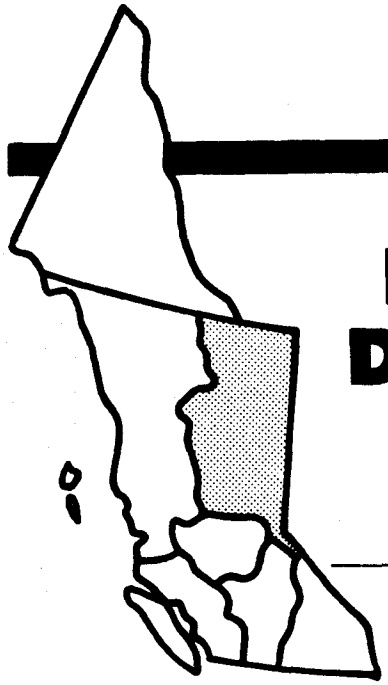


Forest Insect and Disease Conditions

Prince George Forest Region
1987

R. Garbutt and R. Turnquist

Government of Canada
Gouvernement du Canada

Canadian Forestry Service
Service canadien des forêts

CONTENTS

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 1987. 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. This report also evaluates on the basis of impact and population studies, forest damage in terms of growth loss or, in the event of mortality, volume losses, and estimates the potential for future damage.

The FIDS field season extended from May 19 to September 26, during which over 250 insect and 150 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 provided approximately 40 hours of fixed-wing and 12 hours of helicopter time for aerial and aerially accessed ground surveys during the 1987 season (Map 2). 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
Box 687
Prince George, B.C.
V2L 4S8
Phone: 963-7238 or 963-7394

During the remainder of the year the Rangers are based at:

Pacific Forestry Centre
Canadian Forestry Service
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.

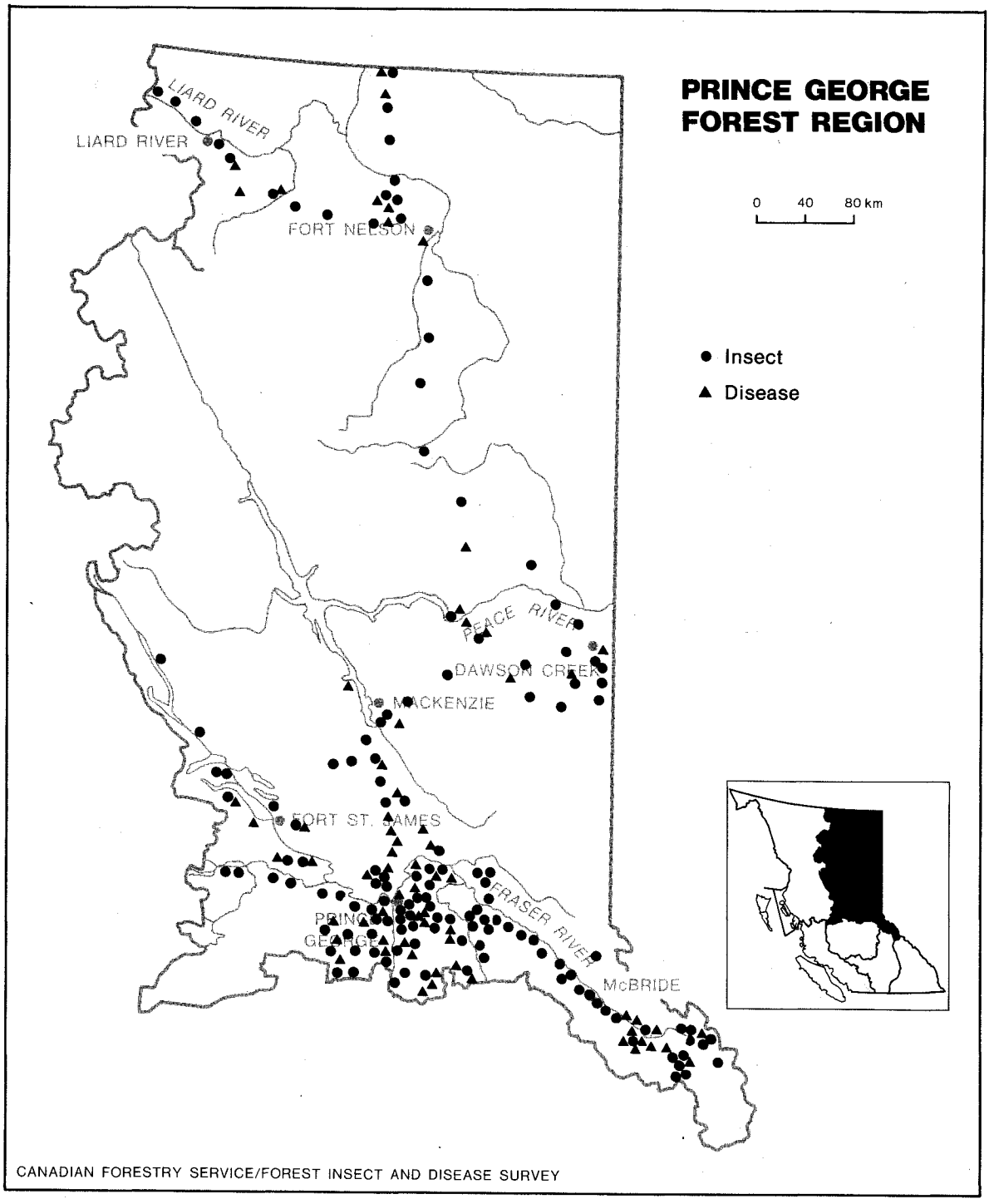
APPENDICES - Available upon request from the Forest Insect and Disease Survey at the above address.

I. Maps of major bark beetle and defoliator infestations compiled during aerial surveys of the Prince George Region, 1987.

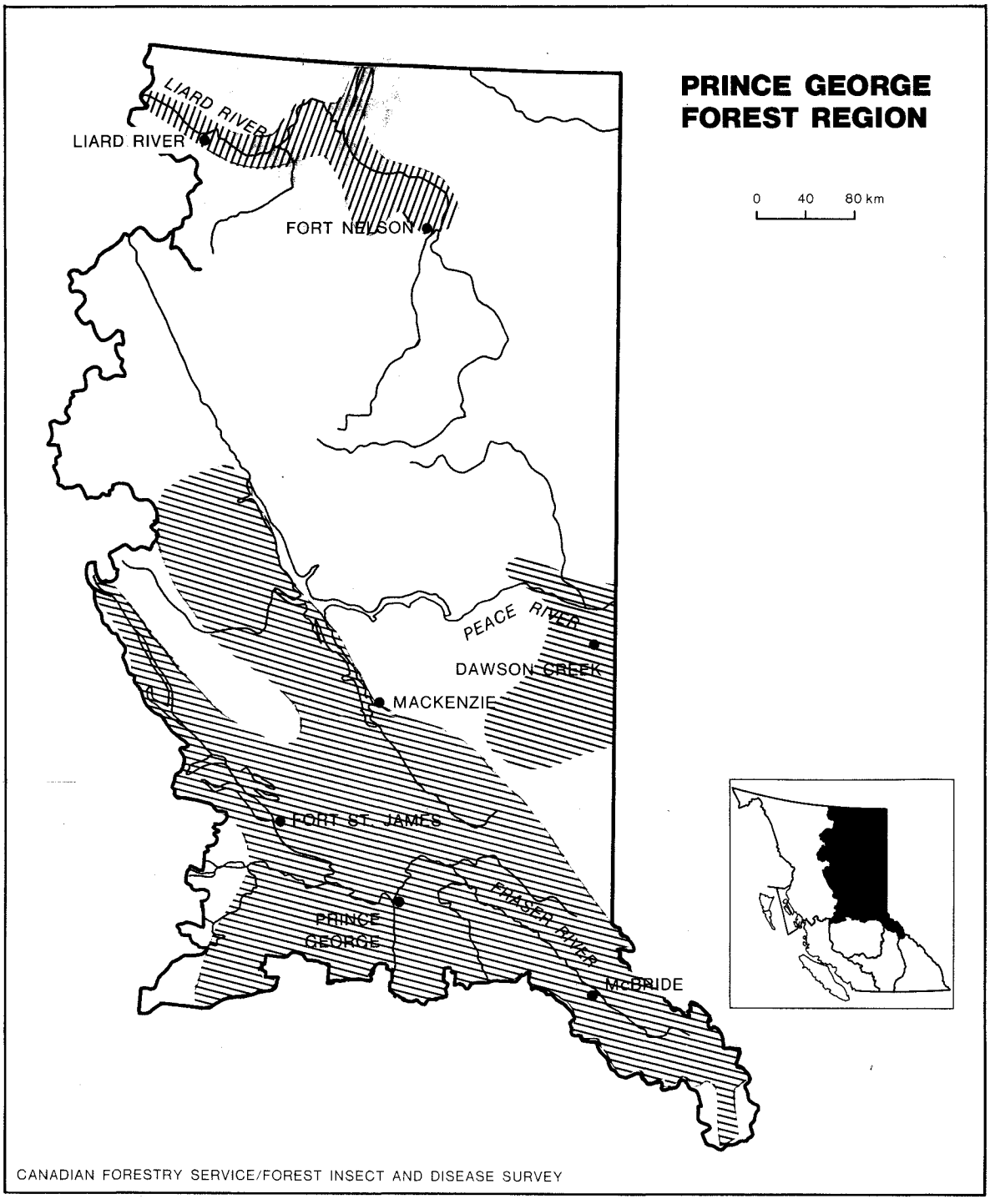
II. Summary of the pheromone trapping program, Prince George Region, 1987.

