FIDS REPORT 92-11

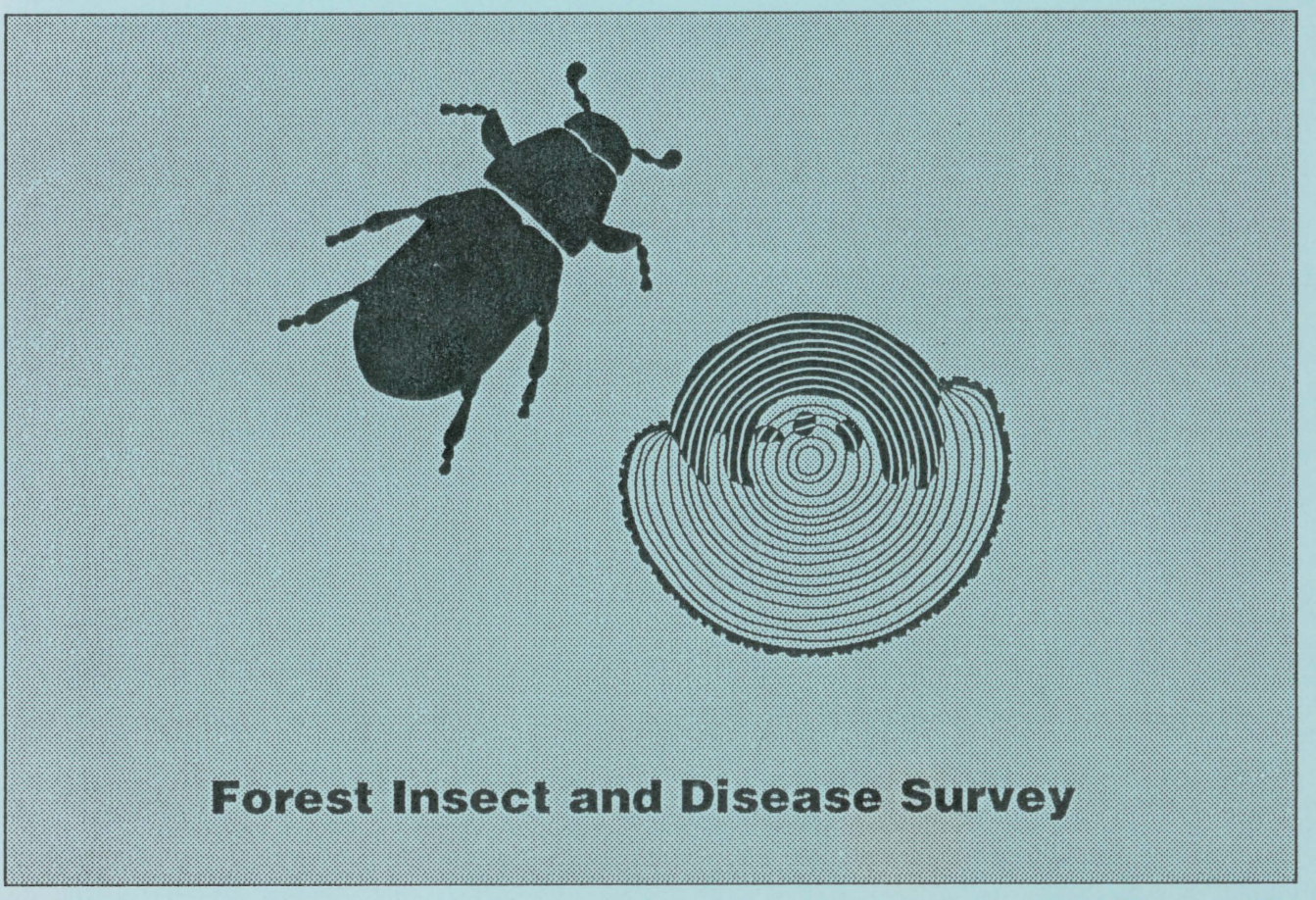
FOREST INSECT AND DISEASE SURVEY

PEST REPORT ON SPECIAL PROJECTS

QUEEN CHARLOTTE ISLANDS

1991

Pacific and Yukon Region



Forest Insect and Disease Survey

Forestry Canada Forêts Canada

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PEST REPORT ON SPECIAL PROJECTS

