

Forest Insect and Disease Conditions

**Prince George Region
1988**

R. Turnquist & R. Ferris



**Forestry
Canada**

**Forêts
Canada**

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APPENDICES

The following appendices are available upon request from the Forest Insect and Disease Survey, Forestry Canada, 506 West Burnside Road, Victoria, B.C. V8Z 1M5.

- I. Maps of major bark beetle and defoliator infestations compiled during aerial surveys of the Prince George Region, 1988 (11 @ 1:100 000; 11 @ 1:250 000; 3 @ 1:125 000).
- II. Summary of the spruce budworm, gypsy moth and black army cutworm pheromone trapping program, Prince George Region, 1988.
- III. Summary of pest problems in provincial parks within the Prince George Region, 1988.
- IV. Summary of pests of young stands, Prince George Region, 1988.

INTRODUCTION

This report summarizes the findings of two Forest Insect and Disease Survey (FIDS) Rangers during summer field studies in the Prince George Forest Region in 1988. Forest pest conditions are listed by host in order of importance with emphasis given to those capable of sudden damaging outbreaks. Most of the information was gathered through: the monitoring of over 150 permanent sample stations throughout the region; the monitoring of already known or recently reported infestations and disease problems; the detection of pest problems during travels through the region; annual aerial surveys during which major pest problems were mapped with reference to area and severity; and special projects designed to gain information for ongoing research.

The FIDS field season extended from May 30 to September 30, during which over 280 insect and 100 disease collections were sent to the Pacific Forestry Centre (PFC) for identification or confirmation (**Map 1**). Some of these were added to the extensive permanent collections in the PFC Insectary and Herbarium.

The B.C. Forest Service (BCFS) provided approximately 21 hours and Forestry Canada 1 hour of fixed-wing and industry provided 1 hour of helicopter time for aerial and aerially accessed ground surveys during the 1988 season (**Map 1**). During aerial surveys, bark beetle and defoliator damage has been quantified within damage classes and references to these classes appear intermittently throughout the report:

Bark beetle mortality classes: light - 5% or less of stand recently killed
 moderate - 6-30% of stand recently killed
 severe - >30% of stand recently killed

Aerial survey defoliation classes:

light - discolored foliage barely visible from the air; some branch and upper crown defoliation

moderate - pronounced discoloration; noticeably thin foliage; top third of many trees severely defoliated; some completely stripped

severe - bare branch tips and completely defoliated tops; most trees more than 50% defoliated

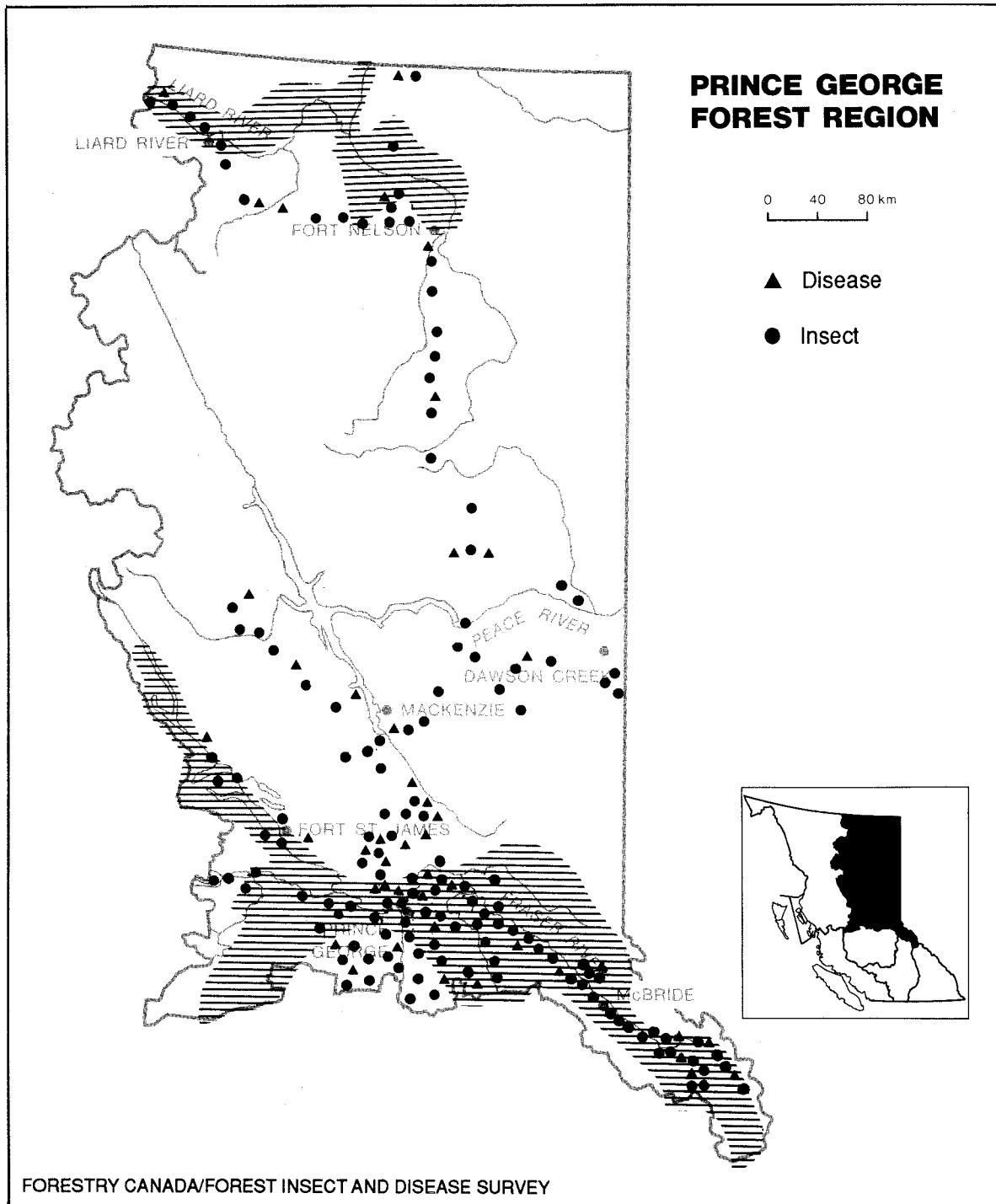
During the field season, correspondence and inquiries with respect to forest pest problems in the Prince George Forest Region can be directed to the Forest Insect and Disease Survey (FIDS) Rangers at:

| | |
|---|-----------------|
| Forest Insect and Disease Survey, Forestry Canada | Phone: 963-7238 |
| Box 687, Prince George, B.C. V2L 4S8 | or 963-7394 |

During the remainder of the year, the rangers are based at:

| | |
|---|-----------------|
| Pacific Forestry Centre, Forestry Canada | |
| 506 West Burnside Road, Victoria, B.C. V8Z 1M5. | Phone: 388-0600 |

Detailed copies of infestation maps, pest reports, leaflets and monographs, as well as regional pest histories, are available from the above address.



Map 1. Locations where one or more forest insect and disease samples were collected and areas covered by aerial surveys to map bark beetle and defoliator infestations in 1988.

SUMMARY

Eastern spruce budworm populations declined for the second consecutive year, lightly and moderately defoliating primarily white spruce over 35 890 ha near Fort Nelson. Two-year-cycle spruce budworm lightly and moderately defoliated 17 520 ha of white spruce and alpine fir in the Bowron River, Morkill River, Everett Creek and Dome Creek drainages. Spruce beetle populations remained at endemic levels in this, their sixth consecutive year of decline. Northern spruce engraver beetles declined for the third consecutive year, top-killing only 15 white spruce. Tomentosus root rot was found in one of nine young stands surveyed in the Region. Spruce cone rust lightly infected white spruce cones at three locations. Spruce weevil populations continued at levels similar to 1987, lightly infecting spruce leaders at several locations. Western blackheaded budworm lightly infected spruce buds throughout the Germansen Landing to Uslika Lake area.

Lodgepole pine mortality due to 1987 mountain pine beetle attacks declined slightly to 72 100 m³ over 3975 ha. Most of the mortality continues to be in the Fort St. James District. Pine engraver beetle populations declined dramatically; little outright mortality was attributed to this pest. White pine blister rust killed or top-killed more than 125 western white pine along the west side of Canoe Arm south of Bulldog Creek, and in the Albreda area. Two collections of various species of woodboring beetles with potential as vectors of the pinewood nematode were made, but extraction results are not yet available. Various microfungi were found, associated with frost or drought stress at four lodgepole pine plantations established in 1986 as a joint Canada-Sweden project.