III. Summary of pest problems in provincial parks within the Prince George Region, 1987.

IV. Summary of pests of young stands (P.O.Y.S.) in the Prince George Region, 1987.



Map 1. Locations where one or more forest insect and disease samples were collected in 1987



Map 2. Areas covered by aerial surveys to map bark beetle and defoliator infestations in 1987

SUMMARY

Eastern spruce budworm populations declined, lightly to moderately defoliating primarily white spruce over 58 450 ha near Fort Nelson. **Two-year-cycle spruce budworms** in the 'non-feeding year' moderately and severely damaged buds of white spruce and alpine fir over 20 000 ha in the Bowron River, Morkill River, Slim Creek and Dome Creek drainages. **Spruce beetle** populations declined for the fifth consecutive year to endemic levels; only 40 recently killed trees were mapped in 23 separate locations throughout the region. **Northern spruce engraver** beetles declined for the second consecutive year, top-killing only 20 white spruce. **Spruce budmoth** larvae damaged an average of 5% of the growing tips of young white spruce throughout the Bowron, Willow and McGregor river drainages. **Large-spored spruce — Labrador-tea rust** killed 90% of the new growth on white spruce over more than 50 ha near Fitzwilliam in Mount Robson Provincial Park. **Spruce weevil** populations were low for the second consecutive year.

Lodgepole pine mortality due to 1986 **mountain pine beetle** attacks increased dramatically to 132 660 m^3 over 4290 ha. This was due primarily to the first aerial survey of a large ongoing infestation in the remote upper Skeena River. Increased **pine engraver beetle** populations killed 1180 trees over 580 ha in the Prince George West Forest District. **White pine blister rust** killed or top-killed more than 100 western white pine along both sides of Canoe Arm, south of Bulldog Creek. **Frost** damage was the most significant problem affecting four lodgepole and Scots pine plantations established within the region in 1986 as a joint **Canada-Sweden interagency project**. **Hyperparasites** of lodgepole pine dwarf mistletoe, thought to have potential as a biological control of the parasitic plant, were found in samples from Bobtail Lake and Tete Jaune Cache. No **pinewood nematodes** were isolated from twenty-three stressed or recently killed lodgepole pine sampled within the region. Various species of **woodboring beetles**, suspected as being the vectors of the pinewood nematode, were collected at eleven sawmills in the region, but no nematodes were found.

Balsam bark beetle killed 10 600 alpine fir over 6125 ha in widespread scattered infestations throughout the region.

Douglas-fir beetle attacks increased, killing an estimated 250 trees in 49 scattered locations, most of which occurred near Cunningham Lake in the Fort St. James District.

Black army cutworm populations collapsed in late 1986 or early 1987 and no damage was recorded in the region.

Porcupine-caused top-kill and tree mortality has greatly increased in recent years, particularly northwest of Mackenzie.

Blowdown was mapped from the air at 27 separate locations within the region covering approximately 800 ha. **Frost** damaged coniferous and deciduous foliage at various locations throughout the region. **Spruce cone maggot** and **spruce seedworm** larvae severely infested a single cone collection from white spruce near Hixon.

A total of 23 young stand surveys at widespread locations yielded a variety of pests, the most common being **Cooley spruce gall adelgid** and **western gall rust**.

Trembling aspen defoliation by the **forest tent caterpillar** declined by 80% to cover 17 025 ha in three separate areas. **Poplar-and-willow borer** populations increased significantly this year, destroying many small willow stems south of McBride and around the city of Prince George. White birch were severely defoliated in several areas within the Prince George city limits by the **ambermarked birch leafminer**. Populations of an **elm leafminer**, first identified on ornamental elms in the city of Prince George in 1986, increased, infesting an average of 50% of the foliage on all elm trees. An unidentified agent caused **dieback** and **leaf deformation** of trembling aspen over a broad area north of Carp Lake and in the upper Misinchinka River area. No adult male **gypsy moths** were trapped in 41 pheromone-baited traps placed in provincial parks, rest areas and private campgrounds.

A table summarizing **other noteworthy pests** is included in this year's report.

Eastern spruce budworm
Choristoneura fumiferana

Light and moderate defoliation of white spruce and alpine fir decreased in area to 58 450 ha in 1987 from 94 700 ha in 1986. Defoliation was mapped by aerial survey (Map 3) from the confluence of the Snake and Fort Nelson rivers to the Liard and up the Liard and La Biche rivers into the Northwest and Yukon Territories. Damage extended west down the Liard River and in the lower reaches of side drainages such as the Beaver and Dunedin rivers, as far west as the Coal River, but defoliation was generally less extensive in these areas than in 1986. No defoliation was seen in Obole Creek and the upper reaches of the Dunedin River and Kledo Creek, where light damage was mapped last year.

