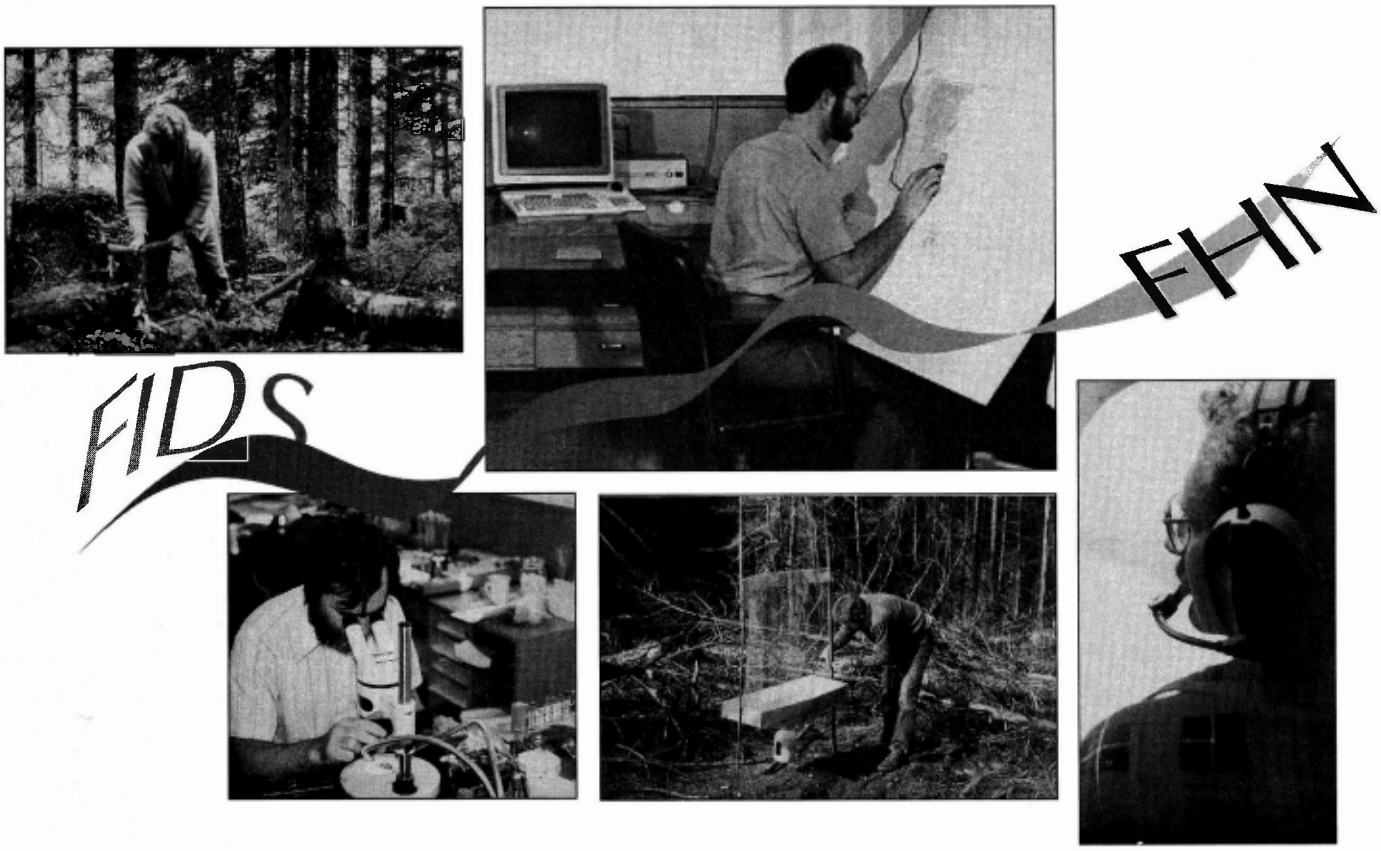
# Forest Insect and Disease Conditions Cariboo Forest Region – 1995

**Robert Erickson**

**Pacific Forestry Centre • FIDS Report 96-1**

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# Preface

The Canadian Forest Service (CFS) reorganization announced in the February 1995 federal budget, resulted in an overall reduction to five establishments across Canada focusing on science and technology development.

The Forest Health Network (FHN) is one of ten Canadian Forest Service Science and Technology networks organized to integrate research among the establishments and seek partnerships with other agencies and stakeholder groups. These networks will promote sustainable forest development and responsible use of Canada's forest resources. The networks reflect the two themes of the Science and Technology program: the acquisition and aggregation of knowledge related to understanding forest ecosystems, and the development of strategies for advancing sustainable forest development. Some of the networks relevant to insects and fungi include: Forest Health, Biodiversity, Effects of Forestry Practices, Pest Management Methods, and Landscape Management.

**National Priorities, Forest Health Network**

1. Monitor and report on changes in national forest health using an expanded and enhanced, ecosystem-based series of plots.

2. Provide, in collaboration with provincial cooperators, national overviews of major forest disturbances due to air pollutants, insects and diseases using nationally standardized monitoring systems with a quality assurance program. This will include national reporting as required by the **Canadian Criteria and Indicators Process for Sustainable Forestry**. The overview will include: area and severity of insect and disease attack; occurrence and associated damage caused by exotic species detrimental to Canadian forests; area and severity of any catastrophic forest depletion and indicators of biodiversity, climate change and forest health.

3. Maintain diagnostic expertise and working reference collections to provide the scientific foundation for support of forest biodiversity policies.

4. Maintain the national forest health database with access to all partners.

5. Participate in the planning and conduct of surveys, and pest risk analysis for exotic forest pests in cooperation with Agriculture and Agri-Food Canada.

6. Continue linkages with other Federal departments and collaborate with Provinces, universities, industry and international agencies.

7. Develop, test, and standardize monitoring techniques, forest health indicators and predictive models.

**Forest Health Network, Pacific Forestry Centre**

In 1996 the Forest Health Monitoring unit at CFS-Victoria will be comprised of seven senior Forest Health technicians. The insect and disease diagnostic capability along with the permanent reference collections and related databases will be retained, with increased emphasis on forest biodiversity aspects. The geographic information system (GIS) and the associated historical database will continue to provide support to the Forest Health unit and the national database.

**New Partnerships**

At this time of transition, we would like to again recognize the very significant support and cooperation provided by many agencies in helping the Canadian Forest Service deliver the annual forest insect and disease conditions reports in British Columbia and the Yukon Territories for several decades. Without the cooperation of employees from federal and provincial parks, Agriculture and Agri-Food Canada, the forest industry, and especially the British Columbia Ministry of Forests, the more than 50 years of insect and disease records affecting the nation's forest would not be as complete.

As the Forest Health Network evolves to fulfill the national aspects of the priorities noted above, we hope that this outstanding level of cooperation and partnership continues. We look forward to working together with our partners in 1996 and beyond.

Dr. Allan Van Sickle, Forest Health Unit Leader

# Introduction

This regional report outlines the status and impact of forest pests in British Columbia in the Cariboo Forest Region in 1995, and attempts to forecast some of their trends. Pests are discussed by host, in order of importance. It is compiled from information obtained mainly from field observations and collections by Forest Health during the 1995 field season, which extended from May 30 to September 30. There were 200 insect and disease samples and other pest data collected and pest damage was mapped and photographed during 40 hours of fixed-wing and 5.5 hours rotary-wing aerial survey, supplied by the British Columbia Forest Service.

Throughout this report, subjective terms "light", "moderate", and "severe" are used. When referring to insect and disease defoliators these are defined as follows:

Light : discolored foliage barely visible from the air, some branch tip and upper crown defoliation
Moderate : pronounced discoloration, noticeably thin foliage, top third of many trees severely defoliated, some completely stripped
Severe : bare branch tips and completely defoliated tops, most trees sustaining more than 50% total defoliation

When referring to bark beetle infestations throughout this report, the following criteria are used:

Light : 1-10% of stems killed
Moderate : 11-29% of stems killed
Severe : 30%+ of stems killed

The Forest Insect and Disease Survey has conducted an annual pest survey in the Cariboo Forest Region since the late 1930s and from an established field headquarters at Williams Lake since 1954. Inquiries can be directed to the new Forest Health Unit in the Cariboo Forest Region at the following address from May to September:

Canadian Forest Service
Forest Health Unit
Sidcum Sub., Comp. 33,
Williams Lake, B.C.
V2G 2V4, Ph. 392-6067

Forest health staff including the ranger, Insectary, and Herbarium may be reached at the address below:

Canadian Forest Service
Pacific Forestry Centre
506 West Burnside Rd.
Victoria, BC V8Z 1M5
Ph. 363-0600/363-0716
FAX 363-6005
Internet: BERICKSON@A1.PFC.FORESTRY.CA

## Summary

The following report summarizes forest pest conditions in the Cariboo Forest Region, based on the survey conducted by the Forest Health Unit in 1995. The pests are grouped by host and land tenure including Timber Supply Area (TSA).

The Cariboo Forest Region is located centrally in British Columbia on the interior plateau. There are three TSA's in the Cariboo Forest Region; Quesnel, Williams Lake and 100 Mile House. Not included in the TSAs are one Tree Farm License (TFL), the National Defense Department Training area near Riske Creek and two major provincial parks, Bowron and Ts'il-os. More detailed reporting for specific pests is available on request from FIDS, Pacific Forestry Centre, Victoria.

**Douglas-fir beetle** infestations decreased to 2930 ha in over 600 patches, from 5230 ha last year, from Quesnel to 100 Mile House but mainly in the Chilcotin Military Training Area near Riske Creek (2440 ha). **Western spruce budworm** infestations continued at low levels in the Clinton area. Larval numbers were high in beating collections, however, only trace defoliation was noted near Clinton along Big Bar Lake Road and on Hart Ridge, similar to 1994.

