

FOREST HEALTH PROGRESS

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

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A NEW APPROACH

With the recent completion of forest health guidebooks for the Forest Practices Code of British Columbia, and the current implementation of new code provisions, it is timely to reflect on some of the lessons we learned while working on these important documents.

Building a guidebook was much more than a process of assembling scientific information and expert opinion: it required cooperation and a basic willingness to develop a product; commitment to objective and selfless debate on goals and objectives; agreement to seek out and honour decisions made by consensus not only by our own expert group but also our colleagues and potential district clients; and acceptance of best available information and first approximations to develop usable, practical guidelines.

Underlying most of the process was a strong expectation of trust, not only amongst our group of technical specialists, but also with our colleagues in the ministry and other groups. We expected that everyone that reviewed drafts, provided comments and offered criticisms were providing constructive input, no matter how the opinions were expressed, verbally or graphically!

For many of us who were accustomed to working independently and freely expressing our views, having to work in concert and in a prescribed format to meet strict deadlines was a novel but occasionally frustrating experience. Nevertheless, we persevered, and produced some of the best guidelines for forest practitioners in the world.

In months, and no doubt years ahead, we will face some equally challenging tasks. We have to field-test and probably revise several guidebooks or sections. Forest health concerns appear to conflict with several ministry forest management issues or goals such as: management of bark beetles and retention of old growth trees in reserves and riparian management zones; partial cut harvesting and control of dwarf mistletoes; stumping for root disease control and soil conservation guidelines; and increased spacing programs and risks of increasing damage from insects and diseases.

As we tackle these residual or new tasks, we should keep in mind these very essential lessons about working together that we experienced from developing the guidebooks.

- J. Muir, Silviculture Practices Branch, Victoria.

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FOREST HEALTH PROGRESS

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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 labelled with an appropriate subject heading should be submitted via electronic mail to S. Turcotte, Silviculture 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.

- J. Muir, Silviculture Practices Branch, Victoria.

EXECUTIVE SUMMARY

This issue of Forest Health Progress—a report by ministry staff to the Forest Health Committee of British Columbia—includes articles on a wide variety of forest health activities.

General activities or articles include: a summary of 1995-96 activities of the forest health unit at Victoria (p. 4); an update on the development of the forest vegetation simulator (FVS) for pest extensions (p. 5); a report on development of skills training packages for forest health aspects of the Forest Practices Code (p. 5); a progress report on development of a computer-based and CD-ROM training module for root diseases and other diseases and insects based on forest health guidebooks (p. 6); ministry plans for developing overview surveys to replace Canadian Forest Service surveys (p. 6); a summary of forest health components of legislation and regulations (p. 7); a project summarizing broad-leaved tree pests (p. 7); a review of forest health components of tree farm licenses (p. 8); and an invitation for editorial contributions (p. 8).

Insect management reports and issues include: observations on Douglas-fir beetle after a partial cutting systems trial at Boston Bar in 1991 (p. 9); a description of an impact study for mountain pine beetle (p. 10); development of standard attributes for bark beetle management that are being rolled up into a software program for district use (p. 10); development of bark beetle management plans for the Lillooet Forest District (p. 12); revision of a bark beetle management policy (p. 14); a brochure on the benefits of bark beetle management (p. 14); a proposal to Forest Renewal B.C. to determine spruce beetle emergence from felled trees (p. 14); accreditation courses for spruce beetle probing courses in the Prince George Forest Region (p. 15); testing spruce beetle probing procedures (p. 16); management of mountain pine beetle in the Morice Forest District (p. 16); a report of the Douglas-fir tussock moth operations (p. 18); an update of plans to eradicate gypsy moth interceptions in B.C. (p. 18); a technical audit of beetle management in the Williams Lake Forest District (p. 18); a proposal to Forest Renewal B.C. to test spruce seed sources resistant to leader weevil (p. 19); a pruning trial proposal to FRBC for a spruce plantation damaged by leader weevil (p. 19).

Disease management issues include: a preliminary view of disease management in B.C. by the new provincial forest pathologist (p. 20); establishment of plots to determine the rate of spread of armillaria root disease in young, coastal, spaced stands (p. 20); development of a root disease extension for the forest vegetation simulator (FVS) for interior stands (p. 21); development of a root disease extension for the tree and stand simulator (TASS) for coastal plantations (p. 21); white pine blister rust resistance related to tree age (p. 21); and testing resistance to blister rust of white pine seedlings from Texada Island (p. 22).

Recent progress on management of mammal damage includes a publication on barriers to protect seedlings (p. 23); and a problem analysis of predator enhancement to manage damage from small mammals (p. 23).

- J. Muir, Silviculture Practices Branch, Victoria.

FOREST HEALTH - GENERAL

Activities of the Forest Health Unit, Victoria. A variety of activities and projects were undertaken by forest health staff at Silviculture Practices Branch in 1995-96 (several reports of individual projects are presented in this issue). Highlights include:

A standard set of attributes for management of bark beetles was finalized with region and district staff, and rolled into a computer database. John Henigman and Val Fletcher are demonstrating the program in a series of visits with district and regional staff. John also helped develop a standard set of forest health activity codes for the Integrated Silviculture Information System (ISIS).

John Muir worked with Resources Inventory Branch staff to incorporate the new damage and condition codes (on Forest Service form FS 747) in their systems, with a current target date of October 1996 for implementation at districts. An interim set of "old" codes might have to be re-issued for use until the October implementation.

Several meetings with Canadian Forest Service and ministry staff have resolved what will be done to develop new overview, forest-level surveys of insect and disease damage. John Muir, Peter Hall, and regional and district staff, are developing work plans, agreements and contracts to undertake the necessary standardization of data, processes and surveys to be done.

Several proposals for trials and developments were made by forest health staff to Forest Renewal B.C. with considerable guidance and advice provided by Tim Ebata. Tim, Peter Hall and John Henigman developed a compendium of all the important sections in the acts and regulations for forest health.

A technical audit of the Cariboo Forest Region and Williams Lake Forest District bark beetle program activities was completed by Peter Hall and several associates.

John McLaughlin and John Muir coordinated the workshops to evaluate the new root disease model for the Forest Vegetation Simulator (FVS), previously known as PROGNOSIS, that appears applicable to southern interior, mixed species, all-aged stands in the Interior Douglas-fir (IDF) biogeoclimatic zone.

A needs assessment for forest health skills training to implement the Forest Practices Code was completed under a contract administered by John Muir, and a two-day training course was developed thanks to considerable input by Stefan Zeglen, Lorraine MacLauchlan, David Pigin, Pat Byrne and others.

A video overview of forest health requirements in the Forest Practices Code was coordinated by John Muir with considerable help from many staff, particularly Tim Ebata and Dave Pigin. A descriptive pamphlet is being developed, and the video should be available soon.

The *Introduction to Forest Health* video coordinated by Patricia Humphreys was distributed after an accompanying background brochure was developed by John Muir. Copies of the video and brochure are available upon request (Fax 604 387-1467 or contact Shirley Turcotte by e-mail STURCOTT@MFOR01.for.gov.bc.ca).

- J. Muir, Silviculture Practices Branch, Victoria.

Whither FVS? Considerable development work has been undertaken by Barry Snowdon, Silviculture Practices Branch and others, to adapt the Forest Vegetation Simulator (FVS), previously known as PROGNOSIS, for use in British Columbia. Challenges have included "bugs" and other "pests" that have arisen in the conversion of the base model to metric units and other changes. Submodels, termed extensions, such as the one being developed for root disease, are linked to and depend on the base model.

