q	Grass control trial - ULV application of glyphosphate	G. Ackerman
Sx 80400 Q	Glyphosphate injection trial	G. Ackerman
Sx 83406 Q	Aerial spray test of herbi ULV sprayer carried on a radio controlled helicopter	J. Gilmour
Sx 83407 N	0.5 ha herbicide trials	C. Thompson
Sx 83501 R	Madge rotocleaner site preparation	N. Endicott
Sx 84701 R	Research trial of 2, 4 - D and glyphosphate	R. Johnson
Sx 82502 G	Site conversion studies in the Stewart Lake area, Dawson Creek	L. Herring
	#1 Chemical/mechanical site preparation in the Stewart Lake Research Area	
	#2 Chemical/mechanical site preparation in the Sunset Research Area	
	#3 Control of native vegetation by soil disking in the Sunset Research Area	
	#4 Control of native vegetation by soil disking in the Stewart Lake Research Area	
	#5 The use of forest herbicides following mechanical site preparation in the Stewart Lake area, Dawson Creek	
	#6 The use of herbicides following the preparation treatments at the Sunset Research Area.	
Sx 82507 G	A preliminary study of the control of native site vegetation with a domestic legume during site conversion in the Peace River	L. Herring

#1 Stewart Lake: Disking/clover study
#2 Sunset: Disking/clover study

Sx 83409 V Conifer release with Garlon at McGuire Creek F. Pendl
B. D'Anjou

Sx 83408 V Operational trial with the herbicide Roundup F. Pendl
at Pender Harbour B. D'Anjou

- H. Benskin, Research Branch, Victoria

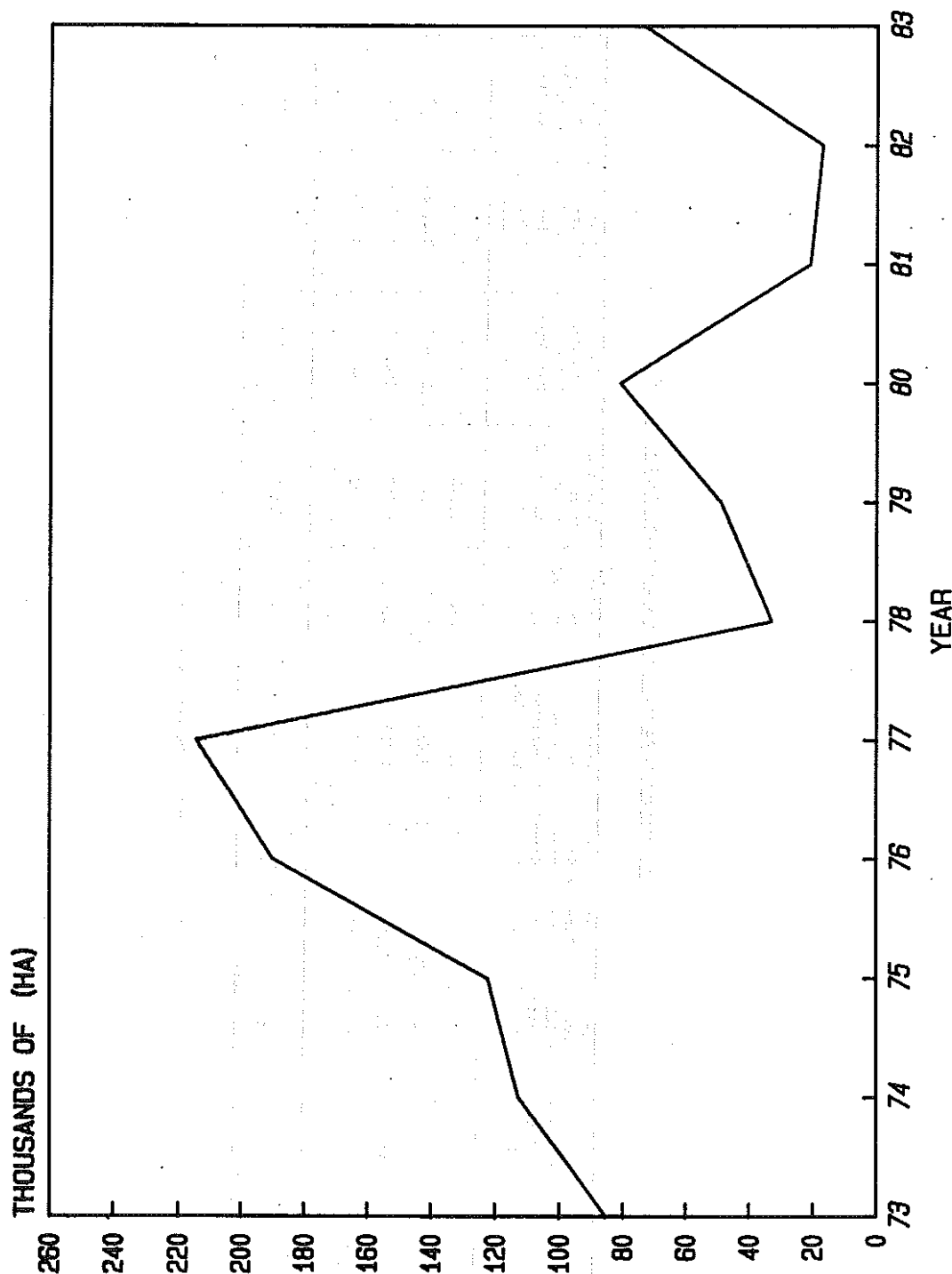
Pest Management Activities for the Kamloops Region, 1983-84