Balsam bark beetle killed an estimated 9950 trees over 1225 ha in widespread high-elevation stands throughout the Region.

Douglas-fir beetle attacks killed an estimated 300 trees over 90 ha, mainly in the Prince George West and Fort St. James districts.

An unidentified rodent damaged semimature lodgepole pine at the Willow River Demonstration Forest.

Larch sawfly was found on ornamental larch in the first such collection made in the City of Prince George.

Rhizina root rot fruiting bodies and tree mortality were found, for the first time, in the Prince George Region. Black army cutworm populations increased, defoliating coniferous and herbaceous material at several locations in the Region. No acid rain symptoms were recorded in a long term study plot near Averil Lake.

Spruce cone maggot and spruce seed moth larvae, along with several other spruce seed pests, infested cone collections from several locations in the Region.

A total of 18 young stand surveys at widespread locations found a variety of pests, the most common being stem rusts, root and terminal weevils, environmental damage and adelgids.

Forest tent caterpillar populations increased, defoliating mainly trembling aspen over 48 315 ha in two separate areas. Populations in the Chief Lake area increased dramatically, and defoliation was reported on ornamentals within the city limits. Poplar leaf and shoot blight infections increased and were widespread in the Germansen Landing, Mackenzie and Fort Nelson areas. Elm leafminer populations continued to defoliate ornamental elms in the City of Prince George. Collections of a previously undescribed aspen disease, purple-brown leaf spot, were made in several locations. No adult male gypsy moths were trapped in 45 pheromone-baited traps placed in provincial parks, rest areas or private campgrounds.

A table summarizing other noteworthy and minor pests is included in this report.

SPRUCE PESTS

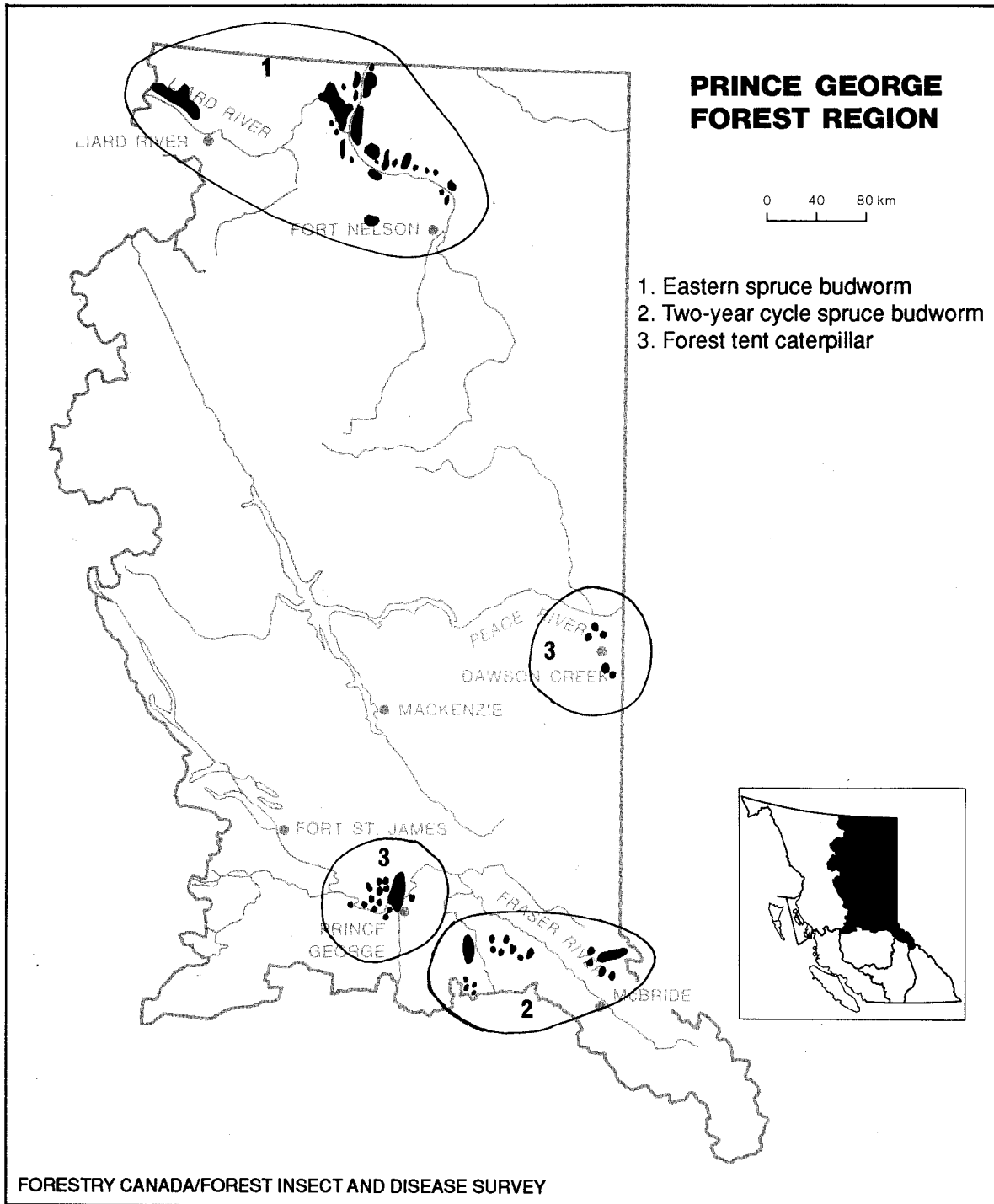
Eastern spruce budworm *Choristoneura fumiferana*

For the second consecutive year, the area of light and moderate defoliation of primarily white spruce and alpine fir decreased to 35 890 ha (Map 2, Table 1) from 58 450 ha in 1987 and 94 700 ha in 1986. Although defoliation was recorded in the same general areas as the past two years, the area of defoliation was reduced at all locations, particularly Kledo Creek, upper Stanolind and Raspberry creeks, and the Dunedin River. The area of defoliation was also reduced along the Fort Nelson River and, to a lesser degree, along the Liard River from the Beaver River to the Northwest Territories. Defoliation was heavier on understory trees; up to 100% of the new growth was defoliated in the Liard River and Smith River areas, while overstory trees in the same locations suffered only light defoliation of the current year's growth.

Table 1. General location and area of eastern spruce budworm defoliation, Prince George Forest Region, 1986-1988.

| General location | Area (ha) | | |
|---|-----------|--------|--------|
| | 1988 | 1987 | 1986 |
| Kledo Creek, upper Stanolind and Raspberry creeks, Fort Nelson River | 915 | 1 855 | 19 440 |
| Ft. Nelson River from Snake River to Nelson Forks and Liard R. to Northwest Territories | 18 460 | 32 475 | 36 080 |
| Liard River from Beaver River to Northwest Territories, Dunedin and LaBiche rivers | 7 115 | 12 480 | 25 260 |
| Liard River from Coal River to Smith River and Liard Hot Springs | 9 400 | 11 640 | 13 920 |
| Totals | 35 890 | 58 450 | 94 700 |

The number of larvae/beating sample at seven Permanent Sampling Stations (PSSs) within the infestation has also declined. In 1986 an average of 175 larvae (range 18-720) were collected; in 1987 these numbers declined to an average of 77 larvae (8-178); and in 1988, it dropped to 34 (5-124). This drop in larval numbers is further demonstrated in the numbers of trees sampled to obtain mass collections for research purposes. In 1986, 950+ larvae were collected from three trees along the Liard Highway; in 1988, 12 trees were sampled to obtain 1000+ larvae, approximately 10 kilometers north of the 1986 sample site.



Map 2. Areas where current defoliation was detected during ground and aerial surveys in 1988.

Three mass collections were made along the Liard and Alaska highways, they were sent to the Great Lakes and Pacific Forestry centres for various research projects including adult rearing and mating and parasite determinations. Parasitism rates from mass collections were low, less than 1%.

Pheromone-baited traps were set out at nine locations in the Region in 1988 (three sets of each pheromone at each location) as part of an ongoing taxonomic and distribution study. The pheromone trapping program in the Prince George Region is part of a larger study within the Pacific Region and parts of Alberta and Alaska, the results of which will be available through the Pacific Forestry Centre at a later date. There were no adults caught in the C. orae traps, and an average of 54 adults (range 0-346) in the C. f.o.b.¹ traps. The negative results in the C. orae traps, repeated for the second consecutive year, are at this point unexplainable, although the same negative results were obtained in Alberta and to a lesser extent in the Yukon.