Other variants of the base model and several pest extensions are available for potential adaptation and use in British Columbia, but with limited staff and funding, we have to rank what applications or modifications will be undertaken. Barry Snowdon plans to convene a user's workshop in May 1996 to determine desired applications and rankings of possible projects. As part of a recent contract, a review of base model variants and extensions was undertaken for forest health in British Columbia, and the report will be circulated for discussion.

- J. Muir and B. Snowdon, Silviculture Practices Branch, Victoria.

Forest Health and Forest Practices Code Skills Training. In 1995, a ministry task force on skills training needed to implement the new code indicated several gaps for forest health. In response, a contract was developed to undertake a needs assessment for training, and to review currently available courses for their content and coverage of the new code provisions. An assessment was completed, and subject to internal reviews and approval, will be circulated for discussion. Approximately 1000 staff and cooperators require some level of training in some aspects of forest health, and several recommendations were made for course development and delivery vehicles. A two-day course on basic code requirements for forest health in developing plans and prescriptions was prepared, and will be circulated for review and comment. Some options for accreditation for certain types of training are also being considered.

As an introduction and overview for forest health provisions in the code, we developed and produced a 14-minute video *The Code and Forest Health*. Copies should be distributed or available by June, 1996.

- J. Muir, Silviculture Practices Branch, Victoria.

Tree Doctor, Phase II. Further additions and refinements to the *Tree Doctor*, a computer-based training module, were made by Douglas Corrin and associates, Malaspina University College, Nanaimo, with support by the ministry and Science Council of British Columbia.

The module contains diagnostic keys and text in a standard computer format, and accompanying photographs on CD-ROM disks. Essentially all of the text and relevant information for the Forest Practices Code guidebooks on forest health are included. Currently the contents are limited to root diseases, dwarf mistletoes and bark beetles, and intentions are to expand the set to include all of the guidebooks by 1997.

Arrangements for providing copies for sale or distribution have yet to be made, but anyone interested in viewing or evaluating the package may contact Douglas Corrin at Malaspina University College (604 753 3245).

- J. Muir, Silviculture Practices Branch, Victoria, and
D. Corrin, Malaspina University College, Nanaimo.

Overview Surveys. In the past, the Ministry of Forests has relied on the Canadian Forest Service, Forest Insect and Disease Survey (FIDS), for a provincial overview survey of pest conditions in the province. This survey has been particularly useful in monitoring and tracking insect populations. However, with the downsizing of the Canadian Forest Service, the FIDS unit has been reduced in size and the mandate has changed to monitoring of general "forest health" through annual assessments of permanent sample plots. FIDS rangers will no longer be available to conduct aerial overview surveys, specialized surveys of young stands and specific surveys of pest incidences as requested by the ministry. 1996 will be a transition year in which FIDS will continue to function normally, although at a greatly reduced capability.

The Canadian Forest Service cannot be relied upon to provide traditional survey assistance after 1996. It is therefore necessary for the ministry to examine the need for developing a survey system that provides necessary information to all response centres in a timely manner. A provincially standardized survey must be able to provide consistent information on an annual basis. Reporting times must be consistent and maps and information should be consolidated at a central location.

If the Ministry is to implement a coordinated provincial survey by the 1997 field season, planning and development of the survey program must begin in 1996. A work plan is being developed to accomplish this task. The work plan will incorporate a review of the existing status of surveys, examines needs and means for standardization, and reviews various resourcing options to allow implementation.

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

Forest Health Related Legislation Summary. I have put together a Microsoft Powerpoint "slide show" containing brief segments of pertinent legislation relating to forest health. The legislation reviewed is the *Ministry of Forests Act*, *Forest Act*, *Forest Practices Code of British Columbia Act*, *Silviculture Practices Regulation*, *Timber Harvesting Regulation*, *Operational Planning Regulation*, *Balsam Woolly Adelgid Regulation*, and a listing of forest health guidebooks and other related guidebooks. Where necessary, short interpretations of the legislation have been added for clarification.

The presentation was not actually set up as a "slide show" but rather as an easy to view reference and source of slides for custom presentations. It would be cruel for anyone to be subjected to a 72 slide presentation on forestry legislation! It is most handy as a reference when it is printed in 6 slides per page, black and white format.

All Regional Forest Health specialists already have a copy of the presentation and it can be sent to you upon request via e-mail transfer in either Powerpoint version 3.0 or 4.0 format. Eventually it will be included in the upcoming Silviculture Practices Branch Forest Health web page for access on the world wide web.

If you have any comments, additions or editorial changes to the present version, please send them to me via e-mail and I will include them in the next revision.

- T. Ebata, Forest Health Project Specialist, Silviculture Practices Branch.

Pest Information on Commercial Broad-leaved Tree Species is Being Assembled. A draft report *A Summary of Forest Health Factors of Commercial Deciduous Trees in British Columbia*, has been completed under contract by Pollard Ecological Consulting (Adriane Pollard). The report, now under review, briefly summarizes all known insect, disease, mammal and abiotic forest health factors that could be a problem in British Columbia for trembling aspen, balsam poplar, black cottonwood, red alder, bigleaf maple, white birch and poplar hybrids. The descriptions of the various damage agents follows the format used in the *Field Guide to Pests of Managed Forests in British Columbia*. The consultant was asked to attempt to rate the factors as important, unimportant and unknown in their impact on commercial deciduous trees.

Once our initial review of the draft report is complete, we intent to send it to numerous operational foresters and researchers for additional review and comment. This review process of the report will help us determine what are the more important forest health factors expected to cause economic damage in deciduous stands in the future. Silvicultural practices concerned with the growing of the trees and specific control treatments will follow from our determination of the pests of importance. If you wish to contribute to this review please contact me.

Following a general agreement on the a list of important pests of commercial deciduous trees of British Columbia, we plan to publish an addendum to the current *Field Guide to Pests of Managed Forests in British Columbia*.

If you would like more information on this project to identify the important pests of commercial deciduous trees in British Columbia, please contact me at 387-8738.

- J. Henigman, Silviculture Practices Branch, Victoria.

Tree Farm License Management Plans. A summary of the forest health or pest management components of Tree Farm License (TFL) Management Plans has been completed. The summary analysis was done under contract by Heather L. Williams. We believe that by using the analysis, we can develop a better standard for forest health input in these licensee documents.

There are 35 TFL's in the province, and we were able to analyze the forest health input in 23 TFL plans. Within the management plans, forest health information is normally found in the Allowable Annual Cut (AAC) rationale; the Statement of Management Objectives, Options and Procedures (SMOOP); the Management and Working Plan (M&WP); and the Timber Supply Analysis (TSA). The existing Ministry guidelines on management plans to licensees were also reviewed.

Over the course of the next months, we will use the management plan analysis and work with the staff of the Resource Tenures and Engineering Branch to develop a better management plan guide to licensees for the forest health component.

An additional objective of the management plan review was to determine what information exists on unsalvaged pest losses from TFLs. We will likely be requesting more information on pest losses from TFL licensees in future plans.

If you would like more information on this project please contact me at 387-8738.

- J. Henigman, Silviculture Practices Branch, Victoria.

Editorial (and Other) Space Available. Forest Service staff with a (reasonable) axe to grind, an unexpressed view, or something interesting to say are encouraged to contact the editor of Forest Health Progress for space on the editorial page or another location for a suitable article. We can accommodate not only text, but also graphics and tables of data!

Potential contributors should keep in mind the general readership and types of articles encouraged for Forest Health Progress as outlined on page 2.

A diversity and variety of opinion is welcomed.

- J. Muir, Silviculture Practices Branch, Victoria.

