

FOREST HEALTH PROGRESS

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

Volume XVII, Number 2 (File 312-20)

December, 1997

Change Management

Change management certainly plays a significant role in the Forest Health world these days.

This is the first full year of "life without FIDS", as witnessed by the absence of a provincial overview survey summary report. Districts, regions and headquarters are working toward the common goal of a Forest Service version of the FIDS overview survey. We anticipate to have the overview surveys in operation in 1998, with a summary report early in the fall. It is important that we maintain annual provincial overview surveys, not only to fulfill our national reporting obligations, but to maintain and increase our knowledge of forest pest dynamics in B.C.

In November, I was able to represent British Columbia at the National Forest Pest Management Forum, held in Ottawa. Unfortunately, I was unable to report, in any more than very general terms, the status of pests in B.C.'s forests. However, our Forest Health Program is the most well-resourced and staffed programs across the Nation, and the envy of several of our provincial counterparts. We must continue to work to protect and improve this important aspect of forest resource management in B.C.

Two international conferences, the Western Forest Insect Work Conference and the Western International Forest Disease Work Conference, were held in Prince George this year. Both were a resounding success and I hope that many of you were able to benefit from at least one of the conferences.

On a personal note, it's great to return to Forest Health! I look forward to working once again with the many dedicated individuals that have made the Forest Health Program the first class program that it is.

- R. Cozens, Forest Practices Branch, Victoria

CONTENTS

SUBJECT	PAGE NO.	SUBJECT	PAGE NO.
1. Forest Health General	5	4. Personnel	57
2. Forest Insects	21	5. Meetings	61
3. Forest Diseases	43		

FOREST HEALTH PROGRESS

EDITORIAL AND COORDINATING STAFF

Editor:	T. Ebata	Forest Practices Branch
Production:	S. Turcotte	Forest Practices Branch

ADVISORS

Entomology:	P. M. Hall	Forest Practices Branch
Pathology:	J. A. Muir	Forest Practices Branch
Forest Health:	J. F. Henigman	Forest Practices Branch
Research:	G. Krumlik	Research Branch

Address all correspondence to:

Ministry of Forests
 Forest Practices Branch
 PO Box 9518 STN PROV GOVT
 Victoria, British Columbia
 V8W 9C2

Attention: Shirley Turcotte

EDITOR'S NOTE

Forest Health Progress is a bi-annual report to the Forest Health Committee of British Columbia on issues, proposals, projects and results by Ministry of Forests staff. Brief, informal and informative articles are welcome from all staff.

Contributions labeled with an appropriate subject heading should be submitted via electronic mail to T. Ebata, Forest Practices Branch for the spring (May) and winter (December) meetings of the Forest Health Committee.

Authors of individual articles should be contacted for any clarification, as the contents do not necessarily constitute official statements of the Ministry of Forests.

- T. Ebata, Forest Practices Branch, Victoria

EXECUTIVE SUMMARY

The void left by the departure of FIDS as a major player in the Forest Health Program has thus far been difficult to fill. Aerial survey courses were presented throughout the province to train observers for our new aerial overview role. Forest health overview surveys were completed by Kamloops Region and Cariboo Region. Prince Rupert Forest Region has noted an increase in the activity of four defoliators and will be monitoring their activity; Vancouver Forest Region is monitoring two outbreaks of blackheaded budworm. Pruned stands were surveyed in the Prince Rupert Forest Region, with varying results and implications for pre-pruning surveys. Surveys of the extent of western balsam bark beetle and damage caused by the beetle are underway in the Kamloops Forest Region.

Approximately 10 000 hectares in the Cariboo and the Kamloops Forest Regions were sprayed to control western spruce budworm. At this time, a project of a similar size is planned for 1998. Control options for European gypsy moth in the Esquimalt - Langford area, where 238 male moths were trapped, are being considered for 1998.

Survey methodologies continue to be important in determining the significance of forest health agents. The Forest Health Surveys guidebook, one of the first guidebooks released, is undergoing revision, as is the *Field Guide to Pests of Managed Forests in British Columbia*. The standards for the collection of forest health information into the vegetation resource inventory have been finalized and published. A plot sampler training course is being developed that will concentrate on the identification of damage agents.

Applied research in topics of forest entomology continues in areas that will help us to understand the impacts of these forest health agents upon forest resource management. Study of hibernation habits of spruce beetle in the Prince George Forest Region continues. Topics in the Prince Rupert Forest Region include impacts of the poplar and willow borer, Warren's root collar weevil, northern pitch twig moth and green-striped forest looper. Finally, a brochure summarizing the findings of a socio-economic analysis of mountain pine beetle management in BC has been completed and released by branch.

Topics in forest pathology continue to be investigated throughout the province. In Prince Rupert Forest Region, studies include rust incidence in pruned pine stands, determination of operational adjustment factors relative to hard pine stem rusts in the Lakes Forest District, determination of the impact of tomentosus root disease in the Bulkley TSA, decay in advanced subalpine fir regeneration in the Bulkley TSA, and a riveting investigation into "oogy boogy" wood. In the Nelson Forest Region, a study into the recovery of pruning wounds on western white pine has been initiated.

General topics reported upon include a feasibility study into bark beetle control by predatory birds, an evaluation of deer browse barrier products, standardization of

methods to calculate net pest losses, control of western spruce budworm by underburning, fir root bark beetle on Vancouver Island, calibration of the Prognosis model to conditions in Southeastern BC, spruce beetle probing accreditation courses, and forest health topics regarding broadleaf tree species.

- R. Cozens, Forest Practices Branch, Victoria.

FOREST HEALTH - GENERAL

Bark Beetle Control May be Going to the Birds: During this fiscal year we are supervising a project to investigate the opportunity to use naturally existing predatory birds to contribute to the control of bark beetle populations. Insectivorous birds, such as woodpeckers, are considered to be major predators of bark beetles. With recent legislated changes in the maintenance of biodiversity through the creation of wildlife trees, there may now be an opportunity for insectivorous birds to be managed to contribute to the control of bark beetle.

With the assistance of our contractor, Dan Miller, we will evaluate the published information and bring specialists together in meetings to determine the potential for insectivorous bird species in B.C. to achieve some level of control of bark beetle populations. Given that results of the specialists discussion suggests that such biological control has merit, forest inventories will be reviewed to find locations in the province where field studies could be undertaken.

Much is known about the biology and population dynamics of most of the economically important bark beetles in B.C. This information should help plan where to focus on the enhancement of bird populations. In the case of mountain pine beetle, it is possible to risk-rate stands of lodgepole pine to beetle damage over a landscape. Similar risk rating and hazard models are under development for other bark beetle species. The mountain pine beetle risk rating model is now being incorporated into forest district operational data bases to assist staff in managing beetle damage.

In compliance with the *Forest Practices Code of B.C. Act* and as recommended in the *Biodiversity Guidebook*, wildlife trees must be established in managed stands, and thus become an attribute of forest landscapes. Many insectivorous birds rely on wildlife trees for their nesting habitat. The recent forest practices requirements to establish wildlife trees over the forest landscape offer an opportunity to review the feasibility to achieve some level of biological control of bark beetles using insectivorous birds.

Bark beetles are known to be a primary food source for downy, hairy, three-toed and black-backed woodpeckers in B.C. As well, bird densities are known to vary in accordance with changing beetle populations. In our project we wish to consider if the bird populations can be managed over landscapes so as to hold endemic beetle populations at low numbers for longer periods. If, in the opinion of bark beetle and bird specialists, this opportunity for biological control likely exists we will offer recommendations for future field research to test our conclusions.

If you would like to know more about this feasibility study please contact the author.

- J. Henigman, Forest Practices Branch, Victoria.

Evaluation of Deer Browse Barrier Products to Minimize Mortality and Growth Loss to Western Redcedar: Starting this September we have initiated a field research study to determine the effectiveness and net present value cost of using four different commercially available deer browse barrier products to protect western redcedar seedling from deer browse on the Queen Charlotte Islands. This project has been funded by the South Morseby Forest Replacement Account. The deer browse barriers being assessed are the Sinclair® tree shelter tube, the Sinocast® tree shelter cone, the Sweetwood® metal cage and the Vexar® mesh tube. The trees and their browse protectors will be maintained and monitored until the trees are growing free of browse damage. A detailed record of the associated costs of the installation, maintenance and barrier removal will allow a full analysis of the browse protection technology. At completion of the project, it will be possible to indicate the ability and the cost associated with each evaluated product to provide browse protection and any other benefits, such as growth enhancement. Limitations of products will be identified. The related costs, over the period of protection, will be calculated as a net present value.

Three large sites were selected on MacMillan Bloedel and Timber West forest tender lands, the sites had been planted with redcedar seedling in the spring of 1997. Within each site are three 2-3 hectare replicate areas, and within each replicate are 20 cluster plots of the replicated protector products and unprotected control trees. Planted seedlings had been originally protected with various protector products prior to the initiation of this study. In setting up the plots, we replaced study protector products on to existing healthy trees. The sites are representative of areas on the Queen Charlotte Islands known to have very high browse pressure and challenging weather conditions. They are in the Coastal Western Hemlock wh 01 - 04 biogeoclimatic subzones..

Prior to establishing the study sites we conducted a meeting of experienced operational forestry staff on the Islands in order to determine the technical measurement standards for the project. We agreed on the types of sites to be tested, the products to be tested, the methods of their installation and their maintenance regimes. Based on these standards, we will be maintaining sites and monitoring browse barrier effectiveness and overall costs each year through the study.

At the completion of the project results should demonstrate which browse barriers and maintenance regimes are most able to effectively protect cedar seedlings and at what net present cost. During the study we will produce annual progress reports and will produce a final report for operational forestry staff at the completion of the study.

If you would like more information on this deer browse protection study please contact the author.

- J. Henigman, Forest Practices Branch, Victoria.

The Standards for the Collection of Forest Health Information into the Vegetation Resource Inventory are Set: Based on the work of many of us at branch and regional offices we now have a complete forest health plot sampling protocol for the Vegetation Resource Inventory (VRI). The Resource Inventory Council (RIC) sanctioned protocol is published in the Vegetation Resources Inventory Ground Sampling Procedures, Ministry of Forest, Resource Inventory Branch, Publication #214, March/97, Section 4.4, Assessing Damage Agents and Severity. For your information the following is the forest health sampling protocol:

4.4 Assessing Damage Agents and Severity

Note: The assessment of damage agents and loss indicators share some common elements but they are separate and distinct processes (perhaps recorded by separate people). Tree loss indicators are discussed in Section 4.5.

The Vegetation Resources Inventory will sample for damage agents and severity on individual trees to provide an assessment of forest health. The sample will identify the agent or agents that cause the damage and quantify severity of the damage. The data is recorded on the Tree Loss Indicator (TL) field card. Damage agent types include abiotic, disease, insects, treatments, vegetation, and wildlife.

The damage agent and severity information will be used to determine:

- causes of tree mortality related to damage agents;
- stand growth reductions related to damage agents;
- species succession as related to damage agents;
- incidence and extent of the damage agent conditions;
- relationships between vegetation (forest) cover and damage agent conditions, used to derive a BEC forest cover hazard and risk rating;
- forest level yield projection and planning procedures (e.g., stratification of data by damage type, damage intensity, or damage risk class); and

- the relationship between damage agent and estimation of sound (undecayed) wood volume as determined through the net factoring and hidden defect processes.

Procedure

1. Assess damage agent(s) or conditions, and damage severity (ies) on all numbered trees, dead or alive, within the integrated plot. You will also assess new species occurring on the Auxiliary Plots. For stumps in the 2.5 metre fixed radius plot, assign a damage code for root diseases.

Use the *Field Guide To Pests of Managed Forests in British Columbia* (Fink et al. 1989) to help identify damage agents and conditions. See Appendix B for damage agent codes, and Appendix C for damage severity and mortality condition codes and standards.

2. Record the damage agents for each tree on the Tree Loss Indicators (TL) Field Card.
 - Use a 1-, 2-, or 3-letter code, depending on your confidence in the identification. The damage agent codes are hierarchical and enable coding from very general (type or category) to specific (species). The first letter indicates the type of damage agent: abiotic (A), disease (D), insect (I), mites (M), treatment (T), vegetation (V), and wildlife (W). The second and third letters indicate the specific agent, if it can be determined.
 - For example, Armillaria root disease is coded DRA (D = disease, R = root rot, A = Armillaria). If unable to identify the specific disease, only that it is a root disease, record DR. If you cannot determine that it is a root disease, but you are certain it is a disease (not an insect or other damage agent), record D for disease.
3. When the tree has more than two damage agents, list at least the most important two damage agents on the TL card. If you wish to list more than two damage agents repeat the tree number on successive rows.
4. Record the damage severity using the codes listed in Appendix C: Damage Severity and Mortality Condition Standards.
5. Always record "O" if no damage agent.

Issues which require clarification in the sampling protocol are the following:

Assessment of "Tree Loss Indicators" refers to indicators that signify the potential presence of decayed wood. The loss indicators (previously known as pathological indicators) to be measured are: conks, blind conks, frost cracks, scars, forks, crooks, large rotten branches, dead tops, root rot, soundings, direct observation, and broken tops. Procedures on the measurement and tallying of these attributes are described in Section 4.5 of the Vegetation Resource Inventory Ground Sampling Procedures.

The "Integrated Plot" is for the purposes of the VRI, the location around which the detailed sample information is collected on the ground for all disciplines. All attributes are attached to the centre point.

The "Auxiliary Sampling Plot" is for the purposes of the VRI, four plots set at 50 m in the cardinal directions from the integrated plot centre, to enhance the information collection at the centre point.

If you would like more information on forest health information to be captured in the VRI please contact the author.

- J. Henigman, Forest Practices Branch, Victoria.

Damage Agent Course to Improve Forest Health Information in the New Vegetation Resource Inventory: Further to an article on training of Vegetation Resource Inventory (VRI) plot samplers in the May/97 edition of Forest Health Progress, we are currently developing a 1 - 2 day course for plot samplers that will focus specifically on the identification of damaging agents. This job is being undertaken by our contractor, Ralph Nevill. The short course would be offered by contracted teachers in the spring prior to the offering of the 2 week VRI training/certification course. We are expecting that students would need the course as a prerequisite prior to taking the VRI course. Arrangements are being made to accept equivalent courses and to allow students to challenge the identification course. We are hopeful that this training course will substantially improve the identification of forest health damaging agents that must be represented in the new forest inventory.

If you would like more information on forest health training for the VRI please contact the author.

- J. Henigman, Forest Practices Branch, Victoria.

Forest Health Surveys Guide Book is being Revised: We have contracted Ralph Nevill to revise and update the Forest Health Surveys Guidebook. It was originally written by Forest Service staff and published as one of the first group of guidebooks in April, 1995. It has been used successfully since that time by forest service and licensee staff to guide landscape level forest health surveys. Specialized surveys for specific pests, such as root rots or bark beetles, are described in other forest health guidebooks.

The contractor will be consulting with selected forest service and licensee staff to determine what editorial changes are required to the guidebook text. Based on these consultations some survey methodologies may be added or deleted from the guidebook text. Draft changes to text will be developed and submitted to selected staff for their concurrence to change.

In particular, the Survey for Pest Incidence (SPI) methodology description in the guidebook will be clarified. An Access® data base program disc will likely be made available to support the use of the SPI data tally. We expect that users of the survey will be able to get the disc from branch or region.

If you would like more information on the editorial update of the Forest Health Survey Guide Book please contact the author.

- J. Henigman, Forest Practices Branch, Victoria.

Progress on Net Pest Loss Estimations: Since the last edition of Forest Health Progress in May there has been substantial progress on the standardization of methods to determine net pest loss estimations. We can expect to see much more accurate data on estimates of net pest losses showing up in timber supply analyses in the future.

In June of this year, I completed my final report to the Chief Forester on the determination of pest losses. The report is entitled "Measurement of Pest Killed Timber" and copies are available from me. The report summarizes how pest losses have been estimated in the past both by timber supply and pest control specialists. An evaluation of the pest loss data existing in the current timber inventory is presented. Finally, two alternative methods of calculating net pest losses are summarized.

During 1997 a number of timber supply area, timber supply reviews have begun to incorporate well organized net pest loss estimations based on the methods that we have proposed. These include Kamloops, Revelstoke and Golden TSAs. Summary reports on the loss estimations for these TSAs are, or will soon be, available. The Invermere TSA pest losses estimation was complete in 1996.