Although spruce budworm populations have declined, parasitism rates remain low and populations are expected to continue in historically active areas along the Fort Nelson and Liard rivers in 1989. Further sampling, and population and damage assessments, will continue.

Two-year-cycle spruce budworm Choristoneura biennis

Defoliation of alpine fir and white spruce by mature two-year cycle spruce budworm larvae was mapped over 17 520 ha in 1988 (Map 2). This is up from 15 670 ha recorded in 1986, the last year of feeding by mature larvae. There were 9080 ha of moderate and 8440 ha of light defoliation in 1988 compared to 20 ha of severe, 7100 ha of moderate and 8360 ha of light in 1986.

Bud sampling conducted in early June at seven infested stands found an average of 10% (range 1-20%) of alpine fir buds infested, indicating the potential for continued light to moderate defoliation² throughout the infested area.

Egg mass sampling conducted in the fall at five locations in the Region indicates the potential for severe defoliation over the next two years (Table 2). In 1989 the severity of defoliation will probably be reduced due to the small size of the immature larvae; however, when the larvae mature and feed in 1990 severe defoliation is likely unless parasitism, disease or climatic conditions reduce the population.

¹C. fumiferana, C. occidentalis and C. biennis are all attracted to the same lure.

²Percent infested buds as related to predicted defoliation:

0 - none; 1-15, light; 16-30, moderate; 31-45, heavy; 45+ severe.

Table 2. Location, average number of egg masses per 10 m² foliage and predicted bud damage of alpine fir and white spruce by two-year cycle spruce budworm, Prince George Region, 1988.

| Location | Average no. of egg masses per 10 m ² foliage | Predicted bud defoliation ¹ , 1989 |
|------------------|--|--|
| Bowron-Coal Road | 514 | severe |
| Everett Creek | 719 | severe |
| Ames Creek | 358 | severe |
| Stoney Lake | 572 | severe |
| Elk Creek | 648 | severe |

¹1-50 eggs, light; 51-150, moderate; 151+, severe.

FIDS will continue to monitor two-year-cycle spruce budworm populations in historically active areas in 1989.

Spruce beetle Dendroctonus rufipennis

Less than five recently killed white spruce were mapped during aerial surveys, compared to 40 in 1987 and over 1000 in 1986, in this the sixth consecutive year of declining populations.

Several reported areas of spruce beetle infestation or potential infestation, i.e. blowdown, were surveyed but no populations were found. The B.C. Forest Service has reported further beetle locations; these will be checked during the 1989 field season. Based on the current decline, populations are expected to remain low in 1989.

Tommentosus root disease Inonotus tomentosus

This white pocket rot was identified in one of nine stands surveyed for the incidence of this root rot in the Prince George Region in 1988. Stands between 20 and 50 years were targeted in this survey in an attempt to determine at what age I. tomentosus infections become identifiable, and to widen the known distribution of this root disease, common in mature stands throughout the Region.

A minimum of 20 trees were examined at each of the nine locations. No crown symptoms were observed in any of the stands surveyed. The one positive sample came from a 45-year-old stand in the upper Chuchinka Creek area where approximately 5% of the stand was infected.

Surveys will continue in 1989 to gather further data on the incidence of this important root rot in younger stands in the Prince George Region.

Northern spruce engraver
Ips perturbatus

In the fourth year of declining populations only 15 current engraver beetle attacks were detected during aerial surveys, compared to 20 in 1987, 800 in 1986 and 4000 in 1985. These included single and grouped trees mainly along Herrick Creek, with some seen near the West Torpy River.

It is thought that Ips populations increased to epidemic levels in 1985 by breeding in the tops of trees killed by the spruce beetle during a major epidemic in the drainages of the Bowron, MacGregor and Parsnip rivers.

A continuing lack of host material for this normally secondary beetle will likely maintain populations at low levels in 1989.

Inland spruce cone rust
Chrysomyxa pirolata

This rust was found on spruce cones at three locations in the region in 1988. Also, aeciospores of C. pirolata were isolated from current year's shoots on 2+0 white spruce stock from a nursery near Prince George. This is a significant confirmation, as this disease has previously never been found in its aecia state on anything other than spruce cones.

C. pirolata infected 11% of white spruce cones near West Creek, northwest of Prince George; 3% of white spruce cones near Frank Lake, south of Vanderhoof; and some cones on a single, stressed white spruce at Km 39 on the Bowron Road.

Further surveys to determine the incidence and intensity of this rust will continue in 1989.

Western blackheaded budworm
Accleris gloverana

Blackheaded budworm infested an average of 10% of the buds on 100% of white spruce and alpine fir in the Germansen Landing-Discovery Creek-Uslika Lake area north of Fort St. James. This insect, which has severely defoliated a variety of conifers in coastal and interior wet belt areas, has never caused significant damage in the Prince George Region. High populations, but no damage, were last reported in this same general area in the early 1950s.

Blackheaded budworm populations have been active in the Babine Lake to Morice River and Burns Lake areas of the adjoining Prince Rupert Region for the past two years, causing generally light to moderate defoliation of the current year's growth in the lower crowns of white spruce and alpine fir. Surveys to monitor this potentially damaging pest will continue in 1989.

Spruce weevil
Pissodes strobi

Spruce weevil populations were active in scattered areas throughout the Region in 1988. Current attack ranged from 2% of the white spruce at Vama Vama Creek to 55% at the Prince George Tree Improvement Station. Approximately 5% of the trees were infested at Fishhook Lake, Tacheeda Lakes, Anzac, Bills and

Chuchinka creeks.

In a conifer release study along Highway 16 East at Vama Vama Creek, part of the aspen overstory was cut and part was left, with approximately 5% and 2% attack, respectively, in the young white spruce. A more detailed survey is planned in this area in 1989.

PINE PESTS

Mountain pine beetle Dendroctonus ponderosae

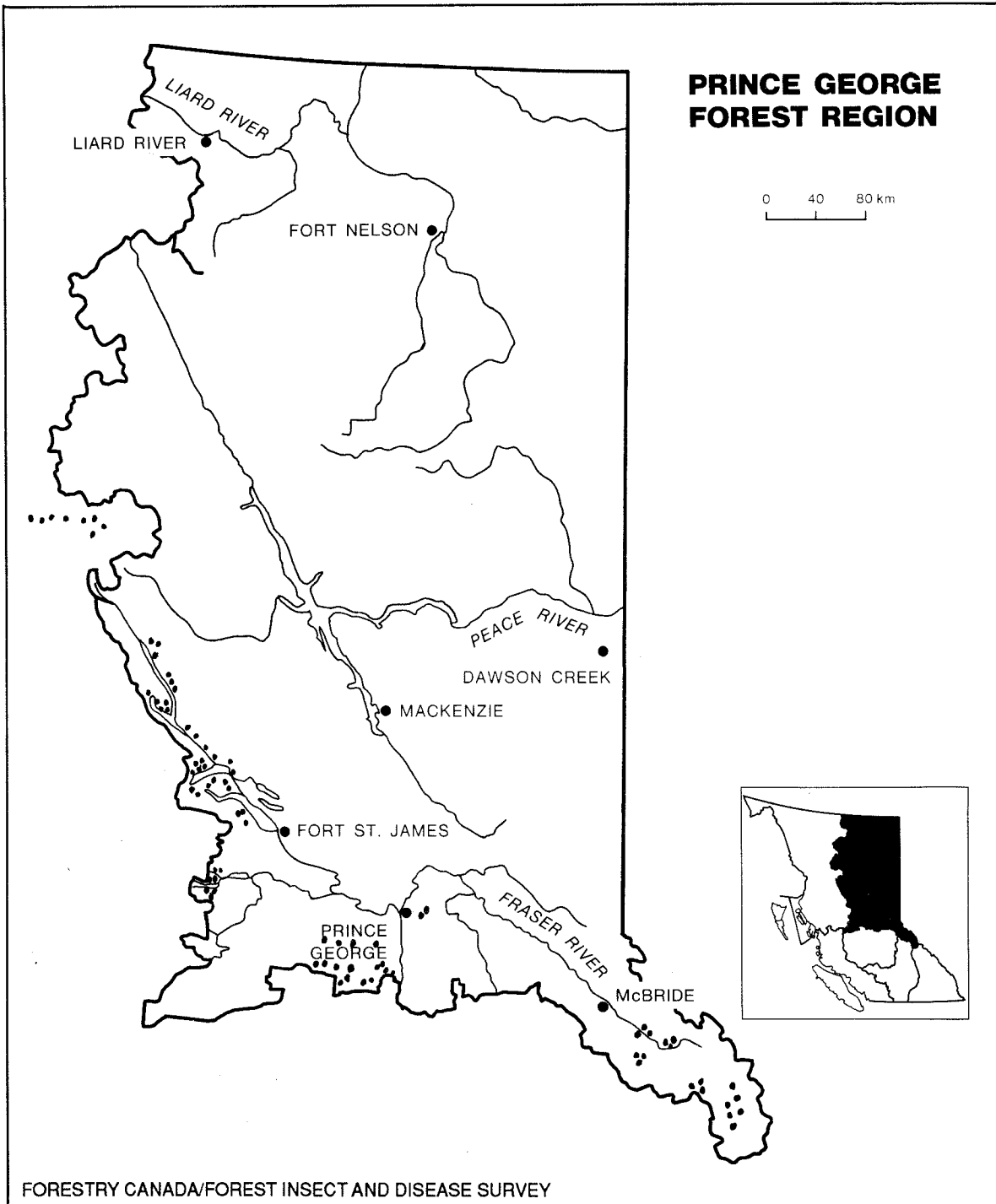
Recorded lodgepole pine mortality due to attacks by the mountain pine beetle decreased to 72 100 m³ over 3975 ha in 1988 from 132 660 m³ over 4290 ha in 1987 (Table 3, Map 3).