FOREST INSECTS

Douglas-fir Beetle and Partial Cutting in the Coast/Interior Transition. I have been monitoring Douglas-fir beetle activity in a partial-cutting systems trial in the Boston Bar area since 1991. Unfortunately, a fire burned through the area late last summer, destroying much of the site before any real conclusions could be made. However, it may be worthwhile reporting my findings so far.

This study was set up to investigate if silviculture systems, alternative to clearcutting, would improve the regeneration success on dry sites in the coast/interior transition. Clearcut, seed tree, two densities of shelterwood and uncut control blocks were established for comparison. Logging was completed during the spring of 1991.

In an attempt to induce seed production (distress cone crop) in the residual trees, stress cuts (partial chainsaw girdling) were made in a portion of the trees in April 1991. Because Douglas-fir beetle seems to be attracted to stressed trees, there was some concern that these artificially stressed trees would become more susceptible to beetle attack. In addition, many of the trees received basal scars during logging.

Prior to logging, no Douglas-fir beetle activity was found within the study area, although there was beetle activity in the general vicinity (within a 1 km radius) and this area has traditionally had episodes of Douglas-fir beetle activity. No beetle attacked trees were detected during the summer of 1991, however, the following spring, 13 red attack trees were found (attacked in the spring of 1991, but, missed during ground surveys for green attack). Consistent with what was occurring over the general area, beetle activity increased within the study area over the next two years. In 1992 and 1993, 25 and 48 trees were attacked. In 1994, 5 attacked trees were found. Most of the beetle attacked trees were in the shelterwood blocks. Although some of the artificially stressed trees were attacked, seemingly healthy trees were attacked more frequently. Trees suffering basal scarring due to logging activities were also attacked, but, again, less frequently than trees without apparent stress factors.

It is difficult to make conclusions from this. It appears that in this instance stress causing factors such as partial girdling and logging scars did not make Douglas-fir more susceptible to attack by the Douglas-fir beetle. It is also difficult to assess if the partial cutting treatments made the trees in the study area more susceptible because the beetle population in the general area increased at the same time. The increase in beetle attack following cutting may have been coincidental.

I will be returning to the study area this spring to see how many trees survived the fire and determine if it is worthwhile to continue monitoring Douglas-fir beetle.

- D. Heppner, Vancouver Forest Region, Nanaimo.

Bark Beetle Impact Study. The second phase of the study at Penticton was carried out during the fall of 1995 in the same stands as were sampled in Phase I. Sampling was as a modified pre-stand tending survey. Information collected from fixed radius plots included:

- all species <7.5 cm diameter
- for preferred species only:
 - i) well spaced stems/ha (post free growing, etc.)
 - ii) any significant noted insects or diseases
 - iii) crown closure by layer (if layered understorey)
 - iv) height class: <0.5m; 0.5 - 1.0m; 1.0 - 1.5m; 1.5 - 2m; 2.0 - 2.5m; or , >2.5m
- at each polygon, the following was assessed:
 - i) snowpress potential (of preferred species only)
 - ii) average height range (for site prep purposes)
 - iii) soil
 - iv) slope classified by: <30%; 30 - 50%; or, >50%
 - v) competing vegetation (species and % cover)

These data will be combined with data obtained in Phase I and analyzed. Analysis is continuing, and a report is anticipated by mid-summer, 1996.

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

Standardized Bark Beetle Data Attributes and Access® Database. Over the past year, a working group of ministry, branch, region and district staff, have developed and reviewed drafts of bark beetle program data attributes with the objective of standardizing the collection of bark beetle program data for the province. A list of the objectives of the standardization initiative are described below.

Through the process of identifying attributes, we have determined the types of information needed by branch, region and district, in order to effectively manage the bark beetle program. We sorted types of bark beetle data as primary and secondary attributes depending on their importance to branch, regions and districts. A list of the primary attributes are listed below, and a list of the secondary attributes are available from the author. Secondary attributes may be important to individual districts and we do not propose to standardize these attributes.

The objectives for the standardization of bark beetle program data were identified by the working group and are as follows:

Provincial Objectives:

- to know the pest incidence by hectares, species, severity, licensee and region;
- to know the licensee performance for the annual report;
- to know unit costs of surveys and treatments for business plans;
- to know total volume of timber killed by pest and tree species; and
- to assist planning in order to detect and treat all high pest risk areas in the province.

Regional Objectives:

- all provincial objectives;
- to know pest losses information to be used to redirect or reallocate harvesting;
- to know pest damage information on forested lands adjacent to provincial forests; and
- district performance.

District Objectives:

- provincial and regional objectives;
- to know long and short term pest losses and population development tracking;
- to assist in the development of goals, associated with business or higher level plans;
- to assist in project management including:
 - treatment tracking and priority
 - work scheduling related to the biological conditions
 - cost management
 - technical efficacy
 - monitoring and following up; and
- to evaluate licensee performance.

This spring the primary bark beetle attributes will be accepted, and we require districts to collect and store the information in the prescribed manner. Districts that do not collect any specific primary attributes because their particular programs do not require the data are not asked to now collect it. For example, districts that do not make use of Monosodium Methanearsonate (MSMA) pesticide will not be collecting primary attribute data on this subject.

The storage of bark beetle program data has always been the responsibility of individual districts. In most cases, district staff have created their own personal computer data bases for storage of data. This should continue, and districts should alter their data bases to accommodate primary attributes in the standardized manner. We hope that this will not be a major undertaking for most districts. In a district where this may pose a serious problem, we are prepared to provide assistance.

At branch, we are currently developing a flexible data base for the bark beetle primary and secondary attributes using the Access® data base program. We are now demonstrating the data base to region and district staff. This program should help district staff to enter and track data more easily and will allow them to do analysis and create reports.

A table of the primary bark beetle data attributes can be found on page 31 of The Tabulations Section in this issue.

Anyone who wishes more information on the standardized bark beetle attributes and data base should contact me at 387-8738.

- J. Henigman, Silviculture Practices Branch, Victoria.

Licensee Bark Beetle Management Plans (BBMP's) and the Forest Practices Code of British Columbia in the Lillooet Forest District. A common complaint of district forest health staff is that licensees fail to adequately address forest health, specifically bark beetle management, in their 5-Year Forest Development Plans (FDP).

In most cases, licensees will simply include "blanket" and often ambiguous statements of their intentions, without committing to any definite management efforts. Sometimes licensees do not include a separate forest health section in their FDP, but bury forest health actions throughout the entire FDP. Large salvage/sanitation operations are usually shown, but not the small patch removal operations. As a result, there is no definitive way to identify licensee commitments to bark beetle management.

Responsibility matrices outline what licensees are responsible for, but no detailed management plans are provided or tied to their FDP. Section 17(3)(c) of the *Forest Practices Code of British Columbia Act*, Sections 15(6)(e) and 29 of the *Operational Planning Regulations*, and pages 11-14 of the *Forest Development Plan Guidebook* clearly state that licensees must address forest health in detail in their FDP's. Unless licensees properly address forest health concerns, they are in non-compliance with the *Forest Practices Code of British Columbia* with respect to Forest Health.