**Mountain pine beetle** infestations increased, killing lodgepole pine over 3850 ha in 980 separate infestations throughout the region, up from 1660 ha last year.

**Pine needle cast** disease on lodgepole pine increased slightly to 556 000 ha, from nearly 500 000 ha last year, mainly in the Chilcotin from Tatla Lake to Riske Creek in the Williams Lake TSA and in the 100 Mile House TSA. Similar widespread infection and defoliation occurred in the Chilcotin from 1981-85, and was suspected to have caused growth reduction especially in the younger trees.

The most common pests recorded in surveys of 21 **young stands**, 15-years-old or younger, treated under FRDA 1 and ll, were spruce and pine **terminal weevils**, **pine needle cast**, **needle rusts** and **mammals**.

Studies at **biomonitoring** and **acid rain plots** east of Quesnel, west of Williams Lake and east of Chasm indicated no effects on vegetation from acid rain.

The area and intensity of defoliation of trembling aspen by **forest tent caterpillar** decreased slightly to 47 200 ha of light to severe from Horsefly to Quesnel, down from 52 000 ha last year. The most severe damage occurred in the Quesnel area where large numbers of larvae had completely stripped aspen of foliage by the middle of June. Some stands had partially refoliated by the middle of July.

# Douglas-fir Pests

## Douglas-fir beetle
*Dendroctonus pseudotsugae*

The area of mature Douglas-fir recently killed by Douglas-fir beetle decreased for the second consecutive year in the Cariboo Forest Region to 2930 ha in 605 patches of 2-200 trees, down from 5230 ha in 1730 patches last year (Figure 1, Table 1). Over 80% of the total area infested in the region, 2440 ha, was mapped in the Chilcotin Military Block north of Riske Creek.

Elsewhere, beetle-killed trees were recorded from the Blackwater River near Quesnel, south along the Fraser River to the Clinton area, east of Williams Lake to Horsefly and west in the Chilcotin to the Homathko River.

Table 1. Douglas-fir beetle infestations, Cariboo Forest Region, **1995**,1994.

| Land tenure and location | Biogeoclimatic zones[1] | **1995** Area (ha) | **1995** Number of patches | 1994 Area (ha) | 1994 Number of patches |
|---|---|---|---|---|---|
| QUESNEL TSA | | | | | |
| Fraser R.- Narcosli Cr. | SBSk1,SBSk2 | 125 | 90 | 220 | 150 |
| WILLIAMS LAKE TSA | | | | | |
| Williams Lake, Horsefly, Alexis Creek | IDF, SBS | 330 | 335 | 780 | 1170 |
| NATIONAL DEFENSE | | | | | |
| DND Block, Riske Creek | IDF | 2440 | 140 | 4110 | 190 |
| 100 MILE HOUSE TSA | | | | | |
| Bonaparte R. | IDF, SBS | 35 | 40 | 120 | 220 |
| Total | | 2930 | 605 | 5230 | 1730 |

[1] SBSk1,k2: sub-boreal spruce, dry, warm.
SBS : sub-boreal spruce.
IDF : interior Douglas-fir.

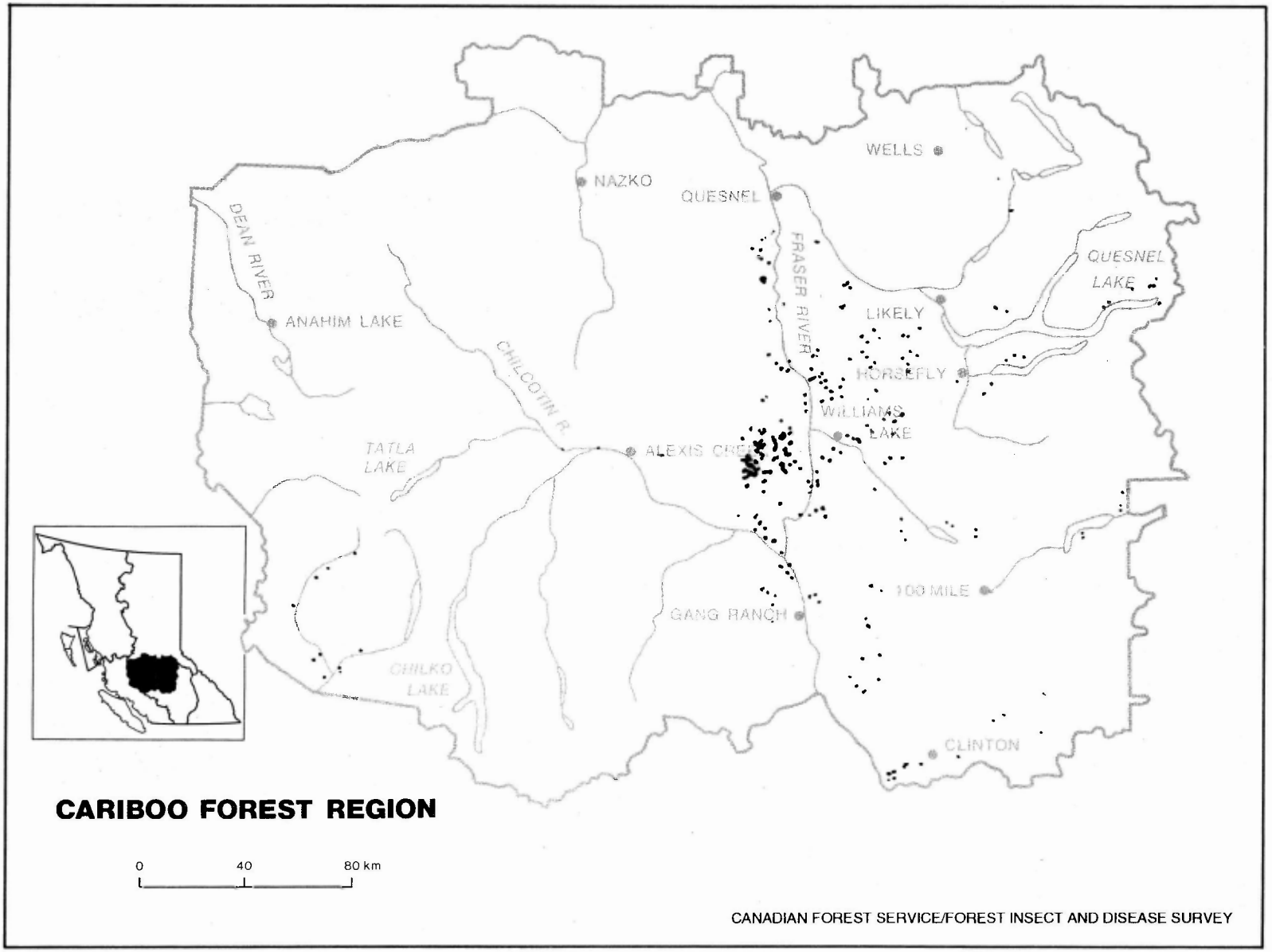


Figure 1. Areas of recent Douglas-fir mortality caused by Douglas-fir beetle, detected during aerial and ground surveys, 1995.

**Quesnel TSA**

Infestations of Douglas-fir beetle in **Quesnel TSA** decreased to 125 ha in 90 patches, down from 150 patches over 220 ha last year. The decrease resulted from salvage logging and host depletion. Infested trees were mapped mainly along the Fraser River north and south of Quesnel.

**Williams Lake TSA, Chilcotin Military Block**

The area of the outbreak continued to decrease in the **Williams Lake TSA** where 330 ha in 335 patches were located, down from 1170 patches totalling 780 ha in 1994. There also was a decrease in the **Chilcotin Military Block** near Riske Creek to 2440 ha in 140 separate patches from 4110 ha in 190 patches last year. Decreases in the block have resulted from host depletion, and improved tree vitality resulting from a sufficient supply of moisture during the growing season.

**100 Mile House TSA**

The decrease, which began last year, continued in **100 Mile House TSA**, where infestations declined to 35 ha in 40 patches from 120 ha in 220 patches last year. The most severe damage was recorded near Kelly and Loon lakes and along Bonaparte River. Control efforts in the TSA included helicopter logging in areas not accessible by ground-based skidding and hauling.

**1995 Survey**

Fixed-radius plots 0.24 ha in size were located throughout the outbreak to assess severity of attack (Tables 2,3, Figure 2). The plots showed **30%** (range 6-69%) of stems per hectare over 20 cm dbh were **currently attacked** at the 11 locations examined, up from an average 16% (range 1-33%) last year. The number of **recently killed red** trees, averaged 13% (range 2-30%), up from an average 11% (range 1-20%) last year. The average percent current attack and recently killed were higher in the DND Block. The locations of these plots were directed to active infestations, marked by a number of red trees.

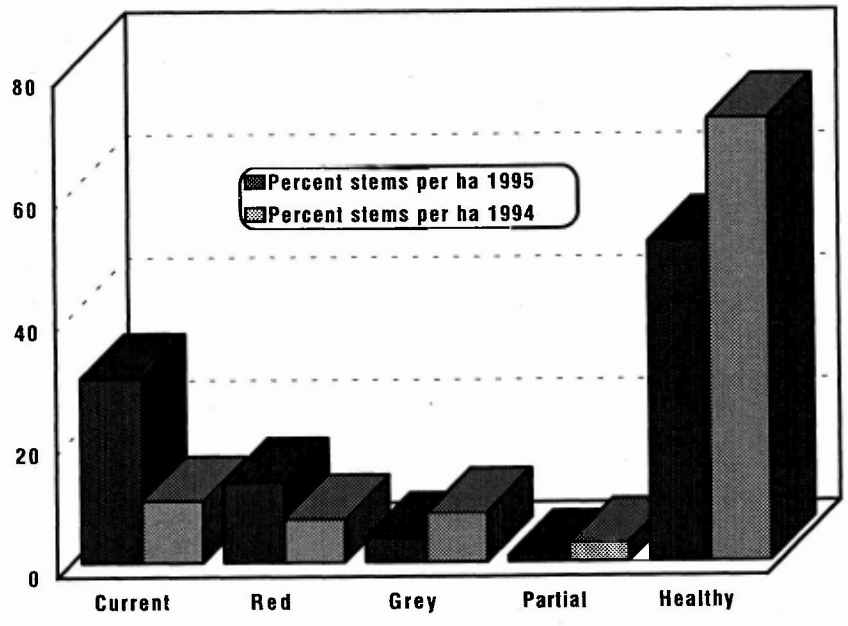


Figure 2. Douglas-fir beetle population status in 1994 and 1995, Cariboo Forest Region.