QUEEN CHARLOTTE ISLANDS

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Prepared for:
South Moresby Forest Replacement Account (SMFRA)

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SUMMARY

Special surveys were initiated and special assessments completed by Forestry Canada, Forest Insect and Disease Survey (FIDS) under the South Moresby Forest Replacement Account (SMFRA) agreement. Surveys were done during the period of July 15-24 and were incremental to regular FIDS survey work.

At Gregory Creek, in an old growth stand slated for selective harvest by several methods (including selective cut, group selection, clearcut and helicopter extraction), dwarf mistletoe affected 84% of overstory hemlock and 44% of regeneration. Armillaria root disease affected two trees; Phellinus pini, a heart rot fungus, affected two trees; sapsucker damage was common as were scarring and broken tops. At Hangover Creek Phellinus pini affected 2% of trees although snags were common. Blowdown occurred at both locations and hemlock sawfly was also common although causing only trace defoliation.

A young spaced stand which was severely defoliated by western blackheaded budworm in 1986 was found to be fully recovered. Spruce aphid, which was common in many areas, infested all the young Sitka spruce at Heather Lake; a plot established at this site did not indicate any growth reduction to date from spruce aphid feeding.

The results of the pre-harvest pest assessment by FIDS at Gregory and Hangover creeks indicate that there is potential for pest related problems to be aggravated by the proposed harvesting projects.

Several possible projects for 1992 as follow-ups to the 1991 work and as new areas to examine include: a post-harvest resurvey at Gregory and Hangover creeks, plots and annual monitoring for pests in a young stand in Rennell Sound, further examinations of the affects of defoliator infestations on young stands, further plot work on spruce aphid and the collection of baseline data and monitoring of pests in yellow cedar.

INTRODUCTION

As part of a Memorandum of Understanding (MOU) between the Ministry of Forests (MOF) and Forestry Canada (ForCan), several projects and surveys incremental to information normally collected by FIDS were initiated or completed during July of 1991 on the Queen Charlotte Islands. The primary focus and bulk of this year's effort was in the assessment of pests present in two specially targeted, steep-slope, old growth stands prior to special alternative harvest systems applied to them under project e.p. 862. Results of these pre-harvest pest surveys are presented along with summary information on permanent plots established, pest damage in spaced stands and plots established in currently active infestations. Suggestions for follow-up work in several of the above projects are included as well as proposals for the establishment of long term monitoring projects under the umbrella of SMFRA.

Project E.P. 862

This project, also designated experiment 34 SMFRA 13.3, and titled "Alternative Silvicultural Systems for Environmentally Sensitive Sites on Steep Slopes.", is designed to test alternate harvest methods on steep, unstable slopes using a helicopter for extraction. The harvest methods to be assessed include single tree selection, patch clearcut (group selection) totalling 25% of an area, group selection totalling 50% of an area and clearcut. Numerous silviculture monitoring plots were established prior to harvest, and various planting regimes are to be implemented post-harvest.

FIDS project

The FIDS objective and mandate was to provide an overview survey of pests in the designated test areas in old growth stands at Gregory and Hangover creeks, prior to treatment. The second objective was to resurvey these same areas after harvest for various insect and disease activity that might be evident.

Locations: Area #1 - Gregory Creek in Rennell Sound (QCI).
Area #2 - Hangover Creek in Rennell Sound (QCI).

Contacts: Del Williams, R.O. Silviculture, MOF, QCI.
Jeff Fournier, Pathologist, MOF, Vancouver Forest Region.
Kevin Weaver, Coordinator, SMFRA Projects, MOF, QCI.