In order to address this problem, a set of district guidelines entitled *Bark Beetle Management Plans (BBMP's) and the Forest Practices Code of British Columbia* were developed through a cooperative effort between Lillooet Forest District Forest Health, Silviculture, Timber, Enforcement and Compliance, and Protection staff, as well as staff from Ainsworth Lumber, Lytton Lumber, and J. S. Jones Holdings. Over a three day period, the entire *Forest Practices Code of British Columbia Act and Regulations* were reviewed specifically for forest health, and all sections directly and indirectly effecting the district forest health program were highlighted, extracted, and condensed. From this, the formal BBMP Development Plan Guidelines were created and they received approval from all parties including the district manager. These guidelines were then implemented as a district procedure. Licensee (including Small Business Forest Enterprise Program) BBMP's include:

- maps identifying all areas of bark beetle attack in the licensee's operating area
- a site description for each area of attack (including all probe information)
- a detailed outline of the proposed management strategy.

This detailed outline can also be referred to as the Logging Plan for the site since it includes method and timing of salvage/sanitation harvesting, number and timing of trap tree and pheromone baiting programs, an estimation of total volume to be salvaged/sanitized, and the exact cutting permit and timbermark being utilized. The BBMP's also include formal "Requests to Fell Trap Trees" and "Requests to Pheromone Bait" for specific sites.

Licensees are now required to complete and submit their draft BBMP's along with their draft 5-Year FDP's at the beginning of each year. The significance of this is that the formal BBMP is a component of the 5-Year FDP. Like the FDP, the draft BBMP must be made available for the public and First Nations review and comment. It must also be presented at all FDP open houses. The BBMP is then finalized, and signed off by the district manager. The licensee has now not only outlined in detail how they will be managing bark beetle attack in their operating area, but have committed to doing so in such a way that it can be monitored and enforced.

BBMP guidelines also outline the development of the second portion of the annual BBMP - the submission of "Requests to Salvage/Sanitation Harvest Bark Beetle Attack", "Requests for Exemption from Basic Silviculture" and "Requests for Exemption from a Logging Plan for those sites less than 1 hectare and 500 m³". Licensees quote the pertinent sections from the *Forest Practices Code of British Columbia Act and Regulations* in their "Requests" for each site being addressed, as outlined in the BBMP guidelines. Each "Request" is evaluated by district staff, and may be revised before being approved by the district manager. Once approved, the licensee is then in a position to salvage/sanitize the beetle attack.

This may seem a tedious process, but since the BBMP guidelines have been implemented, the overall District Bark Beetle Management Program has become far more efficient and effective. The licensees are happy with the approach because, by submitting a BBMP, they are in full compliance with the Forest Practices Code. The Lillooet Forest District staff like the approach because licensee bark beetle management is now more than adequately addressed in their FDP. It is clearly outlined, straightforward to evaluate and approve, monitor and enforce. The public and First Nations approve of the new approach since they are provided the opportunity to review and comment on salvage/sanitation operations specific to forest health.

For the first time, the location of areas where licensees are conducting small patch removal of beetle attack is shown. Normally, harvesting operations of less than a hectare in size are exempted from the requirements of FDP's, and the public and First Nations groups are unaware of such activities. It is not a pleasant task to have to explain to a concerned group why logging trucks are hauling out of an area not addressed in licensee FDP's and supposedly deactivated!

If anyone would like more information on, or a copy of, the Lillooet Forest District Licensee Bark Beetle Management Plan Guidelines, please let me know.

- E. Senger, Lillooet Forest District, Lillooet.

Bark Beetle Responsibilities. A replacement for the original proposed "responsibilities matrix" will be developed this summer. The new document will take the form of recommendations and guidelines to district managers on interpretation and implementation of various aspects of the *Forest Practices Code of British Columbia Act* and associated regulations. It is expected that the content will perform the same function as originally proposed for the matrix.

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

Mountain Pine Beetle Benefit/Cost Analysis Brochure. A brochure has been developed which summarizes the results of the socioeconomic analysis of mountain pine beetle management in British Columbia which was carried out in 1993 by Phero Tech Inc. and Deloitte & Touche Management Consultants. The brochure is a six page, full colour brochure intended for distribution to interested people with some technical background. Final proofs have been produced and printing of the brochure should be done this summer. Copies will be available from Ministry of Forests, Silviculture Practices Branch, Forest Renewal Section.

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

Forest Renewal B.C. Research Proposal to Study Spruce Beetle Emergence for Hibernation. Control of spruce beetle infestations is primarily done by sanitation logging of infested spruce and milling these trees before new beetles emerge. Wherever road access exists and harvesting is permitted under a higher level plan and silviculture prescription, sanitation logging of infested spruce by the end of the first winter after attack is the most successful control tactic. The usual larval stages in the boles of such trees are destroyed in the milling process.

Recently attacked trees, however, may not display any symptoms of attack to aerial observers for over two years and it is difficult to ground-locate such infestations and expedite harvesting plans into more remote areas. Consequently, many infested stands cannot be sanitation logged until the second winter after attack. Harvesting at this period is only partially effective because from 3-88% of immature adults drop to tree root collars to overwinter (Knight 1961)¹ and are thus left behind in stumps. These beetles emerge the following spring to attack adjacent susceptible spruce. It is therefore important to know more accurately the annual ratios of immature adults remaining in tree boles or in root collars. That way, the effectiveness of sanitation harvesting can be maximized by allocating licensee resources where immature adults are overwintering mainly in the boles.

¹Knight, F.B. 1961. Variations in the life history of the Engelmann spruce beetle. *Ann. Entomol. Soc. Am.* 54: 209-214.

According to McCambridge and Knight (1972)², immature adults do not emerge for hibernation from felled trap trees, implying that climatic and/or other physical factors may influence this behaviour. Spruce beetle may also not emerge to hibernate from windthrow or "cold-decked" spruce logs. If this is so, felling of infested spruce at an optimum time the second year after attack may prevent beetle emergence for hibernation. If successful, this tactic would be useful where infested trees are located but haul road access is not yet complete. This would allow licensees to "buy time" and optimize the effectiveness of sanitation logging.

The objectives of the proposed study in the Mackenzie Forest District are: 1) to assess if spruce beetle emergence for hibernation behaviour can be predicted by climatic factors, and 2) to assess if such emergence can be prevented by felling infested trees at an optimal time. 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 will, in turn, maximize potential yields from forests by minimizing attacks in adjacent susceptible stands. We also hope to determine the feasibility of felling infested spruce in advance of harvesting in order to prevent emergence of immature adults, thereby improving the efficacy of subsequent sanitation logging. For further details, please contact the undersigned.

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

Spruce Beetle Probing Accreditation Courses in Prince George Forest Region and the Yukon. In four courses in the fall of 1995, approximately 90 personnel were trained in spruce beetle ground detection procedures in the Prince George Forest Region and the Yukon. Trainees from the Prince George Forest Region included staff from consulting companies, major licensees, B.C. Forest Service district offices, and First Nations organizations. Attendees at a course in Haines Junction, Yukon, included personnel from Indian and Northern Affairs Canada Forest Resources district offices, and independent consultants from the southern Yukon. Along with holders of 2-year certificates from 1994, approximately 150 personnel are currently accredited in the Prince George Forest Region.

Target attendees for the course are mainly people who conduct ground probes and classify spruce beetle attacked trees during probes or walkthroughs, or who administer probe contracts and/or check the field work of others. The course has received a confirmed 7 education credits by the Association of British Columbia Professional Foresters.

²McCambridge, W.F. and F.B. Knight. 1972, Factors affecting spruce beetles during a small outbreak. Ecology 53: 830-839.

The course is outlined in the recent B.C. Continuing Studies Network Natural Resource Management Catalogue for 1996. The next series of courses will start in early September 1996. 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.

Testing of Spruce Beetle Probing Procedures in Prince George Region. As a follow-up to a study conducted in a moderately infested stand in 1995, a further test of the Prince George Region's interim spruce beetle probing procedures will be made in 1996 in a lightly attacked stand in the Mackenzie Forest District.

