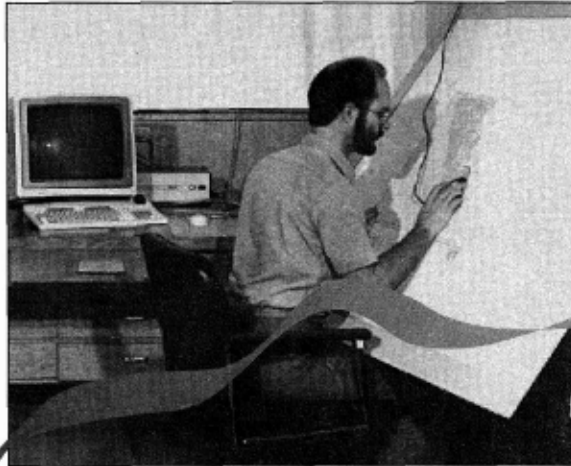




Forest Insect and Disease Conditions Northern British Columbia – 1995

Rod Garbutt and John Vallentgoed
Pacific Forestry Centre • FIDS Report 96-4



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Preface

Canadian Forest Service Transition of FIDS to Forest Health Network

As a result of the Canadian Forest Service (CFS) program review and reorganization announced in the February 1995 federal budget, the CFS had a substantial reduction in resources (37% reduction in staff) and modified its priorities to be more in concert with federal responsibilities in the forestry sector. Overall, the Canadian Forest Service will be reduced to five establishments focusing on science and technology development. Operational forestry activities such as growth and yield, applied silviculture, and the Forest Insect and Disease Survey have been reduced; in this latter case, however, a more nationally focused Forest Health Network (FHN) is being developed.

The Forest Health Network 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.

Forest Health Network - National Priorities

1. To monitor and report on changes in national forest health using an expanded and enhanced, ecosystem-based series of plots.
2. To 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 level input required by the Canadian Criteria and Indicators Process for Sustainable Forestry, such as:
 - area and severity of insect and disease attack;
 - occurrence and severity of exotic species detrimental to forests;
 - area of catastrophic forest depletion; and
 - indicators of biodiversity, climate change and forest health.
3. To maintain diagnostic expertise and working reference collections to provide the scientific foundation in support of forest biodiversity policies.
4. To maintain the national forest health database with access to all partners. Analysis of data and presentation of information in shared electronic formats will be undertaken.
5. To 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. To maintain linkages with other client Federal departments (Environment, Heritage-Parks Canada, Agriculture and Agri-Food Canada) as well as the collaborative efforts with Provinces, universities, industry and international agencies.

7. To develop, test, and standardize monitoring techniques, indicators and predictive models of forest health.

Forest Health Network - Pacific Forestry Centre

In 1996 the Forest Health Monitoring unit at CFS-Victoria will comprise 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) developed since 1984 and the associated historical database will continue to provide support to the Forest Health unit and the national database. The long-term plan is to have a total of six forest health technicians in the Forest Health Monitoring Unit.

The planned staff of the Canadian Forest Service-Victoria, Forest Health Monitoring Unit in 1996 will include:

Forest Health Technicians

Bob Erickson
Rod Garbutt
Nick Humphreys
Peter Koot
Rod Turnquist
Leo Unger
John Vallentgoed

Forest Health Unit Leader

Allan Van Sickle

Associated staff in the Biodiversity and Landscape Management - Decision Support System networks are:

Insectary: Lee Humble, Bob Duncan, Jane Seed
Herbarium: Brenda Callan
GIS: Dennis Clarke

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 cooperation from employees of 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 continued involvement with our clients in research and planning to help develop the Forest Health Network research direction. To this end, we are pleased that there is already agreement between the Canadian Forest Service and the British Columbia Ministry of Forests to undertake a cooperative approach to forest health monitoring that will best meet the needs at both the provincial and federal levels.

We look forward to working together with our partners in 1996 and beyond.

For further information please contact Dr. Allan Van Sickle, Forest Health Unit Leader at

Canadian Forest Service
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C.
V8Z 1M5
(604) 363 0674
avansickle@A1.PFC.forestry.ca

Introduction

The Forest Insect and Disease Survey (FIDS) is a national unit within the Canadian Forest Service (CFS) with the responsibility of: (1) producing an overview of forest pest conditions and their implications, including predictions when possible; (2) maintaining records and surveys to support quarantines; (3) supporting forestry research with records, herbaria and insect collections; (4) providing advice, technology transfer and extension services with respect to current and historical forest insect and disease conditions; (5) developing and testing survey techniques; and (6) conducting related biological and impact studies.

This report summarizes forest insect, disease and other pest conditions in the Prince Rupert and Prince George forest regions in 1995 and forecasts some of the pest population trends. The results of forest pest surveys in northern British Columbia have been reported by CFS-FIDS since 1939. The report was assembled from information gathered by the authors and from contributions by FIDS rangers Nick Humphreys, Bob Ferris and Al Stewart.

Because of reduced coverage by FIDS this year the Prince Rupert and Prince George forest regions have been combined into a single report. Pests that occurred in both regions are discussed in a regional context. Pests are discussed by host, in order of current importance normally in the context of a management unit within a Timber Supply Area (TSA) or Forest District. The Queen Charlotte Islands and the Yukon Territory were also surveyed by FIDS Rangers in the Prince Rupert Forest Region. Pest information for the Queen Charlottes is reported in the Vancouver Forest Region report, and for the Yukon, in a separate FIDS report entitled, Forest Insect and Disease Conditions, Yukon Territory, 1995.

The 1995 field season extended from early June to early October. Insect and disease collections were submitted from throughout the two regions by the authors to the Pacific Forestry Centre (PFC) for identification and verification (Figures 1 and 2).

The B.C. Forest Service provided 21.8 hours of fixed wing and 3 hours of helicopter flying time to conduct aerial surveys and on-site pest examinations. Aerial survey coverage is shown in Figures 1 and 2. Pest survey data were summarized and presented at the annual Forest Health Committee meeting in December 1995, and contributed to a national FIDS report.

The co-operation of provincial, industrial, municipal and academic agencies is essential for the effective fulfillment of the FIDS mandate and their contributions of information, logistical and material support are greatly appreciated.

Definitions

Throughout this report, incidences of aerially observed **bark beetle** mortality are defined as follows:

| | |
|----------|--------------------|
| light | - 1-10% of a stand |
| moderate | - 11-29% |
| severe | - 30%+ |

Aerially observed damage caused by **defoliating insects** is subjectively assigned to one of three defoliation categories as follows:

- light - discolored foliage, barely visible from the air; some defoliation of upper crowns and branch tips
- moderate - pronounced discoloration and noticeably thin foliage; top third of many trees more than 50% defoliated, some completely stripped
- severe - tops and some branches completely defoliated; most trees more than 50% defoliated

Biogeoclimatic units are often referred to in the report in their abbreviated form to conserve space; in alphabetical order they are:

- BWBS_e - boreal white and black spruce, cordilleran
- CWH_{vh} - coastal western hemlock, very wet hypermaritime
- CWH_{ws1} - coastal western hemlock, wet submaritime, submontane
- CWH_{wh1} - coastal western hemlock, wet hypermaritime, submontane
- CWH_{vm} - coastal western hemlock, wet maritime
- ICH_{mc2} - interior cedar-hemlock, moist cold, upper Nass Basin
- ICH_{mc3} - interior cedar-hemlock, moist cold, lower Nass Basin
- ICH_{vc} - interior cedar-hemlock, very wet cold
- SBS_{jl} - Willow River wet cool central sub-boreal spruce
- SBS_{se2} - Fraser Basin moist cool central sub-boreal spruce
- SBS_f - very wet Rocky Mountain sub-boreal spruce
- SBS_{mc} - sub-boreal spruce, moist cold
- SBS_{dk} - sub-boreal spruce, dry cool

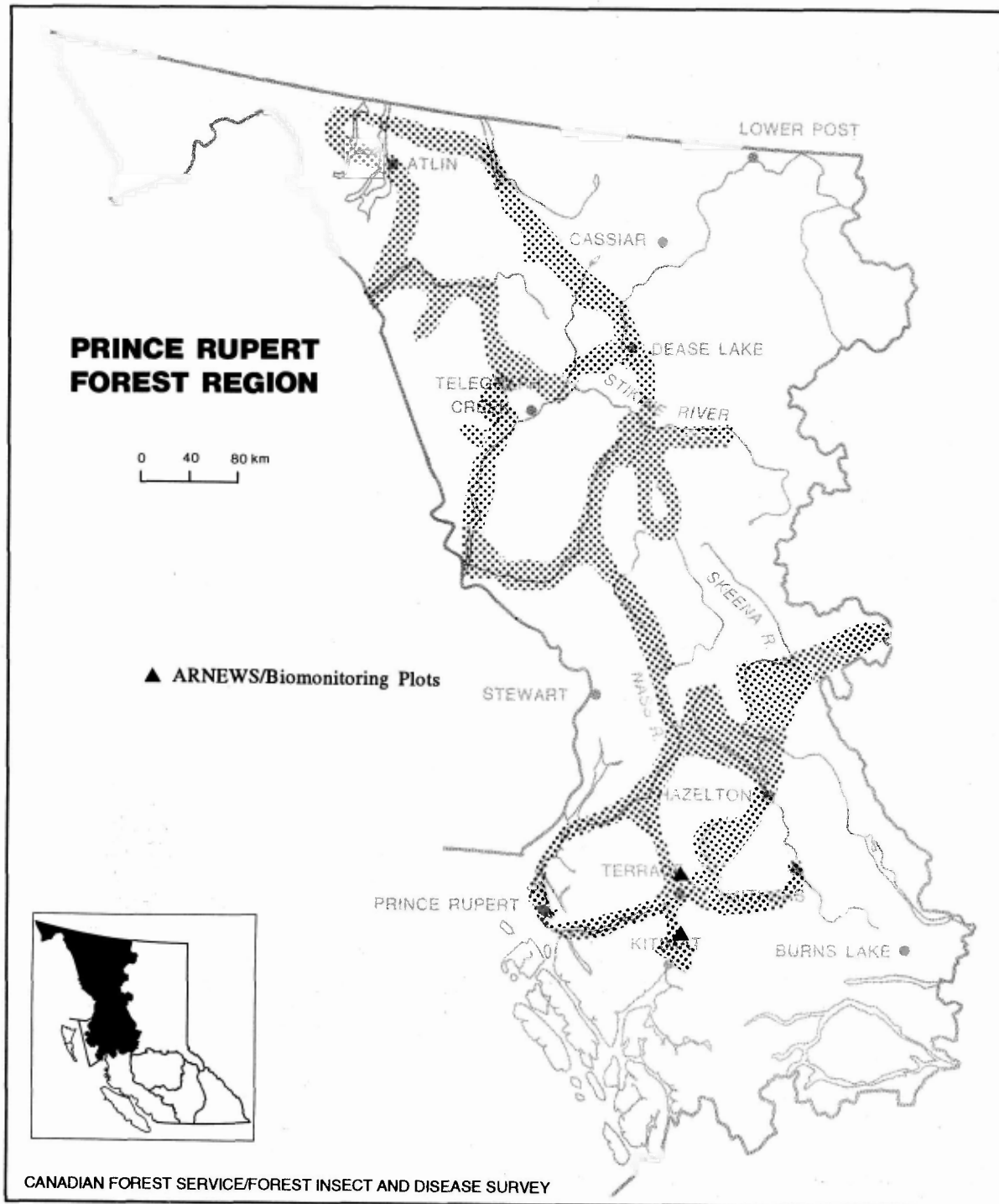


Figure 1. Aerial survey coverage and location of ARNEWS/Biomonitoring plots.

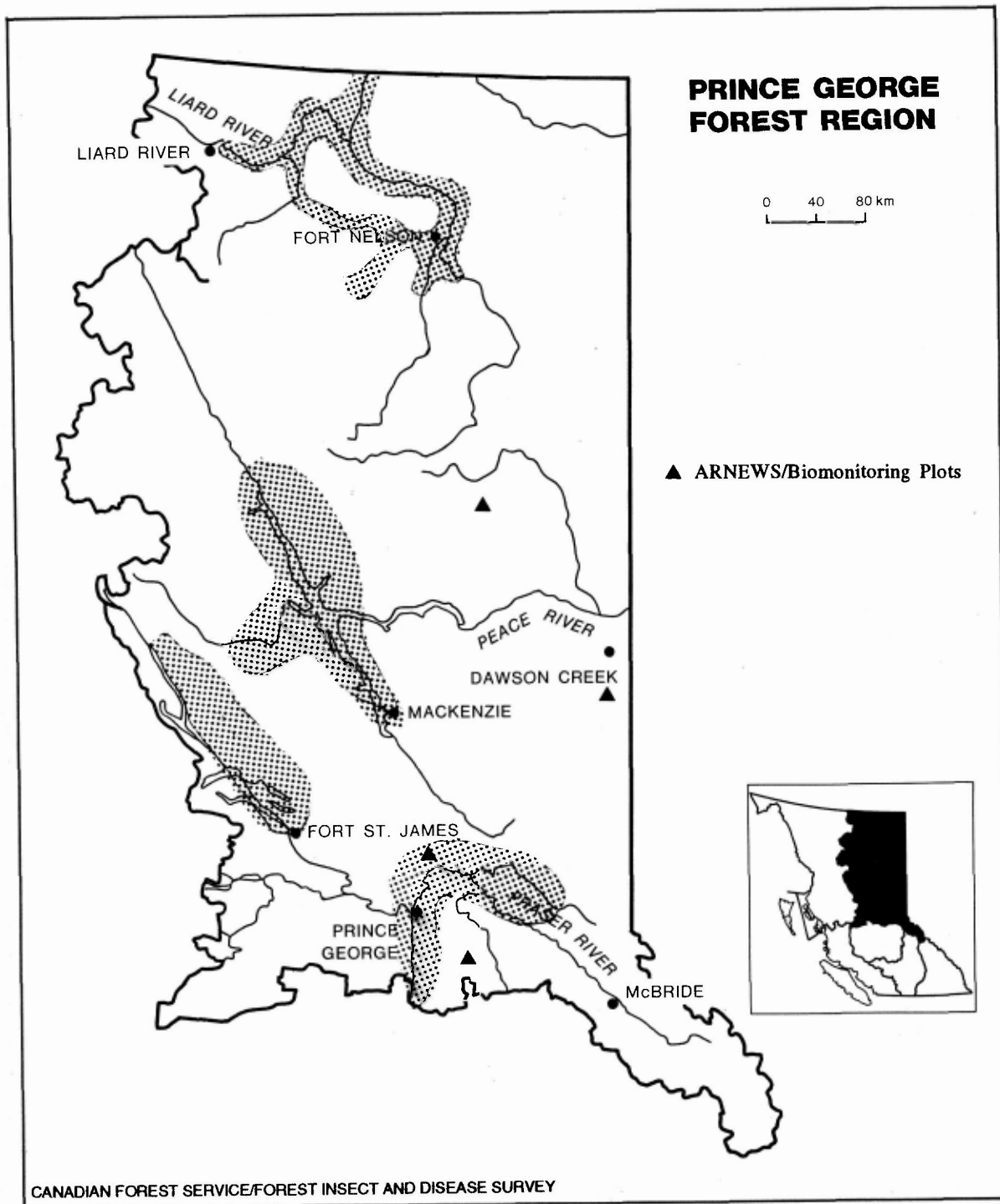


Figure 2. Aerial survey coverage and location of ARNEWS/Biomonitoring plots.

Summary

Mountain pine beetle in the Prince Rupert region killed an estimated 312 000 lodgepole pine over 7545 ha, more than twice the mortality recorded last year. For the Prince George region no total infested area figures are available, but infestations are reported to have remained similar to, or slightly increased in size compared to last year in the southern forest districts. **Pine needlecast** infections declined in intensity and area in northern parts of the Cassiar Forest District, but increased in scattered centers in southern parts of the Kalum district.

Spruce beetle activity increased in the Prince Rupert region with recent spruce mortality mapped over 16 750 ha. Most of the damage occurred in the far northwest, in the Tatshenshini, Chilkat and Inklin river drainages, with additional increases in a chronic infestation in the Morice River corridor. In the Prince George region, the estimated infested area declined to 40 000 ha of light and scattered mortality, mostly on the west side of Williston Lake in the Mackenzie district and in southern parts of the Fort St. James district and northern parts of the McBride district. Current attacks by **spruce weevil** ranged from 0 to 41% of young hybrid spruce in 12 stands surveyed in the southern Kalum district in the Prince Rupert region. Surveys of eight young white spruce stands in the Prince George region found current attack levels ranging from 5 to 24%. Though the distribution of **eastern spruce budworm** infestations was similar to last year in the Fort Nelson Forest District, defoliated area declined to 27 750 ha from 173 000 in 1994. **Two-year cycle spruce budworm** was mapped over 67 000 ha in the Fort St. James and Mackenzie districts in the Prince George region.

Alpine fir mortality caused by the **western balsam bark beetle complex** was mapped over 72 500 ha in the Prince Rupert region and 43 000 ha in the Prince George region. These estimates were conservative due to reduced aerial survey coverage in 1995.

Over-mature and understory western hemlock were lightly to severely defoliated by the **green-striped forest looper** over 700 ha along the Skeena River, northeast of Hazelton. Western hemlock **dwarf mistletoe** remains a serious pest in many stands in the southern Kalum district. **Western hemlock looper** populations collapsed in the Prince George and McBride districts, and no current defoliation was recorded.

No conifer seedling damage resulted from **black army cutworm** feeding at sites where high numbers of moths were trapped the previous year in either the Prince Rupert or Prince George regions, though some feeding damage was observed on herbaceous plants. **Rhizina root disease** fruiting bodies were seen in a single opening at Hunter Creek in the Kalum district, broadcast burned in the fall of 1994. The site had not been planted.

Pine stem rusts, western gall rust, spruce weevil and a range of environmental agents were the main causes of damage in 67 young stands examined during **Pests of Young Stands Surveys (POYS)** in the Prince Rupert and Prince George regions in 1995.

No recent significant damage caused by acid rain or other agents was detected during surveys of six **Acid Rain National Early Warning System (ARNEWS)/Biomonitoring plots** examined in the Prince Rupert and Prince George regions in 1995. During special aerial and ground surveys within the **McGregor Model Forest**, pest problems such as spruce and Douglas-fir beetles were detected and evaluated.