Table 2. Status of Douglas-fir beetle infestations in cruise plots in the Cariboo Forest Region, 1995.

| Land tenure and location | Percent of stems/ha | | | | |
|---|---|---|---|---|---|
| | Current[1] | Red | Grey | Partial | Healthy |
| NATIONAL DEFENSE | | | | | |
| Sapper L. | 39 | 15 | 2 | 0 | 44 |
| Goose L. | 69 | 2 | 0 | 0 | 29 |
| Long L. | 41 | 5 | 0 | 0 | 54 |
| Stack Valley | 23 | 9 | 6 | 3 | 59 |
| Davis Meadows | 53 | 5 | 3 | 0 | 39 |
| Moose Rd. | 25 | 15 | 5 | 0 | 55 |
| Horse Rd. | 8 | 19 | 2 | 0 | 71 |
| Callanan L. | 33 | 11 | 0 | 0 | 56 |
| E. of Fish L. | 15 | 9 | 14 | 0 | 62 |
| WILLIAMS LAKE TSA | | | | | |
| Alexandria | 16 | 30 | 8 | 1 | 45 |
| Essler | 6 | 19 | 6 | 6 | 63 |
| Average | 30 | 13 | 4 | <1 | 52 |

[1] Current = trees attacked in 1995; red = trees attacked in 1994; grey = trees killed prior to 1994.

Table 3. Status of Douglas-fir beetle infestations based on volume of Douglas-fir in cruise plots in the Cariboo Forest Region, 1995.

| Land tenure and location | Percent of volume per hectare ($m^3$) affected | | | | |
|---|---|---|---|---|---|
| | Current[1] | Red | Grey | Partial | Healthy |
| NATIONAL DEFENSE | | | | | |
| Sapper L. | 34 | 33 | 8 | 0 | 25 |
| Goose L. | 89 | 1 | 0 | 0 | 10 |
| Long L. | 53 | 7 | 0 | 0 | 40 |
| Stack Valley | 32 | 15 | 14 | 1 | 38 |
| Davis Meadows | 54 | 6 | 3 | 0 | 37 |
| Moose Rd. | 29 | 25 | 9 | 0 | 37 |
| Horse Rd. | 9 | 35 | 6 | 0 | 50 |
| Callanan L. | 48 | 8 | 0 | 0 | 44 |
| E. of Fish L. | 26 | 20 | 25 | 0 | 29 |
| WILLIAMS LAKE TSA | | | | | |
| Alexandria | 15 | 30 | 15 | 6 | 34 |
| Essler | 5 | 24 | 10 | 5 | 56 |
| Average | 36 | 19 | 8 | 1 | 36 |

[1] Current = trees attacked in 1995; red = trees attacked in 1994; grey = trees killed prior to 1994.

The largest beetle populations were recorded in the **Chilcotin Military Block** where an average 34% (range 8-69%) of stems per ha were infested, up from 20% (range 7-33%) last year.

Douglas-fir beetle prefers mature trees, which makes calculation of the results of surveys by **volume** a more accurate method of interpreting the effect of the beetle on the stand. By this method, 36% of the wood was currently attacked at the 11 locations surveyed throughout the epidemic area (Figure 3), up from 19% last year. When Douglas-fir beetle infestations have subsided, most of the harvestable wood volume in a typical stand has been removed and the only remaining trees are small. These 20-35 cm dbh stems are usually not susceptible to beetle attack.

There were an average 18 healthy Douglas-fir beetle larvae, pupae and adults per 900 $cm^2$ of bark surface, at the locations surveyed in 1995. The population was slightly larger this year, up from 15 per 900 $cm^2$ at other locations last year.

**Forecast**

As predicted in 1994, the outbreak continued this year, however some reductions occurred in number and size of infestations. The reductions may have resulted from the good growth and vigor of the host, especially in the spring and early summer.

Warmer than average and normal winters contribute to high percentages of overwintering brood survival. Weather records from the Atmospheric Environment Service at Williams Lake Airport showed monthly mean temperature in the winter months of 1991-92 were 4.4 C above normal. In 1992-93 the temperature averaged 1.5 C below the 1961-90, 30-year average; in 1993-94 the average monthly mean was normal, -5.8 C and in 1994-95 it was warmer at -4.5 C.

Control action, including trap trees and salvage logging, has been successful in most of the region, however some new attack will occur in 1996. The amount depends on the 1995-96 winter temperatures, the susceptibility of the host in 1996 and the extent of the control action undertaken by forest managers.

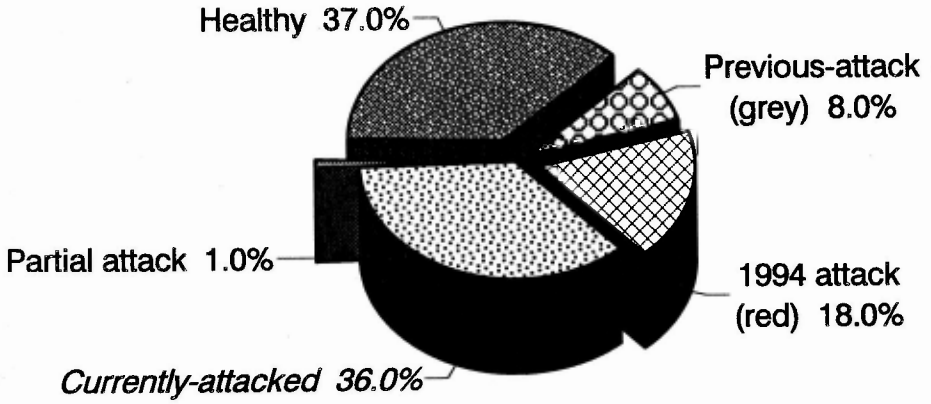


Figure 3. Depletion of stand volume by Douglas-fir beetle, Cariboo Forest Region, 1995

Douglas-fir beetle will continue to be a major pest of mature and overmature Douglas-fir in the Cariboo Forest Region, with fluctuations from year to year (Figure 4). Losses can be reduced using sound management techniques such as trap trees and single tree disposal. Infestations in the DND block especially and elsewhere throughout the region, will continue until the susceptible old growth Douglas-fir is depleted. Including only those infestations recorded this year, approximately 439 500 $m^3$ (including current, red and grey attack categories) has been killed. This is not a cumulative figure but the effects of beetle infestations based on the area mapped in 1995. Sale of the timber affected, at an average 1995 market price of $100.00 per $m^3$, would have realized approximately $43 950 000, down from $70 500 000 (based on a 1994 value of $80.00/$m^3$) last year.

## Western spruce budworm
*Choristoneura occidentalis*

No defoliation of Douglas-fir by western spruce budworm was mapped during aerial surveys this year in the Cariboo Forest Region. However, during ground assessments localized populations were recorded that resulted in trace defoliation at several locations, including Big Bar Lake road, Hart Ridge and Kelly Lake.

### Survey

The number of male moths caught in five pheromone-baited Multipher® traps at Bridge Lake averaged 31, down from an average of 34 trapped last year. There were no larvae collected at this permanent, budworm monitoring plot.

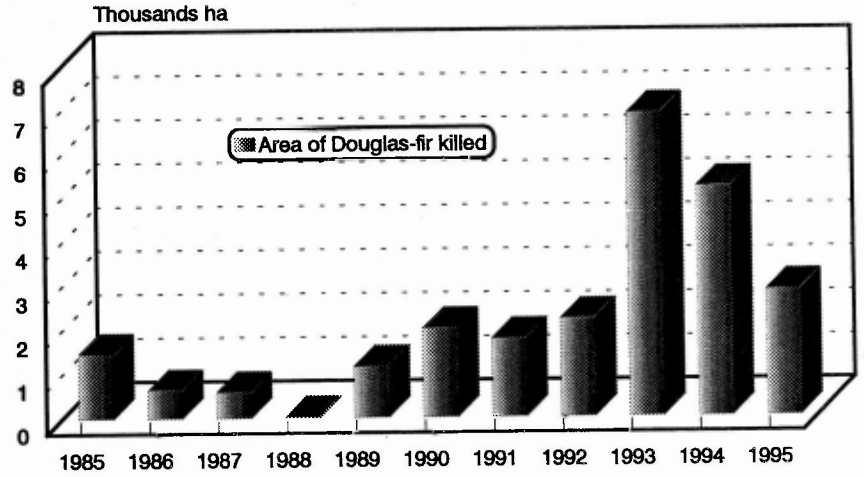


Figure 4. Douglas-fir beetle infestations, Cariboo Forest Region, 1985-95

**Forecast**

Egg counts at two locations near Clinton averaged 230 egg masses/10 $m^2$ of foliage indicating[1] severe defoliation in 1996 at Kelly Lake and Big Bar Lake road. Parasitism, disease and abnormally cool wet weather could reduce the population and the severity of the defoliation.

Budworm populations are dependent on climate, as are other defoliators. Warm, dry weather in the spring of 1996 could contribute to an increase in the area infested.

## Pine Pests

### Mountain pine beetle
*Dendroctonus ponderosae*

The area of lodgepole pine recently killed in Cariboo Forest Region by mountain pine beetle more than doubled to 3850 ha from 1660 ha last year; however, the number of separate infestations decreased slightly to 980 from 1180 (Table 4, Figure 5). Small infestations coalesced reducing the total number of single patches.