A 67 hectare infested stand near Maybelline Lake in the Blackwater drainage was initially probed by a consulting company in September 1995. Sampling units were 100 m long by 10 m wide probe lines or strips spaced 100 metres apart in a parallel grid as per the interim procedure. Initial results revealed a light spruce beetle infestation (1.6% 1995-attack, 0.4% 1994-attack, and a 5.3% 1993-attack). This stand will be re-probed with a 50 metre offset before May 15, 1996 and the results from the first, second, and combined probes will be compared.

The data should reveal the appropriate level of sampling effort required in lightly attacked stands. An examination of spatial patterns of infestations based on level of incidence will also be made. More precise mapping of incidence "strata" will improve planning and effectiveness of spruce beetle sanitation and salvage harvesting. Any questions on this project can be directed to the undersigned.

- R. Hodgkinson, Prince George Region, Prince George and
V. Fletcher, Silviculture Practices Branch, Victoria.

Mountain Pine Beetle Situation in the Morice Forest District. The mountain pine beetle problem in the Morice Forest District is presently at epidemic levels within some planning units. These areas include the Morrison and the Morice North Integrated Resource Management (IRM) units. Other areas, such as the Morice South, Nadina Owen, Tochcha, Bulkley Valley and Tanglechain, also have the potential for the populations to expand. A more proactive approach to dealing with the problem is presently being developed through the Timber Supply Analysis subcommittee on bark beetle strategies.

Under this year's program, all identified infestations were overview mapped and recommendations were prepared by the Ministry of Forests and major licensees in their respective areas of responsibilities.

1995/96 fiscal year, accomplishments included small patch brood removal for.

Huston Forest Products

68 infected polygons, approx. 4 infestation sites per polygon, approx. 12,000 m³;

Northwood Pulp and Timber

230 infected polygons, approx. 4 infestation sites per polygon, approx. 16,563 m³; and

Small Business Forest Enterprise Program

40 infected polygons, approx. 4 infestations sites per polygon, approx. 2000 m³.

Other activities included:

Incorporation of a completely digital bark beetle detection system using Global Positioning System (G.P.S.) waypoints and Geographic Information System (G.I.S.) mapping; development of a digital hazard and risk rating system for three bark beetle species; an estimated 6,600 trees felled and burned through six contracts (2 native initiatives); and 17,621 trees treated with M.S.M.A. Our budget was approximately \$900 000 annually for the 1994/95 and 1995/96 fiscal years.

The new draft district strategy is to use G.I.S. mapping to hazard rate all the mature timber in the district, at the landscape level within each IRM unit. The hazard rating will be used in conjunction with the annual overview flight data to G.I.S. map the stands at risk of being attacked. These stands will then be assessed for treatment through cooperative effort between the Ministry of Forests and major licensees.

Goals for 1996/97 fiscal year include:

- Develop consensus on an overall district bark beetle strategy.
 - Resolve leavestrip/special management zone issues.
 - Incorporate a more timely bark beetle management planning and cutting permit approval process.
 - Develop access into high hazard timber types at risk.
 - Convert bark beetle funding towards more effective use of timber resources.
 - Encourage licensees to address infestations on non-conventional ground through helicopter logging. Presently, Northwood Pulp and Timber (NWPT) has helicopter salvage permits set up for the Tochcha, Morice South, and Morice North IRM units.
 - Monitor the effectiveness of the FRBC stump peeling proposal initiated by NWPT and K.W.B. Contracting.
- T. Bresser, Morice Forest District, Houston.

Douglas-fir Tussock Moth Program Report. The most recent outbreak of Douglas-fir tussock moth has declined and no treatments with nuclear polyhedrosis virus or other methods have been undertaken since 1994. The extent and amount of damage incurred in this outbreak was very small, due to the pheromone detection program which located infestations prior to visible defoliation followed by the early application of the virus in the outbreak cycle. It was not necessary to treat any single site more than once. A final report is being prepared for publication which will outline the program components, present various survey findings, present final results, and discuss this successful application of an integrated pest management system. The manuscript will be submitted to a journal such as Forestry Chronicle.

- P. M. Hall, Silviculture Practices Branch, Victoria, and
L. E. MacIaughlan, Kamloops Forest Region, Kamloops.

Gypsy Moth - North American Strain. By the end of 1995, a total of 36 male North American strain moths were trapped throughout the province. Most of these were single catches in widely scattered locations. Only 4 males were captured at Hope, where more were caught in 1994. A total of 12 males were trapped in New Westminster including 8 males found in a single trap. No egg masses were found during surveys in New Westminster and Hope. Two eradication projects have been proposed by Agriculture and AgriFood Canada: an aerial and ground spray of *B.t.k.* in a localized area near Hope; and a small ground spray application of *B.t.k.* around a suspected introduction at New Westminster. The Environmental Appeal Board cancelled the permit for the New Westminster project.

Cooperative trapping surveys will continue in 1996.

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

Cariboo Region/Williams Lake District Technical Audit. The technical audit of bark beetle management in the Williams Lake Forest District has been completed and submitted to the Executive, Regional Manager, Cariboo Forest Region, and the District Manager, Williams Lake Forest Region. Overall, the audit found the district's program to be satisfactory and effective in reducing damage caused by bark beetles, particularly Douglas-fir beetle. The audit report contains 34 recommendations for refining the program and facilitating planning for succeeding years. The district will be preparing an action plan to address the recommendations.

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

Spruce Weevil, Resistant-Stock Outplanting Trial. A proposal has been submitted to Forest Renewal British Columbia to establish demonstration areas of various planting strategies utilizing stock shown to be resistant or tolerant to damage by the spruce terminal weevil, *Pissodes strobi*. Planting stock shown to be genetically resistant or tolerant to damage caused by spruce weevil will be outplanted in operational settings in high spruce weevil hazard zones on the coast and interior of the province. The stock will be selected in consultation with tree breeding specialists and outplanted in mixtures with susceptible stock and alternate tree species. A limited number of seed sources and a single planting density will be used. Resistant/tolerant stock will be planted in separate blocks of 100% resistant, 50% resistant:50% other species, 50% resistant:50% susceptible stock, 50% susceptible stock:50% other species, and 100% susceptible. The blocks will be monitored over time to assess levels of spruce weevil attack and resultant levels of damage and deformity. The objective of the study will be to evaluate a variety of planting strategies and allow the development of recommendations that will allow spruce to be used as a commercial tree species in areas prone to weevil infestation. Replicates will also serve as demonstration areas and teaching aids.

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

Pruning of Weevil Damaged Sitka Spruce. A proposal to carry out a small pilot trial to prune weevil damaged Sitka spruce has been submitted to FRBC. Recent observations of Sitka spruce plantations that were planted in the 1970s and have subsequently grown through 15 to 20 years of weevil infestation and damage, now indicate that in some circumstances, weevil impacts may not be as severe as was once thought. Although volume and height growth losses are still significant, it appears that stem deformities can be minimized when trees are grown densely. There might be a way to grow Sitka spruce under the threat of attack by spruce weevil.

Although many individual, weevil-attacked trees still develop severe stem deformities, when densely grown, most have only minor deformities that will straighten out in time with the radial growth of wood. However, also characteristic of severe weevil damage as a result of repeated leader mortality, is the compression of stem internodes and the occurrence of numerous whorls of branches within a short distance along the stem. Branch diameters also tend to be larger than normal, and branches are retained on the tree longer. There will still be significant reductions in wood quality. As a component of a silviculture regime, it may be possible to recoup some of the impacts on wood quality by pruning these branches.