T.S.A.	Man days spent directly on Pest Mgt.	Hours Flown Aerial Detection	Area Surveyed Air ha.	Area Surveyed Ground ha.	Area of New Infestation ident. ha.	Infested Area harvested ha.	Infested Area to be harvested ha.	Volume Infested Timber Harvested m ³	Value of Infested Timber Harvested @1.20/m ³	No. of Sec. 88 Contracts	Value of Sec. 88 Con-tracts
Kamloops	773	15	700	10,982	2,530	2,142	1,640+	219,173	\$ 263,007	4	48,836
Okanagan	1,006	28.7	188,000	7,142	7,653	3,956	4,148	1,110,650	1,332,780	12	52,102
Meritt	722	12.6	50,000	775	2,515	804	1,158	300,000	360,000	0	0
Lillooet	96	20	12,800	1,061	8,475	670	925	190,000	228,000	0	0
TOTAL	2,597	76.3	279,100 ha.	20,050	21,183	7,572	7,871	1,819,823	2,183,787	16	100,988

- R. Edward, Kamloops Forest Region, Kamloops

TRENDS IN VISIBLE DEFOLIATION OF DOUGLAS FIR
CAUSED BY THE WESTERN SPRUCE BUDWORM IN
BRITISH COLUMBIA (YEARS 1973 - 1983)