Other FIDS projects:

1. Permanent plot at Heather Lake to assess long term damage in young spruce by spruce aphid, Elatobium abietinum.

2. Damage appraisal of young stand severely defoliated by western blackheaded budworm, Acleris gloverana.

SURVEY METHODS

At Gregory Creek all trees within 12 prism plots were examined. Plots were located at approximately 100 m intervals starting in the southwest corner of the test area and running at approximately 70° for 10 plots and 170° for two plots in an effort to cover most trial types over as large a section of the test area as possible. Observations were also made in transit between plots with special attention to regeneration condition outside the plots. Slopes were noted in excess of 100%. Poor lighting, a closed canopy and extreme slopes also resulted in some modification in dwarf mistletoe assessments. Generally, where visible, trees were divided into upper, mid, and lower crowns, with severe infection assigned to condition where multiple brooms were noted in at least one crown level and other brooms noted elsewhere. Light infection was assigned where a total of only one or two brooms were noted.

At Hangover Creek, 12 prism plots were similarly assessed. The strip was run in a straight line beginning near the north end of the test area and running at approximately 200° in order to cover as much of the area as possible. Conditions were similar to Gregory Creek and the survey method used also similar.

A permanent sampling area was established adjacent to both Gregory and Hangover creeks to monitor defoliators on an annual basis. Plots were established by mapping a specific area adjacent to the test areas and detailing stand information in a permanent file. Three trees of each major species represented in the stands were sampled by placing an approximately 2 x 3 m sheet under the crown of each tree and beating accessible branches with a 2.5 m pole (FIDS standard 3-tree beating method). Resultant defoliator larvae on the sheet were counted and identified.

In a special western blackheaded budworm survey, ten 50 m^2 circular plots at 50 m intervals were established to assess damage caused by the most recent budworm outbreak (1985-88) in this 20-year-old, western hemlock, spaced stand . Trees were examined for symptoms of crown damage and one increment core at breast height was taken at each plot. Cores were later read into a "digimic" reader to measure annual growth, results were examined to determine growth losses during the infestation period.

A plot was also established to monitor spruce aphid activity on young Sitka spruce in a plantation at Heather Lake. Twenty trees were chosen at random and tagged; height, leader length, branch tip length, and DBH were measured and attack levels were assessed in terms of percent of foliage infested. The plot area was mapped out to facilitate annual measurement to assess growth impact over five years.

SURVEY RESULTS

GREGORY CREEK SURVEY

At Gregory Creek, a total of 84 main canopy trees were tallied averaging seven per plot and ranging from 25 to 140 cm in diameter. Western hemlock represented 74% of the stocking, Sitka spruce 14% and western red cedar 12%. Hemlock dwarf mistletoe, Arceuthobium tsugense, was present on 84% of western hemlock of which 56% were lightly infected, 35% moderately infected and 10% severely infected based on visual observations in poor lighting under a closed canopy. All diameter classes from 24 to 120 cm were affected in approximately the same proportions. Regeneration (regen) in the plot areas was also assessed and 44% of sixty young trees 2-15 m tall were infected. In addition to infected main canopy trees and regen, three severely broomed codominant dead western hemlocks were also noted adjacent to plots. Root samples from two of these trees were found to contain Armillaria ostoyae mycelial fans and rhizomorphs. Of 12 Sitka spruce, two were festooned with Phellinus pini sporophores along the lower bole. Sapsucker damage was particularly notable on one spruce, although similar old and new damage was noted to a lesser degree on all hosts through a number of plots. Damage such as dead branches, forking, twisting, sweep, scarring or broken or dead tops were noted throughout the stand as might be expected in old growth on steep

slopes. On 6 of 12 westen red cedar plot trees, basal scarring and/or dead or broken tops were particularly notable.

In addition to conditions within and in association with plot trees, other problems were also present. Blowdown was common throughout the stand. In two areas of several hectares each, the majority of trees had been knocked down by wind; other areas within the stand contained blowdown but with fewer trees affected. In none of these locations were newly exposed faces involved to rationalize windthrow activity. Along the road bordering one side of the block, intermittent severe browse was noted on the young spruce and minor tip dieback, possibly caused by the fungal pathogen Sirococcus strobilinus, was visible on young hemlock.