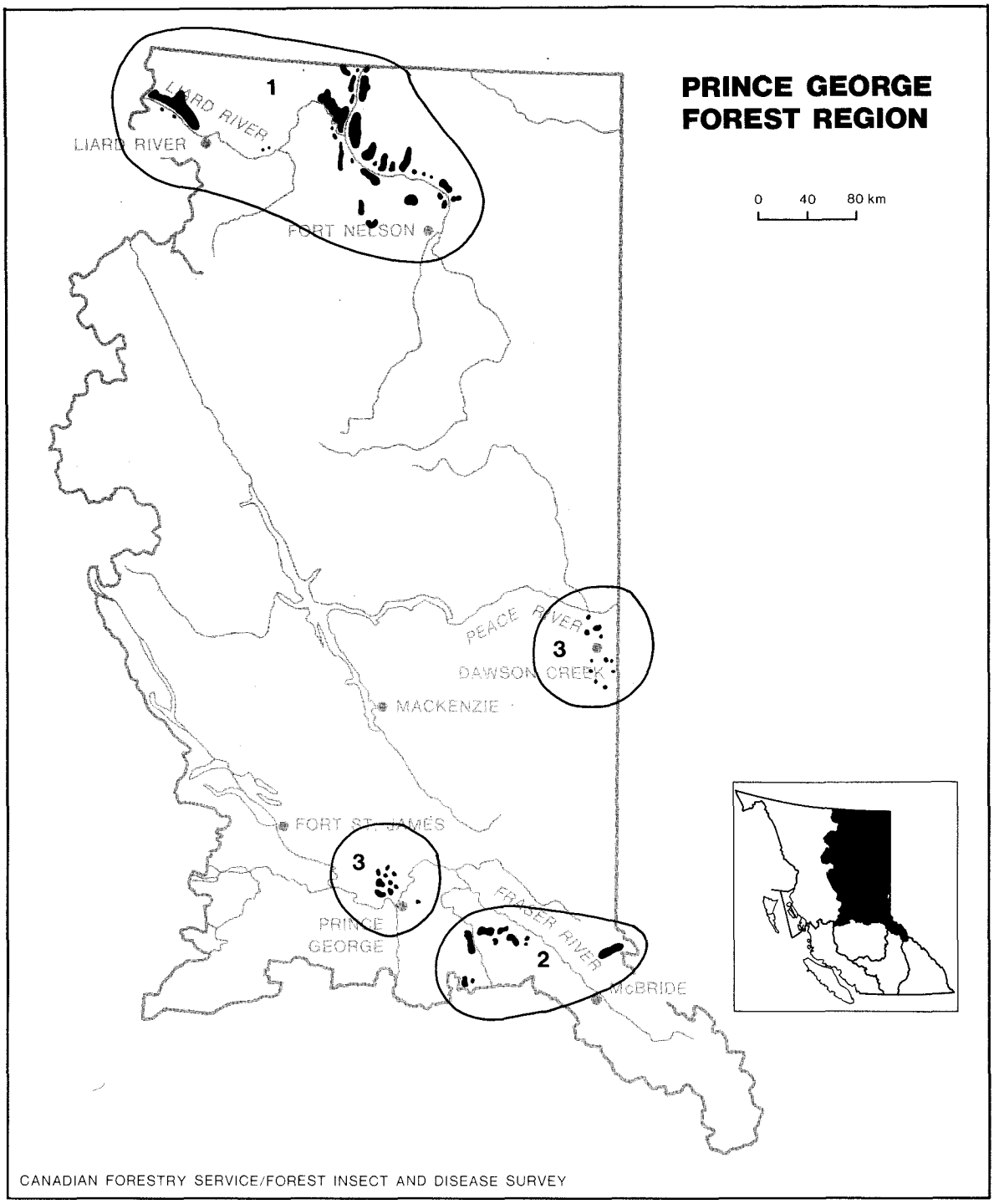
Six mass collections made between Fort Nelson and Coal River were sent to the Great Lakes Forestry Centre and the Pacific Forestry Centre for various research projects including, adult rearing and mating, and parasite determination. Parasitism was extremely low; less than 5% of the examined larvae were parasitized by an unidentified specie of Tachinidae.

Five sets of pheromone-baited traps were set out in the region in 1987 as part of an ongoing taxonomic and distribution study (Table 1). The negative results in the *C. orae* traps may be due to extremely low adult populations or a two-year-cycle population.

Table 1. Number of adult male *Choristoneura* spp. caught in pheromone-baited traps, Prince George Region, 1987.

Location	Trap type	No. of traps	Pheromone (5% conc.)[1]	Avg. no. moths/trap	Species
Fort St. James	"Universal"	3	Acetate	0	*C. orae*[2]
		3	Aldehyde	13	*C. biennis*[3]
Wonowon	Sticky	3	Acetate	0	*C. orae*
		3	Aldehyde	9	*C. fumiferana*[3]
Trutch	Sticky	3	Acetate	0	*C. orae*
		3	Aldehyde	49	*C. fumiferana*
Fort Nelson	Sticky	3	Acetate	0	*C. orae*
		3	Aldehyde	61	*C. fumiferana*
Liard R.	Sticky	3	Acetate	9	*C. orae*
		3	Aldehyde	102	*C. fumiferana*

[1]**Acetate** formulation - chemicals are - trans-11-tetradecenyl + cis-11-tetradecenyl + trans-11-tetradecenol; **Aldehyde** formulation - chemicals are trans-11-tetradecenol + cis-11-tetradecenyl
[2]Only *C. orae* attracted to this bait.
[3]Species confirmed by genitalic examination.



Map 3. Areas of current defoliation by (1) eastern spruce budworm, (2) two-year cycle budworm, (3) forest tent caterpillar determined by aerial and ground surveys, 1987.

Based on low larval parasitism and historical trends, populations of the eastern spruce budworm are expected to remain high and defoliation near Fort Nelson continue in 1988.

Two-year-cycle spruce budworm *Choristoneura biennis*

The known area of infestation expanded to 20 320 ha from 15 670 in 1986, in this the off-cycle year of the two-year-cycle spruce budworm (Map 3). The increase was due to the discovery, during aerial surveys in late July, of trace to light defoliation over more than 4 000 ha in the Morkill River drainage in the McBride District, and 670 ha along Dome Creek in the Prince George East District. The balance of the infested area was in the Bowron River and Slim Creek drainages, in the same stands reported defoliated in 1986.

Surveys of white spruce and alpine fir conducted in late May in stands defoliated in 1986 found no evidence of bud damage; however, a mid-June survey near Stony Lake found evidence of feeding on the new growth, and the area was reassessed (Table 2). The overwintering larvae apparently remained dormant until mid-June, longer than normal, and then commenced feeding on the new flush rather than in the swollen buds. The effect of this delayed emergence was beneficial to the infested stands, since unbroken buds are far more sensitive to feeding damage than newly flushed needles. Normal third-instar larval feeding would have caused up to 70% bud mortality and a proportionate loss of current growth. Actual damage amounted to less than 25% of the current year's needles and an almost 100% successful vegetative bud set for 1988.

Table 2. Location, number of 1986 egg masses and subsequent number of white spruce and alpine fir branch tips infested by second-instar two-year-cycle spruce budworm larvae, Prince George Region, 1987.

Location	1986 No. egg-masses/10 m^2 foliage	% branch tips infested 1987
Southwest Stony Lake	194	82
Km 102 Bowron-Coal Road	331	71
Km 53 Dome Creek Forest Road	244	72
Km 4 Raven Forest Road	538	76
Km 15 Elk Creek Road	224	20

The infestation in the Morkill River drainage was accessed by helicopter on August 13 following the cessation of feeding. As in the other infested areas, feeding had commenced after bud flush. In the mid-crowns of intermediate and understory trees, 90% of the newly flushed tips showed signs of light feeding damage. Foliar discoloration was visible from the air only in the Morkill River and Dome Creek infestations.

If current populations survive into 1988, significant defoliation within infested areas can be expected.

Spruce beetle
Dendroctonus rufipennis

Only 40 recently killed white spruce were mapped during aerial surveys, compared to over 1 000 in 1986, in the fifth consecutive year of declining spruce beetle populations.

Some ground-observed mortality occurred near Slim Creek where roadside contouring resulted in the deposition of soil around the boles of white spruce along the forest edge. Four of these stressed trees had been attacked by spruce beetle in 1986, but galleries were short (avg. <10 cm) and attacks were light, averaging less than one entrance hole per 225 cm^2 bark sample. Broods are expected to mature in the spring of 1988, but will probably disperse into surrounding slash.

Historically, the major causes of spruce beetle population buildup have been, unmonitored white spruce blowdown, and large amounts of log-sized slash left following logging and the establishment of rights of way for roads, railways and hydro lines. In recent years increased awareness of these hazards has led to much cleaner logging and clearing operations, and close monitoring of blowdown. Emphasizing the dramatic decline in spruce beetle populations since 1985, was the low occurrence of attacks in recent spruce blowdown in 1986 and 1987. Populations are therefore expected to remain low in 1988.

Northern spruce engraver
Ips perturbatus

In 1987 only 20 current engraver beetle attacks were detected by ground and aerial surveys, compared with 800 in 1986 and 4000 in 1985. These included single and small groups of attacks scattered in the Parsnip River drainage but no attacks near the Torpy River, where most of the previous years' damage occurred.

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 Bowron, MacGregor, and Parsnip drainages.

A lack of host material for this normally secondary beetle will likely maintain populations at endemic levels in 1988.

Spruce budmoths
Zeiraphera radicana
Z. unfortunana
Z. hesperiana

All three species of *Zeiraphera* were found feeding on the buds of all age class white spruce throughout the Bowron, Willow and lower McGregor drainages. Sampling within these areas revealed an average of 5% of the buds infested (range 1-20%). The damage was negligible, resulting only in the loss of a small portion of the current foliage.

Further surveys will be undertaken to monitor populations of these pests in 1988.