Eighty percent of beetle-caused mortality were found in chronic infestations in the Fort St. James District, many of which are beyond road access. The area of beetle-killed trees increased slightly in the Prince George West and McBride districts while decreasing slightly in the Vanderhoof and Prince George East districts.

Table 3. Timber supply area (TSA), forest district, location, area and volume of lodgepole pine recently killed by mountain pine beetle, Prince George Region, 1988.

| TSA, forest district and location | area (ha) | volume (m ³) | Remarks |
|--------------------------------------|--------------|-----------------------------|--|
| PRINCE GEORGE TSA | | | |
| <u>Fort St. James District</u> | | | |
| Skeena-Sustut rivers | 1130 | 14 060 | |
| Takla Lake | 940 | 23 470 | - from Leo and Bivouac creeks north, including northwest arm |
| Middle River | 220 | 4 280 | - includes Bill Martin Ridge to Kazchek Creek, Baptiste to Tsitsutl creeks |
| North shore Trembleur Lake | 585 | 7 315 | - includes Fleming Creek to Starret Lake area |
| TFL 42 | 540 | 15 940 | |
| Whitefish Lake | 10 | 125 | - from Whitefish Creek to Camsell Creek area |
| Subtotal | 3425 | 65 190 | |

| TSA, forest district and location | area (ha) | volume (m ³) | Remarks |
|--------------------------------------|--------------|-----------------------------|--|
| <u>Prince George West District</u> | | | |
| Tagai-Punchaw lakes | 130 | 1650 | - includes Telegraph Range, Blackwater River, Barton Lake to Punchaw Flats |
| Chilako River-Bobtail Mtn. | 115 | 1450 | - includes Baldy Hughes area |
| TFL 5 | 10 | 125 | |
| Subtotal | 255 | 3225 | |
| <u>Vanderhoof District</u> | | | |
| Francois-Tatin lakes | 45 | 565 | - includes areas south of Fraser L. |
| Subtotal | 45 | 565 | |
| <u>Prince George East District</u> | | | |
| Km 62 Bowron-Coal Road | 5 | 60 | |
| Subtotal | 5 | 60 | |
| TSA TOTAL | 3 720 | 69 040 | |
| MCBRIDE TSA | | | |
| <u>McBride District</u> | | | |
| Canoe Reach | 215 | 2 690 | |
| Albreda-Mt. Thompson | 10 | 125 | |
| Castle Creek | 10 | 125 | |
| Swift Creek | 5 | 60 | - includes Hogan Creek, McLennan R. |
| Robson Corridor-Fraser Valley | 5 | 60 | |
| Subtotal | 245 | 3 060 | |
| TSA TOTAL | 245 | 3 060 | |
| REGIONAL TOTAL | 3 975 | 72 100 | |



Map 3. Areas of lodgepole pine recently killed by mountain pine beetle determined by aerial and ground surveys in 1988.

Fort St. James District

The area of recently killed lodgepole pine declined to 3415 ha from 3845 ha in 1987. Most of the decline occurred in the remote Skeena-Sustut rivers infestation which is spreading eastward. Other chronic infestations along the northwest arm and the main body of Takla Lake continue unabated, mainly due to the inaccessibility of these remote areas. Beetle-caused mortality was again mapped along the Middle River, on the north shore of Trembleur Lake and west to the regional boundary in the Fleming Creek-Starret Lake area. The majority of beetle-caused mortality in TFL 42 continues to be centered between Tarnezell Lake, the Tachie River and Trembleur Lake. Red-topped trees were also mapped near the mouth of Tarnezell Creek and along the western edges of the TFL. Some mortality was mapped in the Whitefish Lake-Camsell Creek area, but at reduced levels from previous years.

An "R" value of 4.2 obtained during spring brood assessments falls into the increasing population range¹, but is considerably lower than the 12 and 20 "R" values of 1987. Fall cruising in TFL 42 found an average 11% current attack (Table 4) down from 34% in 1987, confirming the spring assessments of reduced but still active beetle populations.

Table 4. Status of lodgepole pine in stands infested by mountain pine beetle, Prince George Forest Region, 1988.

| Location | Percentage of stems | | | | |
|--------------------------|---------------------|----------------------|-----|------|---------|
| | Healthy | Current ¹ | Red | Grey | Partial |
| Strip 1, Blk. 61, TFL 42 | 84 | 5 | 6 | 5 | 0 |
| Strip 2, Blk. 61, TFL 42 | 82 | 0 | 3 | 14 | 1 |
| Strip 1, Blk. 6, TFL 42 | 37 | 8 | 51 | 4 | 0 |
| Strip 2, Blk. 6, TFL 42 | 16 | 32 | 48 | 0 | 4 |
| Average | 55 | 11 | 27 | 6 | 1 |

¹Current attack - 1988, Red attack - 1987, Grey attack - prior to 1987, Partial/Pitchout - 1988

Brood assessments during fall cruising found almost 100% emergence in the vicinity of proposed Block 61, where most of the current attack was centered on or around pheromone-baited trees. Up to 2nd-instar larvae were common in brood galleries, normal development for this time of year. Brood emergence at Block 6, TFL 42 was patchy; some trees had parent galleries but no egg production; some had eggs but no brood emergence; and some trees had up to 2nd-instar larvae in brood galleries. The wet, cool spring and early summer may have retarded beetle development in this area to the point where some of the population flew

¹'R' value - ratio of the numbers of counted brood in a 225 cm² bark sample vs. the number of entrance holes. Criteria: ≤ 2.5 - decreasing population, 2.6-4.0 - static population, ≥ 4.1 - increasing population

later than usual, and are waiting until next spring to begin egg laying which would indicate a partial 'off-cycle' population. Further evidence of this was found when some late instar larvae and pupae were found under the bark of red (1987) attacked trees. Normally, all brood would have flown from 1987-attacked trees, any brood remaining and surviving to fly in 1989 would be considered an extended or 'off-cycle' (1.5 - 2-yr) population.

The lower 'R' value and current attack status in 1988, combined with evidence of a partial 'off-cycle' population indicate that mountain pine beetle populations are less vigorous than in 1987. Accessible infestations will be logged during the winter of 1988-89; this combined with single tree disposal should eliminate some of the beetle population in the southern half of the district. Remote infestations in the Skeena-Sustut rivers area and along Takla Lake will continue unchecked until access into these areas is improved.

Prince George West District

The area of mountain pine beetle-killed lodgepole pine was 255 ha, up from 185 ha reported in 1987. Pockets of one to ten beetle-killed trees continue in the Tagai Lake-Telegraph Range area, along the Blackwater River and southwest of Punchaw Lake and Tako Creek (an area where 1987 mortality was attributed to *Ips* sp. attack). Mortality was also mapped, at reduced levels, in the Bobtail Mtn. area, in scattered pockets south of and along the Chilako River, in TFL 5, and near Baldy Hughes.