HANGOVER CREEK SURVEY

At Hangover Creek a total of 81 trees were tallied averaging seven per plot and ranging from 30 to an estimated 130 cm diameter. Western hemlock represented 54% of the stocking, Sitka spruce 32%, and western red cedar 14%. The most serious problem noted was heart rot caused by Phellinus pini, which affected only 2% of plot trees based on external conks. However, silent sentinels scattered throughout the stand were witness to a possible heart rot problem more severe then was evident from conks. Broken, dead or missing tops affected 27% of western red cedar. Dead branches, scarring, forks, crooks and sweep were all conditions common in the plots and the stand. Blowdown was a problem in this stand with one relatively exposed area of the stand having many trees recently broken or uprooted over an area of approximately 5 ha.

No hemlock dwarf mistletoe was found in the plots or noted in the cruised area; however, in an adjacent old growth stand, mistletoe was common in understory. This makes the stand in question suspect, at least in some parts not surveyed.

PERMANENT SAMPLING AREAS

A permanent sampling area was established adjacent to Gregory and Hangover creeks to annually monitor defoliator populations that may impact on these sites in the future. At Gregory Creek, 16 hemlock sawfly larvae were collected from young hemlock in a standard three-tree larval sample. Only trace damage was found and no other species were collected. At Hangover Creek, on understory western hemlock, 25 hemlock sawfly larvae and two larvae of the family Geometridae were collected, again with only trace damage noted. Future sampling can be compared to the current baseline results and could provide indications of any buildup of potentially damaging defoliator insects.

As mentioned, it was while establishing these plots that observations of browse on spruce and tip dieback on hemlock were made at Gregory Creek and dwarf mistletoe damage observed adjacent to the Hangover Creek site.

SURVEY OF WESTERN BLACKHEADED BUDWORM IN YOUNG STANDS

With continued concern over losses incurred from the western blackheaded budworm infestations, a special survey was completed in a young stand in the Tarundl Cr. drainage. This stand was unique because it was spaced in 1986 during the peak of the outbreak. It was noted that larvae were moving from the spaced trees onto the crop trees during spacing and the project was discontinued after an estimated 15 ha were completed. Subsequent assessment determined that the combination of the budworm feeding on the newer foliage, the sawfly feeding on older foliage (ratio of sawfly to budworm was not determined in 1986, but was 2.7:1 on Graham Island in 1987) and spacing concentrating the populations on crop trees resulted in almost complete defoliation at this site in 1986. There was some evidence of beginning recovery in 1987 when the feeding activity in this area was already much reduced. The site was assessed to determine, over the long term, the effects of the epidemic in conjunction with spacing.

Assessments of the stand in 1991 indicate complete recovery with no evidence of mortality, top kill or major branch dieback. Minor branch tip dieback affecting a few branches in the mid and lower crowns of 14% of trees was attributed primarily to other causes such as S. strobilinus. An assessment of growth rates (based on one core from each of 10 plots) over this period indicates a dramatic growth reduction centered around 1987, the year following the most severe feeding (figure). Radial increment averaged 1.14 mm in 1987, only 38% of the growth recorded in 1984, the year before the outbreak. The collapse of the infestation after 1987 in conjunction with the spacing resulted in rapid and dramatic recovery with increment in 1990 averaging 7.15 mm, over six times the 1987 growth rate.

SPRUCE APHID SURVEY

Spruce aphid, after two years at near endemic levels, infested shoreline Sitka spruce from west of Queen Charlotte City to Tlell, as well as near Port Clements, Tow Hill and other areas. At Heather Lake spruce aphid was active in a young stand. To help determine the long term impact on young stands a damage appraisal plot of 20 trees was established. Aphids infested a maximum of 5% of current foliage in 10% of trees. Older foliage was infested in 100% of trees, with over 80% (maximum 84%) of foliage infested in 10% of trees; 10-80% of foliage attacked in 70% of trees, and less than 10% of foliage attacked in the remaining 20% of trees. Sampling was done in July during the period when aphids continued very active in this first year resurgence of the population. Leader lengths and branch tip lengths were measured on one branch per tree. At this early stage of investigation, no correlation was found between current growth and defoliation severity.