Large-spored spruce — Labrador-tea rust
Chrysomyxa ledicola

This needle rust caused the loss of 90% of the current foliage of white spruce over an area in excess of 50 ha near Fitzwilliam, in Mount Robson Provincial Park. Resultant discoloration was highly visible, branch tips having turned from green to a bright golden brown. Six kilometers west near Grant Brook, about 50% of the branch tips were infected over 10 ha. In both locations the infected alternate host, Labrador-tea (*Ledum* sp.), was also collected. The lightly infected alternate host was also collected at the Trout River bridge along the Alaska Highway, though no infected spruce were found.

The disease characteristically attacks only the current growth, therefore limiting the severity of the damage in any one year. Severely infected trees lose growth potential during the infection year but unless infections persist, recovery is complete in the following year.

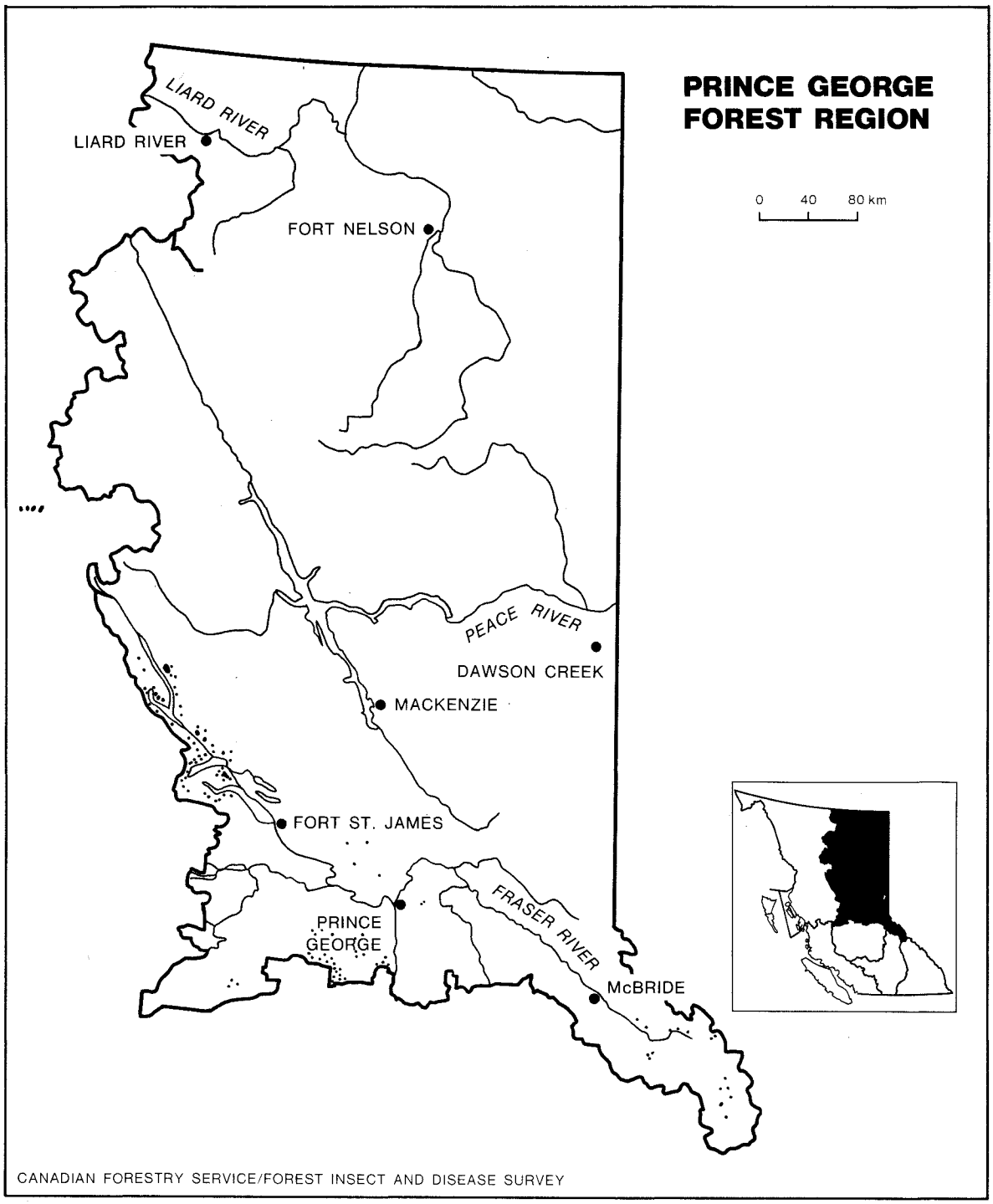
PINE PESTS

Mountain pine beetle
Dendroctonus ponderosae

Recorded lodgepole pine mortality due to attacks by the mountain pine beetle increased to 132 660 m^3 over 4290 ha in 1987 from 9 000 m^3 over 1225 ha in 1986 (Table 3, Map 4).[1]

Seventy-five percent of the volume killed in the region occurred in the remote Skeena-Sustut infestation in the Fort St. James District, flown for the first time in 1987. Other active populations in this district, most notably along the Northwest Arm of Takla Lake near Takla Landing, and in TFL 42, accounted for most of the remaining 25%. Beetle populations declined in the Prince George West and McBride districts and remained low in the Vanderhoof and Prince George East districts.

[1]Volumes calculated using volume/hectare figures provided by the B.C. Forest Service, and volume/tree figures using the 'Whole Stem Cubic Metre Volume Equations' published by the Forest Inventory Division, B.C. Forest Service.



Map 4. Areas of lodgepole pine recently killed by mountain pine beetle determined by aerial and ground surveys, 1987

Table 3. Location, area and volume of lodgepole pine recently killed by mountain pine beetle, Prince George Region, 1987.

Forest district and location	Area (ha)	Volume (m^3)	Remarks
Fort St. James Forest District			
Skeena-Sustut rivers	2750	99 300	- 575 ha of "grey" in addition to this area
Northwest Arm Takla Lake	360	10 800	- includes west shore of Takla Lake
TFL 42 (Tanizul Timber)	250	6 900	
Bill Martin Ridge	185	2 585	- includes Leo Creek
Takla Landing	150	10 000	
North shore Trembleur Lake	60	740	- includes Mt. Copley area and west side Tchentsut Mtn.
Northern end Takla Lake	50	785	- includes Frypan and Ankwill creeks
Middle River	25	320	- north of Baptiste Creek
Cunningham-Whitefish lakes	15	185	- includes Butterfield Creek area
TOTALS	**3 845**	**131 615**	
McBride Forest District			
Canoe Reach	140		- from south of Hugh Allan Creek to Dave Henry Creek
Albreda-Mt. Thompson	45		- scattered individuals and pockets up to 30 trees
Swift Creek	20		- approximately 50 trees
Castle Creek	20		- four pockets of from one to thirty trees
Mt. Robson Corridor	5		- scattered individuals
Rausch River	5		- small groups of approximately 20 trees
TOTALS	**235**	**540**	
Prince George West Forest District			
Tagai Lake-Holman Mtn.-Telegraph Range	150		- includes Blackwater River area - scattered single trees and small groups
Bobtail Mtn. area	10		" " " " "
Ridge tops east of Barton Lake	10		" " " " "
TFL 5 and surrounding area	10		" " " " "
Great Beaver Lake area	5		" " " " "
TOTALS	**185**	**440**	

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Forest district and location	Area (ha)	Volume (m^3)	Remarks
Vanderhoof Forest District			
East of Chedakuz Creek	15		- pockets of one to fifteen trees
West of Bobtail Lake	5		- scattered single trees
TOTALS	**20**	**50**	
Prince George East Forest District			
Km 62 Bowron Coal Road	5		- approximately 40 trees
TOTALS	**5**	**15**	
GRAND TOTALS	**4 290**	**132 660**	

Fort St. James Forest District

Due to the expansion of aerial survey coverage, the recorded area of recently killed lodgepole pine increased almost fivefold to 3 845 ha, from 788 ha in 1986. Mortality in this district accounted for all but 1050 m^3 (0.8%) of the total regional mortality. In the Skeena-Sustut infestation which has been ongoing for six or more years, 2750 ha of light and moderate attack, and 575 ha of "grey" timber, were mapped. At least twice as many grey and old red trees were seen than new reds (1986 attacks) within the area of predominantly grey timber, and many more old attacks were visible scattered within the areas where recent attacks were concentrated.