Advances in GIS and GPS technologies are offering the possibility of other ways of pursuing the net pest loss determination. I currently have a contract with Teresa White, of Cedrus Consulting, to investigate alternative options to determine losses for

coastal TSAs. We are hopeful that this GIS and GPS technology will make some breakthroughs that may be particularly useful for the coast.

We are working with Timber Supply Branch to reach agreement on acceptable approaches to calculating net pest losses. I suspect that we will agree that various methods are acceptable as long as certain minimum standards are maintained. We hope to resolve the standards soon.

- J. Henigman, Forest Practices Branch, Victoria.

Field Guide and Management Handbook for Commercial Broadleaf Tree Pests Soon to be Available: The Forest Practices Branch, with funding from Forest Resources B.C., has retained Pollard Ecological Consulting and Cedrus Consulting to publish a field guide of economically significant pests of commercial broadleaf trees. The field guide will be an addendum to the *Field Guide to Pests of Managed Forests in British Columbia* and should be available in April of 1998. The addendum will facilitate forest health pest identification in broadleaf tree and mixedwood stands as the existing field guide does now for conifer stands. It is expected to be used by foresters and surveyors to identify pests for training and management purposes. This project builds on a report completed in 1996 by Adriane Pollard entitled *A Summary of Forest Health Factors of Commercial Deciduous Trees in B.C.*

To be considered a pest in the field guide, damage must be considered widely conspicuous and/or of significant economic impact to live trees once out of the nursery. The tree species that are considered commercial are: bigleaf maple, red alder, white birch, trembling aspen, balsam poplar, black cottonwood, and hybrid poplars.

Also within the scope of this FRBC project, as a second phase, is the completion of forest health management methods and treatments related to the pests of broadleaf tree species. These methods and treatments will be completed as an insertion into a variety of existing guidebooks and should be available after September, 1999.

The first step in writing the identification field guide was to create a list of diseases, insects, animals, and abiotic factors that were potential pests in B.C. Over one hundred species or groups were originally listed. The pests were divided by tree species attacked and distributed to 22 researchers and operational foresters for comment. To date, 14 diseases, 11 insects, 7 animals, and 4 abiotic factors have been selected as significant economic pests. Each of these will be described in a pest summary including diagnostic features where possible. Economic pests currently identified are listed in the table below.

Diseases	Insects	Animals	Abiotics
• <i>Armillaria ostoyae</i> and <i>A. sinapina</i>	• <i>Agrilus anxius</i>	• moose	• strong wind
• <i>Ceratocystis</i> , <i>Ophiostoma</i> , <i>Verticicladiella</i> , and others	• <i>Choristoneura conflictana</i>	• deer	• frost
• <i>Fomes fomentarius</i>	• <i>Cryptorhynchus lapathi</i>	• elk	• snow, ice storm
• <i>Ganoderma applanatum</i>	• <i>Fenusa pusilla</i>	• cattle	• redheart
• <i>Innotus obliquus</i>	• <i>Leucomoa salicis</i>	• hares	
• <i>Linospora tetraspora</i>	• <i>Malacosoma californicum pluviale</i>	• rabbits	
• <i>Marssonina</i> spp., <i>M. populi</i> , <i>M. brunnea</i>	• <i>Malacosoma disstria</i>	• voles	
• <i>Melampsora medusae</i> f. <i>sp. deltoidae</i>	• <i>Nematus currani</i>	• mice	
• <i>Melampsora occidentalis</i>	• <i>Operophtera brumata</i>	• beaver	
• <i>Phellinus igniarius</i>	• <i>Operophtera bruceata</i>		
• <i>Phellinus tremulae</i>	• <i>Profenusa thornsoni</i>		
• <i>Septoria populicola</i>	• <i>Saperda calcarata</i>		
• <i>Valsa sordida</i> (<i>Cytospora chrysosperma</i>)			
• <i>Venturia populina</i> , <i>V. macularis</i>			

A draft of the new addendum will be circulated for comment amongst the same 22 professionals in December, 1997. It is hoped that unpublished information will be obtained through this process to fill in the blanks such as localized distributions of individual pests. Photographs of the pests and their symptoms are also being sought for the publication. For those of you who do not relish having to memorize more Latin, we will be including common names where possible.

If you would like further details of this project, or you think you could help in the search for information and photographs, please contact us:

- John Henigman, Forest Practices Branch, Victoria, (250) 356-5886
- Adriane Pollard, Pollard Ecological Consulting, Victoria, (250) 380-7108
- Teresa White, Cedrus Consulting, Smithers, (250) 847-2289

- A. Pollard, Pollard Ecological Consulting, and J. Henigman, Forest Practices Branch, Victoria.

Forest health surveys of pruned stands - Line transect forest health surveys were conducted on 45 spaced and pruned stands in the Bulkley/Cassiar (15 stands), Morice (14 stands) and Lakes (16 stands) Forest Districts. All stands were pruned between 1991 and 1996. The stands were composed primarily of lodgepole pine, with a minor component (<15%) of spruce and subalpine fir. The surveys were carried out by Silvicon Services of Smithers. Each transect was 3 m wide, and spaced 100 m apart. All types of damage (disease, insect, mammal and abiotic) were recorded by host species.

The most common damage agent of subalpine fir was moose browse. Although this damage may not cause mortality, it can lead to damage which may make the tree unacceptable as a crop tree. Feeding may also cause scarring which would allow for the introduction of decay fungi. The most significant cause of damage to spruce was the galling caused by an adelgid, likely *Pineus similis*. This damage will have no long term effect on the spruce trees.

The lodgepole pine in these stands had many different forest health problems, but the most serious were the hard pine stem rusts. When all three of the rusts (*Endocronartium harknessii*, *Cronartium comandrae* and *C. coleosporioides*) are considered, the incidence of unacceptable pine trees averaged 2.1%, 5.5% and 4.3%, for the Bulkley, Morice and Lakes Districts respectively. All of these trees had lethal stem galls, or lethal stem and branch cankers. The distance at which branch galls occurred was not measured, so some of these could also be unacceptable. These averages are quite low, but there were three stands in the Morice District and two stands in Lakes District which had incidence levels over 15%. These results show the need for accurate rust surveys, so that these stands are not targeted for pruning, and may also show the need for careful examination of investments in intensive silviculture in B.C.

- K. White, Prince Rupert Forest Region, Smithers

Final year of data collected for long term porcupine study - This data was part of a 10 yr. study that looked at the effects of porcupine damage on second growth coastal western hemlock forests in the North Coast District. Porcupines are the primary forest health problem in this Forest District. The study site has plots which have been examined every year for any signs of attack or mortality. This year the data was recorded by two co-op students, Alex Woods and myself. The data has been sent to Stefan Zeglen for compilation, and it may eventually give us a better understanding of the amount of damage caused by porcupines. Go for it, Stefan!!!

- K. White, Prince Rupert Forest Region, Smithers

Forest Health Inventory of Broadleaf Stands in the Kamloops Forest Region. An inventory of broadleaf forest health concerns was initiated in 1996, funded through the FRBC-Inventory program. Surveys were conducted in 1996 in the Kamloops TSA and were extended in 1997 into the Okanagan, Merritt and Lillooet TSAs. Mature stands of aspen, birch and cottonwood were targeted for assessments due to concerns for the preservation of old-growth characteristics and impacts on wood supply. Approximately 65 person-days were spent assessing 127 polygons over 75 mapsheets in 1997, primarily in the IDF and ICH zones, for a total sample of 258 polygons over the 2-year period (Table 1). Assessments of many potential polygons were curtailed because of access constraints, largely due to private land ownership.

TABLE 1 - Polygons surveyed for pests of broadleaf species in the Kamloops Forest Region by year and BEC classification.

BEC Subzone	1996	1997	Total
BGxh	-	3	3
BGxw	2	-	2
ESSFdk	1	-	1
ESSFwk	2	-	2
ESSFdc	-	1	1
ICHmw	48	24	72
ICHmk	6	-	6
ICHwk	2	7	9
IDFxh	8	21	29
IDFxw	2	-	2
IDFmw	18	7	25
IDFdk	29	57	86
MSxk	5	1	6
MSdm	3	5	8
MSmm	-	1	1
SBSmk	3	-	3
SBSmm	2	-	2
Total	131	135	258

Frost cracks were common on aspen, birch and cottonwood. Damage from moose feeding, bear climbing and human graffiti artists were common for aspen. As in 1996, the most common diseases in aspen stands were Ceratocystis Canker, Cytospora Canker, Sooty-bark Canker, Armillaria Root Disease, Aspen Trunk Rot, Shepherd's Crook of Aspen, and Ink Spot Leaf Blight. Topkill/branch Dieback, White Spongy Trunk Rot, Hardwood Trunk Rot, and Sterile Conk Trunk Rot were common in birch stands. Wetwood, branch dieback, Conifer-Cottonwood Rust, and Septoria Leaf Spot were noted in cottonwood stands. Basal lesions, common in aspen and birch stands, were associated with frost cracks, Armillaria Root Disease, and/or the mortality of one stem in a multiple-stem tree.

Aphids and mites were abundant on all broadleaf species. Carpenter ants, ambrosia beetles and wood borers were often associated with damage caused by moose or frost

cracks. The Satin Moth was common in stands of aspen throughout the IDF but only caused severe defoliation in a few locations. The Northern Tent Caterpillar and the Forest Tent Caterpillar were noted in stands of aspen and cottonwood. An infestation by the Forest Tent Caterpillar was found adjacent to TFL 49, approximately 10 km northwest of Bear Creek Provincial Park. The infestation resulted in severe defoliation in a young stand of aspen over an area of approximately 300 ha. Low numbers of Satin Moth and Northern Tent Caterpillar were also present.

Survey data gathered to date will be compiled by March of 1998, as the funding has been terminated for this project. Distribution maps of significant forest pests will be prepared for aspen, birch and cottonwood. Summary tables of all forest health factors will be prepared by BEC zone and subzone.

- L. Maclauchlan, Kamloops Forest Region, Kamloops, D. Miller, Miller Consulting Services, Surrey, and J. Hodge, JCH Forest Pest Management, Lumby.

Overview of Forest Health in the Kamloops Forest Region. 1997 has been another busy year for the Kamloops Region and district forest health staff. Coupled with ongoing bark beetle and defoliator programs staff have been occupied with many new activities brought on through FRBC and other initiatives.

Douglas-fir beetle, *Dendroctonus pseudotsugae*, and spruce beetle, *Dendroctonus rufipennis*, each covered less than 1,000 ha (as visible from overview flights). It should be noted that in most areas spruce beetle mortality may be underestimated, due to a lack of significant color change this year. The spruce beetle continued to expand in the Lillooet, Kamloops, Clearwater, Salmon Arm, Vernon, Penticton and Merritt districts. Areas of note include the Chase Creek area which has seen a major expansion in 1997 and areas in the south Okanagan, particularly the Dennis Creek/Greyback Lake area. Other major spruce beetle infestations were located in the Hozomeen Range and near Spius and Maka Creeks.

Over 500 ha of sheet, patch and within-stand blowdown was mapped from the air in Wells Gray Provincial Park as a result of the August 1996 wind storm. Upon conducting ground surveys, the blowdown was determined to be far more extensive than mapped from the air. Slocan Forest Products, on the Parks behalf, removed trees from the road into the Park and small patches of Douglas-fir along the roadside that were infested with Douglas-fir beetle. Surveys just completed of the spruce blowdown indicate between 5-20% of the downed material infested with spruce beetle and about 15% of these beetles are in a one year life cycle. BC Parks has decided not to remove any more trees so plans are currently being developed to address the beetle in another way.

Mountain pine beetle, *Dendroctonus ponderosae*, infestations in and around the Princeton area covered over 8,700 hectares, and over 2,700 ha were infested west of

Salmon Arm, in an area stretching from Louis Creek to the Monte Hills. Other significant infestations were located in Snehumption Creek and several other drainages of the Okanagan and Cathedral ranges. In total, mountain pine beetle infestations covered an estimated 16,530 ha in the south half of the region.

Western balsam bark beetle, *Dryocoetes confusus*, was mapped on over 13,500 ha of high elevation stands throughout the southern portion of the region and approximately 12,000 ha in the north. Generally, this beetle is present to some degree in most stands that contain a significant component of mature host species. Stands that were mapped as infested generally had a higher incidence of attack than the norm, which ranged from 0.5% - 4.0%. The most extensive, heavily attacked stands were found in the Graystoke - Buck Hills area of east Kelowna.

Western spruce budworm, *Choristoneura occidentalis*, defoliated over 29,800 ha of Douglas-fir stands in the south portion of the region and an estimated 10,000 ha (still awaiting some data) in the north. 16,200 ha (1,080 ha moderate) were defoliated in and around the Merritt area, and 13,715 ha (730 moderate) were defoliated in and around Peachland, Summerland and Vernon.

Other pests causing less significant damage included Douglas-fir tussock moth (Chase/Pritchard area and north to McClure), western pine beetle and engraver beetles.

Abiotic factors causing tree mortality and/or damage included redbelt, flooding, windthrow, wildfire and frost damage. Of these only redbelt occurred over a significant area.

- L. Maclauchlan, Kamloops Forest Region, Kamloops

Timber Supply Review and Compilation of Unsalvaged Losses. A contract for calculation of unsalvaged losses due to Forest Health impacts is intended to be signed in December, pending funding, and to be completed before the end of the fiscal year. Unsalvaged losses will be calculated for 100 Mile House and Quesnel TSA's. The Invermere method for calculating losses will be used.

- L. Rankin, Cariboo Forest Region, Williams Lake

Cariboo Forest Region Forest Health Surveys. The Cariboo Forest Health Section took steps during the summer of 1997 to collect data which had previously been performed by the federal Forest Insect and Disease Survey Rangers. Pests of Young Stands surveys (POYS) were covered partially by an FRBC funded survey for POYS in pine. Surveys were also conducted in young spruce plantations. Defoliator surveys were conducted by contractor at the permanent sampling stations (PSS) historically surveyed by FIDS rangers annually. Eighty-eight PSS's were visited throughout the region with surveys focused on stands in ecosystems most likely to host critical defoliators. A number of PSS's were not surveyed due to contracting delays which

prevented timely visits to some of the early season sites. Insectary and pathology staff at Pacific Forestry Center (Bob Duncan and Brenda Callan respectively) provided excellent service for identification of insects and diseases collected at PSS's and from other random sites.

Aerial overview surveys using 1:100,000 maps were also carried out with contractors and regional staff to map defoliators, pine needle cast and red belt. Bark beetle overview surveys using 1:40,000 maps were also completed during August-September with contractors, regional and forest district staff. The bark beetle survey has been carried out by Cariboo Region since 1980 and is not an increased workload burden.

Delays have been experienced with the analysis of the data from aerial surveys due to lack of staff and difficulties with budgets. At this time the aerial survey is co-ordinated using a co-operative education student which limits productivity due to lack of experience.

- L. Rankin, Cariboo Forest Region, Williams Lake

Forest Health and the Code Training. A one-day course developed by Forest Practices Branch and Sylvia Riessner of Nu-Tech Training has been piloted. The course provides Ministry of Forests, industry and consulting staff an opportunity to closely study all forest health related legislation in the Forest Practices Code and regulations. Although this topic sounds rather dry, lively discussion is generated through the use of many real-life examples drawn from actual Silviculture Prescriptions, Stand Management Prescriptions, Forest Development Plans, and Higher Level Plans (e.g., the Kamloops TSA LRMP) that the contractor gathered from province-wide sources. There are coastal, northern interior and southern interior versions of this course. The coastal course use examples that focus mainly on management of root disease while the interior versions utilize more bark beetle management related material.

The course was piloted this spring in Nanaimo by Tim Ebata and Stefan Zeglen, and in Kamloops Forest District by Tim Ebata and Dave Piggin, Forest Health Forester, Kamloops Forest District. The Kamloops course was then given twice to a larger audience of district staff, woodlot and first nations representatives, consultants and industry staff who were invited by the District. Approximately 30 people were trained and the feedback was very positive. Suggestions provided by these participants for improving the course will be incorporated in the next version of the course.