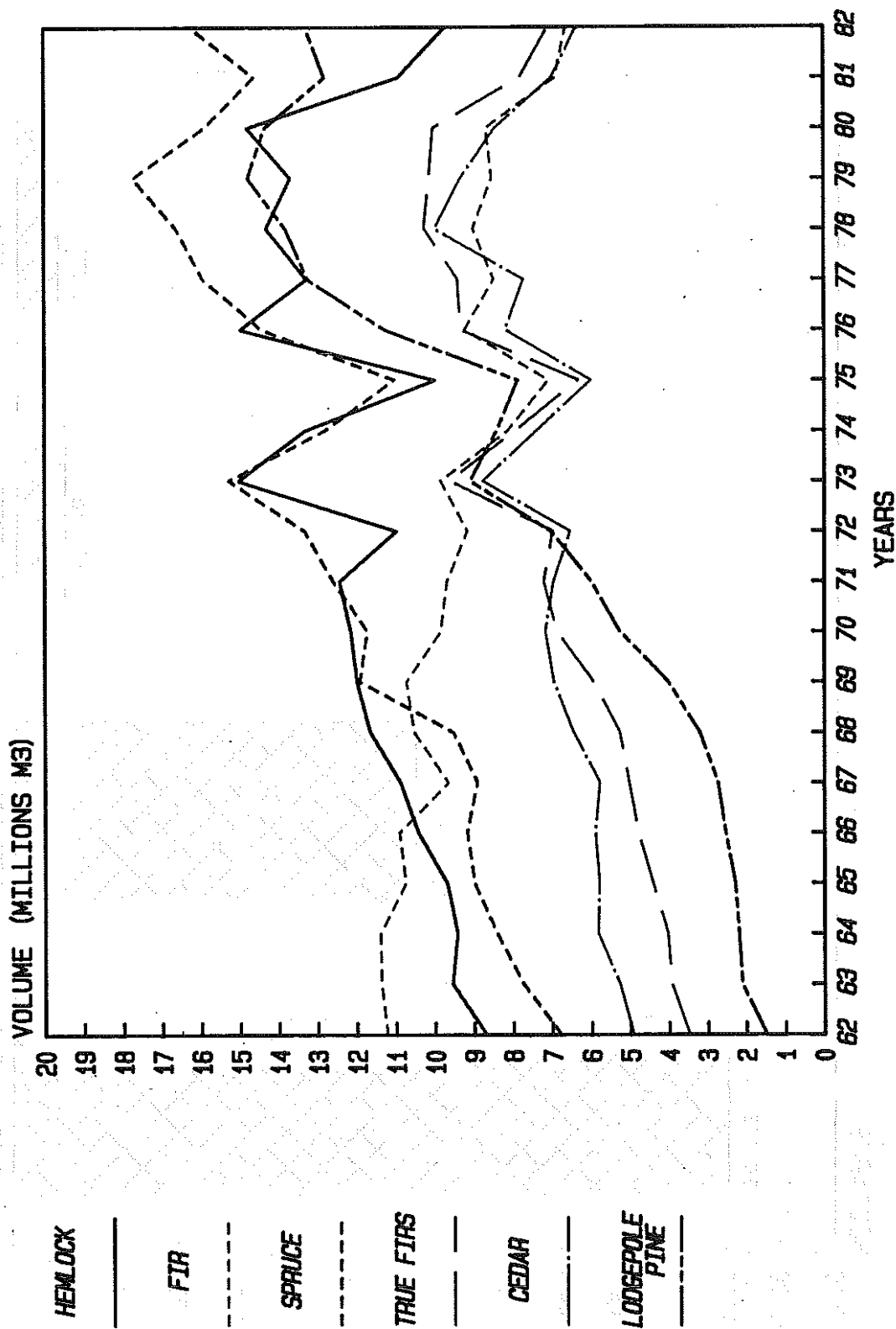
(Source: Canadian Forestry Service data)