Most of the infested area within TFL 42 was contained in four large pockets, three of which were adjacent to a recent cutblock (Block 6), logged two years ago in an attempt to control the expanding beetle populations. Two infested stands adjacent to Block 6 were examined in early June to assess brood potentials; "R"[1] values of 12 and 20 were recorded, representing a very rapidly increasing beetle population. A fall cruise in the same area found 34% current attacks and 17% red attacks, a 2:1 current to red ratio. Additionally, 9% of the stand was partially or strip-attacked. Only 34% of the pine component was healthy, the remaining 66% being either under attack or previously attacked. On the periphery of the main infestation in TFL 42 were several scattered pockets of from one to thirty trees mapped near the mouth of Tarnezell Creek (Photo 1), north and west of Tarnezell Lake and between Block 6 and the Tachie River. A fall probe north of Tarnezell Lake found a ratio of 2.4:1 current to red attack with well developed parent and brood galleries and up to second instar-larvae.

[1]"R" value - ratio of the numbers of counted brood in a 225 cm^2 bark sample vs. the number of entrance holes

Criteria: $\leq$ 2.5:1 - decreasing populations
2.6-4:1 - static populations
> 4:1 - increasing populations

This was also indicative of a vigorous and rapidly expanding population. The cruised timber adjacent to Block 6 is scheduled to be logged before the 1988 beetle flight. It is unlikely, however, that the probed area will be accessed by road and logged within the next few years, and the number and size of infestations can be expected to increase significantly in 1988.

Photo 1.

(Photo may be received by request from

Pacific Forestry Centre,
Canadian Forestry Service,
506 West Burnside Rd.,
Victoria, B.C. V5Z 1M5)

An expanding area of beetle attack totalling 100 ha was observed south of Takla Landing on the east side of Takla Lake. A fall cruise within the infestation found 34% current and 12% red attack, an almost 3:1 ratio, again indicating expanding populations. Parent and brood galleries were numerous and well developed and the predominantly second-instar larvae indicated normal development for the time of year.

Several pockets containing up to 50 trees were mapped over approximately 185 ha along Bill Martin Ridge. During a June probe into one of these infested pockets, brood was evaluated in 10 trees and again an "R" value of 19 indicated a healthy and rapidly expanding population.

Winter logging and single tree disposal by the B.C. Forest Service will help to contain mountain pine beetle populations in accessible areas, but unless there is significant winter mortality, beetle populations will remain healthy and attacks continue at moderate to high levels in 1988. Infestations along the Northwest Arm of Takla Lake, near Takla Landing, and the Skeena-Sustut area are too large for efficient single tree disposal, and too far from any road access for logging, so will continue unabated for at least one more year.

Prince George West Forest District

Nearly 700 lodgepole pine were killed over approximately 185 ha, down from 2000 trees in 1986. Mountain pine beetle mortality occurred mainly in the Tagai Lake area and west to the regional boundary, on Holman Mountain and in the Telegraph Range. Pockets of beetle-killed trees were also seen along the Blackwater River in the extreme southwestern corner of the district, throughout TFL 5 west of the Fraser River, in the Bobtail Mountain area, and in isolated higher elevation pockets east of the Telegraph Range. Most of these infestations consisted of small pockets of from 1 to 10 trees. Additionally, 25 red trees were seen northeast of Great Beaver Lake and 10 trees in upper Docs and West creek areas. Though many more red trees were scattered throughout the Chilako River, Butchers Flats and Bobtail Lake areas, mortality has been attributed to Ips pini engraver beetles, described later in this report.

The B.C. Forest Service used pheromone baits to contain and concentrate beetle populations in preparation for winter logging and single tree disposal. In two locations examined during fall surveys, baited trees were attacked while adjacent trees were either unattacked, strip-attacked, or pitched out. Several baited trees along the Kluskus Trail near the Barton Lake extension road remained unattacked, suggesting limited beetle populations in the area. The one attacked unbaited tree found in the area had been strip-attacked in 1985, 1986 and again in 1987, and contained a mixture of larvae, pupae and callow adults, remnants of a two-year-cycle population that was reported in 1986. In TFL 5, beetle populations were healthy; up to third-instar larvae were present in brood galleries during a late September probe. One tree supported galleries 15 meters up the bole. Lodgepole pine beetle (D. murrayanae) attacks in the butts of some mountain pine beetle-killed trees were common throughout the southwestern portion of the district.

Vanderhoof Forest District

Mountain pine beetle mortality remained low for the second consecutive year. Only 130 red trees were scattered over a total of 20 ha, compared to nearly 400 trees in 1986 and 5000 in 1985. East of Chedakuz Creek, south of Suscha Lake, and in the Jerryboy Hills where attacks have been common since 1985, several pockets of between 1 and 15 trees were mapped. Additional small pockets of mortality occurred: near Johnny Lake, 10 trees; northwest of Batnuni Lake, 15 trees; and west of Bobtail Lake, 13 trees. The B.C. Forest Service has also reported scattered light attacks in the Francois Lake area.

Pheromone baiting in conjunction with single tree disposal and the adjustment of harvest schedules has been employed to combat beetle populations.

Prince George East Forest District

For the past three years scattered lodgepole pine mortality has been recorded on a southfacing slope near Km 62 of the Bowron Coal Road. This year a total of 41 trees in 16 groups were mapped from the air. In September four of these groups, containing a total of 11 red and 11 current attacks, were probed to evaluate the health and vigour of the beetle population. Only two of the currently attacked trees contained brood in short (<10 cm) galleries. Development was staggered with some first- to third-instar larvae and some still actively boring adults. Brood potential, due to both low numbers and staggered

development, was low, and few beetles are expected to rear through to reattack surrounding trees in 1988.

McBride Forest District

A total of 520 red lodgepole pine were mapped by aerial survey throughout the district, a significant decrease from the nearly 1000 trees seen in 1986.

Localized infestations adjacent to and within Mt. Robson Provincial Park, through active control management on the part of the B.C. Forest Service and Provincial Parks, have been virtually eliminated. Only small groups of four trees each were seen near Swiftcurrent Creek, just west of the Park, and on Shale Hill, 8 km east of the Mt. Robson Visitor Centre. Pheromone traps deployed extensively in these areas, as well as most others where 1986 attacks occurred, were very effective in pulling adults into tight easily managed groups of trees (Photo 2). Eighty trees were disposed of in the fall at Swiftcurrent Creek and 83 have been identified for disposal on Shale Hill. No beetle activity could be found elsewhere in the Park.

Photo 2

(Photo may be received by
request from
Pacific Forestry Centre,
Canadian Forestry Service,
506 West Burnside Rd.,
Victoria, B.C. V5G 1M5)

Populations declined for the third consecutive year along Canoe Arm, and this year only small groups totalling 180 trees were seen with concentrations near Bulldog Creek, and Hugh Allan Creek on the eastern shore, and Deer Creek, and opposite Dave Henry Creek on the western shore. Adjusted logging programs will remove infested timber where hazard warrants and access permits, while the remainder will be cut and burned. An increase in the number of red trees (100+) near Albreda probably resulted from populations migrating northward from the Kamloops Forest Region. A 30-tree infestation was mapped on the lower north slope of Mt. Thompson compared with 55 trees seen here in 1986. In four of these found during a September probe, there were numerous exit holes and some overwintering larvae on a two-year-cycle, but no surrounding trees were currently attacked. This area will also be logged before the 1988 beetle flight.

Control of a chronic infestation at Swift Creek (50 trees) has been complicated by the difficulty of the terrain, and its location within the Valemount Watershed. Fall-and-burn operations, however, will likely be approved by the local Water Board.

Infestations were seen for the first time this year beside Castle Creek (75 trees) and the Raush River (20 trees). The Castle Creek infestation was pheromone-baited by the B.C. Forest Service and has recently been accessed and logged, while a winter cut and burn operation is planned for the Raush River infestation.