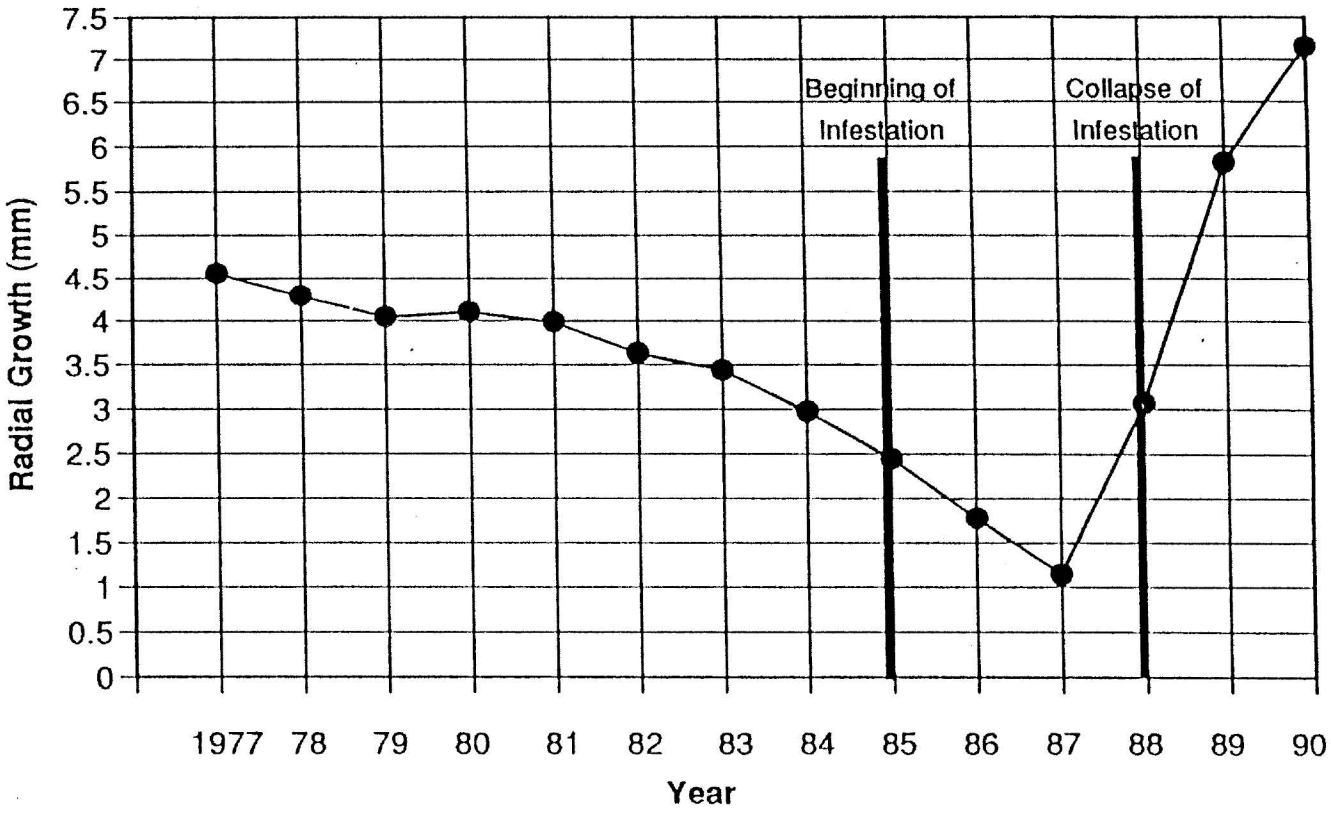

Figure. Radial increment of western hemlock in Tarundl Cr. plots defoliated by western blackheaded budworm and hemlock sawfly. Queen Charlotte Islands, 1991.

DISCUSSION

GREGORY AND HANGOVER CREEKS

Hemlock dwarf mistletoe

1. All regeneration currently infected with mistletoe will remain in patch harvest and clearcuts areas.

2. Understory not infected will probably become infected in all areas of patch clearcuts and single tree selection areas because of proximity to the overstory canopy of infected hemlock.