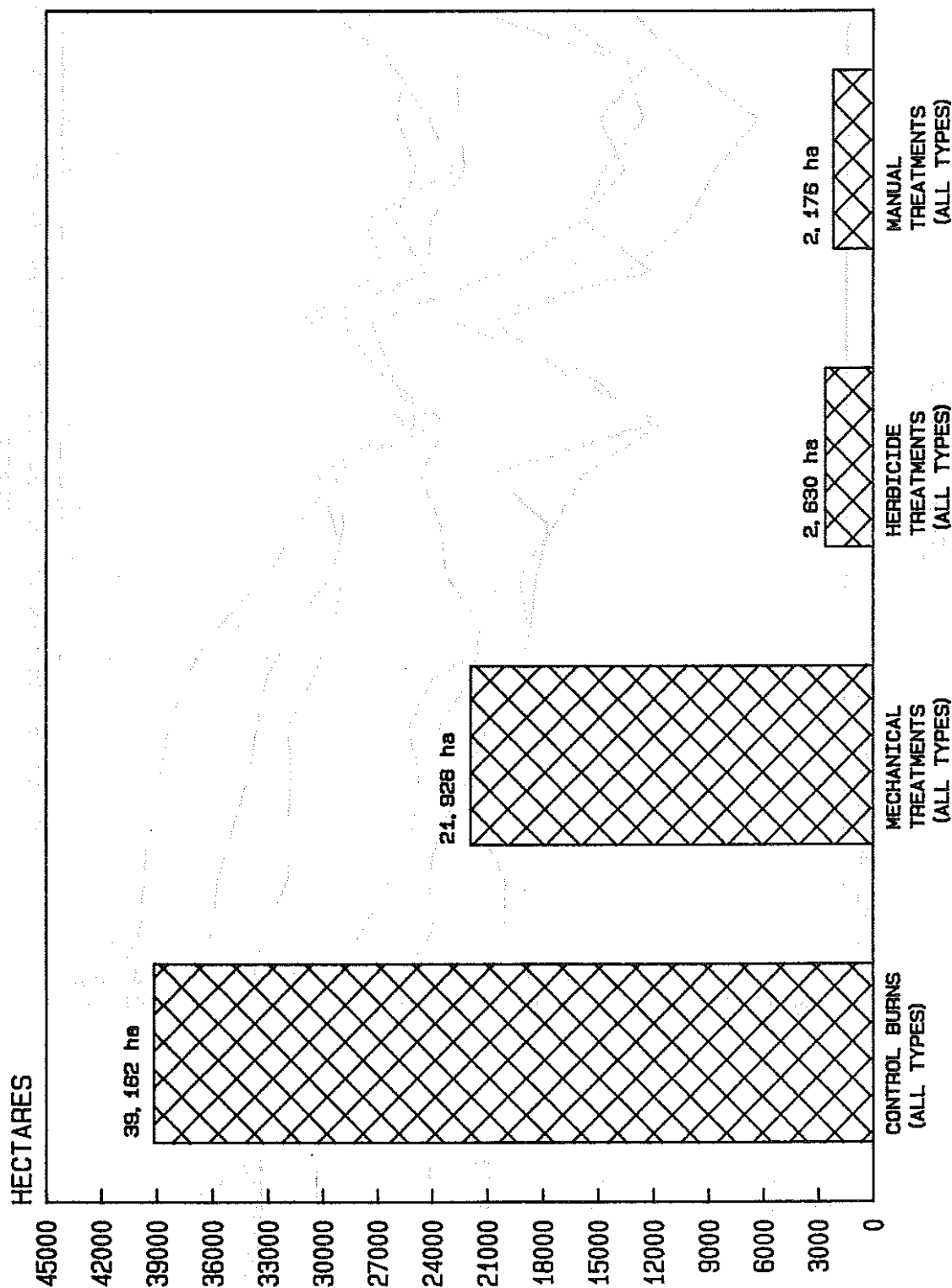
- Compiled by P. Humphreys, Protection Branch, Victoria