It is acknowledged that pruning is a borderline investment even under optimum conditions. This small trial, e.g. a one ha treatment block in two locations with controls, will test the feasibility of pruning weevil damaged Sitka spruce. Potential sites are at Fair Harbour and at Benson River on northern Vancouver Island.

- D. Heppner, Vancouver Forest Region, Nanaimo.

FOREST DISEASES

A Newcomer's View. Forest health workers in British Columbia are certainly in an enviable position. I know of no other jurisdiction where so much attention is being paid to forest health, especially pathology. For a very long time pathologists have felt like they were "a voice crying in the wilderness", full of sage advice and insight, if only a hearing ear could be found. It seems to me that people are listening here in British Columbia (at least for now). I am impressed by the level of awareness of forest health issues possessed by field foresters.

In my opinion, pathologists (and indeed, all those involved in promoting forest health) will be successful in getting their message across and contributing to improved forestry practices to the degree to which they are able to establish cooperative, consultative relationships with practitioners in other forestry disciplines and among themselves. There are certain issues which are proving particularly challenging as we try to balance forest health concerns with those of other forestry professionals. For example, the detection, quantification and treatment of root diseases. These are areas where much has been accomplished, but also have raised many valid questions: Is there a "best" survey method for determining the occurrence and incidence of armillaria infection? How well can we relate above ground expression of disease to below ground infection levels? How can we treat difficult (e.g. steep slope) sites?

I will be visiting as much of the province as I possibly can this year in order to see, first hand, what issues are most important at the operational level, and what I can do to promote further development of solutions. I would be interested in hearing what you think could/should be done.

- J. McLaughlin, Silviculture Practices Branch, Victoria.

So, Just How Fast Does Your *Armillaria* Grow? Two installations to test the rate-of-spread of *Armillaria ostoyae* in young coastal stands were installed last summer. With the invaluable assistance of John McClarnon (Mid-Coast Forest District) and Ron Diprose (Sunshine Coast Forest District), permanent plots were established in 10 to 15 year old stands scheduled to undergo juvenile spacing.

The objective is to see if the cutting of neighbouring susceptible trees allows the rapid spread of armillaria from known single-tree sources through adjacent root systems of cut trees, and onward into other healthy tree roots. By establishing both treated and control plots in the same stand, a comparison can be made as to whether stands would be better off left unspaced until a later date. Conversely, armillaria may not contribute unacceptable additional mortality to the stand and, thus, taking precautions against the disease while spacing may prove unnecessary.

- S. Zeglen, Vancouver Forest Region, Nanaimo.

Development of the Western Root Disease Model. Significant progress has been made in moving the Western Root Disease extension of the Forest Vegetation Simulator (FVS, formerly known as PROGNOSIS) towards operational implementation. On January 29-30, 1996, a multi-agency working group comprised of forest pathologists, computer programmers/model developers and a silviculturalist gathered to review the performance of the model using data collected by participants. Although the base model has not been completely calibrated, the output was considered well within the realm of possibility in terms of volume predictions and stand dynamics, both with and without treatments being applied.

Subsequently, a working session with a wider range of participants, including district forest health personnel, was held March 27-28, 1996. This workshop involved hands-on use of the model, allowing participants to explore various scenarios they felt represented situations they might encounter in their daily work. This session was quite valuable, providing both experience in manipulating the model as well as input required for further development of the model as a resource for operational planning.

- J. McLaughlin, Silviculture Practices Branch, Victoria.

TASS/ROTSIM. Root Rot WinTYPSEY, which uses yield tables generated by TASS/ROTSIM, will (FRBC willing!) be tested operationally in the Duncan Forest District starting this fall. Calibration of the model has been progressing well, and this summer (also FRBC willing) a visual aid tool, coined "pathograms" will be designed to aid silviculturalists in selecting the appropriate root disease-affected yield curves.

- J. McLaughlin, Silviculture Practices Branch, Victoria

Blister Rust Resistance in White Pine - the Age Related Component. When white pine candidate trees are selected throughout the Pacific Northwest, a large number of them are rust free. Because they have endured >20 years of assault from *Cronartium ribicola* and remained rust free while their neighbours have died or are cankered, it is likely that they have some resistance, rather than being merely escapes. Since no abnormal cankers are present, needle defences or age-related defences are suspected. Clones of resistant trees selected in British Columbia from the 1920s to the 1950s that remain relatively canker free support the notion of age-related resistance. Age-related resistance is documented for eastern white pine. Age-related resistance in agricultural crops is often considered race-non-specific and therefore a durable form of resistance.

A question often asked is, "When are planted white pine free-growing?". Plotting the canker incidence over time in Idaho and British Columbia frequently yields a steep curve that does not plateau until about 95% of the trees are attacked, unless the trees originate from a selection program. The curves for the program trees are not as steep and are

expected to plateau sooner. The worst case scenarios would be plantations with a high incidence of *Ribes spp.* on site. Two such cases occur in BC planted with wild stock contrasted with program stock. Surveys in 1995 revealed 37.5% and >95% infection for OR program stock and wild stock respectively at 8 years (Sechelt), and 31% and >98% infection for ID program stock and wild stock respectively at 11 years (Vlem Creek). It is hypothesized that age-related resistance in the program stock is being invoked so the canker incidence curves are plateauing in spite of a high incidence of inoculum on the adjacent *Ribes*. More data are required to confirm this suspicion.

Many plantations of white pine are not expected to be associated with a high incidence of *Ribes* and thus are expected to plateau at a low incidence of infection on program stock. However, even if the blister rust incidence on the program stock reaches a plateau of 30%, this may still be too low to justify a pruning treatment to control the rust. Early plantation walkthroughs are recommended to monitor for *Ribes* incidence. If readily noted, or if high inoculum is expected to reach the site, then further surveying for rust incidence at the earliest possible pruning size should be done to determine if pruning of program stock would be necessary. Continued monitoring of program stock in Idaho and British Columbia is planned to confirm the early plateauing of blister rust incidence in plantations.

- R. Hunt, Canadian Forest Service, Victoria

Testing Texada White Pine Seedlings. Last summer two regional forest health cooperative education students tagged and stem-mapped over 9,000 white pine seedlings as part of an operational trial to test host resistance to white pine blister rust. The trial, initiated originally by Jeff Fournier, tested trees from three different Texada Island seedlots at 13 sites spread over seven districts within the Vancouver Forest Region. Cooperators in this project included the University of British Columbia Oyster River Research Farm and the Greater Vancouver Water District.

The objectives of the trial centred around the belief that some Texada white pine exhibited an uncharacteristic resistance reaction to infection. This resistance takes the form of an active reaction to infection, often leading to the containment of cankers and successful halting of the rust's progress in girdling the tree. For this trial, the intent was to test if this reaction would occur in locations other than Texada and also whether these trees suffer less mortality than a control group either when left alone or when subjected to an early pruning regime (0.5-1.0 m in height for first lift). Tree growth will also be monitored.

Now that Nicole Jeans and Julian Plamondon, the two Simon Fraser University cooperative education students have completed the initial trial setup, annual visits to assess tree infection and mortality will be conducted over the next 20 years.

- S. Zeglen, Vancouver Forest Region, Nanaimo.

MAMMAL DAMAGE

Seedling Barrier Protection from Deer and Elk Browse - A New Publication! We have just issued a new publication *Seedling Barrier Protection from Deer and Elk Browse*. The publication examines how to determine a deer or elk browsing problem may exist on a site, and how to protect the seedlings with different types of barrier products. The focus is on coastal damage and control, and the two primary tree species to be protected are western redcedar and Douglas-fir.