3. In larger clearcuts, any healthy understory not susceptible directly to edge effect infection will probably be infected by the near 50% of regen already infected.

4. Any natural hemlock that comes up after treatment has the potential to become infected.

5. Mortality caused by the mistletoe can be expected over time predominantly in: remaining current crop trees; in the regeneration already in the stand whether currently infected or not; and, in new seedlings as they reach an age to be more susceptible to the mistletoe.

Phellinus pini

Phellinus pini occurred at both Gregory and Hangover creeks and while visual evidence suggests this is a minor problem, the numerous snags at the Hangover Creek site indicate that, with the opening of these stands and increased wind access, more stem breakage due to heartrot may become apparent. Harvesting is not expected to directly affect the incidence of heartrot.

Western blackheaded budworm and hemlock sawfly

Hemlock sawfly populations continued at near endemic levels in both areas and western blackheaded budworm was not found. Based on personal communications with FIDS staff, other researchers and results of survey work over the years, it is evident that devastating outbreak cycles are most likely to develop in old growth stand conditions. The proposed treatments would not preclude these stands from the next outbreak cycle. The retention of an old growth component in these stands could foster large populations and impact would occur; due to the unusual juxtaposition of various stand conditions, severity of impact could not be predicted. Impact has been found to be most severe on middle-aged stands and young vigorous stands on good sites are minimally affected.

Blowdown

Blowdown is currently a serious problem in both stands. Studies, related to blowdown, completed or in process* on QCI could best assess potential impact. Historically, increasing wind access into the stand and exposing trees normally protected increases blowdown losses. Steep, unstable slopes could exacerbate this situation.

Armillaria ostoyae

While found in only two samples near one plot, root disease may be present elsewhere in the stands. Harvesting has been shown to accelerate the spread of the pathogen in some situations. Since the fungus is long lived and does well both as a saprophyte and a pathogen, new natural and planted stock may become infected as their roots come in contact with older infected stumps. Standing mature trees may also be infected in partial cut sections where infected stump roots may be in contact with leave tree roots.

Spruce aphid

While mortality caused by spruce aphid has been reported in other areas, proposed harvest activity at Gregory and Hangover creeks is not expected to increase susceptibility of the remaining stands.

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* Morris M. "Catalogue of Forest Reseach Projects on the Queen Charlotte Islands." South Moresby Forest Replacement Account Project 17. Nov. 1991.

WESTERN BLACKHEADED BUDWORM

Defoliation was severe, recovery was complete, and incremental losses over approximately three years were significant. Evidence from epidemics over the years suggests that young vigorous stands in the 20 year age bracket suffer considerably less than do older stands. The Tarundl Creek stand was severely defoliated for only one year, what would have resulted after two or three years of similar attack is uncertain. A survey of some of the numerous permanent plots, some in similar young stands, established during the epidemic, could further clarify the picture of western blackheaded budworm in young stands.

SPRUCE APHID

Trace or low to moderate aphid population levels appeared to have little effect on young spruce plantations in the first year of attack, as demonstrated at Heather Lake. Continued feeding damage over several years may well have some impact at least in reducing growth rates. Spruce aphid has been the cause of mortality in older stands after repeated severe defoliation over several years. Effects in young plantations appears not to have been well documented.

PROPOSALS FOR FIDS PROJECTS UNDER SMFRA

1. Re-examine Gregory and Hangover creek sites after harvest.

2. Set up permanent plots in a young stand in Rennell Sound, which mirrors conditions at Gregory and Hangover creeks, for annual pest monitoring.

3. Damage appraisal examination of other young stands where plots were established during the most recent WBHB outbreak, in an effort to corroberate the Tarundl Cr. findings detailed above.

4. Annual survey of spruce aphid at Heather Creek site to be augmented by assessments at other plot sites previously established if records of these sites are still available and if the sites can be found.

5. Special one time overview survey of pests in yellow cedar on QCI.

6. Assessment and monitoring of pests in yellow cedar through establishment of permanent plots.