Pine engraver beetle
Ips pini

For the second consecutive year, engraver beetle populations were active in the Prince George West District. Approximately 1180 red trees over 580 ha were attributed to 1987 attacks by Ips pini; however, some of these were year-old reds.

Areas of Ips-attacked trees include the Flats east of the Telegraph Range towards and including the Punchaw area, and south towards the escarpment above the Blackwater River. Additional areas include Butchers Flats, around the Bobtail Lakes and along the Chilako River between Punchaw and the Vanderhoof District boundary. In many of these areas, mountain pine and engraver beetle populations were mixed, but the majority of the mortality was caused by engraver beetle attacks.

Engraver beetle-killed trees were common along the boundaries of cutblocks logged for mountain pine beetle during the winter of 1986-87, particularly in the southern Telegraph Range. This is a reflection of a current problem occurring in the Cariboo Region, where Ips pini caused considerable mortality along cutblock boundaries. 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 Region. 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 green standing timber. Surveys to investigate the extent of Ips populations will continue in 1988.

During summer and fall assessments, attacked trees were examined along the Kluskus Trail east and west of the Barton Lake Extension. In June, Ips mexicanus were found along with Hylurgops porosus in stumps of mountain pine beetle-attacked trees that had been cut and burned in the winter of 1986-87. The lodgepole pine beetle, Dendroctonus murrayanae, was common in butts and root collars of engraver beetle-attacked trees. Several trees attacked in 1987 were examined in September, and were found to contain some Ips tridens adults under the bark. Large amounts of fresh boring dust indicated that most of the population had recently emerged to overwinter in the duff.

White pine blister rust
Cronartium ribicola

More than 100 white pine blister rust-infected western white pine were mapped near the south end of Canoe Arm in the McBride District. Ten separate patches of recent mortality were scattered on both sides of the Arm south of Bulldog Creek. Blister rust was differentiated from mortality caused by the mountain pine beetle (also active in the same area) by its being limited to the minor western white pine component of the stands and its habit of only top-killing some trees. A single whitebark pine recently top-killed by a blister rust infection was sampled beside Moose Lake this year within Mt. Robson Provincial Park.

Blister rust-caused mortality is a chronic problem in five-needle pines and is expected to continue to infect these species 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 1987. The Fort St. James site was re-examined during fall surveys in September. The fifth site near Whitehorse was also examined in June, and results were summarized in the 1987 FIDS Yukon Report 87-7.

The Fort Nelson plot, located on the Fort Liard Highway, was examined on June 18. Approximately 5% of the lodgepole pine foliage was infected by Sclerophoma sp., a weakly parasitic fungus usually associated with drought or frost-stressed tissue. Eighty percent of the Norway spruce which comprised a minor component of the plantation, were dead or dying from infections by a snow mould, Phacidium gaeumanni, and at least 50% of the Siberian larch were top-killed, probably by winter drying or late frost. A saprophytic fungus, Cladosporium sp., was present in the dead tops. Because both tree species are exotics within the Pacific Region, both disease collections represent new host records.

The Fort St. James plot, located on the Teardrop Forest Road, was examined on June 2 and September 17. A needle cast, Lophodermium sp., was present on a few needles on 5% of the lodgepole pine. Late frosts were again the suspected agent, causing top-kill and bud necrosis on approximately 20% of the Siberian larch, predisposing them to the secondary pathogens Sclerophoma sp. and Phoma sp., isolated from damage samples.

The Halfway River plot near Fort St. John and the Nations Bay plot on Williston Lake near Mackenzie had fewer problems. Frost-related top dieback

affected approximately 1% of the Siberian larch at the Halfway River plot. Approximately 5% of the lodgepole pine were bent or broken at the stem, probably by animals or snow. At Nations Bay, some of the lodgepole pine were chlorotic, possibly due to drought. To date, vegetative competition appears to be the biggest problem at this site.

Hyperparasites of lodgepole pine dwarf mistletoe
Colletotrichum gloeosporioides
Wallrothiella arceuthobii

Lodgepole pine dwarf mistletoe plants were collected at five locations in a continuing study to determine the frequency and distribution of various fungi hyperparasitizing mistletoe plants. *Colletotrichum gloeosporioides* was found on samples taken near Tete Jaune Cache in the McBride District, and *Wallrothiella arceuthobii* infected plants were collected near Bobtail Lake in the Prince George West District.

The fungi infect and kill only the aerial portion of the mistletoe plants, preventing them from fruiting and thus spreading to other trees. Studies of their frequency may eventually lead to the use of one or more of the hyperparasites as a biological control agent against dwarf mistletoe, the single most destructive disease of lodgepole pine in the region.

Pinewood nematode
Bursaphelenchus xylophilus

No pinewood nematode was found in 23 stem samples, or collections of live adult round- and flat-headed woodborers, suspected vectors of the nematode. The stem samples were collected from stressed or recently killed lodgepole pine, and the adult woodborers from log decks at 11 sawmills in the southern portion of the region. Additional woodborers were collected by B.C. Forest Service personnel during the servicing of "Lindgren" pheromone traps deployed to monitor the mountain pine beetle flight. Of the nearly 100 woodborers from all sources, 52 were identified as *Monochamus scutellatus*, 9 as *Buprestis rusticorum*, and 6 were *Monochamus maculosus*. The remainder included a broad range of woodborer species.

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 may impose embargoes on some imported green wood products which they suspect might contain the nematode.

Following extensive sampling over the past three years, there has been no evidence to suggest that local strains of the pinewood nematode pose a present or future threat to lodgepole or European pines.

ALPINE FIR PESTS

Western balsam bark beetle–fungus complex
Dryocoetes confusus
Ceratocystis dryocoetidis

In 1987 scattered light mortality of alpine fir caused by this insect/disease complex was recorded in high-elevation stands, killing an estimated 10 600 trees over 6 125 ha, compared with 7 180 trees recorded over 3000 ha in 1986. The increase was largely due to the extension of aerial surveys into the Ingenika, Mesilinka and Osilinka river drainages (600 ha) northwest of Mackenzie, and West Twin Creek and the Dore River drainages just north of McBride (440 ha). Also mapped for the first time was a 500 ha infestation on Quintette Mtn. near Tumbler Ridge. As in previous years, most of the mortality was seen: along the west side of Takla Lake, 2 050 ha; near Manson Creek, 600 ha; along the Missinka River, 260 ha; and along Herrick Creek, 740 ha.

Balsam bark beetle is a chronic problem and mortality is expected to continue at similar levels in 1988.

DOUGLAS-FIR PEST

Douglas-fir beetle
Dendroctonus pseudotsugae

A total of 250 Douglas-fir killed by 1986 beetle attacks were mapped during aerial surveys in 15 locations on 49 ha, up from 73 trees mapped in two infestations in 1986. Most of the mortality (200 trees) occurred in a new infestation just north of Cunningham Lake in the Fort St. James Forest District. The remaining infestations were scattered within the Prince George East District and ranged from 5 to 20 trees at: Harvie Creek, along the McGregor River, north of Eaglet Lake, near the junction of Highway 16 east and Giscombe Road and north of Purden Lake.

Only one red tree was mapped on the east side of Averil Lake in TFL 30, where 40 red trees were mapped in 1986, and no mortality was recorded in the Blackwater River area where mortality occurred for many years prior to 1986.

Douglas-fir beetle primarily attacks stressed or recently killed trees, and unless they contain large aggressive populations, infestations normally die out after a few years. The tightening of utilization standards within the forest industry has reduced the amount of host material available to the beetle and overall populations have declined in recent years. The large numbers of red trees seen near Cunningham Lake, however, constitute a threat to surrounding old-growth Douglas-fir stands and populations will be monitored in the spring of 1988.

MULTIPLE HOST PESTS

Black army cutworm
Actebia fennica

Black army cutworm populations collapsed in 1987 throughout the region; no defoliation of herbaceous ground cover or coniferous seedlings was reported. The collapse occurred between the summer of 1986, when attractant traps caught high numbers of adults, and the spring of 1987. The cause of the collapse has not been determined as larval and pupal parasitism averaged only 23% in the summer of 1986, constituting little threat to the population, and no virus disease was detected. Populations have proven to fluctuate greatly from year to year, and will be closely monitored in 1988.