The Forest Service continued the use of pheromone baits to contain and concentrate beetle populations in preparation for single-tree disposal and logging operations. These management options, along with good road access, have proven to be the most successful tool in combating beetle populations in this district.

McBride Forest District

Mountain pine beetle-caused mortality was mapped over 245 ha, a slight increase from the 235 ha recorded in 1987. Areas where beetle activity continued to be a problem were: Canoe Arm, Albreda-Mt. Thompson, Swift Creek, Mt. Chamberlin and Castle Creek.

Along Canoe Reach on Kinbasket Lake, where beetle populations have been active since 1977, pockets of 1 to 20 trees were mapped at scattered locations from Dave Henry to Baker creeks, on both sides of the lake. Another chronic beetle area is Albreda where several pockets of 1 to 20 trees were mapped. For the second consecutive year, approximately 100 beetle-killed trees were mapped at Castle Creek, up slightly from the 75 trees mapped in 1987. Beetle activity continued, at reduced levels, in the Swift Creek area above Valemount where approximately 10 trees were mapped compared to 50 in 1987. A few small groups of 1 to 10 trees were seen between Swift and Hogan creeks, north of Valemount, and a few red-topped trees were seen near the McLennan River. Approximately 20 red-topped trees were mapped in the Small-Horsey creeks area, and a new group of approximately 10 trees was mapped north of Dunster near Hamilton Creek.

The only mortality seen in the sensitive Robson Corridor area were 10 trees along the lower slope of Mt. Chamberlin, and two red trees at Shale Hill. Only the Shale Hill trees were inside the Mt. Robson Provincial Park boundary.

A few red trees seen near Fitzwilliam and up the Moose River were dying from other causes. No beetle-killed trees were seen towards the headwaters of the Fraser River, another area of concern near the Alberta border. The B.C. Forest Service reports finding 62 current attack trees during fall probes in the Shale Hill area in Mt. Robson Provincial Park. These attacks were associated with pheromone-baited trees which were unsuccessfully treated with MSMA, and are scheduled for disposal during the winter of 1988-89. This brings the total number of mountain pine beetle-infested trees removed in and near Mt. Robson Provincial Park to over 500 during the past three years.

A major concern is that, if mountain pine beetle populations within the Robson Corridor area were allowed to build up unchecked, they could spread east through the relatively low-elevation Yellowhead Pass into Alberta and Jasper National Park, an area that has no history of mountain pine beetle attacks.

Individual tree disposal, in conjunction with pheromone baiting and adjusted logging schedules in accessible areas, is the management option used in the ongoing battle against beetle populations in this district.

Vanderhoof Forest District

Mountain pine beetle activity remained low for the third consecutive year. Approximately 200 red trees were mapped over 45 ha, up from 130 trees over 20 ha in 1987, but still lower than the 5000+ trees mapped in 1985. The main area of active beetle populations was in the western part of the district, adjacent to the Prince Rupert regional boundary.

Approximately 50 red trees were mapped in a new infestation near Tatin Lake, north of Endako, and approximately 75 trees were mapped along the eastern end of Francois Lake. Red trees were also mapped south of Fraser Lake in the Foster-Theda lakes area. Little beetle activity was seen in the extreme southern part of the district, and a few red trees were reported in the Bobtail area, adjacent to the Prince George West District.

Prince George East District

Approximately 20 mountain pine beetle-killed trees were mapped near Km 62 on the Bowron-Coal Road, down from 40 trees in 1987. This is the fourth consecutive year that scattered attacks have been recorded in this area. The number of trees and area under attack has remained consistently low; no control measures have been attempted against this light population. Further monitoring of this area, through aerial and ground surveys, will continue.

Pinewood nematode Bursaphelenchus xylophilus

A total of nine adult Coleoptera, suspected vectors of the nematode, were submitted as part of the ongoing national nematode program. No further information on the presence or absence of nematode is available as extraction and identification are still in progress. The insects collected were Monochamus scutellatus, five adults collected at a small sawmill near Germansen Landing; Strictoleptura canadensis cribipennis, two adults, and Iphthimus serratus, two adults, all collected at CanFor's Prince George Pulp and Paper Mill chip piles. Four other locations sampled for adult Coleoptera were negative.

These collections are part of a nation-wide survey to determine the distribution of the nematode in Canada. The pinewood nematode is responsible for widespread pine mortality in Japan. Scandinavian countries have imposed embargoes on some imported green wood products which they suspect might contain the nematode, and some European countries are also considering similar embargoes.

Following extensive sampling over the past four years, there has been little evidence to suggest that local strains of the nematode pose a present, or future, threat to B.C. conifers.

White pine blister rust Cronartium ribicola

Approximately 135 white pine blister rust-infected western white pine were mapped, mainly along the southwestern end of Canoe Reach on McNaughton Lake, similar to 1987 damage levels. Five separate patches of recent mortality were mapped along the western side of the Arm, south of Bulldog Creek. In addition, two patches of blister rust-caused mortality were mapped in the Albreda area. Blister rust is differentiated from mortality caused by the mountain pine beetle (also active in the same areas) by its being limited to the minor western white pine component of the stands, and its habit of only top-killing many of the trees.

Blister rust-caused mortality is a chronic problem in five-needle pine, and infections in this species are expected to continue in future years.

Joint Canada-Sweden lodgepole pine trial

The four existing lodgepole pine trial sites established in 1986 at Fort St. James, Mackenzie, Fort St. John and Fort Nelson were visited in June and July 1988. The fifth site near Whitehorse was also examined in June, and results were summarized in the 1988 FIDS Yukon Report 89-7.

The Fort St. James plot, located on the Teardrop Forest Road, was examined June 6. Plot trees were generally healthy with good growth and little evidence of problems. Less than 1% of lodgepole pine seedlings suffered top dieback and mortality; a parasitic microfungus, Tryblidiopycnis sp., was isolated from samples collected at this site. This disease is usually associated with stressed trees; drought or frost are the usual primary agents associated with this type of secondary infection. This collection represents a new host and distribution record in the Pacific Region.

The Mackenzie plot, located at Nation Arm on Williston Lake, was examined July 19. Plot trees were generally healthy with good growth except Siberian larch, which suffered approximately 60% top dieback. A weakly parasitic microfungus, Sclerophoma sp., usually associated with drought or frost-stressed trees, was isolated from samples taken from this site. Vegetative competition and competition from natural pines continue to be a potential problem.

The Fort St. John plot, off the Halfway River Road, was examined June 20. Plot trees were generally healthy and growing well with little evidence of problems. Less than 1% of Scots and lodgepole pines had needle discoloration caused by winter damage. Approximately 1% of lodgepole pine seedlings suffered top dieback; again Sclerophoma sp. was isolated from dieback samples. A pine

adelgid, Pineus coloradensis, was common on lodgepole pine at this site.

The Fort Nelson plot located along the Liard Highway was examined June 21. Although plot trees were generally healthy, except for Siberian larch, overall growth and vigor was less here than at the other B.C. locations. All of the Siberian larch suffered top dieback; again Sclerophoma sp. was isolated on collections of the dieback. Approximately 1% of lodgepole pine seedlings suffered top dieback and mortality; Tryblidiopycnis sp. was also isolated, extending the known distribution for this disease on lodgepole pine. A few spruce budworm, Choristoneura fumiferana, larvae were found feeding on Norway spruce; no serious defoliation occurred. A large spruce budworm infestation has been ongoing in the general area for four years, and populations are usually widely found, even at endemic levels. A large block adjacent to the Svenska plot was recently treated with a herbicide, Vision (Roundup), for brush control; no detrimental effects were noted on plot trees.

Pine engraver beetle

Ips pini

After two consecutive years of high engraver beetle populations, the epidemic has collapsed, and very little mortality has been attributed to this normally secondary beetle.

Engraver beetle populations are thought to have built up in the upper crowns of the large numbers of mountain pine beetle-killed trees in the Cariboo and southern Prince George regions. The logging which followed the mountain pine beetle infestations created large accumulations of slash which provided optimum breeding conditions for the engraver beetles, which then attacked standing green timber, particularly along cutblock boundaries. There was no mortality associated with cutblock fringes, a condition which was common in the Prince George West District last year. Some engraver beetle populations still exist, particularly in the pine flats area around and southwest of Punchaw.