**Quesnel TSA**

The number of infestations decreased to 315 from 370 but the area doubled to 1020 ha from 570 ha last year in **Quesnel TSA**, mainly south and west of the city of Quesnel. The most severe infestations were mapped in the Narcosli-Twan creeks area; north of Quesnel in TFL 5; near Charleson Creek and in the Nazko area. Additionally and not included in the TSA total, were approximately 100 ha of recently killed lodgepole pine reported by BCMF in Tweedsmuir Provincial Park near Segulet Lake.

**Williams Lake TSA, Chilcotin Military Block**

Mountain pine beetle infestations in **Williams Lake TSA** more than doubled in area to 1750 ha from 840 ha last year. The number of patches however, decreased to 520 from 550 last year, 53% of the regional total. Major increases occurred in the Big Lake area and north of Riske Creek near Makin Creek.

Infestations increased nearly ten-fold in the **Chilcotin Military Block** to 980 ha from 100 ha last year. Recently killed trees were mapped in 70, 1-120 ha patches, mainly in the northern part of the block near Mackin Creek and Meldrum Lake.

**100 Mile House TSA**

Infestations continued in **100 Mile House TSA**, where severe tree mortality was mapped over 90 ha in 70 patches, down slightly from 125 ha in 215 patches last year. The reduction is mainly due to prompt and effective management of small infestations.

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[1] 1-50 egg masses/10 $m^2$ of foliage = light defoliation
51-150 egg masses/10 $m^2$ of foliage = moderate defoliation
151+ egg masses/10 $m^2$ of foliage = severe defoliation

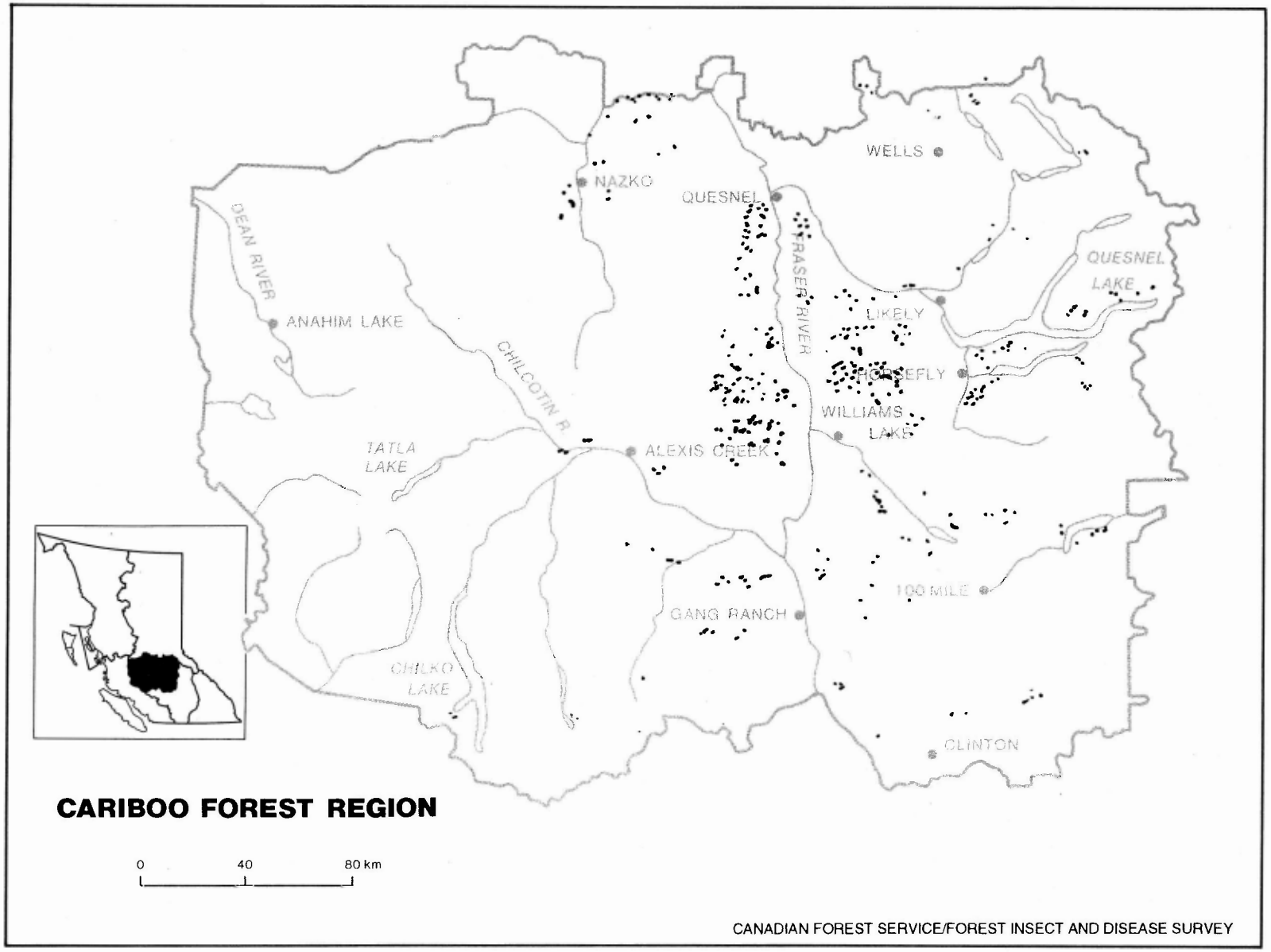


Figure 5. Areas of recent lodgepole pine mortality caused by mountain pine beetle, detected during aerial and ground surveys, 1995.

Table 4. Mountain pine beetle infestations, Cariboo Forest Region, **1995**,1994

| Land tenure and location | **1995** Area (ha) | **1995** Number of infestations | 1994 Area (ha) | 1994 Number of infestations |
|---|---|---|---|---|
| QUESNEL TSA | | | | |
| Narcosli Cr.-Quesnel R.-Nazko R. | 1020 | 315 | 570 | 370 |
| WILLIAMS LAKE TSA | | | | |
| Chilcotin-Horsefly | 1750 | 520 | 840 | 550 |
| NATIONAL DEFENSE | | | | |
| DND Block, Riske Creek | 980 | 70 | 100 | 35 |
| 100 MILE HOUSE TSA | | | | |
| 100 Mile House area | 90 | 70 | 125 | 215 |
| PROVINCIAL PARK | | | | |
| Ts'il-os Park | 10 | 5 | 25 | 10 |
| Total | 3850 | 980 | 1660 | 1180 |

**Provincial Park**

The decline continued in infestations in **Ts'il-os Provincial Park**, including Chilko and Taseko lakes. A few 1-ha to 5-ha patches were mapped along Franklyn Arm and from Chilko Lake to Taseko Lake.

**1995 Survey**

An average of 16% (range 4-30%) of the stems were attacked at ten locations examined throughout the infestation (Table 5, Figure 6), up slightly from an average 15% last year. Recently-killed (red) trees averaged 17% of stems per ha and old dead (grey) averaged 3%, little changed from 16% and 3% last year.

Over 5000 pheromone baits were used by forest managers in all forest districts in or near small infestations to contain the beetle flight within infested stands for single tree disposal. These methods are sometimes effective to control expansion of infestations, especially when used along with control/salvage logging.

The mountain pine beetle flight and attack resulted in populations of 20+ larvae per 900 $cm^2$ of bark surface at most of the infestations examined. Overwintering survival of the mountain pine beetle brood should be high under normal winter temperatures.

Table 5. Status of mountain pine beetle populations in cruise plots in the Cariboo Forest Region, 1995.

| Land tenure and location | Percent of stems/ha | | | | |
|---|---|---|---|---|---|
| | Current[1] | Red | Grey | Partial | Healthy |
| QUESNEL TSA | | | | | |
| Herkyelthtie | 24 | 12 | 6 | 6 | 52 |
| WILLIAMS LAKE TSA | | | | | |
| Likely Rd. | 22 | 8 | 0 | 0 | 70 |
| Mackin Cr. | 7 | 24 | 3 | 2 | 64 |
| Meldrum Cr. | 9 | 21 | 6 | 2 | 61 |
| Jackson L. | 30 | 12 | 4 | 6 | 49 |
| NATIONAL DEFENSE | | | | | |
| Stack Valley | 14 | 7 | 0 | 4 | 75 |
| Deer Trail #1 | 4 | 27 | 0 | 1 | 68 |
| Deer Trail #2 | 11 | 29 | 6 | 0 | 54 |
| Deer Trail #3 | 23 | 26 | 1 | 0 | 50 |
| Shell Creek | 19 | 1 | 0 | 0 | 80 |
| Average | 16 | 17 | 3 | 2 | 62 |

[1] Current = trees attacked in 1995; red = trees attacked in 1994; grey = trees killed prior to 1994.

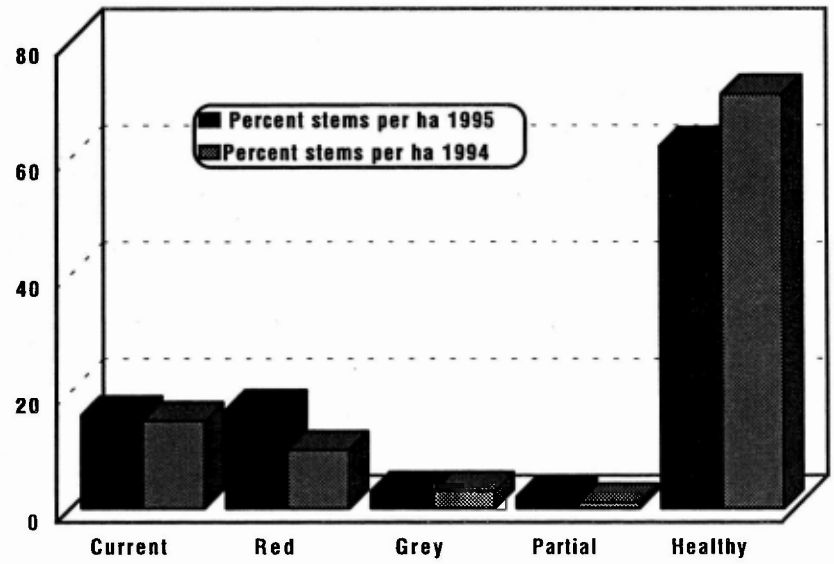


Figure 6. Mountain pine beetle population status in 1994 and 1995, Cariboo Forest Region.