Acid rain national early warning system (ARNEWS)

The acid rain national early warning system (ARNEWS) plot located near Averil Lake (established 1985) was examined as part of a continuing annual national assessment of potential acid rain damage in Canadian forests.

No damage attributable to acid rain, or other pollutants, was observed in this plot, one of fifteen located in British Columbia.

RODENT DAMAGE

Porcupine

Seventy-two patches of primarily lodgepole pine top-kill and full tree mortality were mapped over 800 ha, up from forty patches over 9 ha in 1986. The increase this year is partially a reflection of expanded aerial surveys into the Mesilinka and Ingenika drainages, and partially attributed to a continuing increase in porcupine populations due to an absence of predators such as the fisher, which has suffered from overtrapping. Two successive mild winters may also have played a part in increasing populations. Some patches of mortality including over 300 red trees covered up to 50 ha, and have been slowly increasing in size over a number of years. The provincial government is considering offering a bounty for porcupines in some areas. Porcupine damage is expected to continue at similar levels in 1988.

ENVIRONMENTAL DAMAGE

Blowdown

Approximately 800 ha of blowdown were mapped during aerial surveys throughout the Prince George Region in 1987, and additional patches totalling more than 20 ha were ground-surveyed near Hudson Hope. Some 680 ha were in spruce-fir forest and, although there was older blowdown in some areas, there was no evidence of mortality due to spruce beetle attacks in adjacent stands. Areas where spruce-fir blowdown were mapped included Upper Everett Creek, 65 ha; Tsus Creek, 195 ha; cutblock fringes in the Wichcika Creek area, 330 ha; Hellroaring Creek, 50 ha; and by the upper Missinka River, 40 ha. The remaining

areas were in trembling aspen and mixed pine-spruce-aspen stands.

On the evening of June 12, a severe windstorm caused widespread blowdown and breakage of mainly trembling aspen and white spruce in the Chetwynd-Moberly Lake-Hudson Hope area. Areas of damage up to 5 ha were observed during ground surveys on June 13. Overmaturity and predisposition by various root and butt rots contributed to the trees' susceptibility to damage by high winds. Diseased root samples taken from windthrown white spruce in Moberly Lake Provincial Park Campgrounds were infected by tomentosus root rot, Inonotus (Polyporus) tomentosus. Collections from windthrown aspen at Site I, Peace Canyon Dam were infected by Armillaria sp., probably A. bulbosa.

Frost and winter injury

Late spring frosts damaged white spruce, Douglas-fir and alpine fir trees in young stands at widespread locations throughout the region. In addition, severe foliage-kill was sustained by some mixed age deciduous and coniferous stands in the McBride TSA from the effects of cold, desiccating winds.

The white spruce, Douglas-fir and alpine fir component of many other young planted and natural stands lost up to 20% of the current foliage (some surveyed stands are included in a detailed table of "Pests of Young Stands", available as an appendix to this report), when late spring frosts killed the newly flushed growth. Recurring frost damage, particularly in young spruce plantations, can severely retard and deform the growth of the young trees.

Severe damage to trembling aspen stands near Tete Jaune Cache and just south of Valemount resulted from the action of cold winds killing all of the new flush of leaves. For a total of 10 km, about 30% of all-age roadside aspen were completely defoliated, while the remaining 70% were not damaged. Fortunately, at the time of the event, most of the trees had not yet flushed, so the damage was patchy. Defoliated trees were not scattered at random, but were clumped in groups suggesting a clonal effect, certain genotypes being 'programmed' to flush earlier than others. Beside the East Canoe Forest Road, south of Valemount, in the same area where aspen were damaged, 5% of the branches of all age classes of Douglas-fir were flagged over approximately 2 ha. This damage was attributed to late frost and possibly resulted from the same cold winds that defoliated the aspen.

CONE AND SEED PESTS

During a year of very light cone crops, a single collection of white spruce cones was made near Hixon. Pests were concentrated in the available host material with 90% of the cones infested, 80% by the spruce cone maggot, Lasiomma anthracinum, and 25% by the spruce seedworm, Cydia strobilella (15% contained both pests).

PESTS OF YOUNG STANDS

Increased emphasis on the monitoring of pest problems in young second-growth led to the survey of 24 stands (13 planted, 11 naturally regenerated) in the summer of 1987. Of these, 22 are summarized in Table 4, and the remaining two are discussed below. A more detailed description of individual stands has been compiled as an appendix to this report and is available upon request.

The most damaging pests encountered in young natural lodgepole pine (a major component in 20 of the stands) were the Cronartium spp. stem rusts, C. coleosporioides and C. comandrae. Observations during the surveys indicated, however, that the rusts killed primarily suppressed trees in the more crowded stands. Planted and spaced stands were largely unaffected by either disease.

The most commonly encountered pest was western gall rust, Endocronartium harknessii, which formed branch and stem galls on an average of 11% of the lodgepole pine in 16 stands. The disease frequently kills branches and, not uncommonly, stem galls girdle and kill trees, or weaken them so that they become susceptible to wind breakage. The Cooley spruce gall adelgid, Adelges cooleyi, was seen forming branch tip galls in every surveyed stand with a white spruce component. This pest, along with spring frosts which kill the young growing tips, is largely responsible for stunting and malforming young plantation spruce. Compounding the problem has been subsequent overtopping by more competitive deciduous species like willows and trembling aspen and other conifers such as alpine fir.

The two plantations not included in Table 4 were surveyed by request following the appearance of specific problems. One was a 1986 Forest Resources Development Agreement (FRDA) white spruce plantation near Shelley, where late spring frosts killed 56% of the terminal buds and 20% of lateral buds. The second was a five-year-old white spruce plantation near Stony Lake, established to test the interactive effects of different site treatments (i.e. mounding) and various stock types. An estimated 70% of all stock was infested with Cooley spruce gall adelgid, Adelges cooleyi. An average of 10% of the branch tips (as high as 60%) had formed branch galls in response to adelgid feeding but most of the gall tissue had died, probably as a result of late spring frosts which had also killed 50% of the uninfested lateral buds. In addition, a spruce bud midge, Rhabdophaga swaini, had malformed and killed 10% of the terminals and/or upper lateral buds on 10% of the trees.

Table 4. Pests of young stands, Prince George Region, 1987.

Host	plantations[1]	P/N[2]	Pest	Frequency	P/N	Avg. % trees affected	Range %	Remarks
Lodgepole pine	20	11/9	Endocronartium harknessii	16	10/6	11	1-34	1 tree killed, 80% branch galls, 20% stem galls
			Cronartium sp.	8	1/7	12	1-27	avg. 1% trees killed
			Hylobius warreni	4	2/2	4.5	2-6	infested trees were recently killed
			needle cast (winter flecking)	10	7/3	68	10-94	
White spruce	8	5/3	Adelges cooleyi	7	5/2	76	22-100	avg. 9% branch tips infested
			spring frost	5	4/1	55	29-72	
Douglas-fir	4	3/1	A. cooleyi	3	3/0	70	54-85	avg. 10% needles infested
			spring frost	3	3/0	32	8-45	avg. 5% lateral buds killed at 2 locations, 8% terminal buds killed at third
Alpine fir	1	0/1	Delphinella sp. tip blight	1	0/1	32	32	avg. 20% branch tips killed

[1]Number of surveyed stands in which tree specie comprised >20% of stand
[2]P/N - Planted/Natural

DECIDUOUS TREE PESTS

Forest tent caterpillar
Malacosoma disstria

The area of trembling aspen defoliated by forest tent caterpillar declined to 17 025 ha (Table 5, Map 3) from 91 700 ha in 1986. The decline in the Peace River area, though predicted, was far greater than 1986 egg mass counts indicated, and the 8 653 ha mapped in 1987 was less than 5% of that recorded in 1986. This discrepancy was largely a result of the collapse of infestations in inaccessible areas, where no ground surveys were conducted. Defoliation in the Chief Lake area northwest of Prince George increased to 8 100 ha from 400 ha in the same general area in 1986. A third infested area of 270 ha was located on the northeast side of Tabor Mountain, just east of Prince George, where high larval populations and trace defoliation were recorded in 1986.