Large aspen tortrix defoliated trembling aspen over an estimated 7000 ha in the Prince George region, and 1250 ha in the Prince Rupert region. **Forest tent caterpillar** defoliated trembling aspen and black cottonwood over an area of 55 000 ha, in four forest districts in the Prince George region. **Satin moth** in conjunction with forest tent caterpillar defoliated primarily trembling aspen over more than 7500 ha in the McBride district. **Northern tent caterpillar** defoliated willow over a broad area spanning over 100 km along Highway 37, in the Meziadin Lake area in the Kalum district. White birch over an estimated 220 ha were defoliated by a **birch leafminer** for at least the fifth consecutive year near Bob Quinn Lake in the Kalum district. **Pacific willow leaf beetle** skeletonized willow leaves over broad areas in the Kitwanga and Cranberry Junction areas in the Kispiox district. **Aspen leafroller** moderately and severely defoliated trembling aspen over almost 2900 ha in three districts in the Prince Rupert region. In the Dawson Creek Forest District an unidentified **leafroller** attacked trembling aspen, often in conjunction with forest tent caterpillar and large aspen tortrix. No **gypsy moth** were caught in 26 pheromone traps placed in Provincial Parks, rest areas and major port facilities in the Prince Rupert region or in 5 trap locations in the Prince George region in 1995.

Pine Pests

Mountain pine beetle *Dendroctonus ponderosae*

Prince Rupert Forest Region

Mortality of lodgepole pine due to attacks by the mountain pine beetle increased to 250 000 m³ over 7545 ha in 1995, compared with 142 810 m³ over 5290 ha in 1994 (Table 1, Figure 3). This was the third consecutive year of increase, reflecting a continued escalation of attack throughout the Morice and Lakes forest districts, and in localized parts of the Bulkley and Kispiox districts. Only in the Kalum district had attacks declined.

Table 1. Area, volume and number of lodgepole pine recently killed by mountain pine beetle, FIDS, Prince Rupert Forest Region, 1995

| Location (Forest District) | Area (ha) ¹ | | | | Volume (m ³) | No. of trees |
|-------------------------------|------------------------|----------|--------|-------|--------------------------|--------------|
| | light | moderate | severe | total | | |
| Kalum | 370 | 60 | 15 | 445 | 14 300 | 26 500 |
| Kispiox | 170 | 145 | 10 | 325 | 16 500 | 30 600 |
| Bulkley | 1245 | 95 | 200 | 1540 | 61 100 | 75 400 |
| Morice | 2755 | 770 | 200 | 3725 | 129 000 | 138 000 |
| Lakes | 1460 | | 50 | 1510 | 29 100 | 41 500 |
| Total | 6000 | 1070 | 475 | 7545 | 250 000 | 312 000 |

¹ Data for Kalum and Kispiox districts, the northern Morice district and the Telkwa River Valley of the Bulkley district were derived from FIDS aerial survey sketch maps; the Lakes district, the southern Morice and the majority of the Bulkley were mapped by the B.C. Forest Service, with the areas and impacts calculated by FIDS from supplied maps.

Kalum Forest District

Mountain pine beetle infested 445 ha of lodgepole pine in 1995 compared with 615 ha in 1994, in a continued decline begun in 1989. Approximately 26 500 lodgepole pine were attacked with an estimated volume loss of 14 300 m³.

Attacks continued in the lower Nass Valley with the most sustained and active infestations continuing in the New Aiyansh area. The presence of ambrosia beetles was noted in 30% of trees assessed in the spring, and woodpecker predation was also common, as in previous years. These secondary agents appeared to have only minimal effect on tree condition or beetle success. Across the Nass River from New Aiyansh, only minor beetle activity continued. A decrease for the third consecutive year was seen in the Shumal Creek area and adjacent pine flats, where a large proportion of the host trees are now gray. Small scattered infestations continued northeast along the Nass River to the Cranberry Junction area. Scattered spot infestations were also noted north of Brown Bear Creek. Along the Kalum TSA portion of the Skeena River, no red attacks were seen for the fourth consecutive year.



Natural Resources Canada
Canadian Forest Service
Forest Insect and Disease Survey



Scale 1: 2500000

Projection: Lambert Conformal Conic

Map Produced by GIS: 30 Jan 96

Figure 3. Areas where mountain pine beetle-caused lodgepole pine mortality was mapped during aerial surveys.

Kispiox Forest District

Mountain pine beetle infestations expanded to 325 ha, compared with 250 ha in 1994, due largely to an 80% increase in the Sikintine River Valley. Volume losses totalled 16 500 m³, with the number of red trees totalling 30 600.

In the Cranberry River area only small spot infestations were seen for the third consecutive year. Along the Skeena River near Kitwanga, 20 small scattered infestations totalled less than 50 ha. Light scattered attacks also continued along the Kitsequecla River.

Bulkley Forest District

Though infested area increased only slightly to 1540 following a fourfold increase last year, volume losses increased by 60% to over 61 000 m³. This was due to renewed high intensity attacks in parts the Telkwa River Valley, particularly in the area of Jonas Creek, where infestations have been ongoing for many years. Attacks also intensified in the Goathorn Creek area for the second successive year.

Elsewhere in the district, map information supplied by the B.C. Forest Service indicated that mountain pine beetle activity remained at levels similar to last year. Continued scattered attacks were mapped in the McDonell Lake area, Trout, Reiser and Gramophone creeks areas in the south, and in the Nilkitkwa Lake, Babine River and Nilkitkwa River areas in the north. In central areas of the district scattered attacks were once again mapped in the Chapman Lake area.

Morice Forest District

Recorded mortality and infested area doubled to 129 000 m³ over 3725 ha. This was the first year since 1991 that FIDS has undertaken a detailed aerial survey of the increasingly infested northeast. In the intervening three years mortality estimates from this area were based upon information from other agencies. Infestations are now seen throughout the area east of Babine Lake, with concentrations around Frypan Lake in the extreme north, in the hills paralleling Babine Lake northwest of Old Fort Mountain, and in a broad area bounded by Hautete, Natowite and Nizik lakes. A few large long-standing infestations also continued in stands on the west side of Morrison Lake, but due to salvage logging and host depletion, these were mainly light in intensity. Many additional small infestations were scattered in stands throughout the same general area.

New infestations in the southern portion of the district were identified and pinpointed by GPS¹ during Forest Service aerial surveys in July. All of these infestations (1000+ in number), were small with typically between 1 and 50 trees. Concentrations of attack were again identified between Owen Lake and Owen Hill, in stands to the west of Owen Hill, along Lamprey Creek and the Nanika River, and in the Parrott Lakes and Houston Tommy Creek areas. A single large infestation covering about 80 ha was mapped just south of Chisholm Lake. Farther to the north numerous small patches were seen in the areas of lower Emerson and Dockrill creeks, to the west of Houston, and in the McKilligan and Aitkin creek areas to the east.

¹ Global Positioning System

Lakes Forest District

B.C. Forest Service aerial surveys recorded a fivefold increase in both infested area (to 1510 ha) and numbers of red trees (to 41 500). These figures included some old reds that were not felled during last winter's fall-and-burn program, but they were a small portion of the total. A slow and steady increase in the number and intensity of infestations in the Lakes TSA over the past three years accelerated in 1994, when up to 10:1 current-to-red ratios (C:R)² were recorded in many areas.

Due to the broad distribution of stands with a significant mature lodgepole pine component, infestations were spread throughout the district. North of Babine Lake, 32 small infestations totalled 572 trees, very similar to last year. South of the Lake, between Pendleton Bay and Taltapin Lake, tree counts increased dramatically, with two adjacent patches containing over 3200 red trees, just south of Taltapin Lake. In other areas north of Francois Lake: 650 trees were killed in 21 infestations in the Bulkley/Broman Lakes area; 136 trees in 6 infestations near Forestdale; 290 trees in 15 infestations in the Maxan Lake area; 384 trees in 7 infestations near Decker Lake; nearly 700 trees in 29 infestations in the Burns Lake and Tchesinkut Lake areas; and 71 trees in 10 infestations along the north shore of Francois Lake. Significant increases were also seen in stands adjacent to the southwest shore of Francois Lake, where 1270 red trees were mapped in 19 infestations. In southern areas, however, increases were more modest, expanding by 50% to total about 1800 trees in lakeshore areas of the pondage from Intata Reach south to Tetachuk Lake.

Tweedsmuir Provincial Park

Though there was no specific aerial survey to monitor mountain pine beetle infestations in the Eutsuk Lake area of the Park this year, Forest Service personnel noted a doubling of infested area from the 720 ha recorded in 1994. Due to an intensive pheromone baiting program last year, however, the expansion was largely contained within the same general areas as last year. The two largest infestations mapped in 1994 in stands along the north shore of Eutsuk Lake opposite Connelly Point, coalesced into one continuous patch of red trees.

A controlled burn strategy, designed to reduce beetle populations and thus reduce the risk of infestations moving into nearby Provincial Forest lands, was partially successful. Approximately 500 ha was burned, and significant brood mortalities noted in some areas. Further controlled burning is planned for the fall of 1996.

Fall Surveys and Control Strategies

In the Kalum district, a fall beetle cruise near New Aiyansh found 7% of lodgepole pine in a mixed stand to be currently attacked, compared to 12% last year. This was presaged by reduced overwintering brood survival ("R" = 3.3 (range 0-14))³ and small brood populations in the spring. The C:R was 0.6:1, substantially lower than the previous year. The remaining healthy host represented 48% of the pine in the stand with average diameter approximately the same as the currently attacked trees, but smaller than the reds or grays.

In the Bulkley, Morice and Lakes districts, integrated control strategies combining pheromone baiting with salvage logging operations, MSMA⁴ treatments, and winter "fall-and-burn" programs will affect some control over infestations.

² The ratio of the number of trees in a stand currently attacked to the to the number attacked in the previous year.

³ "R" is defined as the ratio of living brood to parent entrance holes in 225 cm² bark samples.

⁴ Monosodium methane arsenate

History records that, besides host depletion, the agent most effective in controlling beetle populations is the weather, particularly a winter with little snow and a week or more of sustained average temperatures of below -35 C.

Forecasts

The only mountain pine beetle population studies carried out by FIDS this year in stands around Aiyansh in the Kalum district suggested that populations will decline in that area. B.C. Forest Service ground probes in the Bulkley, Morice and Lakes districts found current-to-red ratios of between 1:1 and 6:1, which indicates generally increased attacks in 1996.

Prince George Forest Region

FIDS conducted no ground or aerial surveys of mountain pine beetle damage in the Prince George region this year. The information that follows was gained through personal communication with B.C. Forest Service personnel in the districts where beetle infestations were reported in 1995.

McBride Forest District

Though no area figures are yet available, detailed aerial surveys conducted within the entire district in 1995 noted significant increases in beetle-caused lodgepole pine mortality in a number of areas. Most notable among these were stands on the east side of McNaughton Lake, particularly in the Packsaddle and Hugh Allen creeks areas, and on the west side of the Lake near Albreda. Spot infestations in the main valley north of Valemount continued to increase despite persistent Forest Service "fall-and-burn" efforts. In Mount Robson Provincial Park, spot infestations continued to expand to the east and west from the original Shale Hill infestation. A Parks sponsored "fall-and-burn" remains in effect in these areas.

Fort St. James Forest District

Areas of infestation were estimated at over 22 000 ha, only slightly increased from last year. These infestations were scattered throughout the District with concentrations: in the Sustut River/Bear Lake area, 6000 ha; east and west of Takla Lake, 2900 ha; and in areas just south of Stewart Lake, 2500 ha.

Vanderhoof Forest District

A total of 3670 red trees were mapped in 152 separate infestations. The damage was distributed among four management zones as follows: Bobtail, 1415 trees in 14 infestations; Fraser Lake, 1822 trees in 78 infestations; Kluskus, 410 trees in 25 infestations; and North of Town, 23 trees in 5 infestations. Fall probes found an average current-to-red ratio of nearly 4:1, indicating a potential for significant increased red tree counts in 1996.

Prince George Forest District

Intensive aerial surveys were conducted by the B.C. Forest Service, but the breakdowns were not yet available.

Pine needlecast
Lophodermella concolor

Prince Rupert Forest Region

The incidence of pine needlecast increased in the Kalum Forest District. Up to 0.2 ha areas were moderately discolored near Big Oliver Creek where this disease has been active for several years. Additionally, scattered patches of discoloration were noted throughout the southern half of the District on young roadside regeneration, and in some young pine plantations. In the northern Cassiar district near the Yukon border, young stands adjacent to Highway 37 were discolored for the fourth consecutive year. Disease symptoms however, had decreased in both area and intensity with an average of 30% of the year-old foliage discolored by the disease.

Prince George Forest Region

Pine needlecast discolored foliage of lodgepole pine throughout the southwestern area of the Prince George Forest District and in the southern portion of the Vanderhoof Forest District.

The disease was prevalent in 5-30 year-old stands of lodgepole pine in the Blackwater and Chilako river drainages, in stands off the Bobtail Forest Service Road and along Highway 16 from Quesnel to Prince George. The obvious red foliage was most common on the fringes of stands and in the lower crowns of the trees. In some stands up to 90% of the trees were discolored, and it was common for individual trees to have lost 100% of the year-old foliage.

Over 500 000 ha of discolored lodgepole pine was aerially mapped in the Cariboo Forest Region this year.

Successive years of severe defoliation can cause growth reduction and severe stress in young trees.

Spruce Pests

Spruce beetle
Dendroctonus rufipennis

Prince Rupert Forest Region

Recent spruce beetle activity increased dramatically in the region this year and was aerially mapped over a total of 16 750 ha, compared to 1690 ha in 1994. The damage occurred in two widely separated areas; in the northwest portion of the Cassiar Forest District and adjacent Tatshenshini Provincial Park, and in the Morice River corridor, south of Houston in the Morice district (Table 2, Figure 4).

Spruce Beetle 1995

Prince Rupert Region



Natural Resources Canada
Canadian Forest Service
Forest Insect and Disease Survey



Scale 1: 4500000

Projection: Lambert Conformal Conic

Map Produced by GIS: 26 Jan 96

Figure 4. Areas where spruce beetle-caused white and Sitka spruce mortality was mapped during aerial surveys.

Table 2. Locations and estimated areas of recent spruce beetle infestations mapped by aerial survey, FIDS, Prince Rupert Forest Region, 1995

| Park/Forest District | Location | Area (ha) | | | Total |
|---------------------------------|-------------------|-------------|------------|--------|---------------|
| | | Light | Moderate | Severe | |
| Tatshenshini Provincial Park | Detour Creek | 2600 | 440 | 2185 | 5225 |
| | Low Fog Creek | 1500 | 35 | | 1535 |
| | Tkope R.-Alsek R. | 1700 | | 1180 | 2880 |
| Cassiar | Rainy Hollow | 550 | 1735 | | 2285 |
| | Kelsall River | 700 | | | 700 |
| | Flemer River | 40 | 65 | 1040 | 1145 |
| | Inklin River | | | 1220 | 1220 |
| | Stikine River | 40 | | 5 | 45 |
| | Graham Inlet | 30 | | | 30 |
| Morice | Morice River | <u>1100</u> | <u>585</u> | | <u>1685</u> |
| | Totals | 8260 | 2860 | 5630 | |
| | Grand Total | | | | 16 750 |

Tatshenshini Provincial Park

A first time aerial survey to detect forest pest activity within the newly-formed Tatshenshini Provincial Park, recorded 58 spruce beetle infestations in white spruce stands, over an area in excess of 9640 ha (Figure 4). The infestations were scattered throughout patches of mature timber, on both sides of the Tatshenshini River, from Debris Creek south, almost to the confluence with the Alsek River. Most of the infestations were of light intensity, but moderate and severe attacks were recorded near Detour Creek in the north, and Basement Creek in the south. The prevalence of grey trees in some stands, particularly near the north end of the infested area, indicated that spruce beetle had been active in these stands for at least the last two years, and probably longer.

Cassiar Forest District

A total of 5425 ha of spruce beetle-infested timber was mapped in the Cassiar district in 1995. Drainages in the extreme northwest adjacent to the Alaska border, were flown in early July. As in 1994, three river valleys, the Klehini, Kelsall and Flemer, contained infestations that were extensions of ongoing infestations originating in the Chilkat River Valley of Alaska (Figure 4). Infested area had increased from a total of 840 ha to over 4400 ha in the one year. The largest, covering 2000 ha of high elevation stands in the Rainy Hollow area, was bisected by the Haines Road, between 8 and 10 km from the B.C.-Alaska border. Lower elevation stands containing trees of up to 100 cm in diameter, remained largely uninfested. A sample of forty trees attacked in June of 1994 and flagged later in the the same month, were re-examined in July of this year. About half of the trees had succumbed to attacks and the crowns were beginning to fade (though some were still green and therefore undetectable from the air). Of the remainder, about half had been strip-attacked and were re-attacked this year, and the rest had overcome last year's attack and remained healthy. Because of the delayed color change, many of the red trees that were mapped this year were probably attacked in 1993.

Severe beetle infestations were mapped over 1220 ha in six separate patches near the confluence of the Inklin and Sutlahine rivers, northwest of Dease Lake. Though some gray was included, the trees were predominantly red, suggesting a recent and rapidly expanding population. Contiguous, long-standing large balsam bark beetle infestations and lack of ground access in this remote area precluded further detailing of beetle infestations or future projections.

Small infestations were also mapped along the Stikine River from the Iskut River confluence north to the Skud River. One small area was also noted west of Atlin along Graham Inlet. These attacks occurred mostly in river-bottom areas subject to periodic flooding, and attacks could have been in response to these stresses.

Morice Forest District

The long-standing infestation in river-bottom stands in the lower Morice River in the Morice TSA, doubled in size this year to 1685 ha. Infestations had spread along the river corridor and up some side creeks. The intensity of last year's attacks had also increased and almost one third of the infestations were mapped as moderate. This included a mixed stand where a ground probe last year found that 70% of the mature spruce had been attacked. Nearly 400 ha were very lightly attacked (+ or - 1% of stand) above the north shore of Morice Lake. The spruce mortality was mixed with a much higher incidence of alpine fir mortality resulting from attacks by balsam bark beetle. Heavy woodpecker predation seen in some attacked trees, along with a depletion of suitable host, is expected to contribute to a decline in the severity of infestations in 1996.

Prince George Forest Region

Spruce beetle infestations in white spruce stands declined this year to cover an estimated 40 000 ha, compared with 70 000 in 1994. As in the previous few years most of the damage occurred in the Mackenzie district in stands along the west side of Williston Lake, including areas of very light scattered attack and declining populations. Additional ongoing infestations were mapped by FIDS and the B.C. Forest Service in the Fort St. James and McBride districts.