The legislation is currently undergoing significant revisions and the course will have to be up-dated once these changes and their impacts have been determined. In addition, the up-dated course will include some examples of compliance and enforcement scenarios for specific regulations which Districts may encounter. In the interim, the Powerpoint® presentation FPC.PPT that is posted on the Forest Practices Branch

internal FTP site (ftp\branches\forest_practices\mof_internal\publish\fhealth) will be updated with the most current versions of the legislation.

- T. Ebata, Forest Practices Branch, Victoria

Forest Health and FRBC. The 1997/98 fiscal year's funding opportunities for forest health proved to be highly variable. Currently, FRBC funding for forest health activities can be derived from three FRBC Funding Priorities - Enhanced Forestry, Operational Inventory and Research.

In 1997/98, forest health functions funded by FRBC amounted to \$1,164,750 in Operational Inventories, \$1,211,000 in enhanced forestry, and \$360,000 in Research in 1997 (total of \$4.2 million from 1996-2001). The following tables (Tables 1 and 2) give the detailed distributions of these funds by funding priority, region and district for the land-based activities (i.e., EFP and Operational Inventory).

Enhanced Forestry and Operational Inventory budget proposals for the next fiscal year have been submitted within Regional Investment Plans (RIPs). Final budget allocations are unavailable at this time but are likely to be reduced significantly from 1997/98's due to changing FRBC priorities and revenues.

FRBC funded the following 6 new forest health research projects in 1997/98.

Project Leader/ Review Committee	Title	Amount
Dr. Brenda Callan, CFS/ Pest Management	Pre-publication layout and printing of a poplar disease manual	\$42,525 (1 yr.)
Dr. Beverly Smith/ Extension	Computerized forest insect identification system	\$72,888 (1 yr.)
Dr. John Borden, SFU/ Pest Management	Impact assessment of the western conifer seedbug, <i>Leptoglossus occidentalis</i>	\$93,991 (1 st yr.) \$54,275 (Total 5 yrs.)
Dr. John Borden, SFU/ Pest Management	Chemical ecology and management of wood-boring beetles	\$147,390 (1 st yr.) \$736,950 (Total 5 yrs.)
John Henigman, MOF FPB/ Pest Management	Identification of important commercial broadleaf tree pests	\$40,845 (1 st yr.) \$71,190 (Total 2 yrs.)
Jerry Carlson, Phero Tech Inc./ Pest Management	Improved pheromone tree bait for the western balsam bark beetle	\$34,350 (1 st yr.) \$58,850 (Total 2 yrs.)
Dr. Aine Plant, SFU/ Tree Improvement	Enzymes involved in resistance by spruces to the white pine weevil: biochemical mechanisms and screening for inducible resinosis.	\$78,814 (1 st yr.) \$150,684 (Total 2 yrs.)

Totals by Review Committee (1 st yr. only):	Pest Management:	\$359,101
	Extension:	\$72,888
	Tree Improvement:	\$78,814

Table 1 - Forest Health Enhanced Forestry Projects (EFP) funded in 1997/98

Region	District	Project #	Proponent	Specific Activity	\$\$ Allocated	Regional Total
Kamloops	Vernon	TO97030	MOF	FH Salvage	\$160,000	
	Penticton	KA3596	Weyerhaeuser	identification of pest problems on TFL and recommend & implement trts	\$67,998	
	Merritt	TO96209	Tolko	FH component of a multi-activity proposal BB surveys	\$82,500	
		TO97251	MOF	BB surveys	\$24,000	
		TO97319	Aspen Planers	Data not available	\$50,000	
	Clearwater	T096200	Slocan	pixel surveys	\$25,000	
		T096200	Slocan	IWS provenance trials, mixed density plantings, embling/ reg stock planting, fill planting, assessments	\$26,000	\$435,498
Pr. George	Robson Valley	OP96176	MOF	Data not available	\$52,380	\$52,380
Cariboo		CC96121	MOF	BB mngt plans in parks in the Chilcotin FD	\$37,313	\$37,313
Nelson	Arrow	NE-55-95-0004	Pope & Talbot	Enhanced Forestry including Pw pruning and canker excising (3 contracts)	\$228,652	
	Golden	KB97312-3	MOF	Fall & Burn	\$100,000	\$328,652
Pr. Rupert	Morice	SB-97-098-2	Northwood Pulp & Timber	Fall & Burn, MSMA, baiting	\$10,663	
		SB-97-186-2	Houston FP.	Fall & Burn, MSMA, baiting	\$112,100	
	Lakes	PR-21-96-0117	BC Parks	Tweedsmuir MPB burn	\$109,500	\$232,263
Vancouver	Sunshine Coast	PA-97-174-5	MOF	Surplus pruning funds to FH surveys and off-site spp spacing (high elevation burns)	\$50,000	\$50,000
Forest Practices Branch			MOF	Forest Health Training		\$75,000
Provincial Total						\$1,211,106

Table 2 - Operational Inventory Forest Health Projects funded in 1997/98

Region	District	Project #	Proponent	Specific Activity	\$\$ Allocated	Regional Total
Kamloops		TO96136-IN2	MOF	FH component of a multi- activity proposal	\$15,750	\$500,000
		TO96136-IN3	MOF	root rot surveys, Clearwater	\$18,375	
		TO96139-IN	MOF	Chase Ck. FH Inv training	\$7,875	
		TO96192-IN	MOF	FH inventory of subalpine fir	\$181,510	
		TO96193-IN	MOF	MPB losses - Penticton, Vernon, Merritt FD	\$10,000	
		TO96194-IN	MOF	Broadleaf FH inventory	\$51,000	
		TO96202-IN	MOF	Root disease & stand surveys	\$25,000	
		TO96205-IN	MOF	BC Parks - building a FH interpretive trail in Skihist Prov park	\$22,000	
		TO96209-IN2	MOF	FH Inv - Nicola Valley, Tolko	\$26,250	
		TO96213-IN2	MOF	Ainsworth - Lilloett FD FH Inv	\$49,140	
		TO96269-IN1	MOF	Bridge River Econ. Devel. Soc. (1st Nations gp) - BB hazard & risk rating in Lilloet, Bridge R.	\$23,100	
		TO97003-IN	MOF	Admin to train & assist all of the industry contracts	\$10,000	
		TO97015-IN	MOF	S. Simard's grad student project on landscape level patterns of disturbance by Armillaria	\$60,000	
Pr. George	Mackenzie	OP96127/IN2	TimberWest	Forest Health inventory	\$4,200	\$449,250
		OP96131/IN2	TimberWest	Comprehensive inv.	\$9,270	
		OP96231	Finlay F. Ind.	IWS mapping in Mackenzie	\$104,780	
		OP97186/6IN	TimberWest	Data not available	\$200,000	
	Robson Valley	OP96112	MOF	IWS mngt & strategies	\$70,000	
		OP96113	MOF	BB Hazard & risk map	\$18,000	
		OP96114	MOF	Multi-pest surveys	\$43,000	
Cariboo		CC96127-IN	MOF-FH	Inventory of young PI pests	\$78,500	\$78,500
Nelson	Arrow	KB96167-IN	Pope & Talbot	detailed aerial mapping and ground calls plus development of a FH registry for TFL23	\$28,000	\$107,000
	Kootenay Lk.	KB96332-IN	MOF	Susceptibility rating of Fdi stands to IBD attack on West Arm of Kootenay Lake	\$79,000	
Pr. Rupert	Bulkley	SB-96-095-IN	MOF	Impact of WBBB on Timber Supply	\$30,000	\$30,000
Provincial Total - all operational inventory projects						\$1,164,750

Prospects for new research projects being initiated in forest health are dim as FRBC has allocated only \$4 million for new research for all of its research priority areas. New research will be initiated by direct invitation by FRBC rather than through a general call for proposals as has been the approach used to date. Any new projects will be in topic areas that directly support current high-priority FRBC research needs. Projects that have been approved for multiple year's funding will be continued following the approval of interim progress reports.

- T. Ebata, Forest Practices Branch, Victoria

FOREST INSECTS

A bark beetle outbreak on Vancouver Island!? *Pseudohylesinus granulatus* in the Tahsish River area. For the first time in many years there is a bark beetle outbreak on Vancouver Island. The fir root bark beetle, *Pseudohylesinus granulatus*, has attacked and killed a few hundred amabilis fir in the Tahsish River area. It seems it is an example of the "classic" situation where bark beetle numbers build up in blowdown and then spread into adjacent standing timber. *Pseudohylesinus* beetles seem to be one of those types of bark beetles that are on the boundary between being secondary and primary bark beetles. They generally only attack stressed, recently dead or dying trees. However, occasionally, when the conditions are right, they seem to be able to build into numbers large enough to kill live standing trees.

This is the first time, and I can find no other record of this on the B.C. coast, that I have seen *Pseudohylesinus* beetles build up in windthrow and kill this many trees. The blowdown occurred in the fall of 1994, but it was not until this summer that the bark beetle activity was detected, although it is obvious that the beetles have been active for a few years. The life cycle apparently requires two years. Initial beetle attack occurs in the spring, with some adults reemerging and reattacking later in the summer (overlapping generations). It often takes more than one year of attack to kill a mature tree. New adults emerge in the summer and make hibernating attacks but stay within the bark. I could find all life stages, except live eggs, in mid-September. As a result of all of this, it is difficult to sort out the various beetle generations and determine which one is responsible for the death of the tree.

In addition, it may be possible that the silver fir beetle, *P. grandis* (= *sericeus*), is also involved, but I was not able to find adults while sampling. These two beetles are currently a concern in amabilis fir stands recently defoliated by the conifer sawfly (see article in this issue). Both of these beetles were responsible for considerable mortality of amabilis fir following defoliation by the conifer sawfly in the late 1970's on Vancouver Island.

The forest licensee in the area is currently salvaging the windthrown and beetle killed timber, and sanitation harvesting (this OK Bob?) the trees with current beetle attack in them. This should clean up the situation.

- Don Heppner, Vancouver Forest Region, Nanaimo

Another outbreak cycle of blackheaded budworm in the Vancouver Forest Region. The blackheaded budworm, *Acleris gloverana*, is again in its outbreak phase in the Vancouver Forest Region. Outbreak populations are defoliating mixed stands of western hemlock in the Queen Charlotte Islands and on northern Vancouver Island. The outbreak in the Queen Charlotte Islands has now been active for two seasons. This past summer was the first year of defoliation on northern Vancouver Island.

An estimated 30,000 ha of mixed hemlock stands have been defoliated on the Queen Charlotte Islands. The majority of these stands are within the Gwaii Haanas (South Moresby) National Park. The severity of the outbreak this time does not seem to be as bad as it was during the last outbreak in 1985 - 1987. Another year of defoliation is expected.

On northern Vancouver Island, approximately 15,000 ha have been lightly to moderately defoliated. Most of the defoliation here has been confined to immature stands. There are numerous large patches of defoliation in the Holberg/Mahata River area. Defoliation is mostly light with a few patches of moderate. I expect a major increase in the area involved and the severity of defoliation next summer. This outbreak cycle is expected to be much larger than the previous one in 1988-90 (7,400 ha). If this outbreak follows the course of previous ones, it will probably peak next summer, decline somewhat in 1999 and collapse before the summer of 2000.

Experience from previous outbreaks suggests that the impacts of defoliation will be short-lived and that the damage usually looks worse than it is. Most trees recover within a few years with little more than minor growth losses. However, some mortality will occur and a few stands will experience significant impacts. At this point, we are not yet able to predict where these severe impacts will occur. It is believed that B.t.k. treatments will minimize the impacts of this budworm but its application requires a period of relatively dry weather in June - not a high probability occurrence in these hypermaritime ecosystems. However, *B.t.k.* is not yet registered for use on western blackheaded budworm. Additionally, we have not been able to show that there is a positive benefit/cost to controlling it; the damage has generally not been severe enough.

- Don Heppner, Vancouver Forest Region, Nanaimo

Conifer sawfly infestations in the Vancouver Forest Region. For three years, infestations of the conifer sawfly (*Neodiprion* spp.) have caused significant and highly visible defoliation of amabilis fir and hemlock in the Vancouver Forest Region. Defoliation was first detected in the Phillips River drainage in 1995 (see FHP Volume

XIV, Number 2, pages 10-11). The outbreak expanded dramatically in 1996 from 200 ha to over 10,000 ha. In 1996, additional sawfly infestations were detected in the Kunnum Creek, Adam River, White River, Bigtree Creek and Memekay River drainages within MacMillan Bloedel's TFL 39, and within Schoen Lake Provincial Park. Approximately 4000 ha of amabilis fir and hemlock stands were defoliated on Vancouver Island.

By the fall of 1997, most of the outbreak in the Phillips River drainage had declined. Stands defoliated in 1996 sustained only minor levels of defoliation in 1997. The only exceptions were the extreme back ends of some of the drainages. Smaller areas of light to moderate defoliation were also found in adjacent areas to the west and east (Stafford, Apple, and Paradise river drainages). The sawfly population in the Phillips River area is expected to continue to decline in 1998.

Sawfly populations appear to be decreasing on Vancouver Island as well. The total area of defoliation on the island increased to approximately 5100 ha in 1997, although the severity of defoliation was generally less than in 1996. The exceptions included the upper reaches and steep side drainages of Bigtree Creek, Kunnum Creek, Compton Creek, Adam River, and the Middle Memekay River, where defoliation levels increased or remained high. Evidence of viral disease in the sawfly population was abundant throughout the region, particularly in the Compton and Kunnum Creek drainages. Further mortality at the pupal stage was quite high due to incidences of disease and parasitoids. In a random sample of 46 pupae, only 8 adult sawflies emerged (4 female and 4 male). Adults of two species of hymenopteran parasitoids emerged from 16 pupae. The rest died without hatching to adult stages. Populations should remain moderate or decline dramatically in 1998.

MacMillan Bloedel has initiated salvage harvesting in some stands in the Phillips Arm drainage where defoliation has been high for at least 2 years and a significant number of trees have died. A number of stands on Vancouver Island have been identified as being at high risk to volume and degrade losses. These stands may be scheduled for salvage in 1998/1999.

However, most of the trees within the defoliated area should recover fully. Defoliation has been only light to moderate with current foliage generally untouched in 1997. Populations of the Pacific silver fir beetle (*Pseudohylesinus sericeus*) and the fir root bark beetle (*Pseudohylesinus granulatus*) continue to remain low in numbers. In a previous sawfly outbreak in the late 1970s, these bark beetles attacked and killed many of the stressed trees following defoliation. So far, bark beetle populations do not seem to be causing much of a problem.

The blackheaded budworm (*Acleris gloverana*) is present in the Kunnum Creek area, feeding on current foliage in contrast to sawflies that feed predominantly on old foliage. However, population levels are low and are not expected to erupt in 1998. Barring unforeseeable events such as excessive drought conditions or blowdown with

associated increases in bark beetle populations, affected stands of amabilis fir and hemlock are expected to fully recover within 2-3 years.

- D. Heppner, Vancouver Forest Region, Nanaimo, and D. Miller, Miller Consulting, Surrey.

Spruce Beetle Emergence for Hibernation Research. As a continuation to research started in 1996, spruce beetle emergence for hibernation was examined again in 1997 at two subzones in the ESSF biogeoclimatic zone in Mackenzie District. By determining the relationship (if any) between the percent emergence and climate, we hope to develop a model to predict beetle emergence and a subsequent decision support system that will allow ranking of areas for more efficient sanitation logging in the second winter after attack.

This year's objectives were: 1) to see if emergence was greater at 2.0 - 2.5 m than at 1.0 - 1.5 m up the boles of infested standing spruce, and 2) to obtain a larger data set by reducing woodpecker feeding on phloem, and by reducing grizzly bear vandalism on emergence traps.

In the winter of 1996-97, 22 1996-attacked spruce were chosen at each of two locations. Nylon screening was stapled over tree sample locations to deter woodpeckers from further feeding on underlying larvae-infested phloem. These "woodpecker screens" were also camouflaged with spruce branches to reduce grizzly bear vandalism. In mid-August, the woodpecker screens were removed and replaced with screened emergence traps containing collection vials. These traps were also camouflaged with fresh spruce branches, and the use of flagging tape and tree marking spray paint was minimized. Emergence traps with vials were removed and all underlying phloem was collected from October 6-10, 1997.