ALPINE FIR PESTS

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

Scattered light mortality of alpine fir caused by this insect/disease complex killed an estimated 9950 trees over 1225 ha of high-elevation balsam stands, down from 10 600 trees over 6125 ha in 1987. The decrease is largely due to reduced aerial surveys; however, some large infestations such as the one on the west side of Takla Lake, showed a two-thirds reduction in area.

Balsam bark beetle is a chronic problem and mortality is expected to continue at similar levels in 1989.

Fir-fireweed rust **Pucciniastrum epilobii**

An average of 50% (range 20-80%) of all foliage on 100% of the alpine fir residuals in a cutblock near Loop Lake, northwest of Prince George, were infected by this disease, resulting in severe browning and wilted foliage.

Also, light infections were found on a few trees in the Pass Lake area, east of Prince George, and in the Red Pass area in Mt. Robson Provincial Park. Since fireweed is the alternate host for this rust, recently logged and burned sites have the potential to produce severe infection levels; however, these levels fluctuate considerably from year to year depending on the abundance and proximity of rusted fireweed and favorable climatic conditions during the infection period in the spring.

DOUGLAS-FIR PEST

Douglas-fir beetle Dendroctonus pseudotsugae

At least 250 Douglas-fir killed by 1987 beetle attacks were reported by the B.C. Forest Service and mapped over 90 ha during aerial surveys, compared to 250 trees over 49 ha in 1987. Mortality occurred mainly in scattered patches over the southwestern portion of the Prince George West District. Groups of one to 20 red trees were mapped along the Blackwater River from the Barton Lake Extension to the Fraser River, including TFL 5, the Bobtail-Pelican Road junction, west of Gregg Creek, and the Butcher Flats to Chilako River area.

No mortality was seen in the Averil Lake area where beetle populations were active in 1986. Increased activity was reported in TFL 42, northwest of Fort St. James, an area where light populations have been active for the past two years. Further surveys and monitoring of populations will continue in 1989.

LARCH PESTS

Larch cankers Lachnellula willkommii Leucostoma kunzei Sirodothis sp.

Fifty percent of the tamarack in isolated pockets between Beaver Creek and Parker Creek along the Alaska Highway, south of Fort Nelson, suffered top and lateral dieback and stem and branch cankers caused by L. kunzei and Sirodothis sp., respectively. Although neither of these diseases causes outright mortality, the combined effects can weaken trees, thus making them susceptible to other secondary pathogens or insects which could contribute to mortality. Both of these collections represent new host records.

The canker and dieback was discovered during surveys for European larch canker, Lachnellula willkommii, which was not found in any of the six locations sampled. This canker is responsible for eliminating European larch as a plantation species in parts of Europe, and has been found on tamarack in eastern Canada. Surveys to determine whether or not this potentially damaging disease occurs in the Pacific Region will continue next year.

MULTIPLE HOST PESTS

Black army cutworm
Actebia fennica

Increasing black army cutworm populations defoliated conifer seedlings and herbaceous material at several sites in the region, the first defoliation since 1986.

Conifer seedlings and herbaceous material were severely defoliated over 30 ha at East Twin Creek. Douglas-fir and white spruce seedlings were so severely defoliated (95%+) that the site was replanted. Damage at Caine Creek, C.P. 202/19, was confined to one hectare of light defoliation to herbaceous material. The BCFS and industry reported light damage at Leo Creek, northwest of Fort St. James; the Muskeg River area, northwest of Prince George; and along the east side of Canoe Arm on Kinbasket Lake.

Five pheromone-baited sticky traps were placed at each of 17 one-year-old prescribed burns or wildfire locations throughout the Region. All but one of the trap locations yielded low numbers of adult male moths. At Weedon Lake, an average of 23 moths/trap (range 12-33) was recorded, compared with an average of 1.6 moths/trap (range 0-19) at the other 16 locations. These figures indicate low populations for all areas monitored by pheromone traps, with the exception of Weedon Lake which could experience high populations.

While the incident of virus or disease was nonexistent in mass collections, moderate parasitism rates were detected. At East Twin Creek, 33% of the larval populations were parasitized by Hymenoptera, and 7% were parasitized by Diptera. At Caine Creek, 41% and 7% were parasitized by Hymenoptera and Diptera, respectively.

The low numbers of adults caught in traps combined with moderate incidence of parasitism indicate the possibility of continued low level cutworm populations throughout the region in 1989. Monitoring of recently burned sites, as well as reported outbreaks, will continue in 1989.

Rhizina root rot
Rhizina undulata

Rhizina root rot collections were made at two locations in the Region in 1988. These represent new B.C. distribution records as the disease had not been collected in this Region prior to 1988. The two collections, one of fruiting bodies with no associated seedling mortality and one of Rhizina on dead lodgepole pine seedlings, were made after 17 locations were examined twice during the course of regular surveys.

No evidence of R. undulata was found during July surveys; however, subsequent surveys in September found fruiting bodies of the root rot in an area burned by the 'Frank' Fire, approximately 5 km east of Frank Lake. No seedling mortality was associated with the fruiting bodies as the area was not planted. R. undulata was isolated from dead lodgepole pine seedlings collected from a one-year old burned and recently planted area near Peculiar Lake, southeast of Weedon Lake. Approximately 1% seedling mortality was found.

Rhizina fruits from early summer through to fall frost, a minimum of four months following a burn, and since it is a poor competitor the fungus normally survives for only a few years after the burn, after which it is succeeded by more aggressive fungi. Most seedling mortality occurs within the first year but Douglas-fir mortality on the coast was reported on the same sites for two successive years in 1968/69. In the same two years, mortality of lodgepole pine seedlings and exotic western larch seedlings was closely associated with Rhizina fruiting bodies in two plantations in the Prince Rupert Region.

All areas where Rhizina was found in 1988 will be resurveyed in 1989 to record any further seedling mortality.

Acid Rain National Early Warning System (ARNEWS)

The Acid Rain National Early Warning System (ARNEWS) plot was visited twice in 1988. No sign of acid rain damage was recorded but trace defoliation by two-year-cycle spruce budworm was recorded on two alpine fir (there was no other defoliation in the area).

This plot is part of a national system to gather baseline data on acid rain effects in Canadian forests. The data will be used to quantify changes to the forests that might result from acid rain by monitoring soil, vegetation and trees that may be affected by acidification of precipitation, fog, clouds or other atmospheric pollutants. Monitoring will continue at this plot and fourteen others in British Columbia in 1989.

RODENT DAMAGE

Porcupine damage of primarily lodgepole pine was recorded in seven areas over 14 ha in 1988, greatly reduced from 72 areas over 800 ha in 1987. The decrease this year is partially a reflection of decreased aerial surveys in the Mesilinka and Ingenika drainages and the Tumbler Ridge area, where a majority of damage was recorded in 1987.

At the Willow River Demonstration Forest near Prince George there was a partial girdling on 55% of the semimature lodgepole pine over 5 ha, possibly caused by voles. There was no mortality and all the trees should recover.

CONE AND SEED PESTS

Cone crops were light to moderate in the Region in 1988. Cone samples were collected from seven locations and analyzed for cone insects and disease at the Pacific Forestry Centre (Table 5).

Severe infestations by Strobilomyia neanthracinum and Cydia strobilella were recorded at three and two areas, respectively (Table 5). Both are serious pests that feed on the seeds, destroying a significant portion of the crop.

Table 5. Location, host, percent of cones infested and pest, Prince George Forest Region, 1988.

| Location | Host ¹ | Percent infested | Pest |
|---|-------------------|------------------|-----------------------------------|
| West Creek | wS | 45 | <u>Cydia strobilella</u> |
| | | 40 | <u>Strobilomyia neanthracinum</u> |
| | | 11 | <u>Chrysomyxa pirolata</u> |
| | | 10 | <u>Resseliella</u> sp. |
| | | 5 | <u>Dasineura rachiphaga</u> |
| | | 5 | <u>Mayetiola carpophaga</u> |
| Frank Lake | wS | 55 | <u>Strobilomyia neanthracinum</u> |
| | | 45 | <u>Cydia strobilella</u> |
| | | 3 | <u>Chrysomyxa pirolata</u> |
| Prince George Tree Improvement Station (PGITS) comparative test of spruce progeny | wS | 40 | <u>Strobilomyia neanthracinum</u> |
| | | 5 | <u>Dasineura rachiphaga</u> |
| | | 5 | <u>Resseliella</u> sp. |
| PGTIS spruce progeny trial Prince George | wS | 55 | <u>Strobilomyia neanthracinum</u> |
| | | 25 | <u>Cydia strobilella</u> |
| | | 5 | <u>Resseliella</u> sp. |
| PGITS spruce progeny trial East Kootenay | eS | 45 | <u>Strobilomyia neanthracinum</u> |
| | | 20 | <u>Cydia strobilella</u> |
| | | 5 | <u>Dioryctria reniculelloides</u> |
| Sundance Lakes | tL | | negative |
| Parker Creek | tL | | negative |

¹eS - Picea engelmannii

wS - Picea glauca

tL - Larix laricina

Seed and cone pests will be surveyed in 1989.