SPECIES CUT IN BRITISH COLUMBIA

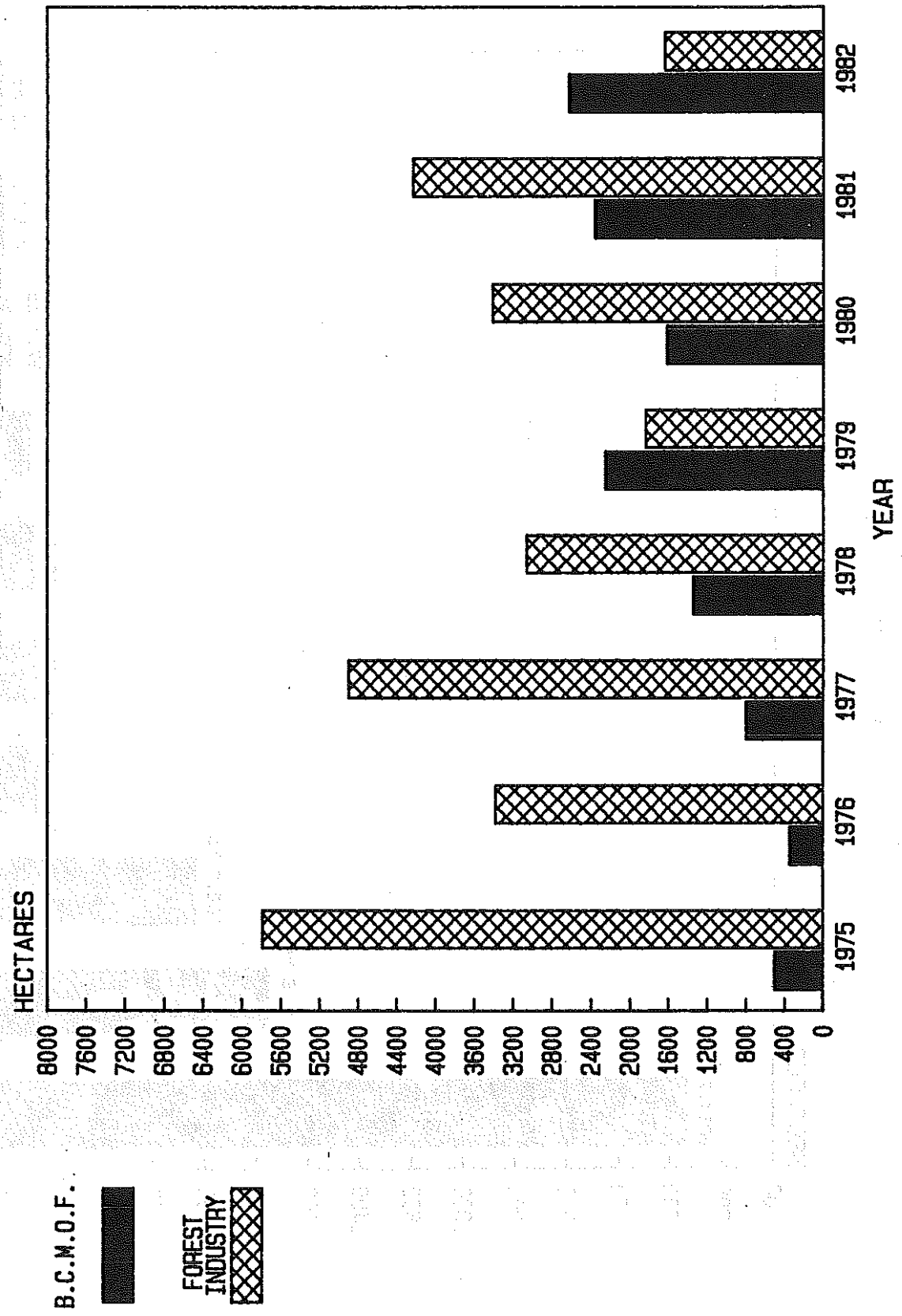
1962 - 1982



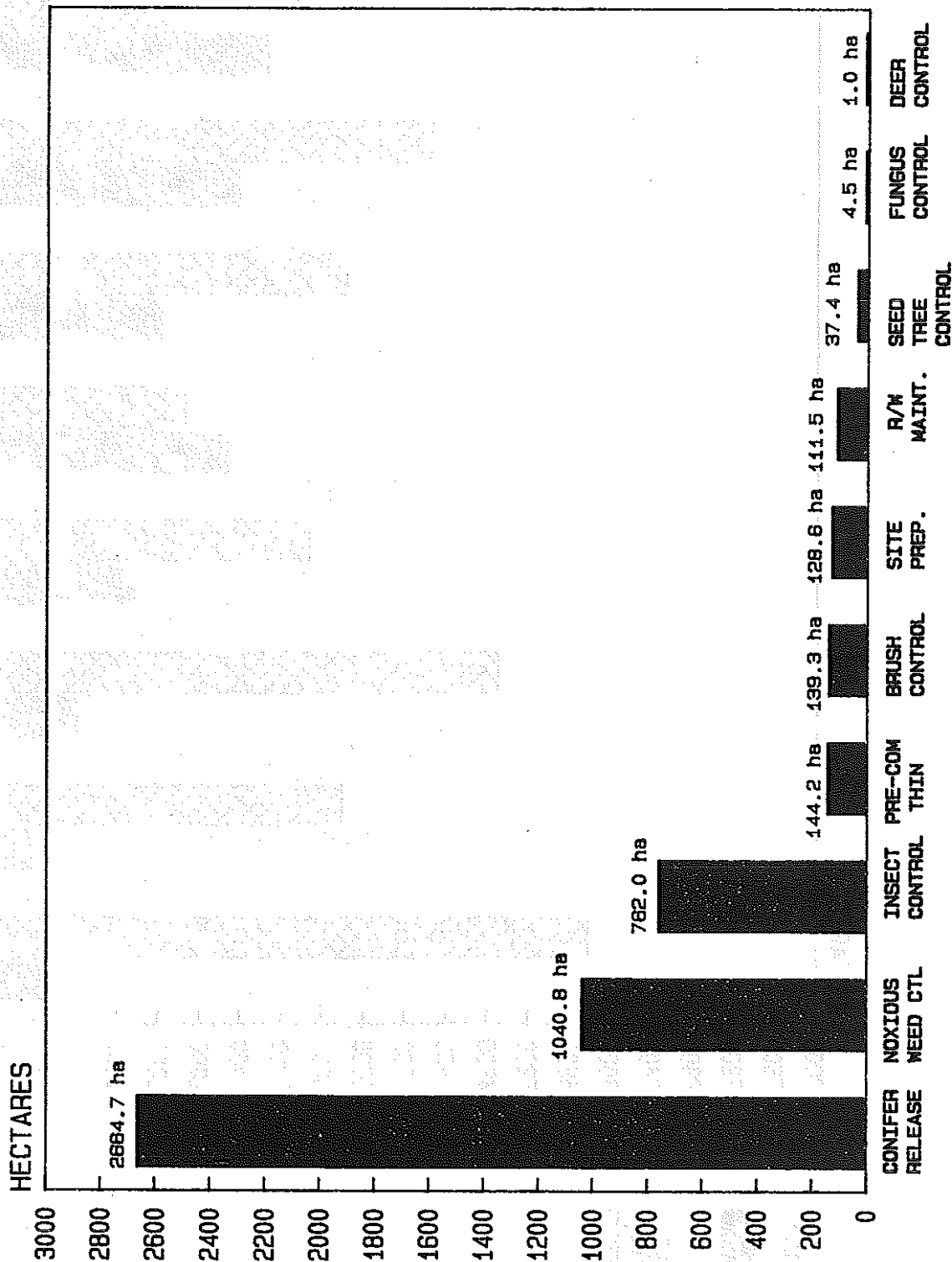
METHODS OF VEGETATION MANAGEMENT BY AREA TREATED IN 1982-83 BY
B.C. MINISTRY OF FORESTS