**Forecast**

Similar to the past two years, the mountain pine beetle outbreak can be expected to increase in the Cariboo Forest Region in 1996, with existing infestations expanding and new ones beginning near the old and at other locations. Areas of mature lodgepole pine in the large expanses of pine forest approaching susceptible age classes throughout the region should be considered high hazard. Mountain pine beetle populations can be temporarily reduced by predators, disease and inclement weather; however the beetle will persist in mature pine stands until the mature pine stand component is depleted.

At the infestations examined, the total volume of pine recorded as either current attack, red and grey averaged 108 $m^3$/ha. Extending this figure to all infestations in the region results in an estimate of 415 800 $m^3$ of pine killed in 1994-95, or about $37 420 000 of wood product lost before deducting revenue gained through salvage efforts.

Annual population increases have occurred simultaneously over widespread areas in the Cariboo Forest Region. Certain weather and stand conditions can cause rapid increases of beetle populations resulting in catastrophic infestations such as those seen through the 1980's (Figure 7). In the past, forest pests were not as closely monitored and slight changes in pest populations often went unnoticed. Timely modern forest management practices, hinging on annual detection surveys, can be effective in reducing the rate of population increase and the resulting damage if the infestations are treated as soon as detected.

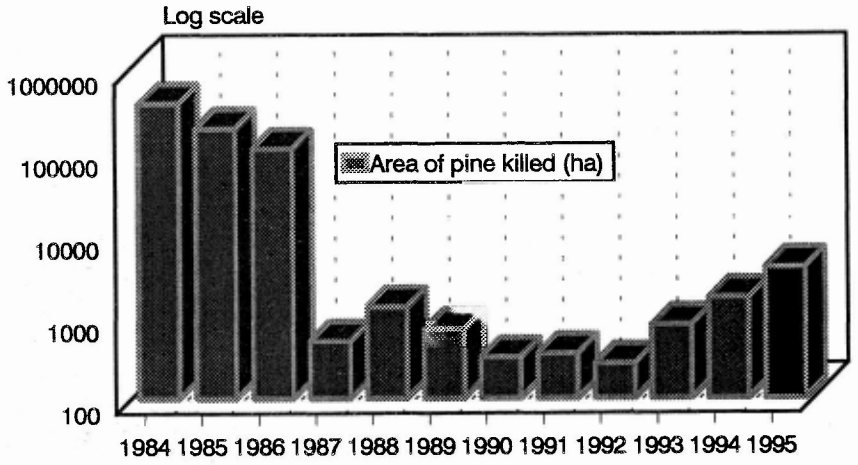


Figure 7. Mountain pine beetle infestations, Cariboo Forest Region, 1984-95.

## Pine needle cast
*Lophodermella concolor*

The area of lodgepole pine discolored by the pine needle cast fungus, *L. concolor,* increased again this year to 556 000 ha light and moderate from 495 300 ha light to severe last year, mainly in the 100 Mile House and Williams Lake TSA's (Figure 8). In the sixth consecutive year of infection in the region, all sizes of trees were affected; however, the highest amount of suspected growth loss, was restricted to pine regeneration 1-5 m high. Up to 90% of the one-year-old foliage on these trees was discolored in the largest area of pine needle cast ever recorded in the Cariboo Forest Region.

New areas of pine infection were recorded over 5000 ha near Webster and Twan creeks in the southern part of **Quesnel TSA**.

In **William Lake TSA** in the Chilcotin, mainly young pine were lightly and moderately discolored by the pine needle cast in 31 large patches over 268 400 ha from Riske Creek to Tatla Lake. The most severe infection in the TSA occurred in the Alexis Creek area.

More than 50% of the total area infected was in the **100 Mile House TSA**. Needle discoloration of pine was light and moderate in four large patches along both sides of Loon Lake over 29 400 down from 40 000 in 1994. Light to moderate needle discoloration was also mapped northwest of Clinton to Big Bar Lake in 19 patches over 46 000 ha, up from 29 400 ha last year and in three patches over 51 000 ha, up from 37 500 ha in 1994 west of Highway #97 from 70 Mile House to 100 Mile House. East of Highway #97, pine was discolored near Green Lake over 30 000 ha similar to last year. Infection expanded near Sulphurous Lake and south of Bridge Lake to Deadman River over 112 000 ha in five polygons, up slightly from 104 600 ha last year.

There was an average 56% total defoliation (range 0-90%) of trees 1 - 5 m high in five permanent damage appraisal plots. They were established at representative locations throughout the infection to assess the damage from infection by this fungus over the next four years. Trees were selected and marked for later re-assessment in circular plots with a radius from 3.9 m - 4.9 m.

The damage to young lodgepole pine is probably more severe than mature trees, since the susceptible one-year old needles represent a large percentage of each trees foliage. Loss of these needles means a loss of growth potential for the year. Chronically infected trees appear "tufted" since only the current foliage remains. Infection of needles occurs during June and July, the summer before the discoloration is visible. Damage will continue if moist weather conditions suitable for the spread of the fungus occur next summer. Pine needle cast in Cariboo Forest Region could be more severe in 1996, since there was 65% more precipitation than normal in June and July,1995 (Environment Canada).

## Lodgepole terminal weevil
*Pissodes terminalis*

The severity and incidence of attack in young lodgepole pine terminals was much greater this year, averaging about 12% of stems, up from <1% in 1994 in stands was examined. Areas sustaining the most severe attack were located in cutblocks reforested to pine in the western parts of the region, near Alexis Creek where consecutive mild winters have promoted a buildup of weevil populations. Populations and damage has fluctuated in the past, peaking at nearly 20% average attack in 1986, mainly in the Chilcotin.

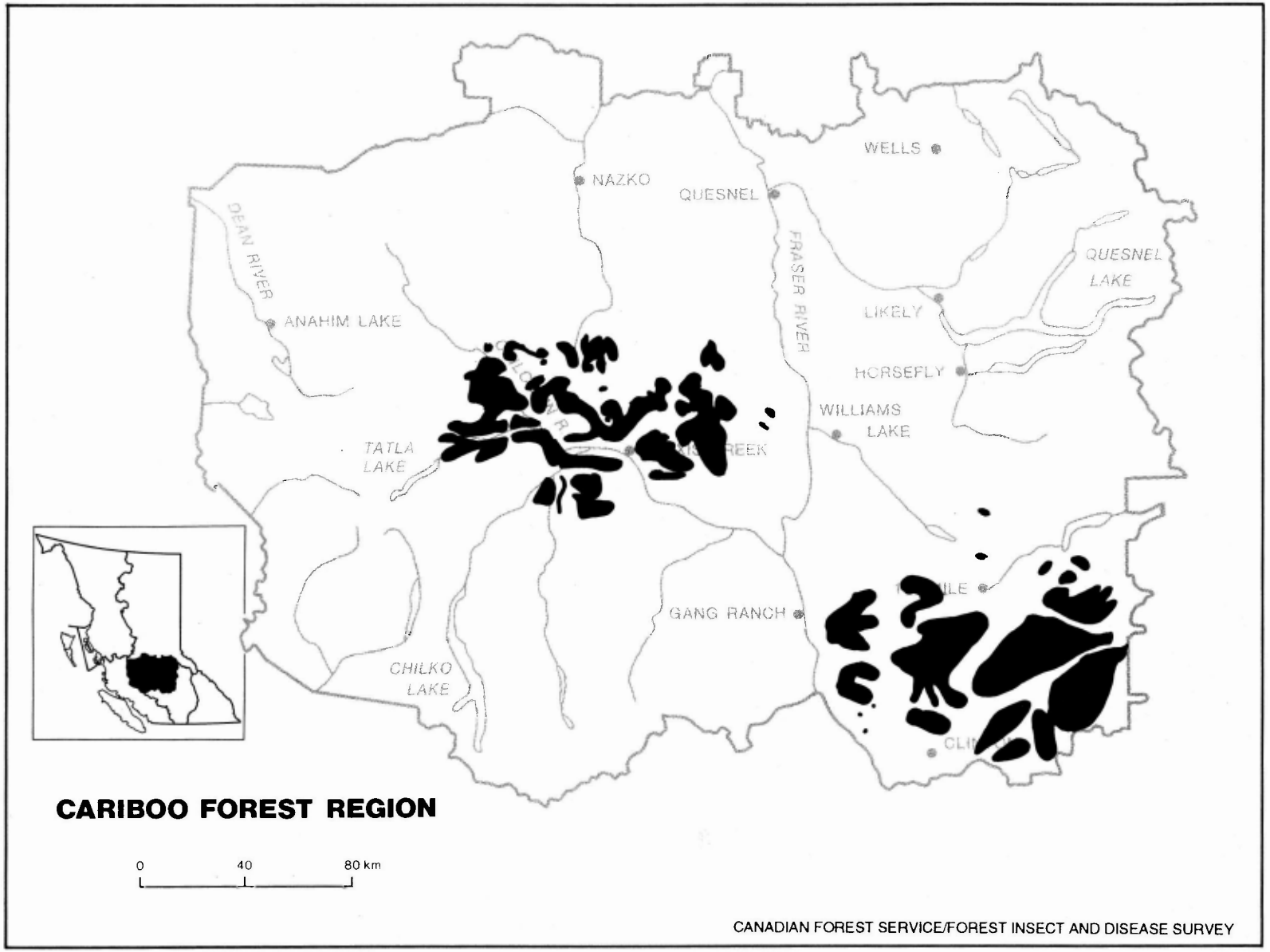


Figure 8. Areas of lodgepole pine discoloration caused by pine needle cast fungi, detected during aerial surveys, 1995.