PESTS OF YOUNG STANDS

A total of 18 planted and natural stands between two and twenty-five years old were surveyed for pest problems in 1988. The most frequently occurring pests are summarized in Table 6. A detailed description of individual stands is available upon request (Appendix IV).

Table 6. Summary of pests of young stands, Prince George Region, 1988.

| Host | Stands ¹ examined | Pest | No. of stands affected | Percent of trees affected | | Remarks |
|----------------|---------------------------------|--|------------------------------|------------------------------|--------|--|
| | | | | Average | Range | |
| Lodgepole pine | 16 | poor form/ multiple top | 7 | 8 | 2-10 | crooked and forked stems, bushy tops, possibly frost or browse related |
| | | <u>Endocronartium</u> <u>harknessii</u> | 6 | 5 | 1-32 | causing stem and branch cankers |
| | | winter flecking | 4 | 64 | 28-100 | generally light, on older needles |
| | | <u>Petrova</u> sp. | 4 | 2 | 1-5 | endemic levels |
| | | <u>Pissodes</u> <u>terminalis</u> | 3 | 2 | 2-3 | " " |
| White spruce | 4 | <u>Adelges</u> <u>cooleyi</u> | 3 | 27 | 14-62 | avg. 10% of branch tips infested |
| | | multiple top/poor form | 3 | 15 | 7-26 | crooked and forked stems, bushy tops possibly frost or browse related |
| Douglas-fir | 1 | <u>Adelges</u> <u>cooleyi</u> | 1 | 93 | - | generally light infestations |
| | | <u>Melampsora</u> <u>medusae</u> | 1 | 86 | - | less than 10% of foliage infected |
| Alpine fir | 1 | <u>Pucciniastrum</u> <u>epilobii</u> | 1 | 100 | - | avg. 50% of foliage infected |

¹Number of surveyed stands in which tree species comprised >20% of stand.

The most damaging pests encountered were the Cronartium spp. stem rusts, C. coleosporioides and C. comandrae. Although these rusts were found in only one stand surveyed, on the 100 Road near the Salmon River, the damage caused was significant. Ten percent of infected stems were killed, 9% had stem cankers (which will probably result in mortality) and 6% had branch cankers. Also, the infected alternate host, Indian paintbrush, was collected at this site.

The most common pest in young lodgepole pine stands was western gall rust, Endocronartium harknessii, which formed branch and stem cankers on an average of 5% of the trees in 38% of stands surveyed. This disease frequently kills branches and the galls can girdle stems, killing trees or weakening them,

predisposing them to wind or snow damage. Other significant pests of lodgepole pine were dwarf mistletoe, Arceuthobium americanum, lightly infecting fringe trees in two areas, and Warren's root collar weevil, Hylobius warreni, infecting 1% of the trees in two areas.

The Cooley spruce gall adelgid, Adelges cooleyi, was the most common pest in white spruce and Douglas-fir stands. Frost damage and the spruce weevil, Pissodes strobi, were also found at low levels in young spruce stands.

As further emphasis is placed on intensive management, interest in pests of young stands and their impact will grow. FIDS will continue to monitor young stands in the Prince George Region in 1989.

DECIDUOUS TREE PESTS

Forest tent caterpillar Malacosoma disstria

The area of mainly trembling aspen defoliated by forest tent caterpillar increased to 48 315 ha (Table 7, Map 2) from 17 025 ha in 1987. This is the third consecutive year of increased populations and defoliation in the Chief Lake-Salmon Valley infestation while the Peace River infestation declined for the second consecutive year. A small infestation in the Mt. Tabor area collapsed.

Table 7. Location, area and severity of defoliation by forest tent caterpillar, Prince George Forest Region, 1988.

| Location | Area of defoliation (ha) | | | | Remarks |
|------------------------|--------------------------|----------|--------|--------|--|
| | Light | Moderate | Severe | Total | |
| Chief L.-Salmon Valley | 20 190 | 19 850 | 3 240 | 43 280 | includes Ness-Nukko-Buck-Reid lakes to Salmon Valley |
| Peace River | 880 | 4 160 | 0 | 5 035 | only in Farmington and Pouce Coupe areas |
| Mt. Tabor | 0 | 0 | 0 | 0 | collapsed |
| Total | 21 070 | 24 010 | 3 240 | 48 315 | |

The most severe defoliation occurred in the Chief Lake-Salmon Valley infestation. Mixed and pure aspen stands in residential and farming areas were completely stripped of foliage. Other tree species such as cottonwood, birch and willow as well as understory shrubs were also defoliated. This infestation intensified and expanded in all directions. Defoliation was recorded south of the Nechako River at Cranbrook Hill, west of Clauminchil Lake to Steele Lake, north to Haglund Lake and east of the Fraser River, below Giscomb Rapids.

The Peace River infestation, which has been active for five years (Table 8) continued to decline; light and moderate defoliation in primarily aspen stands was confined to the Farmington area, and south of Pouce Coupe.

Table 8. Year, location and area of defoliation by forest tent caterpillar, Prince George Forest Region, 1983-1988.

| Year | Area of defoliation (ha) | | Total |
|------|--------------------------|--------------------------|--------|
| | Peace River | Salmon Valley-Chief Lake | |
| 1983 | 0 | 485 ¹ | 485 |
| 1984 | 18 680 ² | 5 420 | 24 100 |
| 1985 | 56 390 | 0 | 56 390 |
| 1986 | 91 700 | 580 ³ | 92 280 |
| 1987 | 8 650 | 8 375 ⁴ | 17 025 |
| 1988 | 5 035 | 43 280 | 48 315 |

¹First recorded defoliation in this area since 1974.

²First recorded defoliation in this area since 1963.

³Increasing population, no defoliation recorded at Mt. Tabor.

⁴Includes 270 ha at Mt. Tabor.

The expansion and intensification in the Chief Lake-Salmon Valley infestation, and the declining Peace River infestation, were predicted by FIDS following 1987 egg mass surveys (FIDS Report 88-4) and confirmed following early spring larval assessments. The Mt. Tabor infestation, which was expected to continue, collapsed for unknown reasons; however, in 1986 a cytoplasmic virus (CPV) was isolated from a mass collection made in the area, and may be at least partially responsible for the collapse.

Egg mass surveys were conducted in September (Table 9); five trees were felled at each sample location and all new and old egg mass bands were counted on each tree. Based on these data and the apparent lack of disease or parasitism in the population, defoliation is expected to intensify and expand in the Chief Lake-Salmon Valley infestation. Defoliation in the Peace River area should continue, and possibly expand as the number of new egg masses is slightly more than the old, and the number of old egg mass bands is inflated by the presence of 2+-year old egg masses. A further consideration in predicting a possible increase in the Peace River infestation is the current state of forest tent caterpillar infestations in the adjoining Prairie Region, particularly Alberta, where some 2.75 million ha were defoliated, and populations are expected to continue at similar levels in 1989.

Table 9. Numbers of new and old egg masses of the forest tent caterpillar and predicted 1989 defoliation, Prince George Forest Region, 1988.

| Location | 1988 defoliation | Average dbh (cm) | Avg. no. egg masses/tree | | Predicted defoliation ¹ |
|---|---------------------|---------------------|--------------------------|-------------------|---------------------------------------|
| | | | New | Old | |
| 6 km S of Pouce Coupe | moderate | 10.8 | 27.4 | 26.4 ² | severe |
| Salmon River Forest Rd. | moderate | 10.8 | 38.8 | 12.0 | severe |
| Christopher Drive, Hart Highlands | severe | 9.4 | 73.2 | 2.2 | severe |
| South of Hoodoo Lakes | moderate | 12.2 | 8.2 | 4.0 | moderate |
| Jct. Chief - Ness lake roads | moderate | 11.0 | 154.8 | 18.8 | severe |

¹Based on a model developed by Hildahl and Campbell at the Northern Forestry Centre, Edmonton, Alberta.