Woodpecker screens deterred any further woodpecker feeding, and the branch camouflaging eliminated all but minor grizzly bear damage to emergence traps. However, our 3.5 m weather tower at Pete Toy Creek was knocked over by a grizzly bear between 5:00 a.m. and 6:00 a.m. on August 28th as evidenced by the "flat-lining" of our wind sensor data thereafter! Prior to the tower's toppling, one of the 3 mm gauge guy wires had been frayed from intense repetitive pressure. The grizzly then felt obligated to bite an apple-sized chunk from the centre of the styrofoam wind direction fin!

Samples are currently being examined at the University of Northern B.C. Subject to funding, plans for 1998 include the installation of up to 3 new replicates in the SBS biogeoclimatic zone in the Prince George District. For further details, contact one of the undersigned.

- R. Hodgkinson, Prince George Forest Region, Prince George, S. Lindgren, University of Northern B.C., Prince George, and A. Stock, Nelson Forest Region, Nelson.

Forest Health Content in Forest Development Plans. Forest Health specialists from the Prince George Region and Districts met in Prince George on October 30, 1997 to discuss the need for a "table of contents" for forest health issues/topics that Districts could use to request licensees to address in their Forest Development Plans (FDP's). Examples include plans for the transportation and milling of beetle-infested wood, pheromone baiting, and the deployment of conventional and lethal trap trees. It was agreed that this list should be contained in a Regional Standard Operating Procedure (SOP) so one is being drafted and circulated for comment. A copy of the finalized SOP will be available from the undersigned in January 1998.

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

Spruce Beetle Probing Accreditation Course. In three courses in the fall of 1997, approximately 110 personnel were trained in spruce beetle ground detection procedures in the Prince George Forest Region. Trainees included staff from consulting companies, major licensees, and Forest Service District offices.

Target attendees for the course are mainly those who conduct ground surveys and classify spruce beetle attacked trees during probes or walkthroughs, or who administer survey contracts and/or check the field work of others. The course includes a 3 ½ hour lecture, a half-day field trip, and a 1-hour written exam. The course outline appears annually in the B.C. Continuing Studies Network Natural Resource Management Spring Catalogue. The next series of course will start in September 1998. For more detailed information on course content or for a complete list of accredited probers, please contact the undersigned.

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

Poplar and willow borer (*Cryptorhynchus lapathi*) damage in the Kitimat Valley - Two regional forest health co-operative education students (with help from a co-op student from the Kalum District) have set up permanent sample plots in the vicinity of Humphrey's and Nalbeelah Creeks in the Kalum Forest District to track mortality of deciduous trees due to the poplar and willow borer.

Humphrey's Creek: This area was originally intended as a cottonwood spacing trial, but contractors spaced the control area, so the trial was abandoned. Three areas of black cottonwood (approx. 25-30 years old) were originally spaced to 800, 1000, and 1200 sph, and these areas had two 30 x 30 m plots placed in each spacing regime. There were also two plots placed in an adjacent unspaced stand of similar age. Five 10 x 10 m plots were located in a nearby juvenile stand. Plot sizes were chosen to try to capture 35-50 trees/plot. Trees in the plots were tagged, and diameters of the mature

trees were recorded. The level of attack was assessed, though this was difficult in some of the larger trees. It was impossible to find a control plot in the area, as almost all trees were attacked. The total number of trees assessed was 202 and 498, in the juvenile and mature stands, respectively. Of these trees, only 60 (8.6%) were **not** attacked by the poplar and willow borer.

Nalbeelah Creek: These plots are in an area which is being planted with cottonwood, willow, red alder and red-osier dogwood in an effort to stop soil erosion. Some of the whips planted have already been attacked by *C. lapathi*, and if attack levels reach those at Humphreys Ck., the soil stabilizing ability of these plants will be greatly compromised. This site is of particular interest, as rehabilitation of this kind of site using poplar and willow will likely become more common in B.C.

These plots will be reassessed yearly so that mortality from the poplar and willow borer can be recorded. It is especially important to record mortality in the young stands, as these small trees seem particularly susceptible to mortality from the borer. Mature trees seem to eventually succumb to the borer as well, but it is still not clear if poplar and willow borer are the agents of mortality in mature trees, or if their activities increase the introduction of rot fungi which then kill the tree. The primary question that needs to be answered is whether or not we can rely on cottonwood as a regeneration species in these areas. There may be a requirement for more research into whether or not hybrid plants are resistant to the borer, or if possible alternate species can be found.

- K. White, Prince Rupert Forest Region, Smithers

Increased defoliator activity in the Prince Rupert Forest Region - After an absence of approximately 10 years, many defoliators have shown up in damaging numbers in the Prince Rupert Forest Region this year. These included the following insects: 1) **green-striped forest looper** in the Kalum District. This is the continuation of the infestation which was first noted in 1996 in the Nass/Kwinageese area. The area of the infestation (~ 20 000 ha) has not increased, only the severity of attack within that area. From a preliminary examination of pupal counts, it looks like this infestation is starting to decline; 2) **two-year cycle budworm** in the Bulkley, Morice and Lakes Districts. These infestations are new this year, and cover approximately 7,000 ha for all three districts combined; 3) **blackheaded budworm** in the Kalum and North Coast Districts. These infestations are quite small, but of concern because they are in regenerating spruce and hemlock stands, and; 4) **hemlock sawfly** in the Kalum District. These are also small infestations, but they are in leave strips surrounded by logged areas which will take quite a few more years to meet green-up requirements. All of these defoliators will be closely monitored in the next few years.

- K. White, Prince Rupert Forest Region, Smithers

Remeasurement of Warren's root collar weevil plots - These plots were originally established in 1990 in the Kispiox District by G. Byford to track mortality and growth loss due to the activity of Warren's root collar weevil (*Hylobius warreni*). The plots were in the Mosquito Flats, Shandilla and Date Creek areas. These plots were relocated, and with the help of two co-op students, had many parameters remeasured. The new data will be compared with the original data to find the number of trees killed by this insect in the years between surveys, and to see if trees heavily attacked in the earlier study showed reduced radial growth in comparison to other trees in the plots. It was very interesting going back and trying to find plots which hadn't been examined for a number of years. It proved quite challenging, and reinforced the thought that long term studies need to have very accurate maps and access notes supplied if they are going to be of any use to future researchers.

- K. White, Prince Rupert Forest Region, Smithers

Northern pitch twig moth (*Petrova albicapitana*) damage standards plot establishment - The goal of these plots was to try and establish damage standards for northern pitch twig moth in young lodgepole pine plantations. Plantations in the Van Dyke area of the Kalum Forest District are known to incur high snow damage, as they receive large amounts of heavy, wet snow in the fall. It had been suggested that northern pitch twig moth was adding to the breakage. There are no current damage standards for this insect. It is unclear if trees which are damaged by this insect can be declared free-to-grow. These plots will hopefully outline what level of damage is acceptable.

The plots were set up by Cypress Consultants in three stands which have sustained minimal to heavy attack from *P. albicapitana*. In each of the three stands, five 5.64m radius plots were established. This plot size (100m²) ensured that approx. 16 trees would be in each plot. This supplied data for about 80 trees in each attack class. Within these plots all PI were tagged and had the following measurements taken: dbh, height, total number of *P. albicapitana* pitch nodules, age of nodules (either current or old), position of nodule (stem or branch), % of stem girdled by stem nodules, and any broken or flagged branches or leaders. As well, any other pests or pathogens (rusts, leader weevil, etc.) were noted.

This data is currently being analyzed to see if there is any correlation between the percent girdling and amount of leader breakage. If there is a correlation found, a damage standard can be established based on the percent girdling of the stem. These plots will be monitored over a 5 year period to track any changes in population and damage levels.

- K. White, Prince Rupert Forest Region, Smithers

Field trip to examine spruce bark beetle damage in Alaska, Yukon Territory and Northern B.C. - On the invitation of the Forest Health and Watershed Forester for the

Yukon Territories, Ed van Randen, I took part in a field trip to observe the damage caused by spruce bark beetle in Alaska and the Yukon Territory. This trip consisted of 5 days of nearly continuous travel (Oct. 14 to Oct. 18 inclusive). The first morning in Whitehorse (Oct. 14) was spent meeting with interested parties and discussing the spruce beetle problem in the Yukon Territory. Rod Garbutt (Canadian Forest Service, Victoria) and myself gave short presentations on the history of spruce beetle outbreaks in the area and spruce beetle management in B.C., respectively. There was an opportunity for those at the meeting to ask questions, and then the meeting was adjourned.

That afternoon, myself and five other people (representing C.F.S., Dept. of Indian Affairs and Northern Development, Haines Junction Renewable Resources Council and the Champagne-Aishihik Nation) caught a charter aircraft to Juneau. Our connecting flight to Anchorage was cancelled due to weather, so we had to catch a 6:00 am flight to Anchorage on the 15th. Once in Anchorage, we were met by two entomologists, Roger Burnside (Dept. of Natural Resources, State of Alaska) and Dr. Ed Holsten (USDA Forest Service).

We were in a meeting all morning, and were given a history of the spruce beetle outbreak on the Kenai Peninsula in Alaska, which has been ongoing for 18 years. There were many interesting discussions on ways of dealing with a huge outbreak with limited resources, and problems encountered in dealing with the public on these issues. After lunch, all of the visitors were flown over the Kenai Peninsula to assess the damage caused by the spruce beetle. This flight lasted over 4 hours, with a stop in Homer to discuss fire readiness planning with the fire chief of Homer. Then it was on to our overnight stop in Kenai, where we met up with R. Burnside and E. Holsten.

The next morning, we were joined by two local forest service employees, and proceeded to five field sites. These showed various areas of attack, and some silvicultural methods being employed to try to reduce the impact of the bark beetle killed trees. Many areas of the Kenai Peninsula are now becoming grasslands of *Calamagrostis canadensis*, as this species is taking over once the spruce canopy is removed by the beetle. It is a very hardy rhizomatous grass, and spruce seeds are not able to penetrate this rhizome layer to germinate. Attempts to burn the grass have been unsuccessful, primarily because the rhizome layer insulates the soil and keeps it cold. This prevents the fire from reaching a temperature necessary to completely burn the grass. There has been some success with preharvest site preparation which gives the spruce seedlings a head start on the grass. Another field stop showed the success in spacing and pruning in reducing beetle attack. Some areas had attack rates 45% lower than surrounding unspaced stands. There are some sites where the birch component is coming back heavily, and this is being encouraged as browse for moose. There was also another stand which had been selectively logged, and the few remaining trees were being attacked and killed by *Ips tridens*. After these stops, we returned to Anchorage, and flew back to Whitehorse that evening.

The main points of interest from my perspective were the massive changes occurring in the ecosystem due to the bark beetle infestation. Large areas of the Kenai Peninsula will no longer be spruce forests, with many areas becoming grassland or deciduous forests. The major concern with the bark beetle was not its affect on forestry, but the increased fire hazard created by the large number of standing dead trees, and the impact on tourism. It was also made clear that public involvement in any decision making process is essential, as several plans failed due to the lack of public input.

Very little forestry occurs on the Kenai Peninsula, and almost all of it is for export through the port at Homer. This is the origin of the logs which arrived in Port Edward earlier this year. These were likely logged on Native Corporation land, as these are the areas where most of the logging is taking place. In general, Alaska has decided that they will lose a large proportion of the spruce component of their forest, and they will live with whatever ecosystem replaces it.

The morning of Oct. 17, Ed van Randen, Rod Garbutt and I drove to Haines Junction to examine the spruce beetle outbreak there. The situation is quite different from Alaska in many respects, but similar in others. There is no problem with grass encroachment, and there is a lot of spruce regeneration on most of the sites. There have been some areas where another bark beetle (*Dendroctonus punctatus*) is attacking and killing trees stressed by spruce beetle attack. There will be a change in forest structure, but not as massive as in Alaska. The main concern for the citizens of Haines Junction is the fire hazard. There is some forestry in the area, but many of the residents do not want to see any more clearcuts. There is some concern that the beetle outbreak may continue to expand, even though it seems to be slowing down.

After a night spent in Haines Junction, a trip was made to Rainy Hollow in B.C. There had been a spruce beetle outbreak in this area 7 years ago, and grey trees were still in evidence. This infestation is a continuation of the huge outbreak in Tatshenshini - Alsek Wilderness Area. Unfortunately, we were not able to fly this area due to poor weather conditions. This area will have no logging, as it is a park, but there will likely be changes to the ecosystem due to the insect outbreak. After this trip, it was back to Whitehorse for the trip home.

This was a very informative trip, and this note just gives a small idea of the amount of information I received. It was very helpful to be able to discuss forest health issues with my counterparts in Alaska and the Yukon Territories. Although the infestation in the Tatshenshini-Alsek will never be considered as a possible salvage operation, there are many other consequences to large insect infestations. This applies whether the insect is spruce bark beetle or mountain pine beetle. I received a large information package from the Alaskan entomologists, so if you have any questions, I will be glad to answer them.

- K. White, Prince Rupert Forest Region, Smithers

Tree mortality due to green-striped forest looper - A contractor (Anne-Marie Roberts) was hired to set up plots in the area of the Kwinageese River/Nass River confluence. These plots were established to track tree mortality due to defoliation by the green-striped forest looper. This is the second year of defoliation in this area, and salvage logging is scheduled to proceed this winter. Since serious defoliation by this insect is uncommon, it was important to try to obtain information on the impacts of this insect while this infestation was occurring.

The contractor established twelve 11.24 m radius (400 m²) plots in areas which had received light, moderate and severe defoliation. Within each plot, all trees were marked with numbered tags, and had the following measurements recorded: dbh, tree height, defoliation estimate, and whether the tree was dead or alive. The contractor also randomly chose 5 mature western hemlock trees in each plot and took pupal samples at dripline, and halfway between the dripline and the bole of the tree on both the North and South aspect. These samples consisted of removing a 30 X 30 cm (900 cm²) area of the moss layer and counting all the pupae within that area. Any pupal mortality or fungal infection was recorded. Increment core samples were taken from a random selection of 10 mature trees/plot in order to estimate tree age, and to look for signs of other defoliation events in the past.

The contractor is currently preparing a report which will be used as baseline information for re-measurements of the plots in future years.

- K. White, Prince Rupert Forest Region, Smithers

Swakum Mountain Underburn Project. The western spruce budworm (*Choristoneura occidentalis*) is a major defoliator of Douglas-fir in south-central British Columbia. Fire suppression has severely affected species composition and structure in stands of Douglas-fir and ponderosa pine, favouring defoliation and impacts by the western spruce budworm. The goal of the underburn project was to remove dense thickets of Douglas-fir with light, ground fires and create canopy gaps in order to promote establishment of ponderosa pine.

An area of approximately 100 ha near Merritt was lightly burned in the springs of 1994 and 1995 in a joint project between the Merritt Forest District and Kamloops Regional Office. Stand composition was predominantly Douglas-fir with a small component (7%) of ponderosa pine. Over 57% of all stems had diameters less than 10 cm (dbh). Forty-seven percent of all stems were initially scorched with a mortality of 22% of original stems. Mortality was highest for small-diameter (< 10 cm dbh) trees than for larger ones (> 25 cm dbh): 28% and 12% respectively.

Impacts of bark and wood boring beetles as well as defoliation by western spruce budworm were monitored over a 3-year period. Trapping surveys were conducted in 1996 to determine impacts upon both arboreal and ground beetles. Bark and wood boring beetles were strongly associated with fire scorched trees with populations of

most bark beetles higher in burnt areas than in the control areas. There was no evidence of any significant infestations of Douglas-fir beetle (*Dendroctonus pseudotsugae*). Currently there are approximately 6 ponderosa pines in one area infested with a combination of mountain pine beetle (*D. ponderosae*), western pine beetle (*D. brevicornis*), turpentine beetle (*D. valens*) and the emergent ips (*Ips emarginatus*). These are expected to diminish in 1998. Monitoring of the impacts by the western spruce budworm will continue.

A German television film crew visited the underburn site this summer and filmed a "mock fire" started by the Merritt Initial Attack crew as well as other aspects of the project and forest health concerns. The western spruce budworm is once again building in the area of the underburn so the film crew got some good footage of recent defoliation and tree impacts.