All of the commonly used barrier products are described and compared in their capacity to protect the seedling terminal leader. Fencing is described as well. Details on installation and maintenance are provided. All of the products require careful installation and regular maintenance. Some products work better than others on different sites.

The cost of browse protection barriers has always a source of concern to foresters. We have attempted to sum all associated costs for each product used over a period of six years as a net present value. These cost estimates should help foresters determine which product will give the most cost effective service.

Detailed data on the effectiveness of browse barriers is lacking. For the report, we interviewed many forestry staff and have provided a summary of their experiences for the assistance of others who wish to use the barrier products.

Browse barriers are used by most agencies experiencing deer or elk damage in British Columbia or the U.S. Pacific Northwest. Numerous repellent products have been tested over the past decade, but few have been shown to work. The only registered repellent product available in British Columbia which is known to work well is Big Game Repellent®. However, re-treatment costs have not made repellents more cost effective than barriers. Another repellent product, Plantskydd® is currently being tested in British Columbia and has shown some encouraging results.

If you require more information on the control of deer or elk browse, please contact me, and if you would like a copy of the new browse protection report, please contact the Forestry Division Services Branch in Victoria at 387-6719.

- J. Henigman, Silviculture Practices Branch, Victoria.

Investigation of Predator Habitat Enhancement Strategy for Managing Small Mammal Damage. A problem analysis has been completed which investigates predator habitat enhancement as a strategy for managing small mammal damage. The study was done through the Silvicultural System Program by contractors Todd Manning and Frances Backhouse. The problem analysis looks at the natural predators of small mammals causing damage to commercial trees. Habitat enhancement for predators of small mammal pests is a relatively new and untried approach that is compatible with the

current shift towards ecosystem management. The problem analysis looks at what predator habitat entails and assesses its value as an animal damage management strategy.

Within the problem analysis, the biology and habitat needs for a variety of mammal and avian predators are described.

A complete discussion of the predator-prey dynamic is presented. It is concluded that predators will never entirely eliminate their prey under normal conditions. Nevertheless, prey populations can be expected to increase to unnaturally high levels, at least temporarily, if predators are absent or present only in very low numbers due to lack of habitat. Therefore, some attention should be paid to maintaining and/or restoring habitat for predators in managed forests.

Because the cost of manipulating habitat to encourage the presence of predators may sometimes be greater than the value of the timber lost to pest damage, habitat enhancement activities should be undertaken as part of overall efforts to maintain biodiversity in managed forests.

At the stand level, predator habitat can be enhanced by creation or replacement of structural elements such as snags and coarse woody debris. Creation of artificial cavities and manipulating logging debris could be undertaken.

The problem analysis recommends that:

- habitat enhancement for predators of small mammals be further investigated through field studies;
- predator habitat enhancement techniques are not recommended as a stand alone practice, rather they must be complementary to existing forest management plans;
- maintenance of forested habitat for predators at the landscape level can be achieved by employing the recommendations of the Forest Practices Code biodiversity guidelines;
- predator habitat may be enhanced by certain stand level practices;
- the use of nest boxes is likely only appropriate in high profile areas, near towns where citizen's groups are willing to contribute their free labour; and
- reintroduction of predators to areas should only be considered where the original causes of the extirpation have been mitigated and only if there is suitable habitat.

Following a review of the report by Forest Service staff, the problem analysis will be made available for wider discussion, in the hope that it spawns some field studies for this type of pest control technique.

If you wish more information on this project, please contact me at 387-8738.

- J. Henigman, Silviculture Practices Branch, Victoria.

PERSONNEL

SILVICULTURE PRACTICES BRANCH

John Muir	Forest Health Officer	Victoria	387-8740
Peter Hall	Forest Entomologist	Victoria	387-3842
Val Fletcher	Forest Health Sampling/Surveys Specialist	Victoria	356-8763
John McLaughlin	Forest Pathologist	Victoria	387-8737
John Henigman	Forest Health Forester	Victoria	387-8738
Shirley Turcotte	Forest Health Management Secretary	Victoria	953-3582
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Bev McEntire	Pest Management Biologist, Seed Production	Victoria	652-7613
Michelle Hall	Pest Management Biologist, Seed Production	Victoria	652-7613
Dave Trotter	A/Nursery Pest Management Specialist	Surrey	582-6910
Robb Bennett	Seed Pest Management Officer	Victoria	652-6593
Brian Wikeem	Noxious Weed Biocontrol Officer	Kamloops	376-1331
Marsha De Wolf	Noxious Weed Biocontrol Technician	Kamloops	376-1331
Susan Turner	Noxious Weed Biocontrol Specialist	Kamloops	376-1331

CARIBOO FOREST REGION

Regional Staff

Leo Rankin	Forest Entomologist	Williams Lk.	398-4439
Don Doidge	Forest Pathologist	Williams Lk.	398-4442

District Staff

Bob Mitchell	Forest Health Officer	Chilcotin	394-4700
Derek Poole	Forest Health Officer	Horsefly	620-3200
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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

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Ken White	Forest Health Assistant	Kamloops	371-6500
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Margot Hollinger	Forest Health Specialist	Penticton	490-2242
Savas Koutsantonis	Forest Health Technician	Penticton	490-2250
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Wayne Anshelm	Forest Health Specialist	Salmon Arm	832-1428
Eric Haupt	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

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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
Randy Lessard	Forest Health Officer	Golden	344-7500

PRINCE GEORGE FOREST REGION

Region Staff

Robert Hodgkinson	Forest Entomologist	Pr. George	565-6122
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Stuart Taylor	Forest Health Forester	Pr. George	565-6774

District Staff

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Nathan Voth	Forest Health Technician	Vanderhoof	567-6363
Lance Mitchell	A/Forest Health Technician	Ft. St. James	997-5248
Steve Bower	A/Forest Health Technician	Mackenzie	997-2200
Sherilyn Smith	Resource Assistant - Silv.	Dawson Creek	784-2350
Rod Negrave	A/Resource Officer - 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
Lou Tromp	Stand Tending/Veg Mgmt For.	Smithers	847-7514
Don Russell	Range Officer	Smithers	847-7443
Gerry Pinkerton	Reforestation Forester	Smithers	847-7512

District Staff

Gary Lloyd	Senior Zone Forester	Bulkley	847-6307
Bill Camenzind	Silviculture Specialist	Bulkley	847-6310
Glen Buhr	Silviculture Practices Forester	Cassiar	771-4211
Bob Wilson	Silviculture Officer	Kalum	638-5138
Doug Davies	Zone Forester	Kalum	638-3290
Paul Hanna	Silviculture Officer	Kispiox	842-7600
Todd Bresser	Forest Health Technician	Morice	845-6224
Todd Burgess	A/Silviculture Officer	Morice	845-6200
Ted Traer	Silviculture Officer	Lakes	692-7515
Terry Thrower	Forest Health Technician	Lakes	692-7515
Mike Grainger	Silviculture Specialist	North Coast	624-7460
Mark Vieweg	Resource Officer-Silviculture	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
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Reinhard Muller	District Silviculturist	Duncan	746-2700
Shawn Rice	District Silviculturist	Mid Coast	982-2000
Mark Palmer	District Silviculturist	Pt. Alberni	724-9205
Chuck van Hemmen	Resource Officer - Silviculture	Pt. McNeill	956-5034
Ron Diprose	Forest Health Technician	Sunshine C.	485-0730
Allan Sugg	District Silviculturist	Qn. Char. Is.	559-6212
Jeff Fournier	Zone Forester	Squamish	898-2100
Dave Minhas	Zone Forester	Squamish	898-2100

MEETINGS

Regional Forest Health Meeting in Prince George. A meeting of regional and district forest health staff was held in Prince George on March 27-28, 1996. Attendance also included forest health specialists from the Silviculture Practices Branch in Victoria, the Quesnel Forest District in the Cariboo Region, and a representative from the Ministry of Environment, Lands and Parks.