Mackenzie Forest District

Since 1994 was not a flight year, this year's aerial survey found little change in levels and patterns of attack. No area figures are yet available, but surveyors reported minor increases in red trees in some areas. B.C. Forest Service probes found variable current attack levels but averaging less than 10% of the trees in affected stands. Host depletion in some areas, most notably the Blackwater area, was the main limitation to population expansion.

Fort St. James Forest District

Infested area declined by almost 40% to 7800 ha. Most of the mortality was in the upper Salmon River area (4000 ha), with smaller concentrations in the Tchentlo and Chuchi lakes areas (2350 ha), and near Cunningham Lake (325 ha).

McBride Forest District

Spruce beetle mortality has increased in recent years in northern drainages, particularly the upper Milk and South Dore rivers, where little of the mature spruce component remains alive. High beetle populations persist in these two areas and, in the absence of available host, there is concern that the beetles may move westward into susceptible stands within Bowron Lakes and Wells Grey provincial parks. Recent spruce beetle mortality was also mapped in the

Roche River drainage, and along the Morkill River where beetles are now attacking trees in leave strips adjacent to the river. Aside from their intrinsic value, these trees provide valuable shade and habitat stability for spawning salmon.

Spruce weevil
Pissodes strobi

Prince Rupert Forest Region

Spruce weevil remained active throughout its range in the Kalum Forest District, with average current attack levels of 18% in 10 surveyed young stands with a history of attacks. The highest recorded current attack levels occurred in the Kitimat Valley, with 41% attack at Cecil Creek (Table 3). This is similar to a nearby Lone Wolf Creek site which suffered 44% current attack in 1994.

Table 3. Spruce weevil in the Kalum Forest District, FIDS, Prince Rupert Forest Region, 1995

| Location | Year | Percent attack | | | Percent Spruce Component | Remarks |
|-----------------------|------|----------------------|-----|-------|--------------------------------|---|
| | | Current ¹ | Old | Total | | |
| Kitimat Valley | | | | | | |
| Shames River | 1995 | 0 | 24 | 24 | 28 | very early survey; symptoms of attack may not yet have been visible |
| Lone Wolf Cr. | 1995 | 32 | 58 | 90 | 50 | 8% of trees too small; many without exposed leaders |
| | 1994 | 44 | 46 | 90 | 54 | |
| Cecil Creek | 1995 | 41 | 54 | 95 | 42 | continuous heavy attacks reduced leader silhouettes attracting weevil attacks |
| | 1994 | 39 | 57 | 95 | 39 | |
| Humphrys Creek | 1995 | 27 | 45 | 72 | 8 | older stand, assessment difficult |
| Clearwater Cr. | 1995 | 10 | 29 | 38 | 71 | small trees, still recovering from severe 1992 frost damage |
| | 1994 | 6 | 37 | 42 | 79 | |
| Onion Lake | 1995 | 36 | 42 | 78 | 97 | biomonitoring plot, older stand (22 yr) good growth |
| Terrace North | | | | | | |
| Leanto Creek | 1995 | 0 | 39 | 39 | 45 | spruce is growing beneath IP overstory; light attack |
| Deep Creek | 1995 | 0 | 50 | 50 | 4 | minor spruce component (Cont'd) |

Table 3. (Cont'd)

| Location | Year | Percent attack | | | Percent Spruce Component | Remarks |
|-----------------------|------|----------------------|-----|-------|--------------------------------|--|
| | | Current ¹ | Old | Total | | |
| Nass Valley | | | | | | |
| Tchitin River | 1995 | 5 | 2 | 7 | 45 | many spruce still below susceptible height |
| | 1994 | 2 | 0 | 2 | 58 | |
| Kwinamuck Lake | 1995 | 28 | 18 | 46 | 71 | clipped July 1993, some currents missed and no second clipping |
| | 1994 | 10 | 16 | 26 | 71 | |
| Northern areas | | | | | | |
| Bowser Lake | 1995 | 0 | 0 | 0 | 89 | average height 2.0 m |
| Spruce Creek | 1995 | 0 | 0 | 0 | 100 | average height 2.5 m |
| | 1994 | 0 | 0 | 0 | 100 | |

¹ includes current only and current plus previous attacks

At the Cecil Creek and Lone Wolf Creek sites, where accumulated attack has equaled or surpassed 90%, many of the spruce were bushy and stunted, showing little height increment. The other major component at these sites was naturally regenerated western hemlock which was poised to assume dominance, as it had in some older stands either by natural selection or spacing choice.

In the Nass Valley, at Tchitin River, where current attack increased to 5% from 2% in 1994, many trees were still very small. At Kwinamuck Lake, in a plantation clipped in July 1993, 28% were currently attacked, compared to 10% in 1994. This example illustrated the difficulty of achieving control with a partial clipping program in a stand, in proximity to untreated infested sites.

In assessments to monitor the northern expansion of the weevil's range no change has been seen in the last five years, with the Meziadin area remaining the northern boundary of attack in the region. In a pure stand at Spruce Creek and a mixed stand at Bowser Lake, no attacks were found, despite abundant susceptible host in a susceptible biogeoclimatic zone (ICHvc). Many young stands in this area are predominantly spruce which are now susceptible. None have been attacked to date.

Prince George Forest Region

Spruce weevil populations remained high throughout most of the extensive areas planted to white spruce in the southern half of the region. The resulting top kill has caused a high incidence of stem defects and significant growth reduction as lateral branches have assumed dominance and have been re-attacked (Table 4).

Table 4. Current and accumulated damage by the spruce weevil in white spruce plantations, FIDS, Prince George Forest Region 1995

| Location | Biogeoclimatic zone | Stand age (yr) | Current attack (%) | Accumulated attack (%) | Stem defects - % of spruce | | | |
|---------------------|---------------------|----------------|--------------------|------------------------|----------------------------|------|-----------|-------|
| | | | | | Crook | Fork | Multi-top | Total |
| Tacheeda Mtn. | SBSj1 | 6 | 17 | 44 | 3 | 4 | 16 | 23 |
| 900 Rd./E. Bear Lk. | SBSj1 | 9 | 14 | 31 | 0 | 0 | 15 | 15 |
| Tacheeda Mtn. | SBSj1 | 9 | 5 | 27 | 0 | 7 | 12 | 19 |
| Narrow Lk. Rd. | SBSj1 | 10 | 10 | 50 | 2 | 18 | 12 | 32 |
| N. Averil Rd. | SBSj1 | 11 | 20 | 64 | 20 | 0 | 25 | 45 |
| Willow Rd. | SBSj1 | 17 | 22 | 75 | 9 | 14 | 29 | 52 |
| 200 Rd./W. Bear Lk. | SBSj2 | 8 | 10 | 43 | 5 | 3 | 17 | 25 |
| Bowron Rd. | SBSf | 8 | 22 | 67 | 1 | 4 | 44 | 49 |
| Bowron/Hagen Rd. | SBSf | 13 | 24 | 56 | 4 | 0 | 24 | 28 |
| Average | | 10 | 16 | 51 | 5 | 6 | 22 | 32 |

Eastern spruce budworm
Choristoneura fumiferana

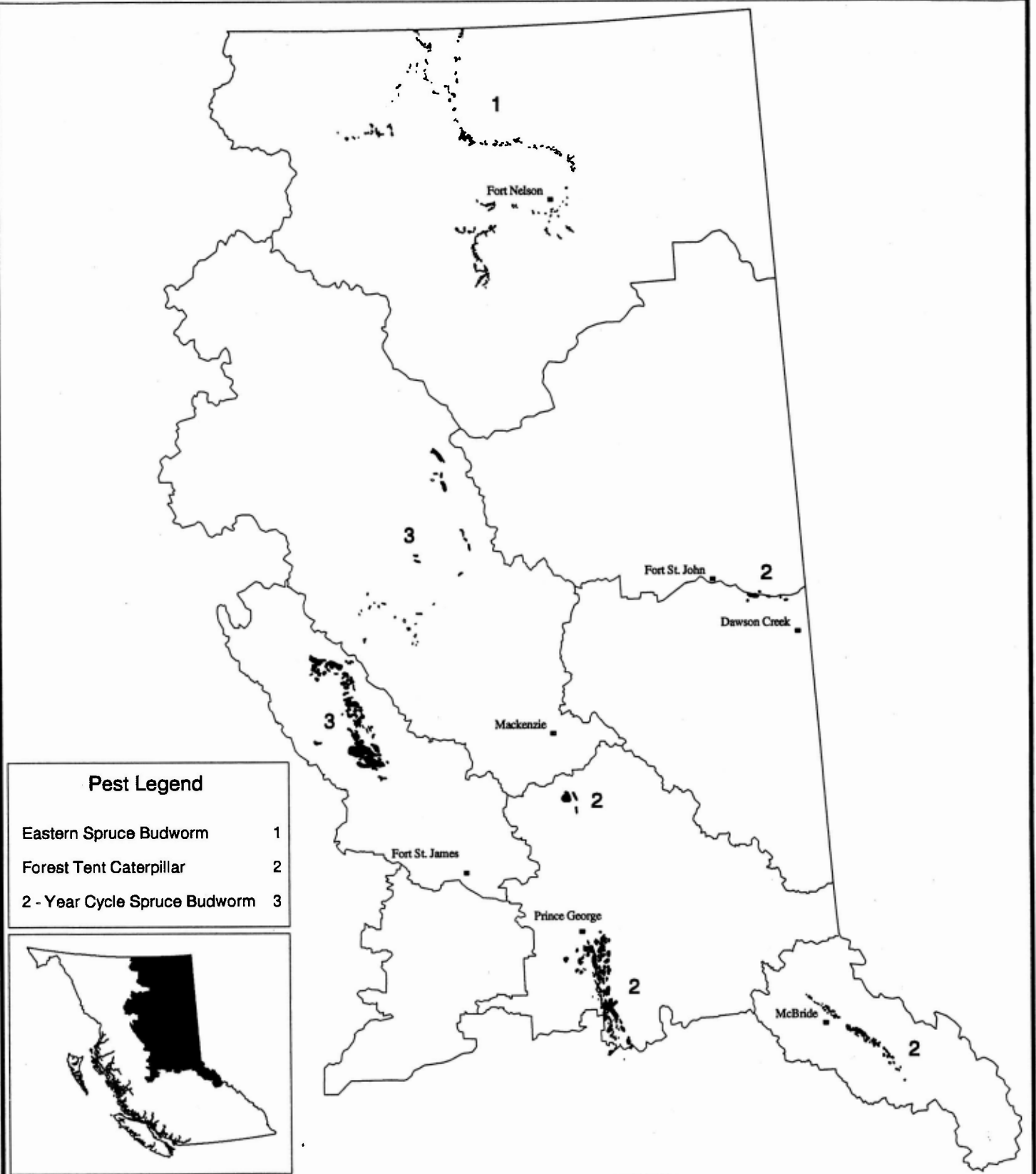
Damage caused by eastern spruce budworm feeding declined dramatically in the Fort Nelson Forest District. Light, moderate and some severe defoliation of white spruce, and to a lesser extent alpine fir, was mapped over a total of 26 820 ha, compared with 173 000 ha in 1994 (Table 5, Figure 5). Though actual infested area and intensity was much reduced, the infestations were almost as widespread as in prior years.

Table 5. Location and area by severity, of eastern spruce budworm infestations in the Fort Nelson Forest District, FIDS, Prince George Forest Region, 1995

| Location | Area (ha) by Severity Class | | | Total |
|--|-----------------------------|----------|--------|--------|
| | Light | Moderate | Severe | |
| Fort Nelson River (Klua Cr.- Snake R.) | 500 | | | |
| Fort Nelson River (Snake R.- Liard R.) | 5700 | 1300 | 900 | 7900 |
| Liard River (north of Nelson Forks) | 2000 | 700 | | 2700 |
| Liard River (Fort Nelson R.- Toad R.) | 1800 | 500 | 70 | 2370 |
| Liard River (Toad R.- Deer R.) | 1400 | 500 | | 1900 |
| Beaver River | 1800 | | | 1800 |
| Toad River | 400 | | | 400 |
| Muskwa River (Gathto Cr.- Tetsa R.) | 4800 | 600 | | 5400 |
| Muskwa River (Tetsa R.- Prophet R.) | 650 | 300 | | 850 |
| Kledo Cr. | 100 | 880 | | 980 |
| Tetsa River | 1600 | | | 1600 |
| Prophet River | 200 | 120 | | 320 |
| Totals | 20 950 | 4900 | 970 | |
| Grand Total | | | | 26 820 |

Major Defoliators

Prince George Region



Natural Resources Canada
Canadian Forest Service
Forest Insect and Disease Survey



Scale 1: 4000000

Projection: Lambert Conformal Conic

Map Produced by GIS: 18 Feb 95

Figure 5. Areas where defoliator damage was mapped during aerial surveys.

North of Fort Nelson, intermittent patches of mostly light defoliation occurred along the Fort Nelson River, westward from the Snake River to the Liard River. In the Liard River corridor, widely scattered patches were seen from the Northwest Territories border as far to the west as the Grand Canyon of the Liard, and along the tributary Beaver River to the Yukon border. A few small patches of light defoliation were mapped along the Toad River near its confluence with the Liard. Some of the most concentrated damage as in prior years, was seen in the Kledo Creek area but, unlike last year, numerous light and moderate patches were also mapped along the Muskwa River from Gathto Creek north. Scattered small patches of light defoliation were also seen along the Tetsa and Prophet rivers, and along the Fort Nelson River, southeast of the town of Fort Nelson.

* Near the confluence of the Kiwigana and Fort Nelson rivers, three lightly defoliated stands totalling approximately 300 ha contained an estimated 30% recent mortality. It is not known if the mortality was a direct result of budworm feeding damage, or if the stressed trees were killed by secondary agents such as spruce beetle or *Ips* spp. Four nearby stands were moderately or severely defoliated by this year's budworm feeding.

Egg mass counts on white spruce branch samples sent by the B.C. Forest Service from the Snake River, Clarke Lake and the Liard spray block varied widely. Small sample sizes reduced confidence in the counts to the level of indicator, rather than predictor. Counts on samples from the Snake River averaged 745 egg masses per 10 m² of foliage. Based upon previous years' egg counts this could indicate increased areas of moderate and severe defoliation in 1996. Counts of 327 egg masses per 10 m² of foliage from the Clarke Lake sample indicated continued high populations in the area. Liard spray block samples totalled only 52 per 10 m² of foliage, suggesting relatively low populations with a chance of trace defoliation in 1996.

Two-year-cycle spruce budworm *Choristoneura biennis*

Extensive defoliation of alpine fir and white spruce continued in the Prince George region over a total of 67 700 ha, mostly in the Fort St. James Forest District and to a lesser extent in the Mackenzie district (Figure 5).

In the Fort St. James district, defoliation was mapped from Mount Kloch northwest to Mount Ogden over a total of 58 300 ha. Stands were moderately defoliated over 12 600 ha, and severely defoliated over 28 900 ha, mainly in the Takatoot Lake, Brule Hill, and western Tchentlo Lake areas, near Tsayta Lake, and in the Falls River drainage.

Scattered patches of light defoliation were mapped over a total of 9400 ha in the Mackenzie district, mostly near the Ospika, Osilinka and Omineca rivers. Several of the defoliated stands near the Ospika River were also infested by a low incidence of the western balsam bark beetle complex.

True Fir Pests

Western balsam bark beetle-fungus complex *Dryocoetes confusus*, *Ceratocystis dryocoetidis*

Prince Rupert Forest Region

Recent mortality caused by the western balsam bark beetle-fungus complex was mapped over an area of 72 500 ha (Figure 6). The reduction from 140 000 ha mapped in 1994, and altered distribution of infestations, reflected changes in aerial survey coverage, rather than changes in beetle activity.

Kalum Forest District

Major beetle activity continued in the upper Bell-Irving River drainage including infestations in the Scott, Todedada, Treaty, Teigen and Snowbank creek drainages, with 290 infestations over 3000 ha; a tripling of area mapped from last year's survey. Minor activity was also noted in the Kalum River drainage north of Kalum Lake over 41 ha, and in two infestations above the Tseax River and one near Brown Bear Creek.

Cassiar Forest District

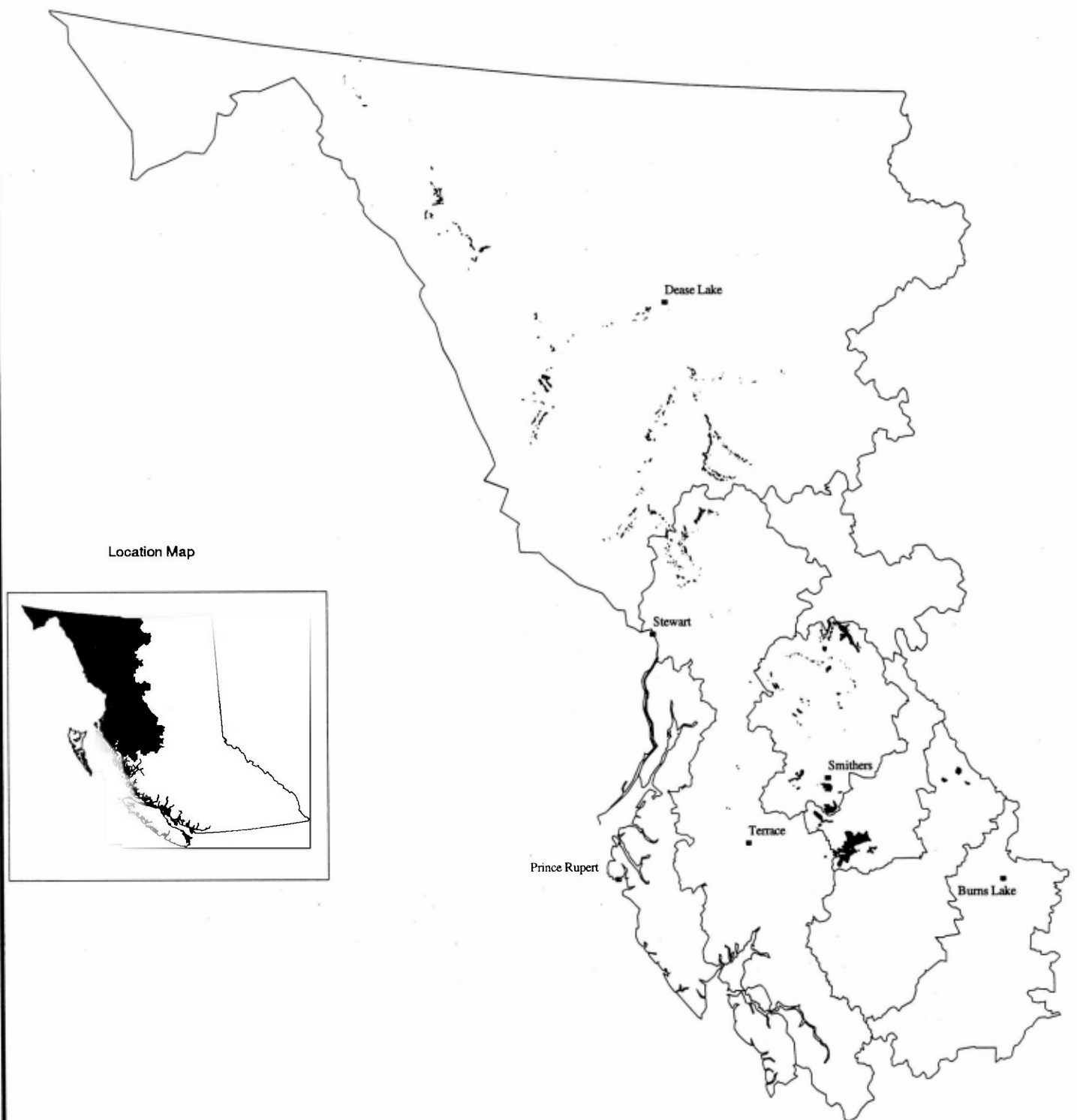
Recent alpine fir mortality was mapped over 15 600 ha in 580 infestations, in parts of the District not flown in recent years. Along the Klappan and Little Klappan rivers, almost 3800 ha of light beetle-caused mortality was mapped in 230 infestations. From north of Kinaskan Lake, south along the Iskut River to McLymont Creek and including the Beaverpond Creek area, 78 infestations covered approximately 1650 ha. Further west, along the Stikine River from Decker Creek north to Chutine River, including major damage areas along Shakes Creek, 3300 ha were mapped in 58 infestations. Light beetle-caused mortality was mapped over 1100 ha west of Dease Lake along the Tanzilla River, near Harper Reed Creek and along the Sheslay River. Along the Inklin River nearly 1800 ha of red trees were mapped in 25 infestations, with a further 2100 ha along the Nakonake and Sloko rivers. Further northwest, about 180 ha in 28 scattered infestations were mapped between Brownlee Lake and Tutshi Lake.