The most severe defoliation occurred in the Chief Lake infestation where many pure aspen stands, some in mixed residential and farming areas, were completely stripped of foliage. The vast majority of larvae were in ultimate instar by June 15, more than a week ahead of last year's development.

Table 5. Location, severity and area of trembling aspen defoliated by forest tent caterpillar, Prince George Region, 1987.

Location	Area of defoliation (ha) Light	Moderate	Severe	Total	Remarks
Peace River area	4 117	4 185	351	8 652	includes Dawson Creek and Fort St. John
Chief Lake area	1 939	3 599	2 565	8 103	includes Ness, Nukko lakes and Salmon River
Tabor Mtn.	225	-	45	270	-
	6 281	7 784	2 961	17 025	

Less than 5% of pupae collected along the Wright Creek Road, near the northern extension of the Chief Lake infestation, contained eggs of *Copidosoma* sp., a parasite known to prey on various Lepidoptera. The low incidence of the parasite is not expected to affect the overall population. No evidence of disease or parasitism was seen in any of the other infested areas.

Egg mass surveys were conducted in all areas in September (Table 6). Five trees were felled at each sample location and all new and old egg mass bands were counted on each tree.

With the exception of Farmington, the number of new egg masses was equal to or greater than the number of old egg masses at all sample locations. Based on these data, and the apparent lack of disease or parasitism, defoliation in the two southern infestations is expected to expand and intensify in 1988. The overall area and intensity of defoliation in the Peace River area is expected to continue to decline.

Table 6. Numbers of new and old egg masses of the forest tent caterpillar and predicted 1988 defoliation, Prince George Region, 1987.

Location	1987 defoliation	Average dbh (cm)	Avg. no. egg masses/tree new egg masses	old egg masses[1]	Predicted defoliation[2]
Farmington (Peace River)	severe	11.6	21.4	35.8	severe
Wright Creek Road (Chief Lake)	moderate	12.4	25.0	25.0	"
Ness Lake Road (Chief Lake)	severe	10.2	28.2	14.0	"
Spence Lake (Chief Lake)	severe	12.0	26.2	8.6	"
Tabor Mountain	light	11.3	21.8	19.6	"

[1]probably includes 2+ year-old egg mass bands
[2]based on a model developed by Hildahl and Campbell at the Northern Forestry Centre, Edmonton, Alberta.

Poplar-and-willow borer
Cryptorhynchus lapathi

One or more willow stems (5-20 stems per bush) were attacked on almost every roadside bush between McBride and Tete Jaune Cache and east into Mt. Robson Provincial Park, in greatly expanded activity this year. Attacks in the vicinity of Prince George were less frequent but discolored stems were still noticeably common. Most attacks in both areas were concentrated in small diameter stems (1-3 cm), unlike samples found in previous years in tree-sized willows and aspen. Some larger diameter boulevard and backyard trees, however, were attacked in downtown Prince George and at Sinclair Mills. The city of Prince George is the northern limit of the known range of this insect in the Prince George Forest Region. This year the distribution limit was extended marginally farther north with the collection made at Sinclair Mills.

A mild 1987-88 winter may result in further increased populations of the borer in the summer of 1988.

Ambermarked birch leafminer
Profenusa thomsoni

Leafmining activity by this introduced defoliator intensified within the city of Prince George this year, with the most severe discoloration in a 5-ha wooded area at Highway 16 and the city bypass, where 80% of the leaves were mined on 100% of the white birch. Similar damage was seen in a 1-ha stand 2 km east of the Canadian National Railway bridge along Highway 16 E. Birch trees throughout the remainder of the city were also infested, but generally to a lesser degree.

This insect was probably introduced with eastern nursery stock, and until discovered in Prince George in 1985, had not been seen west of the Rocky Mountains. A closely related species, *Fenusa pusilla*, was also found in samples

of infested material, the first time it had been seen beyond the lower mainland.

Though populations will fluctuate from year to year, Profenusa (and Fenusa) is expected to continue expanding its distribution in the coming years.

A dieback of trembling aspen

Aspen dieback and leaf deformation were widespread in the Carp-McLeod lakes, Parsnip-Misinchinka rivers areas. Similar damage was noted west of Fort Nelson, along the Fort Simpson Highway north of the Fort Nelson River, and in the Pouce Coupe and Arras areas. Necrotic leaf margins and small poorly developed leaves were the common factors, particularly in the more southern locations. From a distance the damage resembled forest tent caterpillar defoliation, but no evidence of the insect was found during site examinations.

The damage is thought to have been caused by late spring frosts, and the affects may have been compounded by a drought in the summer of 1986 which left the trees in a weakened condition.

Further collections and surveys to determine the cause of the dieback will be carried out as the phenomenon is encountered.

Gypsy moth
Lymantria dispar

The Canadian Forestry Service, Forest Insect and Disease Survey, placed 41 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 into British Columbia.

Table 7. **OTHER NOTEWORTHY PESTS**, Prince George Region, 1987.

Causal agent	Host	Location	Remarks
Alder leaf skeletonizer Fenusa dohrni	mountain alder	Shelley km 4 north Willow Road	60% leaves infested <1 ha 50% leaves on 50% trees for 5 km along roadside
Alpine fir needle cast Lirula abietis-concoloris	alpine fir	Hixon	60% 1984/85 needles infected over 1 ha
Birch leafminer Fenusa pusilla	birch	Prince George	new distribution record; associated with Profenusa thomsoni
Bruce spanworm Operophtera bruceata	various deciduous	Averil L.	moderate defoliation of understory shrubs

Causal agent	Host	Location	Remarks
Conifer-aspen rust *Melampsora medusae*	Douglas-fir trembling aspen	Averil Mtn.	light incidence over 2 ha
Dieback *Ascocalyx* sp.	Douglas-fir	McLeod L.	new host record
Dieback *Sclerophoma pithyophila*	lodgepole pine	Opatcho L.	10% lower crown needles on 10% of trees over 100+ ha
Elm leafminer *Agromyza aristata*	ornamental elms	Prince George	species confirmed, new distribution record; up to 90% (average 50%) of foliage on 100% of trees mined in "Miller Addition" near Fort George Park
Juniper broom rust *Gymnosporangium nidus-avis*	Sitka Mt. ash	Bear L.	new host record
Needle blight *Sphaeropezia* sp.	white spruce	Mischin-sinlika Cr.	new host record
Obliquebanded leafroller *Choristoneura rosaceana*	elm	Prince George	associated with leafminer *Agromyza aristata*
Pale spruce gall adelgid, *Adelges strobilobius*	black spruce	Fort St. John	new distribution record; first British Columbia collection
Poplar shoot blight *Venturia macularis*	trembling aspen	Fort Liard Highway	average 10% foliage infected on 90% trees
Red band needle disease *Scirrhia* (*Dothistroma*) *pini*	lodgepole pine	Opatcho L.	average 10% lower crown needles on 10% of trees over 100+ ha
Seedling dieback *Phoma* sp.	white spruce	Summit L.	<5% of seedlings killed in plantation
Small-spored spruce -- Labrador-tea rust *Chrysomyxa ledi*	Labrador-tea	km 13 Liard Highway	alternate host of rust which also infects white spruce
Spruce gall adelgid *Adelges lariciatus*	black spruce	Petitot R. (north of Fort Nelson)	new distribution record; first British Columbia collection

Causal agent	Host	Location	Remarks
Spruce weevil *Pissodes strobi*	white spruce	Hwy 16 E Hungary Cr. to West Twin Creek	scattered single or small groups of attacks on roadside regeneration
White trunk rot *Fomes igniarius*	trembling aspen	6 collections from various locations	sent to co-operator in USA for taxonomic studies
Willow brooms *Pleospora* sp.	willow	Giscome	10 large brooms on a single tree
Willow brooms *Cryptodiaporthe* sp.	willow	Fort Nelson	common along Muskwa River