# Spruce Pests

## Spruce beetle
*Dendroctonus rufipennis*

There were 29 small, 0.5-ha to 3-ha patches of recently killed mature Engelmann spruce mapped totalling 35 ha in the eastern part of Cariboo Region from Bowron Park to Horsefly River, down from 40 infestations over 60 ha last year. No other increases in spruce beetle populations were noted in the region.

Forest Insect and Disease Survey records show that three major spruce beetle epidemics have occurred in the Cariboo Forest Region since 1962. From 1962-65 near Big Valley Creek and Cottonwood River; from 1969-70 near Cottonwood River and Cariboo Lake and 1980-86, in Bowron Provincial Park and at other scattered locations near the park. The largest infestation peaked at 26 260 ha in 1970. All of these outbreaks began with large-scale blowdown and usually followed the same pattern of population increase in the windfall concentrating the number of emerging beetles, resulting in more successful attack in standing green trees. Weather conditions at the time contributed to widespread moisture stress in mature trees enhancing the success of beetle attack.

**Forecast**

There were no ground surveys completed for spruce beetle in 1995; however, current populations levels will probably continue throughout the region, based on past spruce beetle infestations. Forest managers in Cariboo Forest Region must continue to place high priority on the salvage of spruce blowdown to control spruce beetle populations in all mature spruce stands.

## Two-year-cycle spruce budworm
*Choristoneura biennis*

No defoliation of spruce and alpine fir was recorded this year in the immature year of two-year-cycle spruce budworm in the region, following 110 520 ha light and moderate defoliation from Barkerville to Mahood Lake last year. Next year however, based on past infestations, high elevation spruce and alpine fir stands will likely be defoliated again as the small overwintering larvae mature in the spring. The effect of severe defoliation by two-year budworm on spruce and alpine fir is often ameliorated by a year of little or no damage, allowing some recovery of stand vitality. Considerable top-kill, branch dieback and growth loss on spruce and alpine fir is the result of intensive defoliation by spruce budworm.

# Alpine Fir Pest

## Western balsam bark beetle
*Dryocoetes confusus*

Western balsam bark beetle infestations continued in high elevation spruce-alpine fir stands throughout the region over 1700 ha in 38 separate patches, down slightly from 2500 ha in 65 patches in 1994.

The most severe and widespread damage was noted over 1160 ha in 12 separate patches in the Hendrix Lake - Crooked Lake area where it has been recorded for years. Recently killed trees were also mapped over 540 ha in 26 patches throughout several drainages near Chilko Lake, Sardine Creek in the higher elevation stands between Quesnel and Fraser rivers and in Bowron Provincial Park.

Western balsam bark beetle infestations are chronic in many parts of the region. The number of trees killed fluctuates slightly from year to year, generally continuing until the mature fir component of the stand is depleted. Western balsam bark beetle is a chronic pest of spruce-true fir stands throughout the region and based on historical trends, tree mortality is expected to continue next year.

## Western Hemlock Pest

### Western hemlock looper
*Lambdina f. lugubrosa*

Western hemlock looper populations collapsed in mature western hemlock and western red cedar stands in the eastern portion of the region in late 1993. There was no defoliation or larval population recorded in the region this year.

**Damage appraisal**

In cooperation with B.C. Forest Service, four mortality plots were established at remote locations along Quesnel Lake in 1992 to monitor damage caused to western hemlock and western red cedar by western hemlock looper.

The mortality averaged 38% of stems (range 11-57%) at the four plots, up from an average 35% in 1994, and 6% in 1993 (Table 6). The plot trees also had an average 1.7 m top kill, similar to last year.

Table 6. Condition of trees in western hemlock looper appraisal plots 1992-95, Cariboo Forest Region, 1995.

| Location | Average tree defoliation[1] (percent) 1992 | Total no. of dead trees | | | | Average top-kill (m) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **1995** | 1994 | 1993 | 1992 | **1995** | 1994 | 1993 | 1992 |
| Bouldery Cr. | 96 | 57 | 51 | 12 | 0 | 1.5 | 1.5 | 1.3 | 0.4 |
| Summit Cr. | 78 | 38 | 37 | 4 | 0 | 2.5 | 2.5 | 2.0 | 0.4 |
| Killdog Cr. | 84 | 45 | 43 | 6 | 0 | 1.0 | 1.1 | 0.8 | 0 |
| Lynx Peninsula | 74 | 11 | 8 | 3 | 1 | 1.9 | 1.8 | 1.7 | 0 |
| Average | 83 | 38 | 35 | 6 | <1 | 1.7 | 1.7 | 1.4 | <1 |

[1] There was no new defoliation in 1994 or 1995.

Stands defoliated for at least two years were cruised and 100 western hemlock, western red cedar and alpine fir over 10-cm dbh were selected and marked for later examination at each of Bouldery, Summit, and Killdog creeks and Lynx Peninsula. These plots will be re-examined for several years to obtain an accurate estimate of tree mortality caused by successive years of moderate and severe defoliation. FIDS records of previous infestations show that most tree mortality occurs in the **second** and **third** year **after** the population collapse. Tree mortality in previous infestations averaged from 30-50% of stems per hectare and insects such as hemlock bark beetle, *Pseudohylesinus tsugae,* in the upper bole and western larch borer, *Tetropium velutinum,* in the mid bole were abundant in the dead trees.

Higher rates of mortality occurred in the plots with the most severe defoliation in 1992. The highest was 57% at plot 1, at Bouldery Creek, where steep slopes amplified water stress on the stand. Plot 2 at Summit Creek sustained 38% mortality. Killdog Creek plot 3 had 45% and at Lynx Peninsula only 11% of the plot trees were killed. The stand at Lynx Peninsula, plot 4, is 63% western red cedar, compared to 19% at plot 1, 35% at plot 2 and 36% at plot 3. All plots contained trees nearly dead with only two or three remaining green branches. These were recorded as moribund and are likely to die in the future. There were eight such trees at Bouldery Creek, eight at Summit Creek, nine at Killdog Creek and six at Lynx Peninsula. If these trees were included in the mortality calculations the average mortality at all plots would be 45%.

Tree mortality occurred throughout the range of tree diameters which averaged 51.2 cm (range 14.7 - 175 cm). However, most trees killed were slightly smaller than the plot averages. At Bouldery Creek the average dbh of plot trees was 45.0 cm and the average diameter of dead trees was 34.6 cm. At Summit Creek, the average dbh of all trees was 87.1 cm and the dead trees averaged 77.3 cm; at Killdog Creek the plot average was 65.2 cm and the dead stems averaged 56.7 cm. The average for the Lynx Creek plot was 36.0 cm and the dead stems about the same at 36.1 cm.

The presence of heart rot, caused by *Echinodontium tinctorium*, was noted but not assessed. Secondary insects were not an obvious factor in the mortality of the trees.

Ambrosia beetle attacked 18% of the dead western hemlock plot trees at Killdog Creek in early June. None of the dead trees in the other plots was attacked. There was a larger population of ambrosia beetles at Killdog Creek due to recent nearby logging.

**Forecast**

No egg surveys were carried out in 1995 and no moths were caught in either of two pheromone-baited Multipher traps placed at km 6109 and km 6117, Bouldery Creek Road east of Horsefly.

Western hemlock looper populations are expected to remain low in 1996 in Cariboo Forest Region, based on larval sampling and moth traps. Tree mortality is expected to be slightly higher than that recorded this year, possibly by up to the 8% recorded in the plots as moribund this year.

# Pests of Young Stands

Young stands managed under the Forest Resource Development Agreement (FRDA), were surveyed at 21 locations in the region to assess pest incidence and severity. None of the stands examined was completely pest free. The most common pest recorded was pine needle cast causing up to 90% defoliation of some trees. The treatments carried out included mainly spacing, in stands needing release or rehabilitation.

The young stands examined were scattered throughout four biogeoclimatic zones in all three TSAs. Lodgepole pine, Douglas-fir, and Engelmann spruce were the main host components. Natural and planted regeneration up to 15 years old were sampled using fixed radius plots, (radius range 3.26 - 4.90 m) on transects through the plantations, recording a minimum of 10 plots and 100 trees per stand (Table 7).

Table 7. Pests of young stands surveys, Cariboo Forest Region, 1995.

| Host and pest | Severity index[1] | No. of stands affected | Percent of trees affected |
|---|---|---|---|
| **Lodgepole pine - 2173 trees in 20 stands, 0 stands pest free, major[2] tree species in 18.** | | | |
| Dwarf mistletoe | 5 | 2 | 2 |
| Western gall rust | 5 | 5 | 2 |
| Lodgepole terminal weevil | 4 | 4 | <1 |
| Pine needle cast | 3 | 19 | 68 |
| Lodgepole pine weevil | 3 | 3 | 4 |
| **Douglas-fir - 423 trees in 4 stands, 0 pest free, major species in 3.** | | | |
| Conifer- cottonwood rust | 3 | 3 | 4 |
| **Engelmann spruce - 103 trees in 7 stands, 0 pest free, major species in none.** | | | |
| Spruce weevil | 4 | 1 | <1 |
| Cooley spruce gall aphid | 3 | 3 | 3 |
| **Total: 2699 trees in 21 stands; 654 trees were pest free however no stands were pest free.** | | | |

[1] Severity index: 1. Pest free
2. Negligible damage
3. Loss of current growth potential
4. Loss of long term growth potential and volume
5. Life threatening
6. Mortality

[2] Major is more than 50%.