²Up to 25% are 2+-year-old egg mass bands.

The very high number of new egg masses, 339 on one tree at the Chief Lake-Ness Lake Road junction and 160 on one tree at Christopher Drive, just north of the Prince George city limits, indicate that extremely high larval populations and subsequent severe defoliation could occur in 1989. Forest Insect and Disease Survey will continue to monitor forest tent caterpillar populations in the spring of 1989 and further information in the form of pest leaflets and possibly press releases will be available at that time.

Purple-brown leaf spot **Pollaccia borealis**

This previously undescribed leaf spot, first collected in the Yukon and northern Prince Rupert regions in 1987, was collected at five locations from Prince George to the Yukon and Northwest Territories border in 1988. Collections were made to extend the known distribution of this disease and to provide material for taxonomic work by Dr. A. Funk at the Pacific Forestry Centre. Most aspen were moderately infected at all five sample locations.

This disease causes purplish brown spots to appear on infected aspen foliage early in the spring. These spots enlarge and eventually fall out, causing a 'shot-hole' effect. No mortality or dieback has been attributed to this disease; however, severe infections could interfere with the photosynthetic capability of the foliage and thus reduce incremental growth. Further collections will be made in 1989 to extend the known distribution of this disease.

Poplar leaf and shoot blights
Venturia macularis
V. populina

The incidence of infection by these diseases increased, particularly in the central and northern locations in the Prince George Region in 1988. For the second consecutive year, V. macularis infected trembling aspen regeneration in cutblocks along the Liard Highway, northwest of Fort Nelson. An average of 40% of the foliage on all aspen regeneration was infected. Thousands of hectares of mature aspen were defoliated along Williston Lake and the Rocky Mountain Trench north of Mackenzie. Most of the young and semimature aspen in the Germansen Landing-Manson Creek area, as well as mature aspen in the Carp-War-McLeod lakes area and young aspen along the Hart Highway near the Mackenzie Junction were also infected by this disease.

V. populina infected most black cottonwood along MacDonald Creek, at Racing River and Coal River along the Alaska Highway, as well as along the Liard Highway, northeast of Fort Nelson.

Although no mortality has been attributed to these diseases, repeated severe infections can cause significant dieback, particularly on younger and sapling-sized trees. Growth loss through reduced photosynthesis is another effect of severe infections.

Gypsy moth
Lymantria dispar

Forest Insect and Disease Survey placed 45 gypsy moth pheromone traps in the Prince George Forest Region as part of a continuing interagency monitoring program. The traps were placed in provincial parks, rest areas and private campgrounds; no male moths were caught in any of the trap locations. Hopefully, increased trapping combined with egg mass surveys will prevent the establishment of this potentially serious forest pest in B.C.

OTHER NOTEWORTHY AND MINOR PESTS

Table 10. Other noteworthy and minor pests.

| Pest | Host ¹ | Location | Remarks |
|--|-------------------|--|---|
| Engraver beetle <u>Ips tridens</u> | wS | Germansen Landing | in tops of recently cut spruce beetle-infested trees |
| Frost and winter damage | wS | Prince George Tree Improvement Station | damage to 20% of buds on 75% of immature trees over 5 ha |
| Large-spored spruce - Labrador tea rust, <u>Chrysomyxa ledicola</u> | wS | Sundance Lakes | light infection on new foliage on 100% of young trees |
| Small-spored spruce - Labrador tea rust, <u>Chrysomyxa ledi</u> var. <u>ledi</u> | wS | Beryl Prairie | light infection reported on new foliage on 100% of young trees |
| Resin fungus, <u>Sarea difformis</u> | bS | Halfway River Rd. | associated with cankers, new host record |
| Spruce gall adelgid, <u>Adelges lariciatus</u> | bS | Parker Creek, Sundance Lakes, Wilkie Creek | extends distribution of this pest first recorded in 1987 at Petitot River, near Northwest Territories |
| Bark beetle, <u>Dendroctonus</u> sp., probably <u>D. ponderosae</u> | 1P | Shale Hill, Francois L. | larvae from burned bolts and stump at mountain pine beetle cut-and-burn sites |
| Dwarf mistletoe, <u>Arceuthobium americanum</u> | 1P | Mt. Robson Prov. Park Km 37, Pelican Rd. | moderate infections on 90% of stems over 5 ha light infection on 50% of stems over 5 ha |
| Engraver beetle, <u>Ips latidens</u> | 1P | Francois Lake | in root collar area of mountain pine beetle-killed trees in cut-and-burn area |
| European pine shoot moth, <u>Rhyacionia buoliana</u> | 1P | southwest of Prince George | surveys in native pine stands were negative |
| Frost and winter damage | 1P | Prince George Tree Improvement Station | damage to 25% of foliage on 4% of immature trees over 5 ha |

| Pest | Host ¹ | Location | Remarks |
|---|-------------------|---|---|
| Lodgepole pine beetle, <u>Dendroctonus murrayanae</u> | 1P | Francois Lake | from root collar area of mountain pine beetle-killed trees at cut-and-burn sites |
| Pine engraver beetle, <u>Ips pini</u> | 1P | Middle River, Shale Hill | from burned bolts at mountain pine beetle cut-and-burn sites |
| Salt damage | 1P | from Valemount to McBride | damage to 30% of the old foliage on 40% of sapling-sized trees |
| Secondary bark beetles, <u>Hylurgops rugipennis</u> , <u>H. porosus</u> | 1P | Middle River, Francois Lake, Shale Hill | from root collar area, burned stumps and bolts at mountain pine beetle cut-and-burn sites |
| Striped ambrosia beetle, <u>Trypodendron lineatum</u> | 1P | Middle River, Francois Lake | from root collar and butt of mountain pine beetle-killed trees |
| Warrens root collar weevil, <u>Hylobius warreni</u> | 1P | Middle River | galleries in root collar area of mountain pine beetle-killed trees |
| Conifer-aspen rust, <u>Melampsora medusae</u> | a1F | Purden Lake Provincial Park | infecting 5% of foliage on immature trees |
| Dieback, <u>Potebniamyces balsamicola</u> var. <u>balsamicola</u> | a1F | Km 5, Ahbau Lake Rd. | from dead tip on immature tree |
| Spruce gall adelgid, <u>Adelges cooleyi</u> | D-fir | Bowron Road | infecting 30% of foliage on scattered trees over 5 ha |
| Larch sawfly <u>Pristiphora erichsonii</u> | L | Prince George | light damage to ornamental larch, first collection in city |
| Air pollution damage | bCo | Northwood Pulp Mill | discoloration to 20% of the foliage on 50% of the trees over 100 ha |
| Aphid <u>Thecabius populimonilis</u> | bCo | Bowron Road | lightly infecting foliage in this area |

| Pest | Host ¹ | Location | Remarks |
|---|--------------------|-----------------------------|---|
| Conifer-cottonwood rust, <u>Melampsora occidentalis</u> | bCo | Northwood Pulp Mill | infecting 20% of the foliage on 50% of the trees over 100 ha |
| Leafrollers, <u>Enargia decolor</u> , <u>Epinotia solandriana</u> | bCo | Tudyah Lake | common on sapling-sized trees in this area |
| Elm leafminer, <u>Agromyza aristata</u> | E | Prince George | third consecutive year of damage, 60% of foliage on all ornamental elms in "Miller Creek addition" area mined |
| Oblique banded leafroller, <u>Choristoneura rosaceana</u> | E | Prince George | associated with elm leaf miner for second consecutive year, 30% of foliage on all trees infested |
| Eriophyid mite <u>Phyllocoptes didelphis</u> | tA | Km 37, bobtail road | damage to 5% of foliage on all aspen over 1 ha |
| | | Purden Lake Provincial Park | damage to 2% of foliage on all aspen over 1 ha |
| Poplar borer, <u>Saperda calcarata</u> | tA | Vanderhoof Airport | widespread damage reported throughout this area |
| Eriophyidmite <u>Aculops</u> sp. | W | Cluculz Lake | damage to 10% of foliage on 30% of trees over 5 ha |
| Comandra blister rust, <u>Cronartium comandrae</u> | Indian paint brush | Salmon River | infected alternate host collected, common throughout this area |

¹ws - white spruce; bs - black spruce; lp - lodgepole pine; alF - alpine fir; D-fir - Douglas-fir; L - larch sp.; bCo - black cottonwood; E - elm sp.; tA - trembling aspen; W - willow sp.

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