- L. MacLachlan, Kamloops Forest Region, Kamloops, D. Miller, Miller Consulting Services, Surrey, and P. Byrne, Merritt Forest District, Merritt.

Forest Health at Opax Mountain Silviculture Trial. For the past 100 years, various forms of partial cutting have been the harvesting method-of-choice in the southern interior Douglas-fir (IDF) ecosystems. In conjunction with a highly-effective fire suppression program and minimal stand-tending practices, partial cutting practices have created a broad array of stand structures, ranging from low-density stands of uniform height to variable-density multi-layered stands with patchy distributions of trees and canopy gaps.

These practices have also created concerns about forest health in the IDF. Tree mortality from attacks by the Douglas-fir beetle is influenced by such attributes as age, species composition, size, growth rate and residual slash material. The duration, intensity and frequency of outbreaks of the western spruce budworm (*Choristoneura occidentalis*) have increased due to the abundance of high-quality host material in the form of multi-layered canopies and dense understorey and intermediate canopies of Douglas fir. Past practices of selective logging have increased the incidence and prevalence of various root diseases such as *Armillaria ostoyae*, *Phellinus weirii* and *Phaeolus schweinitzii*.

Forest health was one of the factors assessed in a silviculture trial established at Opax Mountain near Kamloops, in the IDF zone (xh2/dk1). This research trial was established by the collaborative efforts of the Regional Research team and the Kamloops District staff and is a multi-disciplinary research project. Six treatments were allocated to each of two areas: (1) no treatment unit; (2) low-density patch cuts; (3) high-density patch cuts; (4) 80% uniform retention; (5) 50% uniform retention; and (6) 35% island retention. The overall goal of this study is the development of integrated forest management tactics and strategies for IDF forests that use silviculture in the creation and maintenance of stable, productive forested ecosystems.

Blowdown events in 1995 and 1996 were significant and led to concerns about bark and wood boring beetles. Densities of downed trees ranged from 10-40 trees/ha at the IDFdk1 site with Douglas-fir accounting for 57% of downed trees. The IDFxh2 site sustained lower damage with densities ranging from 0-10 trees/ha. Douglas-fir accounted for 87% of the downed trees. A broad array of bark and wood boring beetles utilized downed material. However, subsequent tree mortality was low. In 1996, a total of 16 mature Douglas-firs were attacked by the Douglas-fir beetle. These spot infestations collapsed in 1997.

Funnel trapping trials were conducted in 1996 and 1997 to develop an effective and simple semiochemical-based trapping protocol for the assessment of arboreal beetle diversity. Almost 200 species in 45 families of beetles have been collected in baited Lindgren traps, some unique to the upper canopy. The results provide support for the use of host compounds, pheromones and trap position in an optimal scheme.

Evidence of past epidemics of western spruce budworm and Douglas-fir tussock moth was prominent at the xh2 site. Forty-eight percent of all Douglas-firs were top-killed at this site, with a mean live height of 12.5 m. The mean height of undamaged Douglas-firs was 20.2 m. The mean diameters at breast height of topkilled and undamaged trees were 22.8 cm and 30.5 cm, respectively. There is no current evidence of defoliation by either western spruce budworm or Douglas-fir tussock moth in 1996 or 1997. However, western spruce budworm was detected at Opax Mountain from damage caused to Douglas-fir cones. Assessments of cones in 1997 revealed significant damage by *Dioryctria pseudotsugella* group, *Choristoneura occidentalis*, *Barbara colfaxiana* and *Contarinia oregonensis*.

- L. Maclauchlan, Kamloops Forest Region, Kamloops, D. Miller, Miller Consulting Services, Surrey, and Robb Bennett, Seed Pest Management, Saanichton.

Western spruce budworm control efforts. It was an interesting year for aerial spraying. The Kamloops Region joined forces with the Cariboo Region to spray some areas of concern that were being defoliated by the western spruce budworm. I would like to mention that the cooperation among 100 Mile District (Don Wright), Cariboo Region (Leo Rankin), a consultant (Joan Holt) and the Kamloops Region was a most enjoyable and efficient endeavor.

The 1997 program, however, was not without its "hitches". First, our extended winter made everything much later than normal and when the insects and trees finally responded to the warming weather, everything tried to play "catch-up". Plus, we encountered some challenges in the applicator side of things. Initially, a fixed-wing contractor, using a bull-thrush, won the bid to conduct the aerial application of *B.t.k.* (Foray 48B) and Mimic® 240 LV. There were a series of problems with this contractor leading up to his termination after an equipment failure over my research block. At

this point, Western Aerial Applications, with 2 Hiller 12E's took over the project, and completed it in their usual efficient and professional manner.

The final incident leading to the termination of our first spray contractor occurred on the morning of June 15, 1997. The contractor had just commenced spraying the Mimic block (approximately 3 swaths) when the pump came loose from the hopper and began spilling out the product. The contents of the hopper were deposited both inside and outside of the spray block. Fortunately, the area on which the Mimic was deposited is a forest type similar to the spray block. No adverse affects were noted.

The following table lists dates, and areas treated, in the 1997 western spruce budworm program:

Date	Location & pesticide	Area treated (ha)
1st contractor:		
June 11	Darke Creek (<i>B.t.k.</i>)	400 ha
June 13	Barnhartvale (<i>B.t.k.</i>)	165 ha
June 15	Lower Nicola (Mimic [®] 240 LV)	approx. <20 ha
	subtotal:	585 ha
Western Aerial Application Ltd.:		
June 18, 19, 20	Clinton area, Cariboo Region Program (under separate permit)	±6,200 ha
June 21	Hat/Medicine Creek (<i>B.t.k.</i>)	825 ha
	Ambusten Creek (<i>B.t.k.</i>)	345 ha
June 22	<i>No spray due to rain</i>	
June 23	Lower Nicola (Mimic [®] 240 LV)	70 ha
June 24	Jesse Creek (<i>B.t.k.</i>)	365 ha
	Kirby Creek (<i>B.t.k.</i>)	330 ha
	Mill Creek (<i>B.t.k.</i>)	1,230 ha
	Total:	9,950 ha

Pre- and post-spray larval sampling indicate very good results for both the *B.t.k.* and Mimic[®] 240 LV.

Plans for 1998

Both the Cariboo and Kamloops Regions are again planning to conduct an aerial spray program for budworm. We will continue our joint planning and operational arrangement similar to 1997 since we found that to be the most efficient and economical route to follow. Combined, we are again planning to treat approximately 10,000 ha (5,000 ha in each region).

Results of the 1997 Kamloops Region fall egg mass sampling and defoliation predictions are listed in the table below:

1998 defoliation prediction	No. of sites per predicted defoliation category				
	Kamloops	Vernon	Penticton	Merritt	Lillooet
No rating	0	0	0	2	7
Nil-light	107	18	15	0	20
Light	25	11	11	26	0
Moderate	8	8	16	23	2
Severe	0	0	14	27	0
Total sites:	140	37	56	78	29

- L. Maclauchlan, Kamloops Forest Region, Kamloops

Balsam bark beetle inventory. The aerial survey portion of the balsam bark beetle inventory is now completed with a total of 65,767 ha surveyed by air, or 805 polygons. The percent attack by *Dryocoetes confusus*, as determined by aerial observations, ranged from 0% to about 30% attack rates. In addition to the aerial surveys, Tables 1-3, ground surveys (Survey of Pest Incidence - SPI - format) were conducted and paired plots were installed. The paired plots are intended to gather attacked tree data in each of the BEC's and age classes surveyed. The ground surveys covered a total area of 15,361 ha and 53 paired plots were installed.

Table 1. Total area surveyed by air (ha), grouped by biogeoclimatic subzone and age class.

BEC	Age class			
	6	7	8	9
ATEdcp			37	
ATEdvp	47.8		337.2	18.2
ATEmwp	21.6		63.2	
ATEvcp			142.8	
ATEwcp			754.3	62.2
ATEwmp				52.4
ESSFdc1			2,234.7	
ESSFdc2	349.4	255.3	1,939.8	77.2
ESSFdv	90	192.4	646.6	137.2
ESSFmw	403.7	185.2	3,143.2	2,007.8
ESSFvc	197.4	127.5	2,209.1	350.4
ESSFwc1			467.6	
ESSFwc2	1,038.1	2,024.6	27,363.9	5,042.5
ESSFwc4	149.5	65.6	2,258.6	517.5
ESSFxc	185	43.1	6,124.7	2,741.1
ICHmk1			27.5	38.3
ICHmw2			70.5	
ICHmw3		41.9	51.1	
ICHvk1			148.9	33
ICHwk1	117.1		13.6	
IDFww1				33.9
MSdc			60.2	
MSdm2	295.1	359.6	21.4	53.4
SBSmm	6		246.3	44
Total:	2,900.7	3,295.2	48,362.2	11,209.1

Table 2. Percent *Abies lasiocarpa*, determined healthy, red or grey, by age class (combined 1996 and 1997 aerial survey data), showing total number of polygons surveyed.

Age class	No. polygons surveyed	Percent trees by category		
		red	grey	healthy
6	65	1.85	11.06	86.32
7	58	2.36	14.66	82.97
8	563	1.75	15.38	82.87
9	119	1.50	14.92	83.58
Total:	805			

Table 3. Results from the 1997 balsam bark beetle aerial surveys, showing percent *Abies lasiocarpa* attacked (grey or red) and total number of polygons surveyed, by biogeoclimatic subzone.

BEC	# polygons surveyed	% grey	% red	% atk
ATEdcp	1	10.47	3.60	14.07
ATEdvp	8	7.14	0.41	7.55
ATEmwp	2	11.52	1.95	13.47
ATEwcp	10	11.35	0.82	12.17
ATEwmp	1	2.60	0.00	2.60
ESSFdc1	18	17.49	1.78	19.27
ESSFdc2	15	15.05	1.81	16.87
ESSFdv	30	12.87	2.88	15.75
ESSFmw	72	15.31	1.29	16.60
ESSFvc	4	23.24	1.95	25.19
ESSFwc1	6	11.74	0.07	11.81
ESSFwc2	112	14.42	1.47	15.89
ESSFwc4	3	15.33	1.57	16.90
ESSFxc	22	25.65	3.31	28.96
ICHvk1	2	7.21	0.00	7.21
IDFww1	1	19.98	0.00	19.98
MSdc	1	11.10	0.40	11.51
SBSmm	1	10.62	0.29	10.91
Total surveyed:	309			

- L. Maclauchlan, Kamloops Forest Region, Kamloops

Insect Displays and interpretive guide. The Kamloops Region Forest Health section hired a co-operative student, Holly Douglas, from the University of Victoria biology department for the summer. Holly assembled six large insect displays for distribution to the districts and also wrote an interpretive guide to accompany the displays. The guide includes color photographs of the insects included in the display, their life stages, damage and hosts, and has write-ups on their biology and recognition.

- L. Maclauchlan, Kamloops Forest Region, Kamloops

Pine, pine, pine! I am well into year 2 of my Science Council/FRBC funded project looking at various pests of young pine, and the impact and biology of *Pissodes terminalis*. This project has four major objectives that can be broken into sub-categories. Each objective will add to the development of an integrated management strategy for young lodgepole pine, with emphasis on the assessment and management of

the lodgepole terminal weevil, *Pissodes terminalis* Hopping, along with other damaging agents.

The major components of this project are:

- impact surveys,
- establishment of replicated treatment regimes,
- behavioral bioassays to determine the chemical ecology of *P. terminalis*,
- development of a degree day model for *P. terminalis*, and
- completion of a hazard rating system for the lodgepole terminal weevil.

The interaction and impact of other pests of young pine will be evaluated and factored into the management regimes developed.

I am continuing to collect a list of sites that have received various treatments and then since been affected by pests. Sites in the Merritt, Kamloops, Salmon Arm and Penticton Districts have been affected following spacing and pruning treatments. Examples of insects affecting these stands include: *Synanthedon sequoiae*, *Hylurgops rugipennis*, *Dendroctonus valens*, *Pityophthorus* spp., *Pissodes schwarzi* and others. Monitoring plots have been installed in most of the sites in question. An example of a site recently visited with a contractor (Janice Hodge, JCH Forest Pest Management) on behalf of Weyerhaeuser Co. Okanagan Falls, is located east of McCullough Lake in the MSdm1 biogeoclimatic zone. Thirty-six circular plots (3.99 m radius) were installed to determine pest incidence, impact and relationship to treatment regime. The number of dead and dying lodgepole pine is listed in Table 1, by pest. The incidence of pests on pruned and unpruned trees is listed in Table 2.

Table 1. The number of dead and dying lodgepole pine trees in the McCullough Lake opening, by causal agent, giving total percent trees affected.

Forest Health Agent	Number of trees		Total (%)
	Dead	Dying	
<i>Cronartium comandrae</i>	2		0.6
<i>Pityophthorus</i> spp.	2		0.6
<i>Pissodes schwarzi</i>	3		0.9
<i>P. schwarzi</i> / <i>Hylurgops</i> spp.		3	0.9
<i>Hylobius warreni</i>		1	0.3
<i>Dendroctonus valens</i>		10	3.1
<i>D. valens</i> / <i>P. schwarzi</i>		1	0.3
Total:	7	15	6.9

Table 2. The incidence of forest health agents on pruned and unpruned lodgepole pine trees in the McCullough Lake opening.

Forest health agent	Percent lodgepole pine affected		
	Pruned	Unpruned	Total
<i>Pissodes terminalis</i>	19.5	10.6	30.1
<i>Dendroctonus valens</i>	3.1	0	3.1
<i>Pissodes schwarzi</i>	2.1	0	2.1
<i>Pityophthorus</i> spp.	0.6	0	0.6
<i>Hylurgops</i> spp.	0.9	0	0.9
<i>Hylobius warreni</i>	0.3	0	0.3
Gouty pitch midge	0.6	0	0.6
Pitch twig moth	1.2	0.3	1.5
Commandra rust	0.3	0.3	0.6
Western gall rust	0.9	1.5	2.4
<i>Armillaria</i> root disease	0.9	0	0.9

- L. Maclauchlan, Kamloops Forest Region, Kamloops

Aerial Application of *B.t.* for Western Spruce Budworm. During June 1997, 5 400 ha of interior Douglas-fir forest in the 100 Mile House Forest District were treated with *B.t.* to prevent and reduce damage by western spruce budworm, *Choristoneura occidentalis*. The outbreak centred around the town of Clinton to the north and south of the town along the Highway 97 corridor and also north of Loon Lake. Pre-spray surveys were conducted to delineate the highest infested stands. The surveys were stratified so that the spray application was focused on stands with high risk of severe defoliation and protection of high values young stand and previous silviculture investments. The spray application was completed in co-operation with Kamloops Forest Region by Western Aerial Applicators. A spray is planned for this spring if budworm populations warrant control.

- L. Rankin, Cariboo Forest Region, Williams Lake

Defoliator Survey Summary for Permanent Sampling Stations in the Cariboo Forest Region. Population sampling for defoliators was continued in the Cariboo Forest region in 1997. Permanent Sapling Stations, previously monitored by Canadian Forest Service were surveyed throughout the Region. **Western spruce budworm**, *Choristoneura occidentalis*, had high populations in the 100 Mile house Forest District particularly in the Clinton and Loon Lake areas. The rest of the Cariboo remained at low levels to nil. **Douglas-fir tussock moth** continued low over most of 100 Mile House Forest District but trap counts were higher indicating a potential increase next year. **Two year cycle budworm**, *C. biennis*, was not detected in significant numbers this year in tree beatings even though evidence of current bud mining was discovered. Cooler than normal temperatures may have reduced the overall population survival.

This year is the off-year of the cycle and larvae are very small. During the overview aerial survey, some low level defoliation was mapped. **Western hemlock looper**, *Lambdina fiscellaria lugubrosa*, was not detected at any of its high risk sites in the ICH, indicating low populations.

Deciduous defoliators were at low levels throughout the Cariboo. **Forest tent caterpillar**, *Malacasoma disstria*, was present in minimal amounts in small patches. **Large aspen tortrix**, *C. conflictana*, was observed west of Alexis Creek in a 3 hectare patch. **Satin moth**, *Leucoma salicis*, was recorded defoliating 40 hectares near Bluff Lake. The final report on defoliators in the Cariboo Forest Region will be completed in January.