Overall, 40% of the trees examined in the 21 plots were pest free, down from an average 70% last year. Pine needle cast, caused by *Lophodermella concolor*, increased again and was widespread throughout the region. It was the most common pest in 19 of the 20 plots containing pine. Needle cast symptoms discolored an average 43% of the lodgepole pine foliage examined in the POYS plots and 56% at the five permanent plots established throughout the infection.

The number of lodgepole pine terminals recently killed by lodgepole terminal weevil, *Pissodes terminalis,* averaged less than one percent in four stands attacked, up slightly from 1994, but less than the average 12% recorded in other randomly chosen stands.

The health of young stands is an integral part of forest management and will continue to demand more management resources.

## Multiple Host Pests

### Biomonitoring/Acid rain

There was no mortality or damage associated with acid rain in the three biomonitoring/**A**cid **R**ain **N**ational **E**arly **W**arning **S**ystem (**ARNEWS**), plots in the Cariboo Forest Region, re-examined in June and August, 1996. These plots are located near the Cottonwood River east of Quesnel, west of Williams Lake near Felker Lake and east of Chasm along the Bonaparte River. Further study was carried out in September in the form of foliage sampling for chemical analysis and other tree re-measurements. The Cottonwood plot has been monitored for nine consecutive years with no evidence of change in the condition of plant or lichen growth, except for the minor effects of normal insect and disease conditions.

The ARNEWS plot network was initiated in 1984 when the Canadian Forest Service established a national program to detect early signs of air pollution damage in Canada's forests. Since that time more than 150 ARNEWS plots have been established across Canada; more than 10 000 trees are annually monitored in the plot network.

Annual examinations of the plots includes assessment of tree condition and pest damage, re-examination of the ground cover in the four vegetation subplots, and photography and foliar evaluation of other tagged trees and chemical evaluation of foliage from trees adjacent to the plot. Soils were also analyzed at the time of plot establishment and will be re-examined periodically.

To date at plot 915 at Cottonwood, seven trees have been removed, three were felled by firewood cutters, two were killed by root rot caused by *Inonotus tomentosus,* and two were windfalls. There was trace to light discoloration of year-old needles of lodgepole pine in the plot by the fungus causing pine needle cast, *Lophodermella concolor.* Plot 929 at Bonaparte River had five dead standing ponderosa pine when the plot was first surveyed and one additional death of a suppressed pine tree. There was no recent or old mortality at the Felker Lake plot 922; however, there was trace to light infection of the foliage of all plot and off-plot pine by pine needle cast fungi.

The Canadian Forest Service is concerned about the potential effects of airborne pollutants and acid rain on Canada's forests. Monitoring of the plots will continue in 1996.

### Salt damage

Multi-age roadside Douglas-fir and western red cedar were damaged by spray and seepage of salt, applied last winter for 5 km along the east side of Canim Lake. Damage varied from single defoliated branches to whole tree mortality. Douglas-fir and engraver beetles contributed to tree mortality but were not considered major factors.

Mainly Douglas-fir were affected north of Williams Lake along the Mackin Creek Road from Comer to the Rudy Johnson Bridge over the Fraser River. Again, damage ranging from partial defoliation to tree mortality was evident in a 10 m wide strip along the lower side of the road for 4 kms. Elsewhere in the region there was no salt damage recorded. Damage to roadside trees was an annual occurrence in the late 1980's up until 1991, the last year of widespread defoliation and tree mortality.

## Deciduous Tree Pests

### Forest tent caterpillar
*Malacosoma disstria*

Mainly trembling aspen were lightly to severely defoliated over 47 200 ha in 172 separate patches from Quesnel to Horsefly, down from 52 000 ha in 470 infestations last year (Table 8, Figure 9). The major part of the infestation had shifted from near Horsefly in 1994, northward to the Quesnel area.

Table 8. Area of aspen defoliated by forest tent caterpillar, Cariboo Forest Region, **1995**, 1994.

| TSA and Location | Area of defoliation (ha) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Light | | Moderate | | Severe | | Total | |
| | **1995** | 1994 | **1995** | 1994 | **1995** | 1994 | **1995** | 1994 |
| QUESNEL TSA | | | | | | | | |
| Quesnel | **500** | 720 | **3200** | 0 | **15 900** | 7200 | **19 600** | 7920 |
| Quesnel R. | **2000** | 1010 | **9700** | 5500 | **3400** | 14 100 | **15 100** | 20 610 |
| N.W.Quesnel | **0** | 0 | **5000** | 4200 | **1000** | 1500 | **6000** | 5700 |
| WILLIAMS LAKE TSA | | | | | | | | |
| Horsefly-Big L. | **2700** | 1900 | **2500** | 6200 | **0** | 1940 | **5200** | 10 040 |
| Likely-Beaver Cr. | **800** | 980 | **0** | 4350 | **0** | 500 | **800** | 5830 |
| Tyhee L. | **500** | 1900 | **0** | 0 | **0** | 0 | **500** | 1900 |
| Totals | **6500** | 6510 | **20 400** | 20 250 | **20 300** | 25 240 | **47 200** | 52 000 |

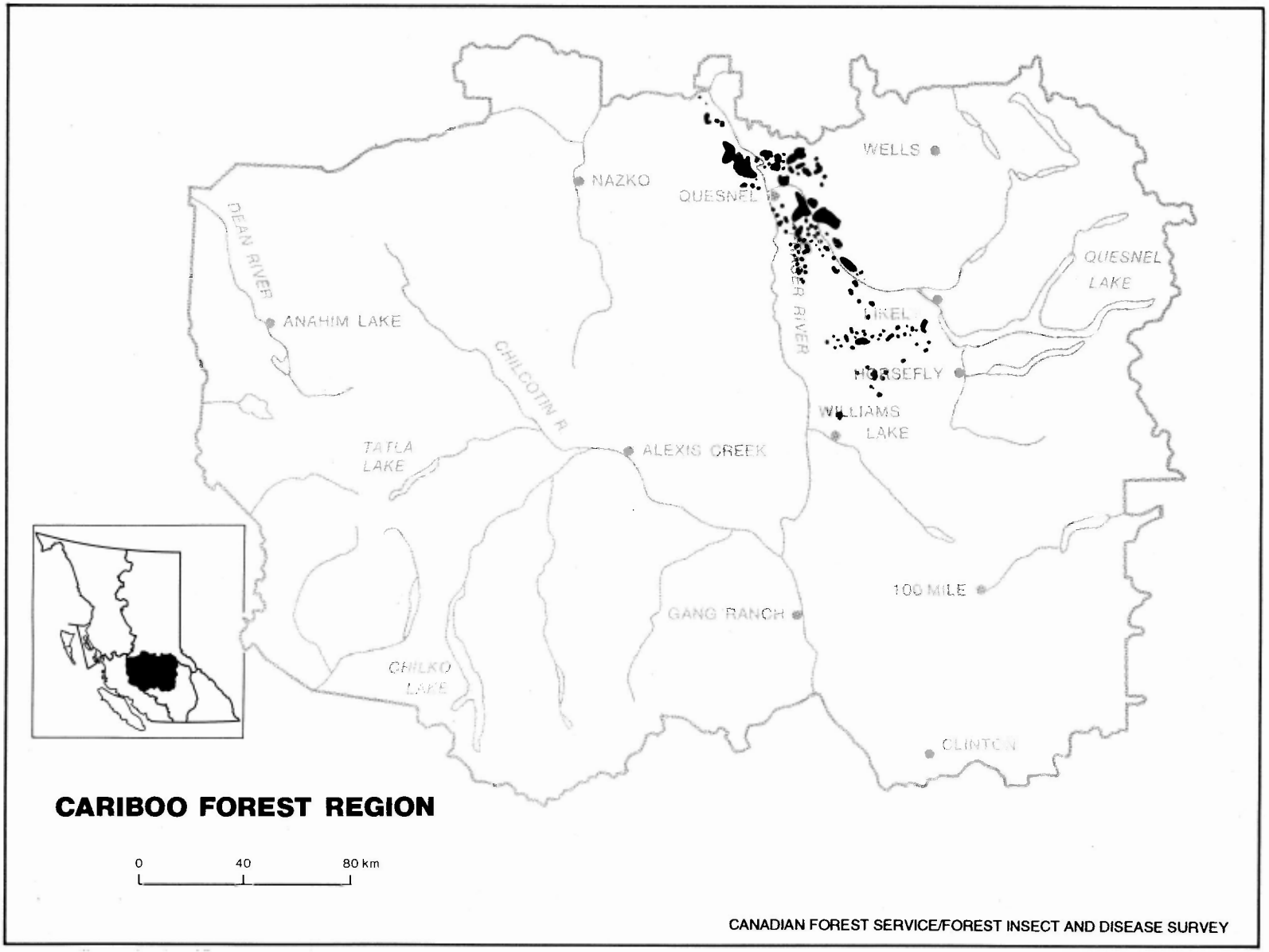


Figure 9. Areas of trembling aspen defoliated by forest tent caterpillar, detected during aerial and ground surveys, 1995.

**Quesnel TSA**

As predicted, infestations expanded in **Quesnel TSA**, resulting in 40 700 ha of light to severe defoliation in and near the city of Quesnel, southeast along the Quesnel River from the city to Beaver Creek and northwest of Quesnel to the Blackwater River. This was nearly a fivefold increase from last year in mainly the same area. Shade and ornamental tree defoliation and large numbers of larvae were major problems for homeowners in the city of Quesnel and surrounding area.

**Williams Lake TSA**

Most of the defoliation occurred from Big Lake to Rose Lake east of Williams Lake, totalling 6500 ha in **Williams Lake TSA.** The outbreak decreased further to 5200 ha light to severe defoliation in the Horsefly-Big Lake area from 10 040 ha last year. Previous to 1994, infestations increased for five consecutive years in the TSA, mainly around Horsefly and Black Creek.