Kispiox Forest District

A total of over 17 000 ha of light mortality was mapped in 220 infestations. Large areas along the Sicintine River to its mouth, totalling about 8500 ha, were infested. Farther down the Skeena River to the village of Kitseguecla and in the Kitseguecla River drainage, scattered, sometimes large infestations totalling more than 4800 ha were seen. Farther west, 70 scattered infestations occurred on slopes above the Kitwanga River, along the Kispiox River, and in greater concentration along upper Kuldo Creek over 2000 ha. Attacks also continued west of Kitwanga in 25 infestations totalling approximately 1700 ha.

Western Balsam Bark Beetle

Prince Rupert Region



Natural Resources Canada
Canadian Forest Service
Forest Insect and Disease Survey



Scale 1: 4500000

Projection: Lambert Conformal Conic

Map Produced by GIS: 26 Jan 96

Figure 6. Areas where balsam bark beetle-caused alpine fir mortality was mapped during aerial surveys.

Bulkley Forest District

Though only the Telkwa and upper Zymoetz river drainages were covered this year, balsam mortality was mapped over an area of over 34 000 ha. Most was in areas of ongoing light attack along the length of the upper north slopes of the Telkwa River from Telkwa Pass to Pine Creek, and across the River in the Howson Creek area. Though not flown this year, ground observations indicated ongoing alpine fir mortality over broad areas in the Blunt Creek and Upper Harold Price Creek areas, in McKendrick Pass, and on upper slopes of both the Babine and Bait mountain ranges.

Morice Forest District

During limited aerial surveys on the east side of Babine Lake a total of 2700 ha of light balsam mortality was mapped in the Hautete Creek and Natowite Lake areas. Though not mapped this year chronic light mortality continued over large areas, particularly in the Walcott area, and in stands above the shores of Morice Lake and Tahtsa Lake.

Prince George Forest Region

Balsam bark beetle infestations in the Prince George region were mapped over an area of over 53 000 ha. However, only a small portion of the region is covered by aerial surveys in any given year, and even in the coverage areas, balsam bark beetle is often not mapped. The suspected extent of balsam bark beetle damage is therefore much higher than that recorded; probably many times higher.

Mackenzie Forest District

The beetle and its associated fungus recently killed alpine fir over more than 13 000 ha in the Mackenzie Forest District. During aerial surveys in June, over 200 infestations ranging in size from a few trees to hundreds of hectares were mapped in numerous drainages along the east and southwest sides of Williston Lake. They were located primarily in the Phillip, Cut Thumb, Tony, Collins, Connaghan and Bruin creek drainages, as well as along the Ospika, Akie and West Nabesche rivers, and on mountain slopes along the southeast side of Williston Lake. Recent mortality was generally light, affecting less than 5% of the trees but cumulative mortality was much higher, exceeding 50% of the balsam component in some of the stands surveyed. FIDS aerial surveys were only conducted in the southern portion of the TSA.

Many of the balsam bark beetle-infested stands were also infested by the two-year-cycle spruce budworm. Lightly defoliated tops were intermingled with dead and dying trees, giving the affected stands a striking reddish hue.

Fort St. James Forest District

Balsam bark beetle mortality was mapped over about 40 000 ha, compared with over 50 000 ha last year. More than 70% of the infested area was mapped in and around the Mitchell Range on the southeast side of Takla Lake. Here also, beetle mortality was mapped in many stands defoliated by the two-year cycle spruce budworm. Infestations over a total of 4500 ha were also mapped in the Cripple Lake area, directly north of Fort St. James.

Balsam bark beetle attacks often continue for many years in a stand. Attack levels normally average only one or two percent per year, though the tendency of alpine fir to retain red foliage for up to five years, exacerbates the visual impact. Annual losses in infested stands are broadly estimated to average four cubic meters per hectare. Commonly, mature and semi-mature trees are attacked, generally above two meters on the bole. Because it has been

primarily a pest of high elevation stands, most of which are low priority or inoperable, it has not commanded much attention within the forest community. This has recently changed as this type of stand has increasingly being relied upon to meet timber supply needs. This is especially true in forest districts such as Morice and Bulkley in the Prince Rupert region, and Mackenzie in the Prince George region, that have large volumes of alpine fir inventory in stands infested by the beetle.

Western Hemlock Pests

Hemlock dwarf mistletoe *Arceuthobium tsugense*

Hemlock dwarf mistletoe remains a serious chronic parasite of western hemlock through much of the Kalum district, south of the Meziadin area. In Pests of Young Stands (POYS) surveys of nine young spaced stands in which hemlock was a major component, three were infected. At Hatchery Creek 27% of hemlock were infected, including 3% severely⁵. The disease was concentrated in a central portion of the stand. At Pontoon Creek, 21% were infected (17% severely), with mistletoe distributed through much of the stand. At Humphrys Creek only 3% were infected in this older stand.

Removal of mistletoe infected trees in these already spaced stands would create a large NSR (not satisfactorily restocked) area in the center of the Hatchery Creek young stand and large openings throughout the Pontoon Creek site. Leaving the mistletoe could result in substantially reduced increment, reduced quality, some mortality, and a problem to be dealt with again in the next rotation. The minor infection level on the older Humphrys Creek site will probably have little impact to rotation age.

Hemlock dwarf mistletoe has been recorded during surveys in treated young stands for the last five consecutive years. Key opportunities exist for mistletoe management in young stands during silvicultural treatments such as spacing and brushing. Identification of infected trees is important prior to treatment. In heavily infected stands a 'no spacing' or stand conversion strategy could be considered. Increasing light into these stands by spacing can activate previously dormant and nearly invisible mistletoe plants, thus exacerbating the problem.

Green-striped forest looper *Melanolophia imitata*

Defoliation of over-mature and understory western hemlock by the green-striped forest looper covered nearly 700 ha, 400 ha of which was severe. The infestation followed a narrow elevational band at the 500 meter level above the west shore of the Skeena River opposite Shewiliba Creek, in the Kispiox Forest District. Though the insect had often been collected in standard beating samples, this was the first recorded outbreak in the Prince Rupert region. The last recorded damage at this latitude was on the Queen Charlotte Islands in 1964, and the last outbreak in the Interior Cedar-hemlock Biogeoclimatic Zone was in the Columbia River Valley, north of Revelstoke in 1953.

⁵ Infection in all crown levels; some crown levels with stem infections and more than 50% of branches infected.

Though the insect responsible for the damage was collected and identified for the first time this year, defoliation had been seen from the air as early as 1993. Defoliation was light in that year, and again in 1994, and it wasn't until this year that the infested stand became accessible by road. When the stand was visited in late July larval feeding had just finished and the insects were in the resting pre-pupal phase on the branches, or had already pupated in the duff.

A mass collection of pupae found below the moss layer was submitted to the PFC Insectary for rearing. Levels of disease and parasitism will be determined at the time of adult emergence in the spring. During the site visit it became quickly evident that the insect population was under intense pressure particularly from predators. Insectivorous birds, particularly varied thrushes and robins were abundant in the stand. On the forest floor the duff had been overturned in many spots where a mid-sized mammalian predator had likely been in search of pupae. Under the moss as well, empty pupae and abundant small mammal droppings testified to the presence of a third predator, probably shrews or voles. In addition, some larvae were seen hanging from branches in a manner characteristic of viral infection. The abundance of predation and the probable viral infection suggested that the infestation was in a late stage, and will probably collapse early next year.

Some of the over-mature and understory hemlock had been completely stripped of foliage this year. This will probably result in some tree mortality. However, due to the infestation, the stand has been selected for priority harvest, so most of the timber value will be salvaged.

Western hemlock looper
Lambdina fiscellaria lugubrosa

No current defoliation of western hemlock or western red cedar was seen in either the Prince George or McBride Forest Districts in the Prince George region in 1995. Looper populations which had declined in 1994, collapsed completely this year. Successive years of severe defoliation by the looper killed about 40%, (range 10-90%), of mainly old growth western hemlock and western red cedar over 35 000 ha in the two districts, since the infestation began in 1991.

Pheromone traps were placed at five locations to monitor the adult flight and maintain the annual record of population fluctuations. An average of 5.5 moths were caught in 1995 compared to an average of 327 in 1994. Populations are expected to remain low in 1996.

Douglas-fir Pest

Douglas-fir beetle *Dendroctonus pseudotsugae*

Douglas-fir beetle remained active within the Prince George region in 1995, most notably in mixed stands around Fort St. James, in areas southwest of Prince George and in the Mt. Robson area. With the exception of minor infestations within the McGregor Model Forest, no FIDS aerial surveys were done in active Douglas-fir beetle areas. Most of the information following was provided by the B.C. Forest Service.

In the Fort St. James Forest District Douglas-fir beetle was mapped over 1060 ha compared with 2950 ha last year. Most of the activity was in mature mixed species stands around Stewart Lake.

Though no area figures are yet available, detailed aerial surveys in the McBride Forest District found increased Douglas-fir beetle activity in stands on the south side of the Robson Valley, below Mt. Terry Fox.

In the Prince George Forest District Douglas-fir beetle activity continued in areas of chronic activity such as Averil Lake and along the Blackwater River. No figures are available.

Multiple Host Pests

Black army cutworm *Actebia fennica*

Prince Rupert Forest Region

In a much reduced black army cutworm detection program, only four sites where significant numbers of adults were collected in pheromone traps in the fall of 1994, were revisited in the spring of 1995. At a Bell-Irving River site (CP 10-5), where the average trap catch was 636 moths, defoliation of ground vegetation (primarily fireweed) was generally light with patches of less than 0.1 ha more severely defoliated. An adjacent site (CP 10-4), assessed due to its proximity, suffered mainly trace levels of defoliation of fireweed with small, scattered patches of light to moderate damage. Both sites were planted, but probably after completion of the larval period as no defoliation was found. At a Deltaic Creek site planted in 1994, the average trap catch was only 204 moths. Defoliation was light and patchy in ground cover and an occasional seedling was slightly damaged. At Hunter Creek, the trap catch was only 110 adults, no seedlings had been planted and ground vegetation covered less than 5% of the site. Minor feeding on devil's club was noted.

Due to program reductions, no traps were placed in the fall of 1995, and no forecast of 1996 larval populations is available. No further surveys for black army cutworm are planned.

Prince George Forest Region

Cutworm infestations were reported on two cutblocks near Ankwill Creek at the north end of Takla Lake. The blocks were broadcast burned in 1993 and planted with white spruce. In the last two years elderberry had become abundant on the site and was to be removed by sheep grazing this spring. Cutworms were seen this spring eating the elderberry on the higher elevation portions of the cutblocks. No seedlings were damaged.

Rhizina root disease

Rhizina undulata

By mid June, *Rhizina* fruiting bodies were common to abundant at a site near Hunter Creek in the Kalum Forest District, in the Prince Rupert region. The site had been broadcast burned in June of 1994, and scattered fruiting bodies had been noted in the fall of that year. Fortunately, planting was delayed until 1996, by which time the risk of infection will be greatly reduced.

Rhizina surveys are usually companioned with black army cutworm trap placement and retrieval. Since the latter program has been discontinued, no new broadcast burn areas were visited. No incidences of seedling root disease were reported by other agencies.

Pests of Young Stands

A total of 67 young stands were surveyed in northern British Columbia in 1995 to record the incidence, and damage caused by a full range of forest pests and other factors. Most surveyed stands had been treated under the Forest Resource Development Agreements (FRDA I or II). To ensure a valid representation of stand conditions, a minimum of 100 trees were examined in a minimum of 10 stocked plots. Plot sizes varied from site to site ranging from 1/200 ha (3.99-m radius) to 1/100 ha (5.64-m radius) depending on stocking. A standard minimum plot interval of 50 m, was increased to 100 m in larger openings to provide a more representative coverage.

Prince Rupert Forest Region

Of the 5279 trees of seven conifer and one deciduous species surveyed in 1995, 3280 (62%) were pest-free (Figure 7), similar to 1994. Only 84 (2%) trees were recorded as recently killed and 176 (3%) were severely deformed or life threatened. A further 1097 (21%) were considered to have suffered a net volume loss or to expect loss of long term growth potential. A total of 41 different pests or damage conditions were recorded, ranging from vegetative press to moose browse to insect and disease damage. A listing of the major pests/damage conditions by host is contained in Table 6. Of these 41 pests, 33 caused significant damage (>SI 3, see Figure 5 for definition) while mortality was associated with only 14. An average of 12 plots and 143 trees were examined per site, for an average of 12 trees per plot.

The 37 surveyed stands were divided among four biogeoclimatic zones; 18 in the SBS zone, 11 in CWH, 6 in the ICH, to 2 in the BWBS zone. Of stand treatments, 31 were spaced, 4 were planted or fill-planted, 1 was chemically brushed and weeded, 1 was pruned.

Table 6. Frequency, by host, of most damaging pests/conditions in young stands treated under FRDA I/II, FIDS, Prince Rupert Forest Region, 1995

| Host/Pest | No. Trees by Severity | | | | No. Stands Affected | % Trees Affected | | | |
|--|------------------------------|----|-----|-----|------------------------|------------------|------|-----------------------|------|
| | Index Code (SI) ¹ | | | | | by Host | | by Stand ² | |
| | 6 | 5 | 4 | 3+2 | | Avg. | Max. | Avg. | Max. |
| Lodgepole pine-2017 trees, 29 stands, 24 pests/conditions, 1506 (75%) pest free | | | | | | | | | |
| Warren's root collar weevil | 3 | 3 | - | - | 2 | 2 | 3 | 1 | 2 |
| Atropellis canker | 2 | - | 41 | 14 | 5 | 9 | 31 | 6 | 22 |
| <i>Cronartium</i> spp.stem rust | 9 | 44 | - | 19 | 5 | 8 | 24 | 6 | 16 |
| Western gall rust | 1 | 27 | - | 67 | 13 | 5 | 31 | 4 | 28 |
| Porcupine | 1 | - | - | 18 | 4 | 4 | 12 | 2 | 8 |
| Squirrel | 8 | - | - | - | 1 | 10 | 10 | 7 | 7 |
| Ice/snow | 14 | 2 | 5 | 5 | 3 | 6 | 18 | 4 | 14 |
| Dead/broken top | 1 | 1 | 14 | 4 | 9 | 2 | 8 | 3 | 5 |
| Fork/crook | - | - | 89 | 13 | 22 | 4 | 17 | 3 | 15 |
| Tree competition | - | 1 | 57 | - | 12 | 7 | 30 | 4 | 11 |
| Spruce (Sitka/white/hybrid) -1516 trees, 34 stands, 20 pests/conditions, 508(34%) pest free | | | | | | | | | |
| Spruce weevil | - | - | 465 | - | 12 | 66 | 100 | 18 | 44 |
| Frost | 35 | 14 | 2 | 229 | 12 | 20 | 47 | 7 | 21 |
| Mechanical | - | 1 | 13 | 4 | 5 | 4 | 20 | 2 | 9 |
| Atypical growth | - | 3 | 4 | 40 | 4 | 6 | 9 | 3 | 9 |
| Fork/Crook | - | - | 13 | 54 | 14 | 6 | 20 | 1 | 13 |
| Tree competition | - | 5 | 94 | 3 | 18 | 20 | 67 | 4 | 12 |
| Western hemlock-1093 trees, 16 stands, 17 pests/conditions, 850 (78%) pest free | | | | | | | | | |
| Hemlock dwarf mistletoe | - | - | 35 | - | 3 | 18 | 28 | 10 | 16 |
| Porcupine | - | 18 | 2 | 11 | 3 | 7 | 13 | 5 | 10 |
| Nutrient deficiency | - | 34 | - | - | 1 | 21 | 21 | 18 | 18 |
| Tree competition | - | - | 29 | 1 | 4 | 14 | 48 | 6 | 16 |
| True fir(alpine/amabilis)-429 trees, 21 stands, 19 pests/conditions, 262(61%) pest free | | | | | | | | | |
| Moose | - | 2 | 37 | 13 | 9 | 30 | 100 | 3 | 15 |
| Damage cause unknown | 3 | - | 1 | - | 2 | 4 | 6 | 1 | 2 |
| Atypical growth | - | 12 | 1 | - | 6 | 26 | 80 | 2 | 7 |
| Flooding | - | - | 15 | - | 1 | 100 | 100 | 8 | 8 |
| Tree competition | - | - | 38 | - | 6 | 35 | 100 | 4 | 18 |
| Western red cedar-192 trees, 11 stands, 10 pests/conditions, 122(64%) pest free | | | | | | | | | |
| Moose | - | - | 4 | 17 | 4 | 13 | 37 | 3 | 7 |