- L. Rankin, Cariboo Forest Region, Williams Lake

Gypsy moth status. Gypsy moth is not native to British Columbia. However, if introduced and established, this insect has the potential of causing damage to a variety of native tree species. The presence of an established population in the province would also likely affect trade and quarantine of British Columbia goods, increasing the need for inspections to guarantee phytosanitation of trade goods destined for markets such as the western United States, New Zealand and others that maintain a gypsy moth free status.

Annual surveys using pheromone traps are carried out by the Canadian Food Inspection Agency (CFIA) with assistance by the B. C. Ministry of Forests and the Canadian Forestry Service. To date, introductions to the province have been detected and successfully eradicated by CFIA with support and assistance by the B. C. Ministry of Forests, and the Ministry of Agriculture, Fisheries, and Food.

Trapping results for gypsy moth in 1997 indicate that there are significant numbers of this insect present in the Langford and Esquimalt areas of southern Vancouver Island. These are the major sites of interest for 1997 and aerial treatment with *Btk* will likely be recommended for the spring of 1998.

A total of 238 male moths have been caught in traps in Langford and Esquimalt: 172 in Langford, and 66 in Esquimalt. Further, at least 20 egg masses have been found in one location in Langford; additional egg masses have been found in Esquimalt. These finds are the most significant in the province; single moths were caught in several traps in other locations, including 6 moths recently found in Duncan; egg mass surveys will be carried out in Duncan, but there were no other indications that new populations have been introduced or established in areas except for the two noted above. All moths found have been identified as North American strain of gypsy moth, no Asian gypsy moths have been trapped in British Columbia in 1998. Some Asian gypsy moth were caught in Washington State.

To date, the Ministry of Forests has taken the following actions this year:

- co-chaired and participated in gypsy moth committee meetings (P. Hall is co-chair of the committee);
- participated in the pheromone-based detection trapping program by placing about 2,000 traps in forested areas around the province, primarily in recreation sites;
- issued a contract to Phero Tech Inc, of Delta, to compile a digital data base of annual detection and treatment data for Vancouver Island for the years 1985 to present (this follows on with a previous project to digitally map historic trapping results for the lower mainland); and,
- issued a contract to Hortcare Services, Abbotsford, to conduct egg mass surveys in critical areas in and around Esquimalt (contract to be completed by Oct. 31, 1997).

The gypsy moth committee of the British Columbia Plant Protection Advisory Council met on Oct. 30 to discuss the trapping results, review the available options, and make preliminary recommendations to the Plant Protection Advisory Council regarding actions to be taken for the remainder of the current fiscal year and for possible treatments in the spring of 1998. Those recommendation will be forwarded to the Canadian Food Inspection Agency for their review and action.

The recommendations include a proposal to the Canadian Food Inspection Agency (CFIA) for eradication programs in both Langford and Esquimalt. This proposal is for multiple aerial applications of the biological insecticide, *Bacillus thuringiensis kurstaki* (*Btk*). Failure to eradicate these new introductions in the early stages could lead to either much larger and even more controversial programs, or, ultimately, to the establishment of gypsy moth in British Columbia.

In past eradication projects, the Ministry of Forests has provide support to CFIA by lending equipment and purchase of materials, particularly *Btk*. Such support will likely be requested again for any treatment operation planned for 1998.

CFIA has instituted a policy of cost sharing of expenses for eradication projects directed against the North American strain of gypsy moth. CFIA intends to pay no more than one third of costs associated with the program, with the balance coming from stakeholders in the province, such as the Ministry of Forests, Ministry of Agriculture, Fisheries, and Food, the forest industry, and affected municipalities. This will be the topic of ongoing discussions as project details are developed.

- P. M. Hall, Forest Practices Branch, Victoria

Gypsy Moth - Mapping of Historical Annual Trapping Densities and Catches. The Ministry of Forests is funding the development of a database which will consolidate annual trapping information. Information that will be incorporated into the geographic

information database includes the following items for each year from 1985 to the present: trap densities; catches in each year with specific location, if known; and, delineation of historic eradication treatments by treatment type for each year. The system incorporates detailed information on street locations and other geographic features. General trapping grid densities are used rather than mapping specific trap locations due to uncertainty of the locations in the early years of the program and because of the size and complexity of the resultant files if all individual traps were mapped.

A contract was given to Phero Tech Inc., Delta, B. C., in 1996 to design and complete the data base for the lower mainland area, including all of Greater Vancouver and as far east as Hope. Another contract was given to Phero Tech in 1997 to compile a similar database for Vancouver Island and the Gulf Islands. Plans include compiling the data for the Okanagan area as well.

This database will be useful in developing plans to deal with gypsy moth and to evaluate eradication successes and failures, and will allow evaluation of introduced populations to determine if they do become established over time. The database allows for visual overlays of successive years, providing key spatial information.

- P. M. Hall, Forest Practices Branch, Victoria

Prognosis/Budworm. Forest management increasingly requires tools to project the future state of forest ecosystems. Forest stand dynamics are affected by the growth and death of individual trees, by management actions, and by the impacts of disturbance agents such as insects, pathogens, and fire. Traditional growth and yield models have typically ignored the impacts of disturbance agents. Their projections of future stand conditions are therefore often unrealistic.

The B.C. Ministry of Forests has been working for several years on calibrating and adapting the Prognosis (Forest Vegetation Simulator) model for use with interior Douglas-fir. Prognosis is a distance-independent individual tree growth model developed by USFS researchers over the last 25 years. Several insect and pathogen extensions to Prognosis have been developed to account for the impacts caused by these damaging agents.

The Ministry is supporting a variant of Prognosis for use in Southeastern British Columbia, called the SEI-variant. The first insect and pathogen extension for the SEI variant is version 3.0 of the Western Root Disease Model. The Ministry is now exploring the suitability and data requirements of a second extension, the Western Spruce Budworm model.

A study was initiated in 1997 to review in detail the foliage biomass components for the WSB-Prognosis model. The specific objectives were:

1. assess the available data and model equations for predicting foliage biomass in eleven host and non-host tree species simulated in the SI variant of Prognosis;
2. compare the model predictions (using current model parameters) to data and/or equations obtained for British Columbia;
3. conduct a simple sensitivity analysis of the model to determine which foliage equations require particular attention; and,
4. summarize the available data and equations into a report which will include recommendations for British Columbia parameter sets and, if required, revisions to the model.

The work was carried out by ESSA Technologies Ltd., Vancouver, B.C.

- P. M. Hall, Forest Practices Branch, Victoria

Socio-economic Analysis of Mountain Pine Beetle Management in British Columbia. A brochure has recently been completed and published that summarizes the findings of a socio- economic analysis of mountain pine beetle management in British Columbia. The brochure is a 6 page, full colour production. Copies may be obtained by writing to the undersigned. Additionally, the brochure will be put on the Ministry of Forests web site at: <http://www.for.gov.bc.ca>.

- P. M. Hall, Forest Practices Branch, Victoria

Aerial Surveys Courses. Forest Practices Branch developed a course to give an introduction to annual aerial overview surveys. The objective of the course is to train aerial surveyors so that the Ministry can assume the functions that the federal Forest Insect and Disease Survey Unit performed prior to their reorganization. The course consisted of two day sessions, one day in the classroom reviewing examples of damage and mapping standards, and a second day in aircraft to do an aerial survey over limited terrain. The course is, at present, a prototype. Course materials include a video for the student, an interactive CD-ROM, and a student workbook; instructor materials include lesson plans, slides, and videos.

Six courses were put on in 1997 - one in each Forest Region. The courses were presented by experienced contractors and course evaluations were received from each participant. Overall comments were also submitted by the contractors presenting the course. A number of recommendations were made for modifications to improve the format and content, but, on the whole, participants thought the course to be worthwhile.

Further developments of the course will continue, but major revisions and delivery will be dependent upon a Ministry decision to proceed with annual overview surveys in an organized, coordinated manner.

- P. M. Hall, Forest Practices Branch, Victoria

FOREST DISEASES

Pinkutt Lake Rust Pruning Trial The first year results were analyzed using Microsoft Access® and written up as a co-op student report by Cory Williams. In one year the incidence of trees with stem infections increased from 12.5 to 21.4 % in control plots and from 13.0 to 19.8 % in pruned plots. In the pruned plots 23 of the branch cankers from the initial assessment had become stem cankers. The leading edge of these former branch cankers was as far as 2 cm from the stem in 1996. Analysis of data on canker movement within control plots showed that 36.6 % of branch cankers did not move at all, which caused a relatively low average rate of spread (2.0 cm/year) of branch cankers toward the stem. No significant difference was found between the distance moved by branch cankers to become new (1997) stem cankers in pruned plots versus control plots. On average live branch cankers were 22.4 cm from the stem while dead branch cankers were 11.8 cm from the stem. The difference in these distances is likely due to the fact that the majority of dead branch cankers are in the lowest whorls. Branches in the lowest whorls are both the shortest and the smallest in diameter. The small diameter branches are killed rapidly by the cankers. If the branch is killed quickly, while the infection is still far enough away from the stem, the disease can not be passed on to the stem. Further remeasurements will elucidate the distance at which branch cankers can be considered non-lethal due to this self pruning mechanism.

- A. Woods, Prince Rupert Forest Region, Smithers

Parrot Lake Rust Pruning Trial A replicate of the Pinkutt Lake rust pruning trial was established at Parrot Lakes in the Morice District. The background for the Pinkutt Lake trial was written up in the December 1995 edition of Forest Health Progress. The Parrot Lake site was originally slated to be spaced to approximately 800 sph and pruned. Fortunately the high rust incidence (> 40 %) was detected in time and plans for the block were adjusted. As in the Pinkutt Lake trial, twelve 25 m x 25 m plots were established on cardinal bearings. A total of 2,427 lodgepole pine trees were examined for rust cankers and identified with a numbered tag. We recorded the whorl on which the infection was found, the direction the branch pointed and the distance the infection was from the stem. Trees with stem infections were not examined for further branch infections. Six of the plots were randomly selected and pruned. Hamish Millar and Cory Williams, Simon Fraser University Science co-operative education

students, did an excellent job of establishing the plots and collecting the data. This trial will be remeasured each year for the next 10 years.

- A. Woods, Prince Rupert Forest Region, Smithers

Determination of an Operational Adjustment Factor (OAF) for Rusts in the Lakes TSA This was the largest forest pathology project undertaken in the Prince Rupert Region this season. The original planning and concept development for this project was done in conjunction with Albert Nussbaum of Research Branch. The overall objective of this project is to determine the impact of hard pine stem rusts (comandra blister rust, stalactiform blister rust and Western gall rust) on the timber supply in the Lakes TSA, Prince Rupert Forest Region. The rust impact will be modelled using TASS (Tree and Stand Simulator). Depending on the magnitude of the impact, the losses will be defined in terms of an Operational Adjustment Factor (OAF) for hard pine stem rusts. The methodology used in this study could form the ground work for the determination of OAFs for other forest pests throughout the Province.

The Old Growth Site Index Adjustment project has been completed for the Lakes TSA. Results of that project indicate that lodgepole pine stands in the Lakes TSA are more productive than previously believed. Any "increases" in stand productivity due to the Old Growth Site Index Adjustment project must be qualified in terms of losses in productivity due to forest health agents. This project will improve the estimates of the OAFs so that the Long Run Sustainable Yield (LRSY) projections for the Lakes TSA reflects the presence and the impacts of hard pine stem rusts. Information gained from this project will be of value to timber supply analysts and planners within the Ministry of Forests as well as forest managers throughout the industry in Northern B.C.

The first requirement of this project was an estimate of the incidence of rusts throughout the Lakes TSA. A sample of 100 stands were randomly selected from the population of juvenile lodgepole pine stands. The Integrated Silviculture Information System (ISIS) was used to determine the population given the parameters of species composition (>80% PI) stocking (<5,000 sph) and age (10-25 years). Due to limited budgets only 67 of these stands were surveyed. Cedrus Consulting of Smithers, B.C. was awarded the contract for the rust incidence determination. A low intensity survey of each of the selected blocks was used to determine the incidence of rust. This survey consisted of a series of 3 m wide, 100 m long transects up to a survey intensity of 0.4 % of the total block area. The stands were grouped into three rust incidence classes; Minimal 0-10%, Alternate 10-20%, and Intensive > 20%. These rust incidence classes correspond to the incidence classes outlined in the Forest Practices Code *Pine Stem Rust Management Guidebook*. The rust incidence estimates were based on those rust infections that will be lethal. This means that trees with comandra and stalactiform branch infections further than 60 cm from the stem were not tallied and neither were gall rust infections further than 10 cm from the stem. All stem infections of all three rusts were considered lethal.

Of the 67 stands surveyed, 31 (46.27 %) were in the low incidence class, 21 (31.34 %) were in the moderate and 15 (22.39 %) were in the high incidence class. On an area basis, a total of 3,322.2 ha were surveyed. Of this total, 45.75 % were in the low incidence class, 27.68 % were in the moderate and 26.57 % were in the high incidence class.

The landscape level rust incidence for the Lakes TSA is significantly higher than two of its neighboring TSAs. In 1996 a similar landscape level incidence survey was conducted in the Morice TSA. In this survey we found that only 6.06 % of the stands were in both the moderate and high incidence classes with the majority of stands, 87.87 %, in the low incidence class, based on a sample of 66 stands. In 1992/93 a total of 1,803 ha were surveyed in the Vanderhoof Forest District. Of this total only 10.04 % was in the high incidence class with 11.09 % in the moderate and 78.87 % in the low incidence class. Clearly, hard pine stem rusts could have a large influence in the Lakes TSA.

From the 67 stands that were surveyed for rust incidence, 10 sample stands from each of the incidence classes (i.e., minimal, alternate and intensive) were randomly selected. Silvicon Services Inc. of Smithers, B.C. was awarded the contract to stem map 10, one hectare plots in each of the three incidence classes. A 100 m X 100 m plot was located in each of these selected stands with effort to ensure the most homogeneous stand composition. The plots were laid out on cardinal bearings.

Each tree within the plot was stem mapped using GPS. The trees species and disease status was recorded along with the x and y coordinates. Trees of all species were mapped to account for inter-tree competition. Tree damage due to other causes, such as root collar weevil, were also recorded. The accuracy of the stem mapped tree locations was ± 2 m. The final product from this contract was a digitized, 1:200 scale stem map of 30, one hectare square plots including the x y co-ordinates of each tree.

The stem maps for the alternate and intensive incidence classes will be compared to the stem map for the minimal incidence on the basis of stand occupancy. The distribution of rusts is typically clumped resulting in some areas of stands becoming voids while other areas remain overstocked. The lower levels of stand occupancy in the more heavily rust infected stands will represent a lower level of stand productivity. Comparisons will be made using the TASS model among the stands with minimal, alternate and intensive rust incidence. The impact of rust on stand productivity for stands in the minimal rust incidence class will be assumed to be zero. Voids caused by rusts in the minimal class will not be of a size large enough to result in a loss of occupancy for the stand. Voids created by rusts in the alternate and intensive rust incidence classes will presumably be more significant. It will be assumed that voids created by rust at age 20 will not be filled with a merchantable size tree by the end of rotation. This assumption is based on the fact that the void areas will be too shaded for infill of lodgepole pine. In order for there to be a merchantable size tree by rotation, these voids would then have to be filled by interior spruce or subalpine fir. Both of

these species are slower growing than lodgepole pine so it is very unlikely that they will reach a merchantable size by rotation of 80 years. The impact of rust in stands in the alternate and intensive rust incidence classes will be determined by comparing the productivity of these classes to the productivity of the minimal rust incidence class. The differences in the projected volume over the rotation among stands in the three rust incidence classes will then represent the impact from the rusts.

The results from this study will be used by Research Branch of the Ministry of Forests to derive an Operational Adjustment Factor (OAF) for rust impacts on timber supply in the Lakes TSA. The OAF determination will be based on modeling the voids (hence will likely be classified as an OAF I) created by rusts at the three levels of incidence. The methods used in this project will also be applicable to other TSAs where hard pine stem rusts are found.