Agenda topics were:

- Bark beetle responsibilities under the Forest Practices Code
- Standardization and use of beetle tracking and data bases
- Sketchmapping and "border pests" in 1996
- Forest health clauses in cutting permits
- Beetles in riparian reserve zones
- Silviculture exemptions in beetle areas
- Root diseases - update on surveys and hazard and risk assessments
- Forest Renewal B.C. forest health project proposals
- New forest health guidebooks
- Forest health training courses available

Two of the more significant outcomes of the meeting were agreements on a draft regional bark beetle responsibility guideline and a draft guideline for managing beetles in riparian reserve zones. Please contact me for a copy of the meeting's detailed action points/minutes.

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

Alberta - British Columbia Intermountain Forest Health Workshop in Jasper. Representatives of the Alberta Forest Service, Alberta Environmental Protection Department, British Columbia Forest Service, Parks Canada, Forestry Canada, U.S. National Parks, and a forestry consultant met February 6-7, 1996 at the Palisades Training Centre in Jasper. Topics included:

- Agency ecosystem management perspectives and field applications
- New forest health legislation in British Columbia
- Major forest pest conditions and management programs
- Forest health monitoring: the evolution of FIDS and agency roles post-FIDS
- Ecosystem monitoring
- Whitebark pine ecosystems
- Douglas-fir beetle in Jasper National Park
- Pheromone-based management systems
- Kooteney mountain pine beetle paleoecology

A field trip on the afternoon of February 6th allowed attendees to view the results of a large prescribed burn on steep terrain, Douglas-fir beetle damage and monitoring, and a large blowdown from a severe storm. Minutes of the meeting are being prepared by Parks Canada. If you have any questions in the interim, please contact the undersigned.

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

1996 North American Forest Insect Work Conference. In 1996, the annual Western Forest Insect Work Conference will be held in association with the Eastern and Southern Insect Work Conferences at a joint meeting in San Antonio, Texas. The meeting will be held in during the week of April 8, 1996. The theme of the conference will be "Forest Entomology: Vision 20:21"; a wide variety of topics will be addressed during various panel discussions and workshops.

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

1997 Western Forest Insect Work Conference. The 1997 Western Forest Insect Work Conference will be held in Prince George, British Columbia, April 21-24, 1997. The sessions will be held at the Prince George Civic Centre and accommodations will be available at several nearby hotels. A program has not, as yet, been drafted, but will include workshops and panels addressing various aspects of forest entomology and general forest and resource management. Peter M. Hall is the chairman of the Program Committee and Staffan Lindgren is chairman of the Local Arrangements Committee. Draft programs and details on accommodation and Prince George amenities will be sent out in late summer or early fall. Any ideas for topics, or suggestions for the conference, should be sent to the undersigned.

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

Forest Health Provincial Specialists Meeting, April 16-17 & (18), Richmond. The annual provincial forest health specialists meeting was held at Radisson Inn, Richmond. District, regional and branch staff discussed and resolved a variety of issues from recent downsizing and re-structuring of the Canadian Forest Service Forest Insect and Disease Survey (FIDS) to joint projects with the stand tending specialists. Minutes of the meeting and follow-up action items were distributed. Each region and branch maintains a manual of issues and actions arising from the meetings for continuity and follow-up.

- J. Muir, Silviculture Practices Branch, Victoria.

Forest Health Decision Support Steering Committee Organizational Meeting. On November 8, 1995, a meeting concerning the above was held in Victoria. Structure, terms of reference and membership of the committee was discussed. In addition, summery presentations were made of a number of decision support systems currently under development. Minutes of the meeting are available from the author.

- V. Fletcher, Silviculture Practices Branch, Victoria.

TABULATIONS

Primary Bark Beetle Data Attributes¹:

NAME	COLUMN WIDTH ¹	DESCRIPTION
1. District code (Org. Unit)	3	e.g. DIN = Invermere
2. Location	30	geographic name
3. Damage agent and condition codes	3	as per the FS747
4. Map sheet	xxxx_xxx_x.x	B.C.G.S. map, 1:20 000 or 1:50 000 for most districts
5. Client Number	8	e.g.: consult Finance and Administration, ISIS or Timber staff for a list of client numbers for your district
6. Infestation Number	12 ²	administrative identifier e.g. 95xxxxxxxx where 95 is the year and xxxxxxxx is the identifying number, replaces beetle site, beetle polygon, polygon I.D.
7. Last Previously Related Infestation Number	12	identifies a linkage between this infestation number and one from the year previous
8. Latitude (GPS)	xx.xx.xx	degrees, minutes and seconds
9. Longitude (GPS)	xxx.xx.xx	degrees, minutes and seconds
10. Area (ha)	xxx.x	values from 0.1 through 999.9 ha
11. Hectares surveyed	xxx.x	total area of infestation evaluated in survey
12. Survey date	xx.xx.xx.xx ³	(century), year, month and day
13. Survey type	5 ³	to be reconciled with ISIS activity codes, e.g. walkthrough: WALK, we can create a set of probe codes if needed
14. % most-recent attack (current/green)	xxx.x	
15. Numbers most-recently attacked (current/green)	4 ⁴	
16. % 2nd most recent attack (red)	xxx.x	
17. Numbers related to 2nd most-recently attacked (red)	4 ⁴	
18. % 3rd most-recent attack (grey)	xxx.x	
19. Numbers related to 3rd most-recently attacked (grey)	4	
20. Number of baits, proposed	3	

¹Please refer to article *Standardized Bark Beetle Data Attributes and Access@ Database* by J. Henigman on p. 10.

Primary Bark Beetle Data Attributes (Continued):

NAME	COLUMN WIDTH ¹	DESCRIPTION
21. Number of baits, actual	3	
22. Number of MSMA trees, proposed	3	
23. Number of MSMA trees, actual	3	
24. Number of conventional trap trees, proposed	3	
25. Number of conventional trap trees, actual	3	
26. Number of fall and burn/peel, proposed	3	
27. Number of fall and burn/peel, actual	3	
28. Harvesting method	5 ³	e.g.: helicopter removal: HEREM, or single tree removal: STREM (see ISIS activity codes)
29. Logging or treatment date in year one, proposed	xx.xx.xx.xx ³	(century), year, month and day
30. Logging or treatment date in year one, actual	xx.xx.xx.xx ³	(century), year, month and day
31. Treatment completed (Y/N)	1	
32. Comments	255 ³	

1. COLUMN WIDTH: to be standardized for the PC data base and with ISIS
2. an infestation number should normally be assigned to a discrete group of infested trees; districts may choose to identify numerous small discrete groups of infested trees in the same area with an infestation number, following the two digits designating the year, each district may choose its own numbering system to identify specific infestations
3. for programming purposes for attributes 13 and 28 the ISIS activity code bases, techniques and objectives should be identified; for attributes 12, 29 and 30 include century with the date; and for attribute 32 the largest field width possible should be selected
4. Red/Green ratios can be calculated using Primary Attributes #15 and 17.

PUBLICATIONS AND REPORTS

Booth, I. and J. Henigman. 1996. Seedling Barrier Protection from Deer and Elk Browse. Ministry of Forests.