- ¹ SI 2 - minor damage, negligible impact
SI 3 - significant loss of current growth potential
SI 4 - causing net volume loss or loss of long-term growth potential
SI 5 - life-threatening or severely deforming
SI 6 - recently killed
² all hosts

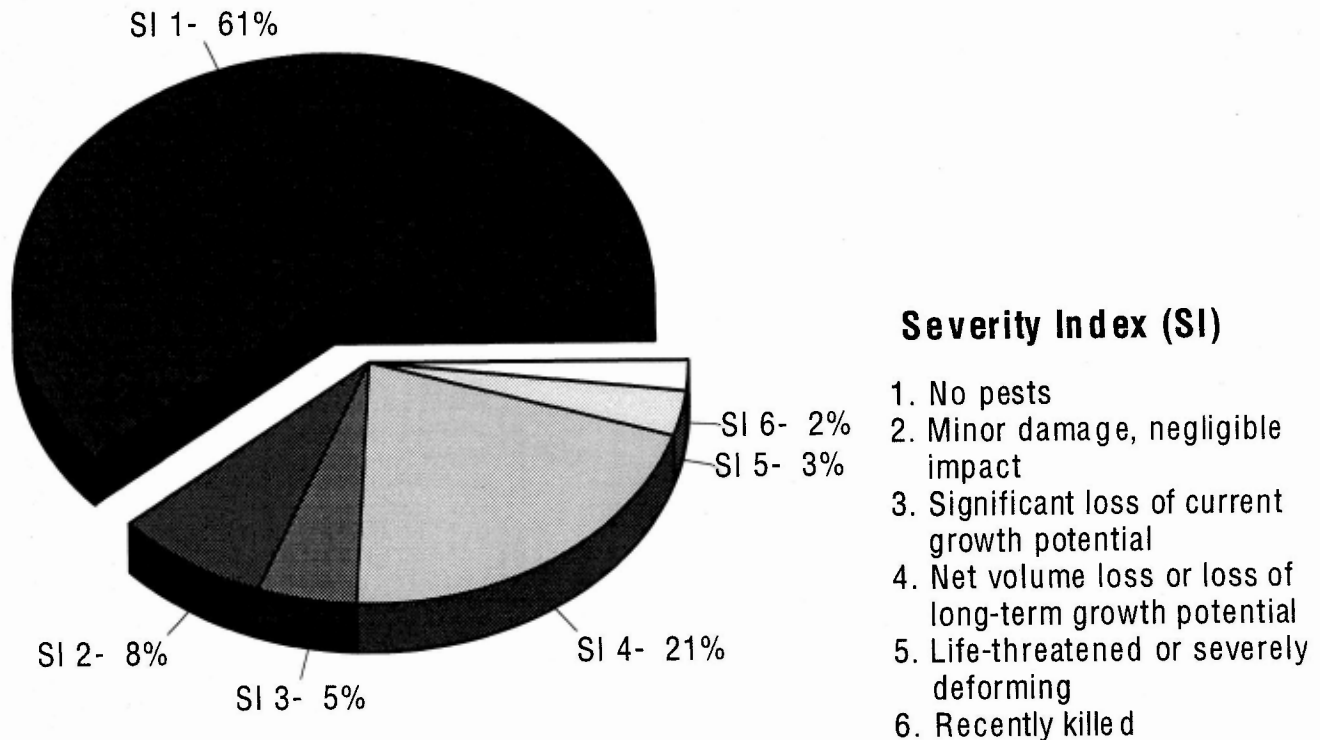


Figure 7. Percentage of 5276 trees of seven conifer and one deciduous species in each of six severity classes determined during surveys of 37 young stands, FIDS, Prince Rupert Forest Region, 1995.

The 1995 POYS surveys found frost to have caused the most mortality in spruce, stemming from a 1992 May freeze, while on lodgepole pine, a number of pests including Warren's root collar weevil, *Atropellis* canker, *Cronartium* spp. stem rusts, Western gall rust and mammals were agents of mortality. The most commonly occurring pest was spruce weevil which had infested (from current and prior attacks) 470 Sitka and hybrid spruce in 12 stands. Much of the remaining damage of significance was in the form of growth effects such as forks and crooks, dead or broken tops and others, most of which stemmed from events many years in the past, and for which no cause was determined. Competition from other tree, brush and herbaceous species was the third major cause of growth loss and low vigour.

Abiotic damage, frost and snow/ice, caused 58% of the mortality and 24% of the overall significant damage (defined as damage >SI 3). Assorted damage conditions (combined under the title of "Damage cause unknown") were responsible for 6% of the mortality but 30% of the significant damage. Spruce weevil was the only insect recorded this year causing significant damage; 35% of the instances of damage were attributed to this pest. Diseases, most notably stem rusts and western gall rust in lodgepole pine, caused 15% of the total mortality and 16% of the significant damage. Mammals, primarily moose and porcupine caused 4% mortality and 9% of overall significant damage. A summary of the incidence of the more severe pests and damage is contained in Table 7.

Table 7. Most important pests and/or damage conditions in young stands by frequency and severity, FIDS, Prince Rupert Forest Region, 1995

| Pest | No. trees affected ¹ | | | No. stands | No. trees ² | % trees | | |
|-----------------------------|---------------------------------|-----|-----|------------|------------------------|-------------------|-------------------|-------------------|
| | SI6 | SI5 | SI4 | | | Avg. ³ | Min. ⁴ | Max. ⁴ |
| Frost | 35 | 14 | 2 | 12 | 270 | 18 | 1 | 21 |
| Ice/Snow | 14 | - | 6 | 8 | 98 | 2 | 1 | 14 |
| <i>Cronartium</i> spp. | 9 | 44 | - | 5 | 72 | 4 | 1 | 16 |
| Windthrow | 4 | - | - | 4 | 6 | <1 | 1 | 2 |
| Damage cause unknown | 3 | - | 1 | 2 | 4 | 1 | 1 | 2 |
| Warren's root collar weevil | 3 | 3 | - | 2 | 6 | <1 | 1 | 2 |
| Atropellis canker | 2 | - | 38 | 5 | 57 | 3 | 1 | 22 |
| Western gall rust | 1 | 26 | - | 13 | 95 | 5 | 1 | 28 |
| Mechanical | 1 | 3 | 26 | 18 | 61 | 1 | 1 | 9 |
| Porcupine | 1 | 18 | 19 | 7 | 52 | 2 | 1 | 10 |
| Dead/broken top | 1 | 2 | 32 | 13 | 48 | 1 | 1 | 5 |
| Bear | 1 | 1 | - | 2 | 4 | <1 | 1 | 2 |
| Animal damage | 1 | - | - | 3 | 6 | <1 | 1 | 3 |
| Armillaria root disease | 1 | - | - | 1 | 1 | <1 | 1 | 1 |
| Spruce weevil | - | - | 470 | 12 | 470 | 31 | 1 | 44 |
| Tree competition | - | 5 | 204 | 22 | 228 | 4 | 1 | 18 |
| Nutrient deficiency | - | 34 | - | 1 | 34 | 3 | 18 | 18 |
| Atypical growth | - | 19 | 14 | 13 | 74 | 2 | 1 | 24 |
| Moose | - | 2 | 42 | 15 | 81 | 2 | 1 | 15 |
| Lean | - | 4 | 9 | 13 | 21 | <1 | 1 | 3 |
| Hemlock dwarf mistletoe | - | - | 36 | 3 | 36 | 3 | 1 | 16 |
| Lodgepole terminal weevil | - | - | 16 | 7 | 16 | <1 | 1 | 4 |
| Comandra stem rust | - | 2 | - | 1 | 2 | <1 | 2 | 2 |
| White pine blister rust | - | 1 | - | 1 | 1 | <1 | 1 | 1 |
| Flooding | - | - | 15 | 1 | 15 | 3 | 18 | 18 |
| Multi-topped | - | - | 36 | 16 | 62 | 1 | 1 | 7 |
| Fork/Pronounced crook | - | - | 93 | 34 | 187 | 2 | 1 | 15 |
| Basal Sweep | - | - | 1 | 2 | 2 | <1 | 1 | 1 |
| Herbaceous competition | - | - | 2 | 2 | 2 | <1 | 1 | 1 |
| Shrub competition | - | - | 9 | 3 | 9 | <1 | 1 | 2 |
| <i>Pineus</i> sp. | - | - | 7 | 12 | 51 | 1 | 1 | 5 |

¹ SI 4 - causing net volume loss or loss of long-term growth potential

SI 5 - life-threatening or severely deforming

SI 6 - recently killed

² Includes trees with pest damage in SI categories 2 and 3 which have little or no long-term significance.

³ Regional averages on affected host species

⁴ From trees in plots in affected stands only

As in prior years, insects and diseases were found to be less problematic than abiotic influences such as frost, ice/snow. Much of the significant damage was in the form of forks, crooks, and broken or multiple tops, which could only be recorded as symptoms with no direct links to cause. These types of damage are thought to have been predominantly environmental in origin. Where insects and diseases were the main concern, only a few species caused significant damage. Rather than being outbreak-based like most of the foliage-destroying insects and diseases, these were of the chronic variety and included such pests as stem rusts, spruce weevil and dwarf mistletoe. The significance of their damage is based primarily in their long-term activity. This characteristic makes them more responsive to stand-specific management strategies such as spacing regimes or species conversion.

By identifying stands with pest problems that can be mitigated by specific management techniques, POYS surveys provide opportunities to enhance stand values. They also provide valuable "snapshots" of stands taken at the beginning of a period of unmonitored growth.

Prince George Forest Region

Of the 3581 trees of five conifer and one deciduous species surveyed in 1995, 2527 (71%) were pest-free (Figure 8), similar to 1994. Only 69 (2%) trees were recorded as recently dead and 74 (2%) were severely deformed or life-threatened. A further 346 (10%) suffered a net volume loss, or a loss of long term growth potential. A total of 17 different pests or damage conditions were recorded, ranging from basal sweep to moose browse to insect and disease damage. A listing of the major pests/damage conditions by host is contained in Table 8. Of these 17 pests, 14 caused significant damage (>SI3) while mortality was associated with 7. An average of 10.5 plots and 119 trees were examined per site, for an average of 11.4 trees per plot.

The 30 surveyed stands were all located within the Sub-boreal spruce biogeoclimatic zone. Of stand treatments, 16 were spaced, 6 were planted or fill-planted, 3 were chemically brushed and weeded, 2 were mechanically brushed and weeded and 3 were not treated.

Lodgepole pine accounted for 50% of trees examined in 1995, but 100% of the tree mortality. The primary agents of this mortality which affected a total of 3.8% of the pine were *Cronartium* spp. stem rusts (2%), and squirrels (1%)(Table 9). The latter girdled trees by feeding on the cankers caused by the former, so were essentially secondary agents of mortality. Other significant pests included western gall rust, *Endocronartium harknessii*, which infected 1.5% of the pine causing life threatening stem galls, spruce weevil which caused top dieback of 15% of the white spruce from current attacks, and forks, crooks and multiple tops in an additional 8.5% of the spruce from past attacks.

Table 8. Frequency, by host, of most damaging pests/conditions in young stands treated under FRDA I/II, FIDS, Prince George Forest Region, 1995

| Host/Pest | No. Trees by Severity | | | | No. Stands Affected | % Trees Affected | | | |
|---|------------------------------|----|-----|-----|------------------------|------------------|------|-----------------------|------|
| | Index Code (SI) ¹ | | | | | by Host | | by Stand ² | |
| | 6 | 5 | 4 | 3+2 | | Avg. | Max. | Avg. | Max. |
| Lodgepole pine- 1776 trees, 23 stands, 17 pests/conditions, 1338 (75%) pest free | | | | | | | | | |
| <i>Cronartium</i> spp. | 37 | 39 | - | 4 | 11 | 4 | 15 | 3 | 13 |
| squirrel ³ | 20 | 5 | 7 | 14 | 8 | 4 | 22 | 3 | 22 |
| Warren's root collar weevil | 5 | - | - | - | 2 | 2 | 5 | 2 | 4 |
| western gall rust | 2 | 28 | - | 50 | 15 | 4 | 10 | 3 | 9 |
| porcupine | 2 | 2 | - | 48 | 6 | 9 | 49 | 8 | 49 |
| ice/snow | 2 | - | 2 | 5 | 5 | 2 | 3 | 2 | 2 |
| Atropellis canker | 1 | - | 1 | - | 1 | 1 | 1 | 1 | 1 |
| needle casts and blights | - | - | 6 | 39 | 4 | 10 | 25 | 7 | 17 |
| <i>Lophodermella</i> sp. | - | - | 6 | - | 1 | 5 | 5 | 5 | 5 |
| Dead or broken top | - | - | 2 | - | 1 | 3 | 3 | 1 | 1 |
| Sequoia pitch moth | - | - | - | 36 | 7 | 5 | 11 | 3 | 8 |
| multi-topped | - | - | - | 18 | 4 | 4 | 7 | 3 | 5 |
| White spruce - 1150 trees, 22 stands, 6 pests/conditions, 592 (51%) pest free | | | | | | | | | |
| spruce weevil | - | - | 176 | - | 9 | 19 | 28 | 18 | 28 |
| multi-topped ⁴ | - | - | 197 | - | 9 | 21 | 44 | 20 | 44 |
| fork ⁴ | - | - | 53 | - | 6 | 8 | 18 | 8 | 18 |
| crook ⁴ | - | - | 44 | - | 7 | 6 | 20 | 6 | 20 |
| Cooley spruce gall adelgid | - | - | - | 83 | 6 | 47 | 79 | 10 | 26 |
| ice/snow | - | - | - | 3 | 1 | 2 | 2 | 2 | 2 |
| Douglas-fir - 263 trees in 7 stands, 3 pests/conditions, 245 (93%) pest free | | | | | | | | | |
| Armillaria root disease | 1 | - | - | - | 1 | 17 | 17 | 1 | 1 |
| multi-topped | - | - | 13 | - | 2 | 15 | 17 | 3 | 5 |
| ice/snow | - | - | - | 4 | 1 | 4 | 4 | 4 | 4 |
| Alpine fir - 142 trees, 12 stands, 3 pests/conditions, 105 (74%) pest free | | | | | | | | | |
| multi-topped | - | - | 2 | - | 2 | 1 | 100 | 1 | 1 |
| moose | - | - | - | 22 | 5 | 32 | 68 | 4 | 12 |
| ice/snow | - | - | - | 13 | 3 | 46 | 100 | 4 | 9 |
| Western hemlock - 95 trees, 2 stands, 1 pest/condition, 94 (95%) pest free | | | | | | | | | |
| multi-topped | - | - | 4 | - | 1 | 100 | 100 | 1 | 1 |
| Poplar spp - 79 trees, 5 stands, no pests, 79 (100%) pest free | | | | | | | | | |

- ¹ SI 2 - minor damage, negligible impact
SI 3 - significant loss of current growth potential
SI 4 - causing net volume loss or loss of long-term growth potential
SI 5 - life-threatening or severely deforming
SI 6 - recently killed
² all hosts (in stands in which pest occurred only)
³ damage resulting from squirrels feeding upon *Cronartium* spp. stem cankers
⁴ probably resulting from past spruce weevil attacks

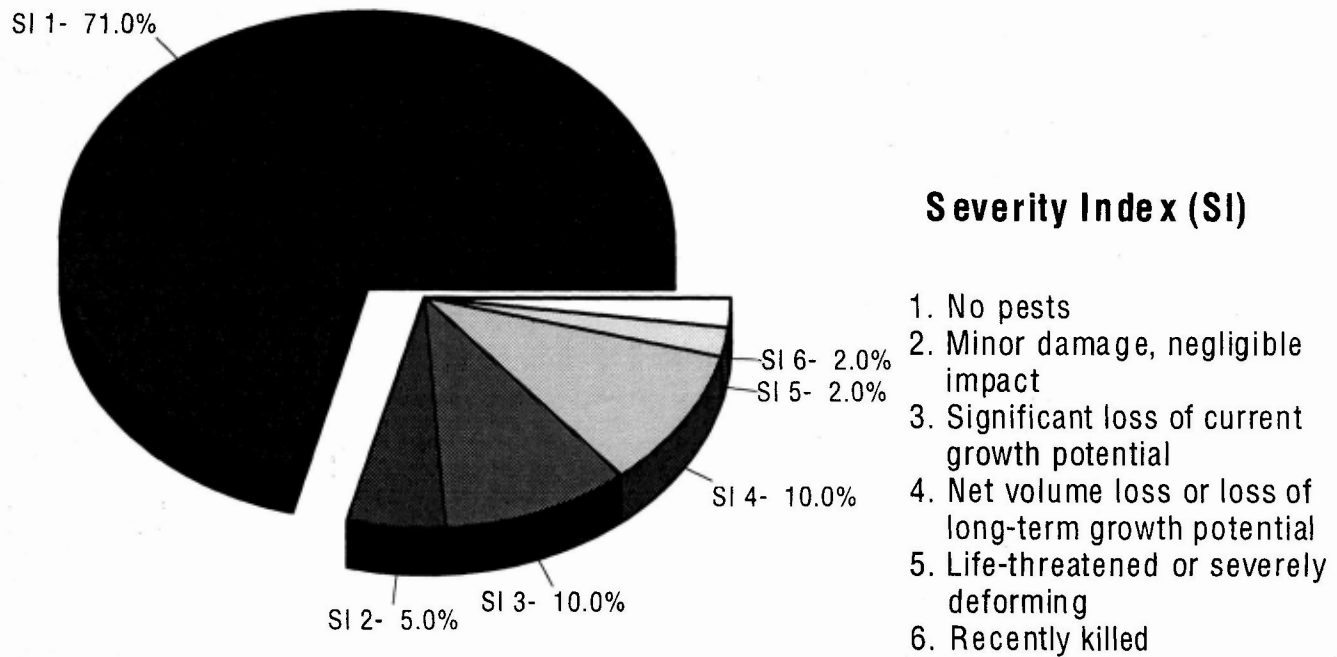


Figure 8. Percentage of 3581 trees of five conifer and one deciduous species in each of six severity classes determined during surveys of 30 surveyed young stands, FIDS, Prince George Forest Region, 1995.