- A. Woods, Prince Rupert Forest Region, Smithers

Determination of the Impact of Tomentosus Root Disease in the Bulkley TSA. We randomly selected 50 spruce leading polygons of all age classes from the data base for the Bulkley TSA. The sample was drawn from the operable land base outside of CORE ecosystems. The contract for the field work and report was awarded to David Rusch of Rot Rooters. He established a 11.28 m radius plot in each of the 50 polygons. The location of the plots was determined on a 1:20,000 scale map prior to visiting the site. Within each plot every spruce and lodgepole pine tree was measured for height and diameter. All live spruce and lodgepole pine within the plots were also examined at the root collar and on 3 main roots within 1 m of the root collar, using a gas powered drill and a ship auger to determine if they were infected with Tomentosus. Confirmation of infection was based on the presence of redbrown stain and pitted decay on the increment core sample. A root collar increment core sample was used to determine the average radial increment over the past 10 and 20 year periods. The volume of live infected trees was determined using height and diameter measurements and the Schumacher volume equations for each species.

For the immature stand plots, rather than determining volume lost, a tree count including the proportion of trees infected was made. In addition, an estimate of the proportion of the plot area within a 3 m radius of any sign of infection (infected trees or stumps) was made.

All standing dead spruce and lodgepole pine trees were closely examined to determine that Tomentosus was the cause of mortality. Positive identification of Tomentosus caused mortality was based on the presence of characteristic pitted decay in the roots or at the root collar. This pitted decay pattern is often visible for over 30 years following the death of trees. If pitted decay was present it was assumed that Tomentosus root disease was responsible for the death of the tree. Pitted decay found more than one meter from the root collar up the bole of the tree may be due to *Phellinus pini*. Any

uncertain designations were noted. The time of tree death was estimated based on the amount of bark and branches that were still on the tree.

For those dead trees that had fallen, the species, cause of mortality, height (length of the bole) to the nearest meter and the diameter to the nearest centimetre were recorded. The length of time that the tree has been on the ground was also estimated. This estimation, where possible, was based on the age of scars that were created on nearby trees as the dead tree fell. The age of the scars were determined by taking an increment core from the scarred portion of the tree and subtracting the age of that core from a core sample taken outside of the scarred area. In cases where these methods were not feasible due to lack of scars, an estimate of the age of the blowdown was made based on the state of decomposition that the tree was in. These estimates were made using the experience gained from the fallen trees that did leave suitable scars. It is accepted that these estimates are rough, thus, age estimates were made to the nearest 10 years.

The volume lost due to the death of infected trees consists of two components. The first is simply the volume of dead wood that is no longer harvestable. The second loss component is the increment growth that the infected tree would have put on had the tree continued to live. In order to determine this estimate, first, the approximate time of death must be established. Then, the average radial increment of the healthy trees in the plot over the period of time since the time of tree death must be added to the dead trees diameter. The projected height of the dead trees were obtained by entering the height and diameter of all live trees into a cruise compilation program. The sum of the growth loss and the current dead tree volume is the total volume loss. This volume loss was reported as being over the past 10 or 20 year period.

The projected impact for the next 20 years were made using the volume estimates of the infected live trees. It was assumed that these infected trees will die within the next 20 year period.

The final report will consist of an estimate of the incidence (in percent) of *Tomentosus* root disease for both lodgepole pine and interior spruce. The report will include a *Tomentosus* volume loss estimate for the past 20 years for spruce leading polygons in the Bulkley TSA. This estimate will be divided into two, ten year intervals and will include the losses for both lodgepole pine and interior spruce. The report will include a projected impact due to *Tomentosus* in spruce leading polygons over the next 20 years based on the presence of live infected trees in the mature stands (> 30 years old). The report will also include an estimate of the proportion of plot area included within a 3 m radius of any signs of infection in the immature stands (< 30 years old). Unfortunately, this report was not completed in time to be included in this issue of Forest Health Progress.

- A. Woods, Prince Rupert Forest Region, Smithers

Installation of Stem and Stump Map for Tomentosus Root Disease

Tomentosus root disease is the one of the most damaging pathological agents affecting juvenile interior spruce stands in the Prince Rupert Forest Region. Mortality caused by this disease does not usually become apparent in young stands until they are 15 to 20 years old. The distribution of the mortality in young stands depends on the distribution of infected stumps from the previous stand. The rate at which these infection centres expands has been investigated in the Prince George Region but there is no equivalent project in the Prince Rupert Region. It is quite possible that the rate of spread of the disease in this region differs from that of the Prince George Region. The objective of this project is to track the development of Tomentosus root disease in a juvenile stand to demonstrate whether or not there is a difference in the rate of spread between this region and the Prince George Region. The results will also indicate the extent of losses that can be expected in spruce leading stands regenerated on Tomentosus infected sites in the Prince Rupert Region.

Laing and McCulloch Forest Management Services Ltd. was awarded a contract to stem map a one hectare plot in a 15 year old interior spruce plantation in the ICHmc2 biogeoclimatic subzone near Kispiox, B.C. The plot location was selected on the basis that the surrounding mature stands were heavily infested with Tomentosus root disease. The location of every tree and stump was recorded using GPS in a similar manner to that used for the Lakes TSA hard pine stem rust project described above. Each spruce tree in the one hectare plot was identified with a numbered tag and drilled at the root collar with an increment borer to determine if the tree was infected with Tomentosus. This attention to detail was seen as being somewhat excessive by the contractor but it did pay off. In many cases the juvenile trees showed no sign of crown symptoms yet were clearly infected based on the increment core. Efforts were made to determine the disease status of the stumps in the block based on the presence of pitted decay in the stump top. This was difficult due to the age of the stumps, however, it was thought that any information on the pre-harvest levels of infection was better than none. Only those stumps containing clear evidence of pitted decay were mapped. The final product will be a 1:200 scale map of the 1 ha plot showing the location of every tree and stump

and their disease status. The field work component of this project is complete but the report and maps was not completed in time for inclusion in this article.

- A. Woods, Prince Rupert Forest Region, Smithers

Decay in Advanced Subalpine Fir Regeneration in the Bulkley TSA Subalpine fir is a major component (40 %) of the timber supply in the Bulkley TSA. The acceptability of subalpine fir advanced regeneration has recently been examined. New criteria are being developed that will allow for greater use of advanced subalpine fir regeneration. One of the biggest concerns that critics have had over the changes to the acceptability criteria was in regards to the extent of decay in the advanced regeneration. Their argument was that much of the advanced subalpine fir regeneration has been suppressed

for long periods of time and so had a greater probability of being decayed. Proponents of the changes to the acceptability criteria argued that there was no concrete evidence that a tree of good form and vigour was necessarily decayed simply because it was old. Partial harvest silvicultural systems are being prescribed more frequently due to adjacency concerns and the realization that clear cutting is not always the most appropriate silvicultural system. The extent of decay in the advanced subalpine fir regeneration needs to be assessed on a landscape level. The relationship between tree age and incidence of decay also needs to be examined for subalpine fir advanced regeneration in the Bulkley TSA. A contract was awarded to Laing and McCulloch Forest Management Services Ltd. of Smithers, B.C. to try to answer some of the unknowns regarding decay in advanced subalpine fir regeneration. The specific objectives of this study were as follows:

- (1) To determine the incidence of decay in subalpine fir advanced regeneration within the ESSFmc, SBSmc2 and the ICHmc2 of the Bulkley TSA.
- (2) To determine which fungal species are primarily responsible for internal stem defect in advanced subalpine fir regeneration within the same biogeoclimatic variants.
- (3) To examine the relationship between decay incidence and tree age within subalpine fir advanced regeneration in these variants.

Initial stand selections were made by the contractor using 1:20,000 forest cover maps and regional biogeoclimatic maps. A minimum of five stands were sampled in each of the three biogeoclimatic variants. The selected stands contained subalpine fir as dominant forest cover species, were <500 m from an accessible road and contained a significant understory component of subalpine fir. The selected stands contained no evidence of past logging history. Meeting this final criteria proved to be more difficult than we thought it would be, particularly in the ICH.

Plots were located 100 m apart along strip lines. At each plot the nearest 3 trees in each regeneration layer (layer 2: >7.5 - 12.5 cm dbh, layer 3: >1.3 m height and up to 7.5 cm dbh, layer 4: < 1.3 m height) were sampled. The diameter at 0.3 m was measured to the nearest 0.1 cm. The trees were then cross sectioned at 0.3 m and 1.3 m and the percent of diameter of decay, if present, was estimated. Layer 4 trees were only sectioned at 0.3 m. Any scars or stem defects that could be possible infection courts were noted. The cross section of the stem at 0.3 m also served as a suitable point to determine tree age. An attempt was made by the surveyor, Monty Horton, to identify the decay causing fungi in the field. If he was unable to identify the decay pathogen in the field he brought in samples to me. I was able to identify some but the majority of the unknown samples were sent to Applied Forest Science Ltd. for a final attempt at identification.

The field work component of this project is complete but the report will be summarized in the next issue of Forest Health Progress.

- A. Woods, Prince Rupert Forest Region, Smithers

“Oogy Boogy” Wood The cause of burls on conifers is not well understood. We have examined six subalpine fir stands in the Prince Rupert Region that are particularly heavily burlled. The cause for this exceptionally high density of burls is unknown, and perhaps a bit eerie, hence the name “oogy boogy”. In these stands over 50 % of the trees are affected with some trees having hundreds of burls. In some cases there are burls on interior spruce and lodgepole pine as well, but by far the majority of the burls are found on the subalpine fir.

Hamish Millar, a co-operative education student from Simon Fraser University decided to do his term report on one of these stands. The study stand is located at Hunter’s Basin near Telkwa, B.C. The stand is in the SBS biogeoclimatic zone. All of the other known “oogy boogy” stands are also located within this zone. Hamish wrote up a very good review of the sparse literature on the topic of burls. He also helped in the establishment of a permanent sample plot in the Hunter’s Basin stand. In this plot we selected 40 understory subalpine fir trees. We grafted ten burl free crowns onto burlled stems and ten burlled crowns on to burl free stems. We also grafted ten burl free crowns on to burl free stems and ten burlled crowns on to burlled stems. From this simple study we will hopefully be able to determine if there is an infectious agent that can be passed from burlled portions of a tree into unburlled portions. It is possible that the burls all resulted from a single climatic event although this appears unlikely. We have not carefully aged the trees yet but it appears as though there are ‘young’ burls and much more developed ‘old’ burls. There seems to be more and more of these stands in the Region as I ask field people to look for them....Spooky!

- A. Woods, Prince Rupert Forest Region, Smithers

White Pine Pruning Trial Report on Pruning Wound Recovery. Pruning refers to the removal of branches from the stem of a tree. Benefits of pruning western white pine include: reduction of *Cronartium ribicola* (white pine blister rust) infections in the bole; increasing clear wood production by reducing knot formation; and increasing mature wood production (i.e., reduces the fibril angle in woody xylem tissue). Current pruning guidelines (*Pruning Guidebook* 1995, and USDA publication NA-FR-01-93) outline the importance of **not** cutting into the branch collar which can affect the natural healing tissues contained within the collar. The guidebook recommends pruning branches flush with the branch collar, leaving a stub of 5 mm or less (*Pruning Guidebook* 1995). The *Pruning Guidebook* links the healing rate of pruning wounds to the rate of diameter growth of the tree, branch diameter, and various other factors. However, the primary author has noted that pruning and leaving even a short stub takes about 8-12 years to fully occlude the western white pine pruning wounds be examined.

This study examined the influence of three factors on the healing rate of white pine pruning wounds:

- 1) pruning so as to cut into the branch collar (Flush) vs. pruning so as to avoid cutting or damaging the branch collar (Normal), i.e., leaving a short stub;
- 2) spray treatment of "dirty" water on to the pruning wounds vs. no spray treatment on pruning wounds; and,
- 3) aspect was recorded, in case aspect was a factor in wound healing.

The White Pine Pruning Wound Recovery Trial was located in a 0.5 ha site located west of Nakusp, across the lower Arrow Lake, near Mosquito Creek, and is a part of TFL 23. The site consisted of a stand of naturally regenerated 12 year old white pine with an average tree height of 5 m and stem diameters with a range between 5-15 cm. Within the plot 100 trees were randomly selected for treatment and numbered between 1 to 100.

Tree numbers falling between 1-25 fell into the category "Normal" pruning/north and "Flush" pruning/south. Three whorls were pruned "Normally" on the north part of the bole (leaving stubs of 3-7 mm or less, although some stubs 8-10 mm were recorded) and then the same whorls on the south side were pruned "Flush" (cutting into the first fold or two of the branch collar). Coloured plastic headed tacks were placed onto the borders between the two pruning types to facilitate later re-measurement. Tree numbers 26-50 fell into the category Normal/south, Flush/north; tree numbers 51-75 were Normal/east, Flush/west; and tree numbers 76-100 were Normal/west, Flush east.

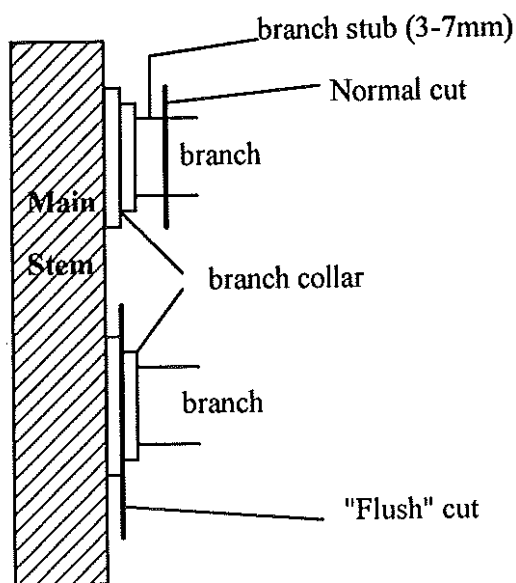


Figure 1 Schematic Diagram of the Two Pruning Treatments

Five trees in each category were randomly selected to be sprayed with a "dirty water" treatment. The "dirty water" consisted of stirring duff and upper mineral soil into clean water, allowing the debris and soil particles to settle prior to being discarded. The water remaining was then used to treat randomly selected pruning wounds. Tree numbers, whorl numbers, limb wound width, stub length, pruning type and treatment direction were then recorded on cards in March, prior to the start of the 1995 growing season. Wound widths and stub lengths were measured to the nearest millimeter. Stub lengths were measured from the last fold of the branch collar to the severed end. After the 1996 growing season, the same trees' pruning wounds were re-measured.

After organizing and reviewing the data (including over 1,800 pruned branches) some general trends were observed:

- 1) cardinal direction appeared **not** to have any noticeable effects on rate of healing and,
- 2) the dirty water treatment appeared **not** to have any noticeable effects on rate of healing.

However, there were obvious differences noted in the healing rate of those wounds pruned "Flush" and those pruned "Normal". On average the wound diameters for trees pruned Flush and Normal were 22 mm and 14 mm respectively. After two growing seasons the residual unhealed wounds were 10 mm (Flush) and 11 mm (Normal).

Pruning Type	Diameter of wound		Rate of Healing (radius in mm)
	1995	1996	
Flush	22	10	2.88
Normal	14	11	0.63

Thus, wounds that had been pruned flush healed more than 4 times faster than wounds that had been pruned.

At the end of the 1997 growing season, or prior to the 1998 growing season, the wounds will be re-measured to determine if healing rates remain constant and to see if wound occlusion has occurred in the flush pruned treatment. Very few, if any, pruning wounds with stubs are expected to occlude in 1997.

- D. Norris and C. Brownlie, Nelson Forest Region, Nelson

Stumping Accelerates Tree Growth. Would you be interested in a method to grow trees to meet free-growing standards in three years, and "green-up" requirements in

four? If so, Don Norris and district staff in the Nelson Forest Region can show several examples where young western larch planted on an Interior Cedar-Hemlock(ICH) site that was stumped for armillaria root disease have met these criteria. Preliminary results suggest that other tree species such as western white pine and ponderosa pine also might grow at similar accelerated rates on stumped sites.

Several ministry operations staff and researchers are beginning to suspect that productivity of many ICH sites - particularly those sites where trees have been selectively cut or even "high-graded" in past decades - can be chronically repressed by armillaria root disease. Stumping can substantially reduce the chances of young trees becoming infected, and prevent or delay growth repression caused by root infection.

Foresters should be very interested in hearing about techniques to enhance tree growth on certain sites, and such treatments might be attractive for support by Forest Renewal B.C. if they appear worthwhile on a forest-level basis. Nelson region staff are currently analyzing these possibilities.