**Damage**

The most common adverse effects of forest tent caterpillar infestations on trembling aspen are growth reduction and branch and top dieback. There is also a great nuisance to the public from the presence of thousands of hairy larvae since many of the infested stands are on private and recreational property.

**Parasites/Diseases/Predators**

Parasitism of larvae at seven representative locations averaged 46% (range 20-86%) by dipteran parasites, up from an average 32% (range 8-89%) last year at nearby locations. This is based on collections of 100 late instar larvae at each location (Table 9). Insect parasites, particularly dipterans, such as *Arachnidomyia aldrichi*, appear early in an infestation and can reduce populations by 80%. Nucleopolyhedrosis virus, NPV, and fungal pathogens were also present in all collections and could be major factors in reduction of populations. Cool temperatures at the time of egg hatch causes mortality of early instar larvae making early spring temperatures critical for larval survival and birds can also play an important role as predators.

Table 9. Percent parasitism of forest tent caterpillar larvae/pupae, Cariboo Forest Region, 1995.

| TSA and Location | Percent killed by parasites | |
|---|---|---|
| | Hymenopterans | Dipterans[1] |
| QUESNEL TSA | | |
| Cottonwood R. | <1 | 14 |
| Quesnel West | 0 | 72 |
| Quesnel North | 0 | 36 |
| Quesnel East | 0 | 50 |
| Quesnel South | 0 | 86 |
| WILLIAMS LAKE TSA | | |
| 150 Mile House | 0 | 20 |
| Average | <1 | 46 |

[1] Unidentified at the time of writing, however, probably *Arachnidomyia aldrichi*.

**Forecast**

Egg masses were assessed on each of three trees at seven representative locations throughout the outbreak. The surveys indicated that two of the locations will be severely defoliated, three moderately, and two lightly defoliated in 1996 (Table 10).

Table 10. Predicted defoliation of trembling aspen by forest tent caterpillar in 1996, based on egg mass surveys, Cariboo Forest Region, 1995.

| TSA and location | Average number of egg masses/tree New | Old | Avg. dbh (cm) | Predicted[1] defol. 1996 | Defoliation 1995 |
|---|---|---|---|---|---|
| QUESNEL TSA | | | | | |
| Quesnel North | 4 | 14 | 8 | moderate | severe |
| Quesnel West | 32 | 35 | 9 | severe | severe |
| Quesnel East | 5 | 5 | 8 | moderate | severe |
| Quesnel South | 4 | 15 | 10 | light | moderate |
| Bouchie L. | 21 | 38 | 11 | severe | severe |
| WILLIAMS LAKE TSA | | | | | |
| Beaver Valley | 1 | 3 | 10 | light | moderate |
| 150 Mile House | 5 | 8 | 9 | moderate | moderate |
| Average | 14 | 24 | 9 | | |

[1] A 10-cm dbh tree would be 100% defoliated with 11+ egg masses.

Forest tent caterpillar infestations in the region have typically remained one to three years at any given location and then have shifted to other nearby uninfested aspen. There should be no defoliation in the Horsefly-Likely-Big Lake area next year. Small patches of light to moderate defoliation may again be visible but the large patches will not recur, especially along the Quesnel River from Quesnel to Beaver Creek. Infestations should subside south of Quesnel, with only small patches of light to moderate defoliation apparent. North and west of Quesnel the infestation will continue with large patches of moderate to severe defoliation and large numbers of larvae; however, this may be the final year. Infestations have occurred each decade in the Quesnel-Bridge Lake area including Horsefly, Forest Grove and 100 Mile House for the past 40 years. Major weather changes, as we have experienced periodically in the past, could affect larval survival and alter projected infestation trends.

## Gypsy moth
*Lymantria dispar*

There were no adult moths caught in pheromone-baited sticky traps placed in forest recreation areas, parks, other crown land and highway rest areas in the region this year (Table 11), the 18th consecutive year FIDS has monitored the populations of this pest.

Table 11. Gypsy moth trapping sites and results, Cariboo Forest Region, 1995

| TSA and location | | Number of sticky traps per location | Number of male moths caught |
|---|---|---|---|
| QUESNEL TSA | | | |
| Australian Cr. | Rest area | 1 | 0 |
| Ten Mile Lake | Rest area | 1 | 0 |
| WILLIAMS LAKE TSA | | | |
| Bull Canyon | Provincial Park | 1 | 0 |
| McLeese Lake | Rest Area | 1 | 0 |
| Drummond Lake | Military Training Area | 2 | 0 |
| Horsefly Lake | Provincial Park | 1 | 0 |
| 100 MILE HOUSE TSA | | | |
| Bridge Lake | Provincial Park | 1 | 0 |
| Canim Lake | Provincial Park | 1 | 0 |
| Chasm | Provincial Park | 1 | 0 |
| Downing | Provincial Park | 1 | 0 |
| Green Lake | Provincial Park | 3 | 0 |
| Kokanee Bay | Private Park | 1 | 0 |
| 108 Mile | Municipal Park | 1 | 0 |
| Lac La Hache | Provincial Park | 3 | 0 |
| Loon Lake | Provincial Park | 1 | 0 |
| Mahood Lake | Provincial Park | 1 | 0 |
| Ruth Lake | Provincial Park | 1 | 0 |
| BELLA COOLA | | | |
| Hagensborg | Municipal Airport | 1 | 0 |
| Stuie | Provincial Park | 2 | 0 |
| Total | | 25 | 0 |

The gypsy moth survey is a co-operative project with Agriculture Canada (Plant Health), the Canadian Forest Service, and the British Columbia Forest Service to monitor the spread of this important defoliator of deciduous trees. The survey will continue in 1996 in the Cariboo Forest Region.

### Satin moth
*Leucoma salicis*

Populations declined near Bluff Lake southwest of Tatla Lake, causing 40 ha of severe defoliation of mainly aspen down from 160 ha of severe defoliation last year. Satin moth is a pest of mainly poplar that was introduced to Canada from Europe 75 years ago. This insect has caused significant defoliation of poplar forests for many years in the Kamloops, Vancouver and Nelson regions. Population increases are usually closely followed by increases in native and introduced parasites resulting in collapse of infestations. Since there were no parasites or

diseases found in larval collections reared at Pacific Forestry Centre, populations will probably continue at Bluff Lake in 1996.

### Poplar-and-willow borer
*Cryptorhynchus lapathi*

Mortality of willow caused by the poplar-and-willow borer continued throughout the region, predominately in the eastern portion. Willow shrubs had 10-100% of stems killed by this pest, mainly in the wetter biogeoclimatic zones.

Continued mild winters have contributed to the increases in borer populations and damage. The most severe damage occurred this year from Quesnel west to Puntchesakut Lake where all the willow were attacked and 40 - 100% of the shoots were killed on each shrub. Many 2-10 ha patches of willow were also attacked in the area from Horsefly to the Quesnel River. Weevil populations were high throughout the range of willow in the region, mainly in the warmer, damper biogeoclimatic zones. These zones and subzones are often the ones where competition from brush is a seriously limiting factor in the establishment of new stands after harvesting. Mortality of willow is not seen by forest managers as a situation that needs changing, and it may be an important bio-control tool.

Damage will continue in 1996; however, the severity will depend on winter temperatures that affect adult weevil survival.

### Pacific willow leaf beetle
*Tricholochmaea d. carbo*

Willow shrubs were defoliated by this leaf beetle in widespread 1/4 - 10 ha patches from Quesnel south to Canim Lake including Williams Lake and Horsefly. Damage was most severe in aspen wetlands where willow were completely defoliated. The defoliation was the most severe and widespread ever recorded in the Cariboo region.

## Other Noteworthy Pests

Collections and observations of other potentially damaging pests, currently of minor significance, are listed by host and importance in Table 12.

Table 12. Pests of minor significance in the Cariboo Forest Region in 1995.

| Host/pest | Location | Damage | Status[1] |
|---|---|---|---|
| **Coniferous Hosts** | | | |
| **Douglas-fir** | | | |
| Douglas-fir needle cast *Rhabdocline pseudotsugae* | 150 Mile<br>Bull Mtn.<br>Hart Ridge<br>Riske Creek | From 20 to 70% of small, 1-4 m high trees had 20-60% of foliage infected in 1/4-200 ha patches. | I |
| Conifer-cottonwood rust *Melampsora occidentalis* | Bridge L.<br>Canim L.<br>Big L.<br>Springhouse<br>Bonaparte R. | From 40 to 100% of the younger trees had 15-50% of foliage infected in 1/4-200 ha patches. Continued infection will result in growth loss and branch mortality. | I |
| **Ponderosa Pine** | | | |
| Elytroderma disease *Elytroderma deformans* | Loon L.<br>Clinton | Brooming and premature needle loss of ponderosa pine remained in 1995, in chronically infected areas near Loon Lake, Clinton and west to Kelly Lake. Over 30% of the trees had 20% of the foliage infected, similar to last year. The infection was confined mainly to brooms in the lower crown. | S |
| **Whitebark Pine** | | | |
| Lachnellula canker *Lachnellula arida* | Tweedsmuir Park | Trees growing at 1650 m elevation had 5% of all branch tips killed on 10% of the trees over a widespread area. | S |

Table 12. (Cont'd)

| Host/pest | Location | Damage | Status[1] |
|---|---|---|---|
| | | **Deciduous Hosts** | |
| **Poplar** | | | |
| Hypoxylon canker *Hypoxylon mammatum* | S. of Quesnel | One tree was infected and 5 others were recorded showing the same symptoms in a mature stand over 1 ha. 5% tree mortality was evident. | I |
| **Alder** | | | |
| Anthracnose *Gnomonia intermedia* | Bull Mtn. | All alder, 1-3 m high had 30% of new shoots killed by this fungus over 2 ha, in association with adelgids. | I |

[1] I = Increasing; D = Decreasing; S = Static