Table 9. Most important pests and/or damage conditions in young stands by frequency and severity, FIDS, Prince George Forest Region, 1995

| Pest | No. trees affected ¹ | | | No. stands | No. trees ² | % trees affected | | |
|--------------------------------|---------------------------------|-----|-----|------------|------------------------|-------------------|------|------|
| | SI6 | SI5 | SI4 | | | Avg. ³ | Min. | Max. |
| <i>Cronartium</i> spp | 37 | 30 | - | 11 | 80 | 5 | 1 | 23 |
| squirrel ⁴ | 20 | 5 | 7 | 8 | 46 | 3 | 2 | 33 |
| Warren's root collar weevil | 5 | - | - | 2 | 4 | 2 | 1 | 3 |
| Western gall rust | 2 | 28 | - | 15 | 80 | 5 | 1 | 13 |
| porcupine | 2 | 2 | - | 6 | 52 | 3 | .5 | 52 |
| ice/snow | 2 | - | 2 | 10 | 29 | 1 | 1 | 9 |
| Atropellis canker | 1 | - | 1 | 1 | 2 | .1 | 1 | 1 |
| multi-topped ⁵ | - | - | 206 | 15 | 206 | 5 | 1 | 43 |
| Spruce weevil | - | - | 176 | 9 | 176 | 15 | 8 | 28 |
| fork and/or crook ⁵ | - | - | 142 | 16 | 142 | 5 | .4 | 23 |
| needle casts and blights | - | - | 12 | 5 | 51 | 2.6 | 1 | 18 |
| basal sweep | - | - | 4 | 1 | 4 | 2 | 4 | 4 |
| dead or broken top | - | - | 2 | 1 | 2 | .1 | .9 | .9 |

¹ SI 4 - causing net volume loss or loss of long-term growth potential

SI 5 - life-threatening or severely deforming

SI 6 - recently killed

² Includes trees with pest damage in SI categories 2 and 3 which have little or no long-term significance.

³ % of all species affected in all stand

⁴ damage resulting from squirrels feeding upon *Cronartium* spp stem cankers

⁵ mostly related to previous attacks to white spruce by spruce weevil.

Special Directed Surveys

ARNEWS/Biomonitoring

Prince Rupert Forest Region

Between 1984 and 1986, 15 ARNEWS (Acid Rain National Early Warning System) plots were established throughout the province in support of a national program designed to detect early signs of damage related to aerial pollutants or acidified precipitation. Since their establishment the plots have been closely monitored, and any changes in health and composition have been recorded. In 1992 an additional 12 plots, now called Biomonitoring plots, were established to address concerns that some biogeoclimatic zones and major tree species were unrepresented or underrepresented in existing plots. In addition to establishing the new plots in 1992, the focus of analysis was broadened for all plots to better assess conditions in the total forest environment. No visual evidence of acid rain or aerial pollutants was noted in any plots assessed in 1995 (Figure 1). Minor incidences of broken tops, stem cankering, galling and sapsucker damage were recorded as in previous years.

In the Terrace Watershed plot #908 near Deep Creek, all plot western hemlock and western red cedar trees were healthy. Soil and foliage samples were collected for chemical analysis as part of the five-year assessment. Chemical analyses are in progress and comparative analyses will follow, for the purpose of detecting and assessing changes over time.

In the Sitka spruce plot (with hemlock understory) at Onion Lake, pest-related damage was similar to previous years, with 36% of leaders currently attacked by spruce weevil compared to 28% last year. Accumulated current and previous years attacks increased to 78% from 61% two years ago. A variety of other minor pests were present in the plot at low levels. These included: a trace of old frost damage, common but minor bud moth, *Zeiraphera* sp. branch tip feeding, a trace of *Chrysomyxa* sp. needle rust, a few spruce galls on one tree caused by the gall aphid, *Pineus similis*, minor moose browse and one tree showing pronounced terminal fasciation. In standard three-tree beating samples taken adjacent to the plot, 17 western blackheaded budworm, *Acleris gloverana*, larvae were captured from hemlock, and one from spruce. Additionally, one larva each of conifer sawfly, *Neodiprion* sp., and greenheaded spruce sawfly, *Pikonema dimmockii*, were found on the hemlock and spruce respectively.

Prince George Forest Region

Four plots established within the region were all assessed in 1995 (Figure 2). All plots were subject to the annual tree-by-tree condition assessment. The ARNEWS plot, established in 1985, was due also for the five year assessment.

The northernmost of the plots, #924, was established in 1992 adjacent to the Alcan Highway just north of Wonowon, within a pure stand of lodgepole pine. Nine of the 62 plot trees had single or multiple western gall rust, branch galls, and an additional 6 trees had both branch and stem galls. Two of the trees had stem cankers caused by *Atropellis piniphila* on the stem. Despite these diseases, all trees appeared vigorous.

Plot #927 is located near One Island Lake, south of Dawson Creek, in a stand of trembling aspen. All trees appeared healthy but with some bare branch twigs in the upper crowns and light defoliation on some trees by an unidentified free-feeding defoliator earlier in the season.

At the Willow River Plot #923, near Prince George, all 39 lodgepole pine were healthy. There were minor instances of stem attack on two trees by western gall rust, while single trees had sustained minor bear damage and attack by Sequoia pitch moth.

Plot #907 was established in a primarily white spruce stand in 1985 near Averil Lake within TFL #30, and what has become the McGregor Model Forest. This year the five year assessment was done in the plot. No recent mortality, significant pest activity or other types of damage were detected within the plot this year. Chemical analyses of foliage and soil are in progress.

McGregor Model Forest

The McGregor Model Forest, one of two in B.C., and ten nationwide, covers an area of 180 675 ha within Northwood's TFL 30, northeast of Prince George. The Model Forest program was initiated to act as a focus for new forestry initiatives in selected productive ecozones.

An annual aerial survey to detect and map pest damage found recent mortality resulting from attacks by four different pests. Spruce beetle killed white spruce over 718 ha, 86% of which was of moderate intensity. Most of the damage occurred near Woodall and Limestone creeks, and Pass, Boundary and Averil lakes. The attacks are thought to have been largely initiated by scattered blowdown reported to be common in the affected stands.

Recent sheet blowdown was mapped in eight patches over 191 ha in 1995, mostly in upper Seebach Creek.

Previous severe defoliation caused by western hemlock looper (populations collapsed in 1994), caused significant mortality in some western hemlock stands. Incidences of tree mortality have continued to occur as severely stressed trees succumb to the effects of climate and secondary pests. Up to 50% mortality was mapped over 115 ha.

Douglas-fir beetle was recorded in 29 scattered spots totalling 25 ha, mostly in the Averil Lake area, down from 150 ha in 1994.

Scattered spot attacks by mountain pine beetle were mapped over 23 ha near Mokus and Herring creeks, and Averil Lake.

Other pests recorded during ground surveys within the Model Forest included spruce weevil which affected 10% of the white spruce leaders in a stand along the North Averil Road. Western gall rust and *Cronartium* sp. stem rust infected 6% of the lodgepole pine at Tay Creek. *Cronartium* sp. and *Ips* sp. engraver beetles killed 7% of the pine in a natural stand along the North Fraser Road.

The McGregor Model Forest will be resurveyed for incidences of pest-related damage in 1996.

Climatic Damage

Blowdown

Prince Rupert Forest Region

Blowdown was mapped over a total of 220 ha during aerial surveys, in four separate areas. The largest area, totalling 110 ha, was made up of six smaller patches along the Nass River west of the Ishkheenickh River. A single 38 ha patch of scattered blowdown occurred along the Kitimat River, and another area of severe damage was mapped over near Cullivan Creek in the Stikine River drainage. Five small patches were mapped along the Sikintine River, near the confluence with Skeena River.

Prince George Forest Region

Eight patches of recent sheet blowdown were mapped over 191 ha within the McGregor Model Forest. Most of the damage occurred in the upper Seebach and Horn creeks area, with a single patch at the confluence of the McGregor and Fraser rivers.

Mammal Damage

Porcupine

Erethizon dorsutum

During aerial overview surveys, 668 ha of porcupine damage was mapped in 57 areas, all located in the Kalum TSA. Porcupine feeding damage was also noted in three young stands during POYS surveys.

Porcupine damage was mapped mainly as small patches from the New Aiyansh area south to Terrace, though more numerous attacks occurred at Hadenschild Creek and along Erlandsen Creek. Scattered pockets of porcupine damage were noted near the Wedeene River and along the Skeena River near Whitebottom Creek and Windsor River. Scattered light attacks were mapped in one area at Kitwanga and three further north along the Kinskuch River, and light, mostly old damage was also noted in one area along the Kitimat River. The Shames River and the Khutzeymateen Inlet drainages traditionally harbor porcupine populations, but were not surveyed this year.

During ground surveys, porcupine damage was noted in three spaced young stands. Along the north Copper River 23% of the stand trees had been damaged in scattered pockets, though no recent activity was noted. Mostly hemlock had been attacked causing severe topkill, but no mortality in the plots. At Deception Creek porcupines caused topkill over approximately 4 ha of a 15 ha spaced stand. Overall attack was only 5% but within the damaged area at least 15% of crop trees were damaged. At a Shames River site, porcupine activity declined with only 1% of plot trees showing recent damage. The Shames River has supported a very active porcupine population in the past.

Populations often persist in a given area for a number of years, with rodents revisiting the same sites to feed on young trees. Where pre-treatment assessments indicate porcupine activity, further investment in stand enhancement does not always produce desired results. A stand at Hadenschild Creek illustrates a major concern. From the aerial survey, this location was identified as the most severely affected in the district, with an estimated 20% of the young alpine fir and hemlock killed or top-killed. A follow-up walkthrough assessment confirmed the nature and cause of the damage. The stand had been spaced and at least partially pruned. Scarring on some of the spaced material revealed a history of porcupine activity. Allowing for an increased residual stand density which includes sacrifice trees, or avoiding spacing altogether, are two options that have been suggested.

Deciduous Pests

Forest tent caterpillar *Malacosoma disstria*

The forest tent caterpillar defoliated trembling aspen over an area of 55 000 ha in 1995, (Figure 5) up from the 41 000 ha recorded in 1994. The major increase was in the Prince George district where 45 000 ha of defoliation was recorded in the third consecutive year of expanding populations. In the Robson Valley the area of defoliation increased to 7000 ha after decreasing last year. In 114 separate infestations from west of McBride to McNaughton Lake, trembling aspen were completely stripped of foliage. Populations also increased in the Dawson Creek and Taylor areas, with defoliation recorded over 2700 ha. For the first time in more than 15 years the tent caterpillar caused defoliation in the Fort Nelson District; patches totalling several hundred hectares were noted east of Fort Nelson.

Mortality of trembling aspen has begun to appear in stands in the Prince George area that have been severely defoliated for a number of years. A special aerial survey was undertaken in late July to assess the extent of the damage. Fifty-nine stands in which at least half the trembling aspen had been killed, were mapped over 1400 ha from Summit Lake south to the Regional boundary. Many of the remaining live trees have sustained varying degrees of crown dieback. Additional mortality is expected from climatic stresses, continued infestation by the tent caterpillar and secondary attacks by other insects and diseases.

Forecast

Egg mass surveys in the late summer and fall were undertaken in three separate infested areas. Two severely defoliated stands sampled above the south shore of the Peace River near Taylor, yielded an average of 22 and 13 egg masses per tree, indicating continued moderate-to-severe defoliation next year. At two sites south of Prince George and two sites near McBride, egg mass counts averaged eight and four respectively. Defoliation is expected to continue in these areas at light to moderate levels in 1996.

Large aspen tortrix
Choristoneura conflictana

Prince Rupert Forest Region

Large aspen tortrix defoliated trembling aspen over an estimated 1250 ha in 1995, in three widely separated locations.

In the Kispiox TSA, tortrix feeding damage occurred for the third consecutive year between the Cranberry River and Douse Lake. An estimated 850 ha of trembling aspen stands were lightly to severely defoliated, compared with 1148 ha last year.

For the second consecutive year moderate and severe defoliation of trembling aspen occurred over approximately 200 ha above the north shore of Tyhee Lake in the Bulkley TSA, and over a similar area in stands near the east end of Burns Lake in the Lakes TSA.

No new defoliation was seen during aerial surveys this year in the Cassiar District where tortrix damage was reported in 1993, and mapped over 6000 ha in the Telegraph Creek area in 1994. However, only a small portion of last year's attack area was flown this year. Unlike the two previous years, there had been no reports of defoliation in the remaining area from the public or other agencies, so it is likely that populations were reduced or had collapsed.

Prince George Forest Region

Defoliation of trembling aspen by the large aspen tortrix continued in the region for the fifth consecutive year. Light-severe defoliation occurred in four forest districts on more than 7000 ha.

In the Vanderhoof Forest District, defoliation was noted for the third consecutive year in the Nechako River Valley, over an estimated 2000 ha. The total area of feeding by the tortrix in the Nechako Valley decreased somewhat from 1994, but the patches of defoliated trees were more widespread. Completely defoliated aspen trees were noted east of the Sinkut River, and west of Fort Fraser. The scattered pattern of infestations was caused by the intermixing of farmland and coniferous forest with pure aspen stands. The last infestation in this area, in 1980, covered almost 40 000 ha, and extended north past Fort St. James.

Tortrix-caused defoliation was also mapped in the Dawson Creek and Mackenzie forest districts, with over 2500 ha of damage recorded in each district. Patches of moderate to severe defoliation were noted at Grayling Lake southeast of Mackenzie, near the Ospika Arm of Williston Lake, and around Dawson Creek. Scattered patches of defoliated aspen and birch have been noted in-and-around Dawson Creek, adjacent to, and sometimes in conjunction with, infestations of forest tent caterpillar. The same conditions have also been reported in the Fort Nelson area with large aspen tortrix and tent caterpillar defoliating aspen north and east of the Town.

Following pupation within rolled leaves, adults emerge in late June to mate. Females then deposit egg masses on the leaves. The larvae hatch in August and seek out overwintering sites.

Predictive tools for this defoliator have not been developed. Infestations often last 2-3 years, resulting in reduced tree vigor and the loss of some upper tree twigs and branches, but little mortality. Various predators and parasites are common, but starvation, following consumption of the available food source, is often cited as the major contributor to collapse. In some areas understory white spruce have been partially defoliated by mature larvae, but tortrix populations cannot survive on a coniferous host.

Satin moth
Leucoma salicis

Satin moth larvae, in conjunction with the forest tent caterpillar, conspicuously defoliated trembling aspen, and, to a lesser extent, black cottonwood and willow throughout the Robson Valley, and over an estimated 6700 ha between Valemount and McBride in the McBride TSA. Random surveys of the infested stands indicated that approximately 25% of the defoliating larvae were satin moth.

The satin moth population pupated during the early part of June, with a moth flight following a few weeks later. Though not observed this year, it is normal for eggs to hatch in August, and for early instar larvae to skeletonize foliage for about two weeks before spinning their hibernacula for overwintering. Satin moth larvae were easily distinguished from the tent caterpillar by the large shiny yellowish blotches appearing along the back.

The satin moth is native to Europe and Asia and was accidentally introduced to North America early in this century. The preferred host on this continent are exotic poplars especially white poplar. Satin moth is most commonly recognized as a pest of shade, park or windbreak trees. The first confirmed sightings were in southwestern British Columbia and New England in 1920. Since then the moth has spread throughout most of southern British Columbia, though last year marked the first time it had been detected in the Prince George Forest Region.

Northern tent caterpillar
Malacosoma californicum pluviale

Northern tent caterpillar tents and defoliation were visible for 100 km along Highway 37 from south of Van Dyk Camp north to as far as Taft Creek in the Kalum TSA. This is the third consecutive year of expansion. The most severe defoliation was concentrated from south of Meziadin Lake to near the north Hanna Creek bridge. Up to 20 ha patches of moderate to severe defoliation of alder, willow, trembling aspen and various deciduous brush species occurred in young conifer plantations. Trace defoliation and occasional tents were again noted on herbaceous plants within a conifer plantation in the Aiyansh area.

In the Meziadin area, on hosts averaging only 6.8 cm in diameter, an average of 2.6 egg masses (range 0-6) were found, down from 8.4 in 1994 on larger trees. While this is below the threshold for complete defoliation, it indicates continued defoliation in the area for 1996. Numerous egg masses were also readily visible in the campground area of Meziadin Provincial Park.

Typically, infestations collapse after three or four years due to the effects of diseases, parasites or predators. The current reduction in egg mass numbers may signal a collapse at the end of the 1996 period.

Birch leafminer
Lyonetia speculella

White birch in the area from Echo Lake to north of Bob Quinn Lake in the Prince Rupert Region were discolored by this birch leafminer for at least the fifth consecutive year. Severe damage was recorded in 13 patches over a total of 222 ha, down from 661 ha last year. During ground surveys, additional less severe discoloration was noted along roadsides and in scattered patches of birch in conifer stands in the same general area. No tree mortality has been recorded as a direct consequence of the feeding.

Pacific willow leaf beetle
Tricholochmaea decora carbo

The Pacific willow leaf beetle skeletonized roadside willow in the the southwestern Prince Rupert Region for at least the fifth consecutive year, though defoliation was much reduced from last year. From Kitwanga north to Moonlit Creek along Highway 37, scattered light attacks with occasional patches of severe were seen. Further north, attacks expanded from the Cranberry River crossing to south of Van Dyk camp. Along the Highway 16 corridor west of Carnaby, where last year's feeding damage extended almost to Terrace, this year's activity was light and scattered; the lowest level in five years.

Infestations have generally been limited to feeding on roadside willow. No mortality has been noted and such infestations have been reported lasting from 2-10 years.

Aspen leafroller
Pseudexentera oregonana

This aspen leafroller caused moderate to severe defoliation in the Prince Rupert Region in small scattered patches totalling 400 ha near Devil's Elbow above the Skeena River.

Larvae feed on new foliage and complete development by late May, therefore identification of this leafroller was based primarily on the nature and timing of the damage. Similar early season leafroller damage, previously identified as *P. oregonana*, continued in patches throughout the Terrace area, with the damage commonly severe.

Aspen leafroller

Prince Rupert Forest Region

Moderate and severe damage caused by an early-feeding unidentified leafroller was mapped during aerial surveys over 2160 ha, just west of Hazelton. Light and moderate leafrolling damage over 200+ ha was seen on the eastern slopes of Hungry Hill, near Houston.

Prince George Forest Region

A similar leafroller damaged all age classes of trembling aspen over a broad area between Taylor and Pouce Coupe, and near Tumbler Ridge in the Dawson Creek district. In the first mentioned area leafroller populations often overlapped with high forest tent caterpillar and large aspen tortrix populations. In these areas the leafroller damage was minor compared to that caused by the other two insects.