Advocating potential benefits of disease management treatments is an exciting new aspect of forest disease management in British Columbia. Often, forest pathologists appear to be regarded as harbingers of doom and gloom resulting from certain management practices rather than promoters of new forest management opportunities.

- J. Muir, Forest Practices Branch, Victoria and D. Norris, Nelson Forest Region, Nelson.

"New" Pathologist's Tasks. As the "new" forest pathologist at Forest Practices Branch, I have several tasks from my predecessors (John McLaughlin and Jeff Beale) and from my previous position as forest health officer that are underway or planned or even completed. Because of the transition to being a forest pathologist again, some tasks will have to be postponed until time or knowledge permits!

Projects include:

- Damage agent and condition codes revision. We have circulated a list of proposed revisions and are probably going to recommend preserving most of the three-letter codes. The current ministry corporate set of codes is listed on the Integrated Silviculture Information System (ISIS).
- Free-growing damage criteria. A revised set of criteria to assess healthy trees is being developed under contract by Laing and McCulloch Forest Management Services Ltd., Smithers, B.C.
- Armillaria root disease risk assessment. A new risk assessment procedure developed by Don Norris and John McLaughlin is being reviewed by regional forest pathologists as a guidebook revision or supplement. A workshop was held at Kelowna to develop a framework for the procedure.

- Root disease effects in coastal spaced and/or fertilized stands. Dr. Ralph Nevill is preparing a report based on analyses of Jeff Beale and others for data from the research installation Experimental project (EP 703).
- Adjustment factors for analyzing effects of root disease in coastal Douglas-fir. Completion of the report based on analyses of permanent sample plot data by Jeff Beale and McMillan Bloedel Ltd is on hold until next year.
- Laminated root rot incidence diagrams for WINTIPSY v1.4a/ROTSIM. Tim Ebata is preparing a final project report to Science Council to account for Forest Renewal BC funding in 1996-97. Stefan Zeglen is coordinating reviews of the diagrams by district staff. The diagrams are intended for input of root disease survey results into the root disease module.
- Tree Doctor. Development of diagnostic software and illustrative photographs on a CD-ROM by Doug Corrin at Malaspina University College is continuing. The ministry and Malaspina are discussing an arrangement to facilitate development and marketing of the program.
- PROGNOSIS BC root disease model. Release of the model was postponed to allow further calibration of the base model. Hadrian Merler has agreed to lead the project to develop operational scenarios for reference by district staff and licensees.
- Root disease training course. The ministry code-guidebook training package was revised, based on comments by Stefan Zeglen.
- Hemlock dwarf mistletoe model. Some preliminary work is being done by RamSoft Systems Ltd., Victoria (Robert MacDonald) to determine if the Canadian Forest Service model developed by the late Dr. Bill Bloomberg can be adapted to run with the ministry TASS model for western hemlock in coastal sites. Further development is probably required because TASS deals with even-aged stands, whereas a model is needed to try to forecasts effects of mistletoe in uneven-aged or silviculture retention situations now being used or recommended for coastal forests.
- Effects of site preparation on stem rust of lodgepole pine. Lorne Bedford's data from large-scale operational site preparation trials near Prince George are being analyzed to determine possible effects on stem rust infection of lodgepole pine. Several differences are apparent, and appear related to effects of rapid stem growth in some treatments.
- Pop-up treatment for root disease. A Forest Renewal BC contract was arranged with Carl Larlee to develop a training course for the "pop-up" treatment for armillaria root disease being developed by Don Norris. This is a mechanical whole-tree extraction that is used for stands in the Interior-Cedar-Hemlock(ICH) zone as a substitute for conventional spacing treatments that could exacerbate disease damage.
- Lecturing in forest pathology. Dr Bart van der Kamp invited me to teach his 3rd-year forest pathology course at the University of British Columbia, January to April 1998. Approximately 120 students are expected, and I am looking forward to the experience.

If you have any suggestions or questions, please contact me at the usual telephone or facsimile number at our new office at 1450 Government Street.

- J. Muir, Forest Practices Branch, Victoria

White Pine Blister Rust 1997 Resistance Selection Activities. The following report by the Canadian Forest Service was submitted to the ministry for the interagency blister rust resistance program.

Clonal Propagation. Eighty coastal and 54 interior progeny showing slow-canker growth were cloned in 1997. Of the total 134 clones, two were from the 1990 inoculation; 30 from 1992; and 102 from 1993.

Stock Evaluation. Stock from the inoculation year 1995 showed low needle lesion frequency when spots were counted in 1996. In order to help ensure adequate levels of infection, it was decided to place the 1995 stock in the *Ribes* garden for additional infection in the fall of 1996. Only selected seedlings were re-assessed for spotting in the spring of 1997 owing to limited resources. All 1995 stock was examined for cankering in the summer of 1997 after which canker-free trees were potted for further examination and potential move to the *Ribes* garden. Cankered trees were set out in beds for continued observations through 1999.

Potted stock from the 1994 inoculation was assessed in the summer of 1997 and seedlings were assigned to one of three categories: normally cankered, canker-free, and slow-canker growth. The normally cankered seedlings were held for continued observation for possible slow-canker growth development. Canker-free seedlings were moved to the *Ribes* garden in August for re-inoculation and the slow-canker growth seedlings were retained for clonal propagation in early 1998. The out-planted 1994 stock (i.e., the stock that was cankered when observed in late spring of 1996) was assessed for evidence of slow-canker growth and selected trees were potted and retained for clonal propagation in 1998.

Potted stock from the 1991 through 1993 inoculation was assessed as described above for the 1994 stock. Cankered seedlings with well-established normal cankers were discarded while those judged borderline were retained for continued assessment. Any slow-canker-growth seedling and any seedlings that were canker-free or had less than two cankers from re-inoculation in the *Ribes* garden were retained for clonal propagation in 1998.

Testing of cloned material. In the initial cloning of material, categories of seedlings selected included spots-zero (SZ), spots-only (SO), needle-shed (NDLS), and fungicidal-short-shoot reaction (FSS). Inoculation of a selection of these seedlings showed the material to be susceptible, leading to a recommendation against using the material for seed orchards. A decision was made to subject all clones from these

categories to re-inoculation in the *Ribes* garden in case some proved to have worthwhile traits.

Accordingly, all clones in these categories were moved to the *Ribes* garden along with the 1994 inoculation year material. The clones will be assessed through 2001 for their performance. Any useful material will be included in those recommended for seed orchard deployment.

Excess stock plantations. From the inoculation year 1991 through 1995, the seedlings that were surplus to our needs for the controlled inoculation were distributed to collaborators on the coast and interior (as appropriate for the stock origin) for field planting to assess the stock's performance in the field versus the results from controlled inoculation. In 1997, one plantation on the coast and two plantations in the interior were assessed for disease occurrence to establish initial data points on disease progression curves. These will eventually permit projection of cumulative disease incidence in the stand to rotation. Four other plantations established on the coast which have contrasting families for needle lesion frequency and early cankering incidence were examined. It is too early to establish any trends with the disease incidence data.

Technology transfer. A summary of cloned material to-date was used as a basis to project the total output of the joint white pine selection program to its completion for both the coast and interior. Its purpose is to serve as a tool in seed orchard planning through the end of the selection program. The summary and projection were presented, distributed and discussed at a meeting with B.C. Ministry of Forests and industry personnel at a meeting at the Pacific Forestry Centre on October 28, 1997.

For further information, contact me at telephone (250) 363-0629, fax (250) 363-0775 or e-mail: gjensen@pfc.forestry.ca

- G. Jensen, Canadian Forest Service Pacific Forestry Centre, Victoria

PERSONNEL**FOREST PRACTICES BRANCH**

Russ Cozens	Forest Health Officer	Victoria	387-8737
Peter Hall	Forest Entomologist	Victoria	387-3842
Val Fletcher	Forest Health Sampling/Surveys Specialist	Victoria	356-8763
John Muir	Forest Pathologist	Victoria	387-8740
Tim Ebata	Forest Health Project Specialist	Victoria	387-8739
John Henigman	Forest Health Forester	Victoria	387-8738
Shirley Turcotte	Forest Renewal Secretary	Victoria	953-3582
Dwayne Brooke	Noxious Weed Control Officer	Kamloops	319-4074 (Cell Ph.)
Marsha De Wolf	Noxious Weed Control Technician	Kamloops	319-4074 (Cell Ph.)
Susan Turner	Noxious Weed Control Specialist	Kamloops	319-4074 (Cell Ph.)
	Noxious Weed Office phone	Kamloops	376-3973

TREE IMPROVEMENT PROGRAM

Robb Bennett	Seed Pest Management Officer	Victoria	652-6593
Michelle Hall	Seed Pest Management Biologist,	Victoria	652-7613
Ron Planden	Seed Planning Forester	Victoria	652-8303

NURSERY AND SEED OPERATIONS BRANCH

Don Summers	Manager, Nursery Extension Services	Surrey	930-3301
Dave Trotter	Nursery Pest Management Specialist	Surrey	930-3302
Diane Gertzen	Special Proj./Christmas Tree Specialist	Surrey	930-3309

CARIBOO FOREST REGION**Regional Staff**

Leo Rankin	Forest Entomologist	Williams Lk.	398-4439
------------	---------------------	--------------	----------

District Staff

Bob Mitchell	Forest Health Officer	Chilcotin	394-4700
Brad Powell	Forest Health Officer	Quesnel	992-4400
Von Vickers	Forest Health Officer	Williams Lake	398-4341
Don Wright	Forest Health Officer	100 Mile House	395-7873

KAMLOOPS FOREST REGION**Region Staff**

Lorraine Maclauchlan	Forest Health/Research	Kamloops	828-4177
Hadrian Merler	Research Associate	Kamloops	828-4176

District Staff

Rob Martin	Forest Health Specialist	Clearwater	587-6781
Dave Piggin	Forest Health Specialist	Kamloops	371-6518
Ed Senger	Forest Health Specialist	Lillooet	256-1277
Pat Byrne	Forest Health Specialist	Merritt	378-8449
Margot Hollinger	Forest Health Specialist	Penticton	490-2242
Savas Koutsantonis	Forest Health Technician	Penticton	490-2250
Jim Wright	Zone Forester, Silviculture	Salmon Arm	832-1424
Wayne Anshelm	Forest Health Specialist	Salmon Arm	832-1428
Kirk Hughes	Forest Health Specialist	Vernon	558-1784

NELSON FOREST REGION**Region Staff**

Art Stock	Forest Entomologist	Nelson	354-6633
Don Norris	Forest Pathologist	Nelson	354-6143

District Staff

Dan Reibin	Forest Health Officer	Arrow	
Ross Elliott	Forest Health Officer	Boundary	442-5411
Liz Goyette	Forest Health Officer	Cranbrook	426-3391
Emile Begin	Forest Health Officer	Invermere	342-4200
Julie Castonguay	Forest Health Officer	Kootenay Lk	825-1142
Norm Tennant	Silviculture Specialist	Revelstoke	837-7611

PRINCE GEORGE FOREST REGION**Region Staff**

Robert Hodgkinson	Forest Entomologist	Pr. George	565-6122
Richard Reich	Forest Pathologist	Pr. George	565-6143
Stuart Taylor	Forest Health Forester	Pr. George	565-6123

District Staff

Bruce Doerksen	Forest Health Technician	Pr. George	565-7100
Sharron Schiefelbein	Forest Health Technician	McBride	569-3748
Nathan Voth	Forest Health Technician	Vanderhoof	567-6363
Barb Harrison	Forest Health Technician	Ft. St. James	996-5276
Steve Bower	Assistant Forest Health Tech.	Mackenzie	997-2200
Sherilyn Smith	Resource Assistant - Silv.	Dawson Creek	784-2350
Brian Farwell	For. Res & Pract. - Silviculture	Ft. St. John	787-5600
Steve Lindsay	Resource Officer - Silviculture	Ft. Nelson	774-3936

PRINCE RUPERT FOREST REGION**Region Staff**

Neil Endacott	Silviculture Officer	Smithers	847-7513
Alex Woods	Forest Pathologist	Smithers	847-7478
Ken White	Forest Entomologist	Smithers	847-7479
Lou Tromp	Stand Tending Forester	Smithers	847-7514
Don Russell	Range Officer	Smithers	847-7443
Gerry Pinkerton	Reforestation Forester	Smithers	847-7512

District Staff

Bill Camenzind	Silviculture Officer	Bulkley	847-6310
Bob Wilson	Silviculture Officer	Kalum	638-5138
Doug Davies	Zone Forester	Kalum	638-3290
Bruce La Haie	Silviculture Officer	Kispiox	842-7600
Todd Bresser	Forest Health Technician	Morice	845-6224
Ted Traer	Silviculture Officer	Lakes	692-7515
Fiore Millinazo	Forest Health Technician	Lakes	692-7515
Mike Grainger	Silviculture Specialist	North Coast	624-7460

PRINCE RUPERT FOREST REGION**District Staff (Con't)**

Mike Grainger	Resource Officer-Silviculture	North Coast	627-0462
Mark Vieweg	Resource Officer-Silviculture	Lakes	692-7515
Fiore Millanazo	Forest Health Technician	Lakes	692-7515

VANCOUVER FOREST REGION**Region Staff**

Don Heppner	Forest Entomologist	Nanaimo	751-7107
Stefan Zeglen	Forest Pathologist	Nanaimo	751-7108

District Staff

John Ingram	Resource Officer - Silviculture	Campbell Rv.	286-9300
Buck Tanner	Timber Specialist	Campbell Rv.	286-9300
Kelly Schellenberg	Small Business Forester	Duncan	746-2768
Shawn Rice	District Silviculturalist	Mid Coast	982-2000
Mark Palmer	District Silviculturist	South Island	724-9205
Karl Branch	A/District Silviculturist	Pt. McNeill	956-5034
Ron Diprose	Forest Health Technician	Sunshine C.	485-0730
Allan Sugg	District Silviculturist	Qn. Char. Is.	559-8447
Jeff Fournier	Silviculture Officer	Chilliwack	794-2225
Doug Bacala	Basic Silviculture Officer	Squamish	898-2134

MEETINGS

Forest Health Provincial Specialists Meeting. The annual provincial meeting of Branch, Region and District Forest Health specialists is set for April 14-15, 1998 at a location to be announced (likely at the Richmond Inn). Please forward suggestions for agenda items to Dave Piggin, Russ Cozens and/or Robert Hodgkinson by January 16, 1998. Last year's meeting took the form of a half day of brief presentations followed by three workshops each focusing on specific issues for resolution. This format appeared to stimulate discussion and involvement from all participants and it may be used again this year although this will be the task of the agenda committee to resolve.

If you require the minutes from last year's meeting, please contact Shirley Turcotte.

- T. Ebata, Forest Practices Branch, Victoria

Western Forest Insect Work Conference: The 1997 Western Forest Insect Work Conference was held in Prince George, British Columbia, during the week of April 14. The conference was well attended with over 150 people registering. Proceedings of the conference have been completed in first draft form; it is expected that proceedings will be sent out by Christmas or soon after.

The 1998 Work Conference will be held in Jackson Hole, Wyoming. The first conference notice and preliminary program have already been sent out.

- P. M. Hall, Forest Practices Branch

1997 Western International Forest Disease Work Conference. The 45th annual meeting of western North American forest pathologists and associates was held at Prince George, B.C., Sept 15-19, 1997. Sixty-five attended the session organized by Richard Reich, Prince George Forest Region, and Kathy Lewis, University of Northern British Columbia. Field trips included spruce plantations with tomentosus root rot east and west of Prince George, and diseases of young lodgepole pine stands. An enjoyable banquet was arranged at the university.

Many of the attendees were impressed with the amount of detailed forest health research that is underway or was completed in the region.

- J. Muir, Forest Practices Branch, Victoria

1998 Western Forest Disease Work Conference: The 46th annual WIFDWC will be held on the University of Nevada campus in Reno September 28 - Oct 2, 1998. No program details are available at this time. For more information contact Jim Hoffman, USDA Forest Service, Idaho at (208) 373-4221.

- R. Sturrock, Canadian Forestry Service, Victoria

TIM EBATA
FOREST HEALTH SECTION
MINISTRY OF FORESTS
FOREST PRACTICES BRANCH
1450 GOVERNMENT ST
VICTORIA BC V8W 3E7