TOTAL HECTARES OF LAND TREATED IN B.C. IN 1975-82
WITH HERBICIDES FOR FORESTRY PURPOSES



COMPARATIVE SUMMARY OF THE PURPOSE OF PESTICIDE USE
BY AREA TREATED IN 1982¹

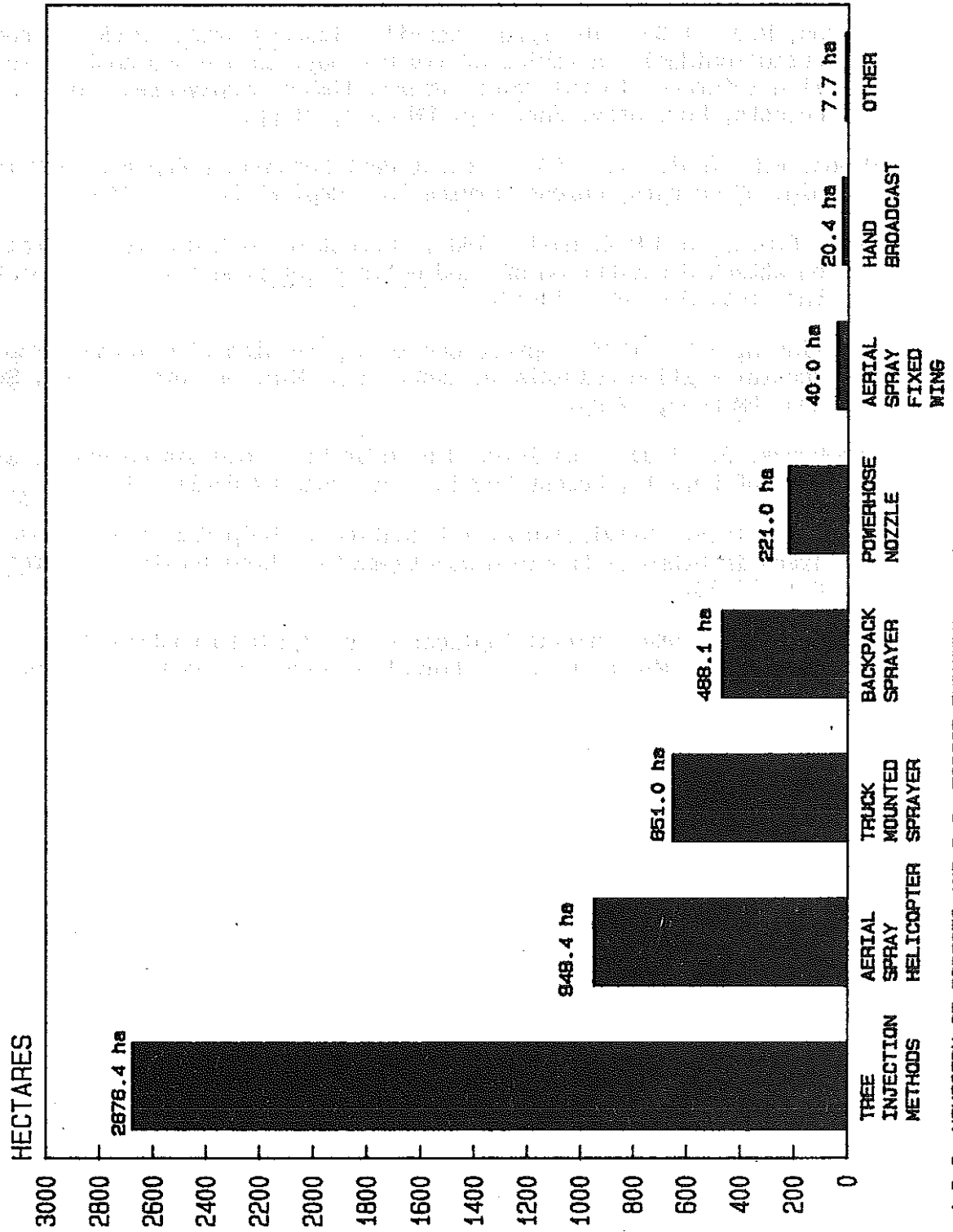


¹ B.C. MINISTRY OF FORESTS AND B.C. FOREST INDUSTRY COMBINED

- P. Humphreys and J. Henigman, Protection Branch, Victoria

COMPARATIVE SUMMARY OF METHODS OF PESTICIDE

APPLICATION BY AREA TREATED IN 1982¹



¹ B.C. MINISTRY OF FORESTS AND B.C. FOREST INDUSTRY COMBINED

- P. Humphreys and J. Henigman, Protection Branch, Victoria

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