Leafroller damage patterns were the same in all areas mentioned above. The insect larvae rolled the leaves into tubes and then fed within the roll. The insect was apparently small because the actual feeding damage was minor, and most of the injury to the trees was the loss of photosynthetic opportunity due to the greatly reduced surface area of the rolled leaves. Aspen stands and especially the tops of trees appeared thin and ragged in areas with heavy populations.

Gypsy moth
Lymantria dispar

No moths were caught in single pheromone-baited traps placed at 26 locations in the Prince Rupert Region and at 5 locations in the Prince George Region as part of an ongoing cooperative program to detect any introduction of this pest into B.C. No moths have been caught to date in either of the two northern forest regions in traps placed by FIDS, or in additional traps placed by Agriculture Canada and the B.C. Forest Service.

Trapping was focused in areas frequented by travelers, such as provincial parks, private campgrounds, major highway rest areas, airports and at port facilities. Ocean freighters arriving from infested Soviet ports pose the greatest threat of introduction of the Asian gypsy moth. Recreation vehicles often carry egg masses from central and eastern areas of the continent, and are considered the primary vectors in the spread of the European form of the insect.

Chronic Diseases

A number of chronically-occurring diseases (Table 10) are important causes of damage and losses, but are not annually surveyed because they are widespread and fluctuate little from year to year. Management practices to mitigate these diseases are most commonly applied during harvest-regeneration or juvenile stand tending.

Table 10. Important chronic diseases, FIDS, Prince Rupert and Prince George Forest Regions, 1995

| Disease | Host(s) ¹ | Location | Remarks |
|--|----------------------------|---------------------------------|--|
| Atropellis canker <i>Atropellis piniphila</i> | IP | southern half of region | sporadic stem deformation, locally severe impact |
| Cedar diebacks unknown cause(s) | wrC yC | throughout host range | long term top-down dieback leading to mortality |
| Comandra blister rust <i>Cronartium comandrae</i> | IP | throughout host range | kills young trees especially in crowded stands; locally severe impact |
| Aspen trunk rot <i>Phellinus tremulae</i> | tA | throughout region | causing extensive decay |
| Hemlock dwarf mistletoe <i>Arceuthobium tsugense</i> | wH | through most of host range | widespread, particularly severe in remaining old-growth stands |
| IP dwarf mistletoe <i>Arceuthobium americanum</i> | IP | throughout southern interior | widespread but sporadic, causing significant growth loss |
| Red ring rot <i>Phellinus pini</i> | sS, wS, dF, wH, aF, alF | throughout region | widespread, particularly in old-growth stands |
| Indian paint fungus <i>Echinodontium tinctorium</i> | wH, alF | throughout host range | widespread in old-growth stands, decay common |
| Spruce broom rust <i>Chrysomyxa arctostaphyli</i> | wS | throughout host range | widespread, particularly in northern half of region |
| Stalactiform blister rust <i>Cronartium coleosporioides</i> | IP | throughout host range | particularly damaging in young crowded stands; locally severe impact |
| Tomentosus root disease <i>Inonotus tomentosus</i> | wS IP | throughout interior | growth loss, windthrow and mortality in old-growth, increased mortality in young stands |
| Western gall rust <i>Endocronartium harknessii</i> | IP | throughout host range | galls widespread in all age classes; minor mortality and stem breakage |

¹ aF - amabilis fir
alF - alpine fir
dF - Douglas-fir
IP - lodgepole pine

sS - Sitka spruce
tA - trembling aspen
wH - western hemlock

wrC - western red cedar
wS - white spruce
yC - yellow cedar

Other Noteworthy Pests

Insect populations and the incidences of many diseases fluctuate from year to year; in any one year levels of some potentially damaging pests are sufficiently low that little damage is reported. Occurrences of such pests and others of minor significance are reported in Table 11.

Table 11. Other noteworthy pests, FIDS, Prince Rupert and Prince George Forest Regions, 1995

| Host/pest | Location | Description |
|--|-----------------------------------|---|
| CONIFERS | | |
| Lodgepole pine | | |
| A heart rot <i>Perenniporia subacida</i> | Leanto Creek | identified in single recently-killed plantation tree |
| Squirrel damage | Boya Lake Provincial Park | up to 10 branch tips per tree killed by cone stripping |
| Spruce | | |
| Eastern spruce gall adelgid <i>Adelges abietis</i> | Thornhill, Terrace | introduced from Europe, now on both native and ornamentals, scattered |
| Large-spored spruce - Labrador-tea rust <i>Chrysomyxa ledicola</i> | Gnat Lakes | light to mod. discoloration scattered along Hwy. 37 from Tanzilla R. to Eddontenajon Lk. |
| Spruce gall aphid <i>Pineus similis</i> | Spruce Cr., Onion Lk., Bowser Lk. | affecting up to 5% of tips on 7% of trees-to trace only |
| Western blackheaded budworm <i>Acleris gloverana</i> | Onion Lk., Kinaskan Prov. Park | single larvae in beating samples |
| winter damage | Kalum District | nearly 50% terminal buds died or produced stunted growth at Bowser Lk.; 26% at Spruce Cr. |
| Western hemlock | | |
| Hemlock sawfly <i>Neodiprion</i> sp. | Prince Rupert, Exchamsiks R. | up to 35 larvae in beating sample, often associated with <i>A. gloverana</i> outbreaks |

Table 11. (Cont'd)

| Host/pest | Location | Description |
|---|--|--|
| Western blackheaded budworm <i>Acleris gloverana</i> | Exchamsiks R., Onion Lk. | up to 13 larvae in beating samples, indicating possible expanding populations |
| True firs | | |
| A bark beetle <i>Pseudohylesinus tsugae</i> | Remo | common on lower boles of stressed or disturbed semi-mature to mature |
| Common fir-bracken rust <i>Uredinopsis pteridis</i> | Shames R. | incidental in young stands |
| Western red cedar | | |
| Saddleback looper <i>Ectropis crepuscularia</i> | Moore Cr. | 8 larvae in beating sample, capable of causing mortality |
| DECIDUOUS | | |
| Red alder | | |
| Alder flea beetle <i>Altica ambiens</i> | Leanto Cr. | localized severe skeletonizing |
| Alder leaf beetle <i>Tricholochmaea punctipennis</i> | Amsbury | reported as numerous on alder |
| Black cottonwood | | |
| A bud midge <i>Dasineura</i> sp. | Hellsgate Slough | at least 75% of terminal buds infested in young plantation |
| A cottonwood blight <i>Guignardia</i> sp. | Exstew R., Polymer Cr., Hellsgate Slough | first noted at SCI nursery near Exstew R., this year found also in a plantation and in roadside naturals, unique to this area |
| Cottonwood leaf beetle <i>Chrysomela</i> sp. | Bob Quinn Lk. | causing scattered defoliation of fringe young trees |

FIDS – POYS 1995
Prince George Forest Region
Pest by Host Analysis
Report 95-1

John R. Morris Jr.
October 17, 1995
Version 1.1

| True Fir (002) | | Total number of True Fir trees in the Prince George region: 2 |
|---|---|---|
| Multi-topped (1202) 2 trees in 2 stands. | Average % on host for 2 stands: 100% (100%-100%) Average % for all trees in 2 stands: 1% (1%-1%) | Multi-topped affect(s) 100% of True Fir trees in this region. |
| True Fir (007) | | Total number of True Fir trees in the Prince George region: 140 |
| PEST FREE (0100) 105 trees in 10 stands. | Average % on host for 10 stands: 80% (32%-100%) Average % for all trees in 10 stands: 9% (1%-27%) | 75% of the True Fir trees in this region are pest free. |
| Moose (1008) 22 trees in 5 stands. | Average % on host for 5 stands: 32% (3%-68%) Average % for all trees in 5 stands: 4% (1%-12%) | Moose affect(s) 16% of True Fir trees in this region. |
| Ice/Snow (1108) 13 trees in 3 stands. | Average % on host for 3 stands: 46% (13%-100%) Average % for all trees in 3 stands: 4% (1%-9%) | Ice/Snow affect(s) 9% of True Fir trees in this region. |
| Spruce (043) | | Total number of Spruce trees in the Prince George region: 1150 |
| PEST FREE (0100) 592 trees in 22 stands. | Average % on host for 22 stands: 66% (17%-100%) Average % for all trees in 22 stands: 24% (3%-72%) | 51% of the Spruce trees in this region are pest free. |
| Adelges cooleyi (0302) 83 trees in 6 stands. | Average % on host for 6 stands: 47% (21%-79%) Average % for all trees in 6 stands: 10% (2%-26%) | Adelges cooleyi affect(s) 7% of Spruce trees in this region. |
| Pissodes strobi (SW) (0510) 176 trees in 9 stands. | Average % on host for 9 stands: 19% (9%-28%) Average % for all trees in 9 stands: 18% (9%-28%) | Pissodes strobi (SW) affect(s) 15% of Spruce trees in this region. |
| Ice/Snow (1108) 3 trees in 1 stand. | Percentage on host for this stand: 2% Percentage on all trees in this stand: 2% | Ice/Snow affect(s) 0% of Spruce trees in this region. |
| ??? (3021) 2 trees in 1 stand. | Percentage on host for this stand: 5% Percentage on all trees in this stand: 2% | ??? affect(s) 0% of Spruce trees in this region. |
| Crook caused by SW (510C) 44 trees in 7 stands. | Average % on host for 7 stands: 6% (1%-20%) Average % for all trees in 7 stands: 6% (1%-20%) | Crook caused by SW affect(s) 4% of Spruce trees in this region. |
| Fork caused by SW (510F) 53 trees in 6 stands. | Average % on host for 6 stands: 8% (3%-18%) Average % for all trees in 6 stands: 8% (3%-18%) | Fork caused by SW affect(s) 5% of Spruce trees in this region. |
| Multi-topped caused by SW (510M) 197 trees in 9 stands. | Average % on host for 9 stands: 21% (12%-44%) Average % for all trees in 9 stands: 20% (10%-44%) | Multi-topped caused by SW affect(s) 17% of Spruce trees in this region. |

Total Number of Trees in the Prince George Region: 3581

Note: "Average % on host for x stands" refers to the average % of host trees affected in stands where the pest was found. If the sum of percentages is greater than 100%, one or more trees had multiple pests.
 Technical Note: A 0% represents a value between 0.000% and 0.500%. Values are rounded up and down when above and below 0.500%, respectively, for simplicity.

Pine (054)**Total number of Pine trees in the Prince George region: 1776****PEST FREE (0100)**

1338 trees in 23 stands.

Average % on host for 23 stands: 78% (47%-100%)

Average % for all trees in 23 stands: 49% (2%-84%)

75% of the Pine trees in this region are pest free.

Hylobius warreni (0502)

5 trees in 2 stands.

Average % on host for 2 stands: 4% (2%-5%)

Average % for all trees in 2 stands: 2% (1%-4%)

Hylobius warreni affect(s) 0% of Pine trees in this region.

Synathedon sequoiae (0515)

36 trees in 7 stands.

Average % on host for 7 stands: 5% (1%-11%)

Average % for all trees in 7 stands: 3% (0%-8%)

Synathedon sequoiae affect(s) 2% of Pine trees in this region.

Atropellis sp. (0601)

3 trees in 1 stand.

Percentage on host for this stand: 1%

Percentage on all trees in this stand: 1%

Atropellis sp. affect(s) 0% of Pine trees in this region.

Cronartium sp. (0607)

77 trees in 10 stands.

Average % on host for 10 stands: 4% (1%-15%)

Average % for all trees in 10 stands: 3% (0%-13%)

Cronartium sp. affect(s) 4% of Pine trees in this region.

Cronartium coleosporioide (0608)

1 tree in 1 stand.

Percentage on host for this stand: 1%

Percentage on all trees in this stand: 1%

Cronartium coleosporioide affect(s) 0% of Pine trees in this region.

Cronartium comandrae (0609)

2 trees in 2 stands.

Average % on host for 2 stands: 1% (1%-1%)

Average % for all trees in 2 stands: 1% (1%-1%)

Cronartium comandrae affect(s) 0% of Pine trees in this region.

Endocronartium harknessi (0622)

80 trees in 15 stands.

Average % on host for 15 stands: 4% (1%-10%)

Average % for all trees in 15 stands: 3% (1%-9%)

Endocronartium harknessi affect(s) 5% of Pine trees in this region.

NEEDLE CASTS, BLIGHTS AND RUSTS

45 trees in 4 stands.

Average % on host for 4 stands: 10% (2%-25%)

Average % for all trees in 4 stands: 7% (2%-17%)

NEEDLE CASTS, BLIGHTS AND RUSTS affect(s) 3% of Pine trees in this region.

Lophodermella sp. (0718)

6 trees in 1 stand.

Percentage on host for this stand: 5%

Percentage on all trees in this stand: 5%

Lophodermella sp. affect(s) 0% of Pine trees in this region.

Bear (1001)

1 tree in 1 stand.

Percentage on host for this stand: 1%

Percentage on all trees in this stand: 0%

Bear affect(s) 0% of Pine trees in this region.

Porcupine (1010)

52 trees in 6 stands.

Average % on host for 6 stands: 9% (1%-49%)

Average % for all trees in 6 stands: 8% (0%-49%)

Porcupine affect(s) 3% of Pine trees in this region.

Squirrel (1014)

46 trees in 8 stands.

Average % on host for 8 stands: 4% (1%-22%)

Average % for all trees in 8 stands: 3% (1%-22%)

Squirrel affect(s) 3% of Pine trees in this region.

Ice/Snow (1108)

9 trees in 5 stands.

Average % on host for 5 stands: 2% (1%-3%)

Average % for all trees in 5 stands: 2% (1%-2%)

Ice/Snow affect(s) 1% of Pine trees in this region.

DAMAGE CAUSE UNKNOWN (1200)

1 tree in 1 stand.

Percentage on host for this stand: 1%

Percentage on all trees in this stand: 1%

DAMAGE CAUSE UNKNOWN affect(s) 0% of Pine trees in this region.

Multi-topped (1202)

18 trees in 4 stands.

Average % on host for 4 stands: 4% (2%-7%)

Average % for all trees in 4 stands: 3% (2%-5%)

Multi-topped affect(s) 1% of Pine trees in this region.

Total Number of Trees in the Prince George Region: 3581

Note: "Average % on host for x stands" refers to the average % of host trees affected in stands where the pest was found. If the sum of percentages is greater than 100%, one or more trees had multiple pests.
 Technical Note: A 0% represents a value between 0.000% and 0.500%. Values are rounded up and down when above and below 0.500%, respectively, for simplicity.

| | | |
|---|--|--|
| Dead or Broken top (1204) 2 trees in 1 stand. | Percentage on host for this stand: 3% Percentage on all trees in this stand: 1% | Dead or Broken top affect(s) 0% of Pine trees in this region. |
| Fork or Pronounced Crook (1206) 45 trees in 9 stands. | Average % on host for 9 stands: 5% (1%-15%) Average % for all trees in 9 stands: 4% (0%-15%) | Fork or Pronounced Crook affect(s) 3% of Pine trees in this region. |
| <hr/> | | |
| Douglas-fir (071) | Total number of Douglas-fir trees in the Prince George region: 158 | |
| PEST FREE (0100) 144 trees in 6 stands. | Average % on host for 6 stands: 92% (67%-100%) Average % for all trees in 6 stands: 13% (3%-34%) | 91% of the Douglas-fir trees in this region are pest free. |
| Armillaria ostoyae (0901) 1 tree in 1 stand. | Percentage on host for this stand: 17% Percentage on all trees in this stand: 1% | Armillaria ostoyae affect(s) 1% of Douglas-fir trees in this region. |
| Multi-topped (1202) 13 trees in 2 stands. | Average % on host for 2 stands: 15% (14%-17%) Average % for all trees in 2 stands: 3% (1%-5%) | Multi-topped affect(s) 8% of Douglas-fir trees in this region. |
| <hr/> | | |
| Douglas-fir (072) | Total number of Douglas-fir trees in the Prince George region: 105 | |
| PEST FREE (0100) 101 trees in 1 stand. | Percentage on host for this stand: 96% Percentage on all trees in this stand: 96% | 96% of the Douglas-fir trees in this region are pest free. |
| Ice/Snow (1108) 4 trees in 1 stand. | Percentage on host for this stand: 4% Percentage on all trees in this stand: 4% | Ice/Snow affect(s) 4% of Douglas-fir trees in this region. |
| <hr/> | | |
| Cedar (087) | Total number of Cedar trees in the Prince George region: 22 | |
| PEST FREE (0100) 20 trees in 1 stand. | Percentage on host for this stand: 100% Percentage on all trees in this stand: 9% | 91% of the Cedar trees in this region are pest free. |
| Basal Sweep (1210) 2 trees in 1 stand. | Percentage on host for this stand: 100% Percentage on all trees in this stand: 1% | Basal Sweep affect(s) 9% of Cedar trees in this region. |
| <hr/> | | |
| Hemlock (092) | Total number of Hemlock trees in the Prince George region: 95 | |
| PEST FREE (0100) 94 trees in 2 stands. | Average % on host for 2 stands: 100% (100%-100%) Average % for all trees in 2 stands: 21% (10%-31%) | 99% of the Hemlock trees in this region are pest free. |
| Multi-topped (1202) 1 tree in 1 stand. | Percentage on host for this stand: 100% Percentage on all trees in this stand: 1% | Multi-topped affect(s) 1% of Hemlock trees in this region. |

Total Number of Trees in the Prince George Region: 3581

Note: "Average % on host for x stands" refers to the average % of host trees affected in stands where the pest was found. If the sum of percentages is greater than 100%, one or more trees had multiple pests.
 Technical Note: A 0% represents a value between 0.000% and 0.500%. Values are rounded up and down when above and below 0.500%, respectively, for simplicity.

Poplar (311)**Total number of Poplar trees in the Prince George region: 79****PEST FREE (0100)**
79 trees in 5 stands.Average % on host for 5 stands: 100% (100%-100%)
Average % for all trees in 5 stands: 11% (3%-25%)

100% of the Poplar trees in this region are pest free.

Poplar (312)**Total number of Poplar trees in the Prince George region: 54****PEST FREE (0100)**
54 trees in 4 stands.Average % on host for 4 stands: 100% (100%-100%)
Average % for all trees in 4 stands: 12% (3%-23%)

100% of the Poplar trees in this region are pest free.

Total Number of Trees in the Prince George Region: 3581

Note: "Average % on host for x stands" refers to the average % of host trees affected in stands where the pest was found. If the sum of percentages is greater than 100%, one or more trees had multiple pests.

Technical Note: A 0% represents a value between 0.000% and 0.500%. Values are rounded up and down when above and below 0.500%, respectively, for simplicity.

FIDS – POYS 1995
Prince George Forest Region
Pest by SI and Host Analysis
Report 95-2

John R. Morris Jr.
October 17, 1995
Version 1.0

| True Fir (002) | | Total number of True Fir trees in the Prince George region: 2 |
|--|---|--|
| Multi-topped (1202) SI 4 2 trees in 2 stands. | Average % on host for 2 stands: 100% (100%-100%) Average % for all trees in 2 stands: 1% (1%-1%) | Multi-topped affect(s) 100% of True Fir trees in this region (SI 4). |
| True Fir (007) | | Total number of True Fir trees in the Prince George region: 140 |
| PEST FREE (0100) SI 1 105 trees in 10 stands. | Average % on host for 10 stands: 80% (32%-100%) Average % for all trees in 10 stands: 9% (1%-27%) | 75% of the True Fir trees in this region are pest free. |
| Moose (1008) SI 2 8 trees in 3 stands. | Average % on host for 3 stands: 29% (13%-50%) Average % for all trees in 3 stands: 2% (1%-5%) | Moose affect(s) 6% of True Fir trees in this region (SI 2). |
| Moose (1008) SI 3 14 trees in 2 stands. | Average % on host for 2 stands: 36% (3%-68%) Average % for all trees in 2 stands: 6% (1%-12%) | Moose affect(s) 10% of True Fir trees in this region (SI 3). |
| Ice/Snow (1108) SI 2 12 trees in 2 stands. | Average % on host for 2 stands: 19% (13%-25%) Average % for all trees in 2 stands: 5% (1%-9%) | Ice/Snow affect(s) 9% of True Fir trees in this region (SI 2). |
| Ice/Snow (1108) SI 3 1 tree in 1 stand. | Percentage on host for this stand: 100% Percentage on all trees in this stand: 1% | Ice/Snow affect(s) 1% of True Fir trees in this region (SI 3). |
| Spruce (043) | | Total number of Spruce trees in the Prince George region: 1150 |
| PEST FREE (0100) SI 1 592 trees in 22 stands. | Average % on host for 22 stands: 66% (17%-100%) Average % for all trees in 22 stands: 24% (3%-72%) | 51% of the Spruce trees in this region are pest free. |
| Adelges cooleyi (0302) SI 2 83 trees in 6 stands. | Average % on host for 6 stands: 47% (21%-79%) Average % for all trees in 6 stands: 10% (2%-26%) | Adelges cooleyi affect(s) 7% of Spruce trees in this region (SI 2). |
| Pissodes strobi(SW) (0510) SI 4 176 trees in 9 stands. | Average % on host for 9 stands: 19% (9%-28%) Average % for all trees in 9 stands: 18% (9%-28%) | Pissodes strobi(SW) affect(s) 15% of Spruce trees in this region (SI 4). |
| Ice/Snow (1108) SI 2 1 tree in 1 stand. | Percentage on host for this stand: 1% Percentage on all trees in this stand: 1% | Ice/Snow affect(s) 0% of Spruce trees in this region (SI 2). |
| Ice/Snow (1108) SI 3 2 trees in 1 stand. | Percentage on host for this stand: 2% Percentage on all trees in this stand: 2% | Ice/Snow affect(s) 0% of Spruce trees in this region (SI 3). |
| Adelges sp. (3021) SI 2 2 trees in 1 stand. | Percentage on host for this stand: 5% Percentage on all trees in this stand: 2% | Adelges sp. affect(s) 0% of Spruce trees in this region (SI 2). |
| Crook caused by SW (510C) SI 4 44 trees in 7 stands. | Average % on host for 7 stands: 6% (1%-20%) Average % for all trees in 7 stands: 6% (1%-20%) | Crook caused by SW affect(s) 4% of Spruce trees in this region (SI 4). |
| Fork caused by SW (510F) SI 4 53 trees in 6 stands. | Average % on host for 6 stands: 8% (3%-18%) Average % for all trees in 6 stands: 8% (3%-18%) | Fork caused by SW affect(s) 5% of Spruce trees in this region (SI 4). |

Total Number of Trees in the Prince George Region: 3581

Note: "Average % on host for x stands" refers to the average % of host trees affected in stands where the pest was found. If the sum of percentages is greater than 100%, one or more trees had multiple pests.
 Technical Note: A 0% represents a value between 0.000% and 0.500%. Values are rounded up and down when above and below 0.500%, respectively, for simplicity.

| | | | |
|---|--|--|---|
| Multi-topped caused by SW (510M) SI 4 | | Average % on host for 9 stands: 21% (12%-44%) | Multi-topped caused by SW affect(s) 17% of Spruce trees in this region (SI 4). |
| 197 trees in 9 stands. | | Average % for all trees in 9 stands: 20% (10%-44%) | |
| Pine (054) | | | Total number of Pine trees in the Prince George region: 1776 |
| PEST FREE (0100) SI 1 | | Average % on host for 23 stands: 78% (47%-100%) | 75% of the Pine trees in this region are pest free. |
| 1338 trees in 23 stands. | | Average % for all trees in 23 stands: 49% (2%-84%) | |
| Hylobius warreni (0502) SI 6 | | Average % on host for 2 stands: 4% (2%-5%) | Hylobius warreni affect(s) 0% of Pine trees in this region (SI 6). |
| 5 trees in 2 stands. | | Average % for all trees in 2 stands: 2% (1%-4%) | |
| Synanthedon sequoiae (0515) SI 3 | | Average % on host for 7 stands: 5% (1%-11%) | Synanthedon sequoiae affect(s) 2% of Pine trees in this region (SI 3). |
| 36 trees in 7 stands. | | Average % for all trees in 7 stands: 3% (0%-8%) | |
| Atropellis sp. (0601) SI 4 | | Percentage on host for this stand: 1% | Atropellis sp. affect(s) 0% of Pine trees in this region (SI 4). |
| 1 tree in 1 stand. | | Percentage on all trees in this stand: 1% | |
| Atropellis sp. (0601) SI 6 | | Percentage on host for this stand: 2% | Atropellis sp. affect(s) 0% of Pine trees in this region (SI 6). |
| 2 trees in 1 stand. | | Percentage on all trees in this stand: 1% | |
| Cronartium sp. (0607) SI 3 | | Average % on host for 2 stands: 1% (1%-2%) | Cronartium sp. affect(s) 0% of Pine trees in this region (SI 3). |
| 4 trees in 2 stands. | | Average % for all trees in 2 stands: 1% (1%-2%) | |
| Cronartium sp. (0607) SI 5 | | Average % on host for 9 stands: 3% (1%-11%) | Cronartium sp. affect(s) 2% of Pine trees in this region (SI 5). |
| 38 trees in 9 stands. | | Average % for all trees in 9 stands: 2% (1%-10%) | |
| Cronartium sp. (0607) SI 6 | | Average % on host for 4 stands: 5% (1%-15%) | Cronartium sp. affect(s) 2% of Pine trees in this region (SI 6). |
| 35 trees in 4 stands. | | Average % for all trees in 4 stands: 4% (0%-13%) | |
| Cronartium coleosporioide (0608) SI 5 | | Percentage on host for this stand: 1% | Cronartium coleosporioide affect(s) 0% of Pine trees in this region (SI 5). |
| 1 tree in 1 stand. | | Percentage on all trees in this stand: 1% | |
| Cronartium comandrae (0609) SI 6 | | Average % on host for 2 stands: 1% (1%-1%) | Cronartium comandrae affect(s) 0% of Pine trees in this region (SI 6). |
| 2 trees in 2 stands. | | Average % for all trees in 2 stands: 1% (1%-1%) | |
| Endocronartium harknessii (0622) SI 3 | | Average % on host for 12 stands: 5% (1%-10%) | Endocronartium harknessii affect(s) 3% of Pine trees in this region (SI 3). |
| 51 trees in 12 stands. | | Average % for all trees in 12 stands: 3% (1%-9%) | |
| Endocronartium harknessii (0622) SI 5 | | Average % on host for 12 stands: 3% (1%-6%) | Endocronartium harknessii affect(s) 2% of Pine trees in this region (SI 5). |
| 28 trees in 12 stands. | | Average % for all trees in 12 stands: 2% (1%-4%) | |
| Endocronartium harknessii (0622) SI 6 | | Percentage on host for this stand: 1% | Endocronartium harknessii affect(s) 0% of Pine trees in this region (SI 6). |
| 1 tree in 1 stand. | | Percentage on all trees in this stand: 1% | |
| NEEDLE CASTS, BLIGHTS AND RUSTS (0700) | | Average % on host for 4 stands: 13% (2%-25%) | NEEDLE CASTS, BLIGHTS AND RUSTS affect(s) 2% of Pine trees in this region (SI 2). |
| 39 trees in 4 stands. | | Average % for all trees in 4 stands: 9% (2%-17%) | |
| NEEDLE CASTS, BLIGHTS AND RUSTS (0700) | | Average % on host for 2 stands: 4% (4%-5%) | NEEDLE CASTS, BLIGHTS AND RUSTS affect(s) 0% of Pine trees in this region (SI 4). |
| 6 trees in 2 stands. | | Average % for all trees in 2 stands: 3% (2%-3%) | |

Total Number of Trees in the Prince George Region: 3581

Note: "Average % on host for x stands" refers to the average % of host trees affected in stands where the pest was found. If the sum of percentages is greater than 100%, one or more trees had multiple pests.
 Technical Note: A 0% represents a value between 0.000% and 0.500%. Values are rounded up and down when above and below 0.500%, respectively, for simplicity.

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|---|---|--|
| Lophodermella sp. (0718) SI 2 6 trees in 1 stand. | Percentage on host for this stand: 5% Percentage on all trees in this stand: 5% | Lophodermella sp. affect(s) 0% of Pine trees in this region (SI 2). |
| Bear (1001) SI 4 1 tree in 1 stand. | Percentage on host for this stand: 1% Percentage on all trees in this stand: 0% | Bear affect(s) 0% of Pine trees in this region (SI 4). |
| Porcupine (1010) SI 3 46 trees in 2 stands. | Average % on host for 2 stands: 26% (2%-49%) Average % for all trees in 2 stands: 25% (1%-49%) | Porcupine affect(s) 3% of Pine trees in this region (SI 3). |
| Porcupine (1010) SI 4 2 trees in 1 stand. | Percentage on host for this stand: 2% Percentage on all trees in this stand: 1% | Porcupine affect(s) 0% of Pine trees in this region (SI 4). |
| Porcupine (1010) SI 5 2 trees in 2 stands. | Average % on host for 2 stands: 1% (1%-1%) Average % for all trees in 2 stands: 1% (0%-1%) | Porcupine affect(s) 0% of Pine trees in this region (SI 5). |
| Porcupine (1010) SI 6 2 trees in 2 stands. | Average % on host for 2 stands: 2% (1%-4%) Average % for all trees in 2 stands: 1% (1%-1%) | Porcupine affect(s) 0% of Pine trees in this region (SI 6). |
| Squirrel (1014) SI 2 1 tree in 1 stand. | Percentage on host for this stand: 1% Percentage on all trees in this stand: 1% | Squirrel affect(s) 0% of Pine trees in this region (SI 2). |
| Squirrel (1014) SI 3 13 trees in 4 stands. | Average % on host for 4 stands: 7% (1%-22%) Average % for all trees in 4 stands: 6% (1%-22%) | Squirrel affect(s) 1% of Pine trees in this region (SI 3). |
| Squirrel (1014) SI 4 13 trees in 7 stands. | Average % on host for 7 stands: 4% (1%-11%) Average % for all trees in 7 stands: 2% (1%-7%) | Squirrel affect(s) 1% of Pine trees in this region (SI 4). |
| Squirrel (1014) SI 5 3 trees in 2 stands. | Average % on host for 2 stands: 2% (1%-2%) Average % for all trees in 2 stands: 1% (1%-2%) | Squirrel affect(s) 0% of Pine trees in this region (SI 5). |
| Squirrel (1014) SI 6 16 trees in 6 stands. | Average % on host for 6 stands: 5% (1%-15%) Average % for all trees in 6 stands: 3% (1%-4%) | Squirrel affect(s) 1% of Pine trees in this region (SI 6). |
| Ice/Snow (1108) SI 3 4 trees in 2 stands. | Average % on host for 2 stands: 2% (2%-3%) Average % for all trees in 2 stands: 2% (2%-2%) | Ice/Snow affect(s) 0% of Pine trees in this region (SI 3). |
| Ice/Snow (1108) SI 4 2 trees in 2 stands. | Average % on host for 2 stands: 1% (1%-2%) Average % for all trees in 2 stands: 1% (1%-1%) | Ice/Snow affect(s) 0% of Pine trees in this region (SI 4). |
| Ice/Snow (1108) SI 6 3 trees in 1 stand. | Percentage on host for this stand: 2% Percentage on all trees in this stand: 2% | Ice/Snow affect(s) 0% of Pine trees in this region (SI 6). |
| DAMAGE CAUSE UNKNOWN (1200) SI 6 1 tree in 1 stand. | Percentage on host for this stand: 1% Percentage on all trees in this stand: 1% | DAMAGE CAUSE UNKNOWN affect(s) 0% of Pine trees in this region (SI 6). |
| Multi-topped (1202) SI 3 18 trees in 4 stands. | Average % on host for 4 stands: 4% (2%-7%) Average % for all trees in 4 stands: 3% (2%-5%) | Multi-topped affect(s) 1% of Pine trees in this region (SI 3). |
| Dead or Broken top (1204) SI 4 2 trees in 1 stand. | Percentage on host for this stand: 3% Percentage on all trees in this stand: 1% | Dead or Broken top affect(s) 0% of Pine trees in this region (SI 4). |

Total Number of Trees in the Prince George Region: 3581

Note: "Average % on host for x stands" refers to the average % of host trees affected in stands where the pest was found. If the sum of percentages is greater than 100%, one or more trees had multiple pests.
 Technical Note: A 0% represents a value between 0.000% and 0.500%. Values are rounded up and down when above and below 0.500%, respectively, for simplicity.

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|--|---|--|
| Fork or Pronounced Crook (1206) SI 2 3 trees in 1 stand. | Percentage on host for this stand: 2% Percentage on all trees in this stand: 2% | Fork or Pronounced Crook affect(s) 0% of Pine trees in this region (SI 2). |
| Fork or Pronounced Crook (1206) SI 3 41 trees in 8 stands. | Average % on host for 8 stands: 5% (1%-15%) Average % for all trees in 8 stands: 4% (0%-15%) | Fork or Pronounced Crook affect(s) 2% of Pine trees in this region (SI 3). |
| Fork or Pronounced Crook (1206) SI 4 1 tree in 1 stand. | Percentage on host for this stand: 1% Percentage on all trees in this stand: 1% | Fork or Pronounced Crook affect(s) 0% of Pine trees in this region (SI 4). |

Douglas-fir (071)**Total number of Douglas-fir trees in the Prince George region: 158**

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|---|---|---|
| PEST FREE (0100) SI 1 144 trees in 6 stands. | Average % on host for 6 stands: 92% (67%-100%) Average % for all trees in 6 stands: 13% (3%-34%) | 91% of the Douglas-fir trees in this region are pest free. |
| Armillaria ostoyae (0901) SI 6 1 tree in 1 stand. | Percentage on host for this stand: 17% Percentage on all trees in this stand: 1% | Armillaria ostoyae affect(s) 1% of Douglas-fir trees in this region (SI 6). |
| Multi-topped (1202) SI 4 13 trees in 2 stands. | Average % on host for 2 stands: 15% (14%-17%) Average % for all trees in 2 stands: 3% (1%-5%) | Multi-topped affect(s) 8% of Douglas-fir trees in this region (SI 4). |

Douglas-fir (072)**Total number of Douglas-fir trees in the Prince George region: 105**

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|---|--|---|
| PEST FREE (0100) SI 1 101 trees in 1 stand. | Percentage on host for this stand: 96% Percentage on all trees in this stand: 96% | 96% of the Douglas-fir trees in this region are pest free. |
| Ice/Snow (1108) SI 2 4 trees in 1 stand. | Percentage on host for this stand: 4% Percentage on all trees in this stand: 4% | Ice/Snow affect(s) 4% of Douglas-fir trees in this region (SI 2). |

Cedar (087)**Total number of Cedar trees in the Prince George region: 22**

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|---|--|--|
| PEST FREE (0100) SI 1 20 trees in 1 stand. | Percentage on host for this stand: 100% Percentage on all trees in this stand: 9% | 91% of the Cedar trees in this region are pest free. |
| Basal Sweep (1210) SI 3 2 trees in 1 stand. | Percentage on host for this stand: 100% Percentage on all trees in this stand: 1% | Basal Sweep affect(s) 9% of Cedar trees in this region (SI 3). |

Hemlock (092)**Total number of Hemlock trees in the Prince George region: 95**

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|---|--|---|
| PEST FREE (0100) SI 1 94 trees in 2 stands. | Average % on host for 2 stands: 100% (100%-100%) Average % for all trees in 2 stands: 21% (10%-31%) | 99% of the Hemlock trees in this region are pest free. |
| Multi-topped (1202) SI 4 1 tree in 1 stand. | Percentage on host for this stand: 100% Percentage on all trees in this stand: 1% | Multi-topped affect(s) 1% of Hemlock trees in this region (SI 4). |

Total Number of Trees in the Prince George Region: 3581

Note: "Average % on host for x stands" refers to the average % of host trees affected in stands where the pest was found. If the sum of percentages is greater than 100%, one or more trees had multiple pests.
 Technical Note: A 0% represents a value between 0.000% and 0.500%. Values are rounded up and down when above and below 0.500%, respectively, for simplicity.

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|---|---|---|
| Poplar (311) | | Total number of Poplar trees in the Prince George region: 79 |
| PEST FREE (0100) SI 1 79 trees in 5 stands. | Average % on host for 5 stands: 100% (100%-100%) | 100% of the Poplar trees in this region are pest free. |
| | Average % for all trees in 5 stands: 11% (3%-25%) | |
| Poplar (312) | | Total number of Poplar trees in the Prince George region: 54 |
| PEST FREE (0100) SI 1 54 trees in 4 stands. | Average % on host for 4 stands: 100% (100%-100%) | 100% of the Poplar trees in this region are pest free. |
| | Average % for all trees in 4 stands: 12% (3%-23%) | |

Total Number of Trees in the Prince George Region: 3581

Note: "Average % on host for x stands" refers to the average % of host trees affected in stands where the pest was found. If the sum of percentages is greater than 100%, one or more trees had multiple pests.
Technical Note: A 0% represents a value between 0.000% and 0.500%. Values are rounded up and down when above and below 0.500%, respectively, for simplicity.