Forest Insect and Disease Conditions Prince George Forest Region - 1994

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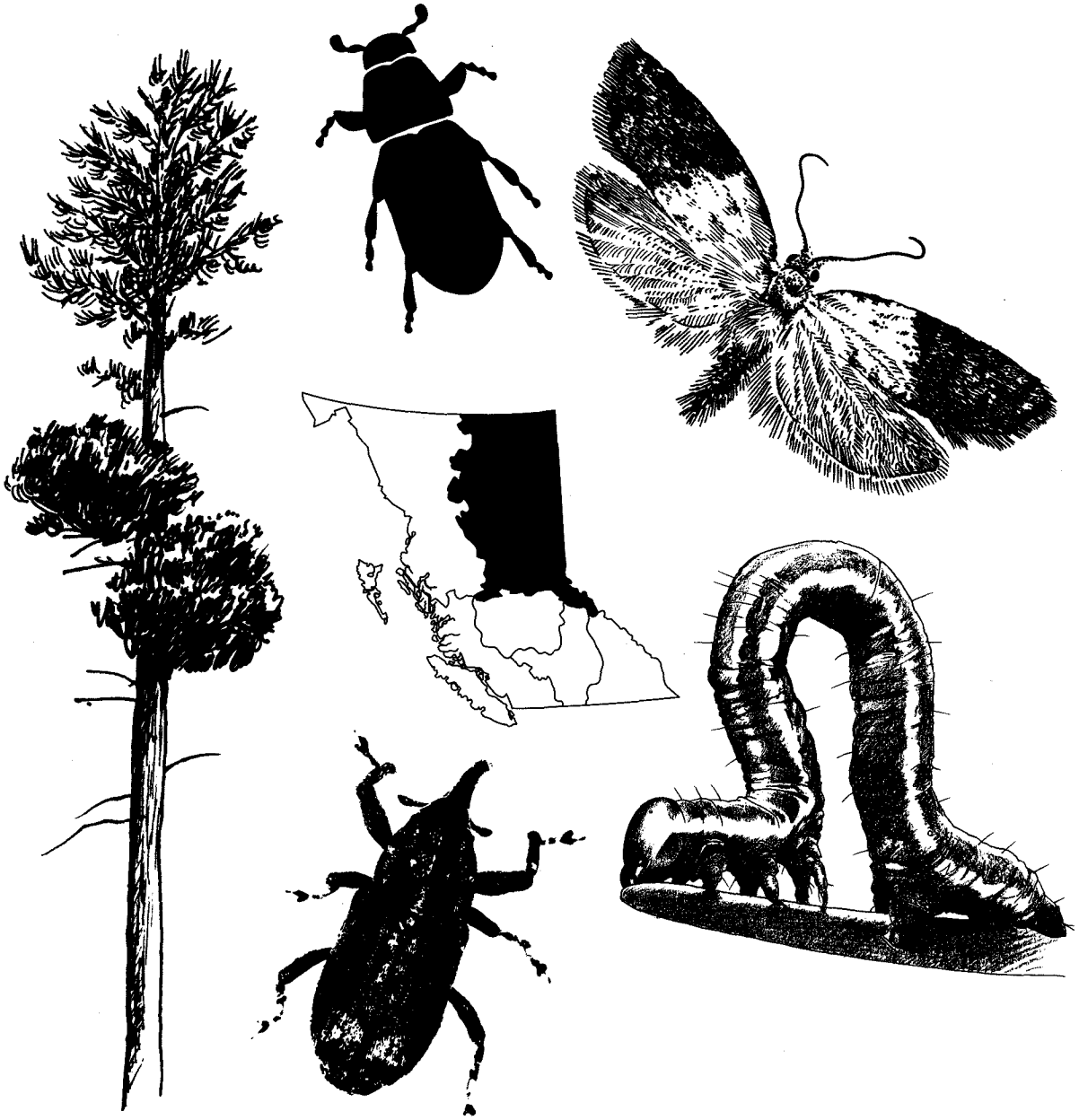
Canadian Forest Service - Pacific and Yukon Region



Natural Resources Canada
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Contents

Foreword

Forest Insect and Disease Survey (FIDS) is a nation-wide network within Forestry Canada with the responsibility of: (1) producing an overview of forest pest conditions and their implications, including predictions where possible; (2) maintaining records and surveys to support quarantines; (3) supporting forestry research with field studies, records and Herbarium and Insectary collections; (4) providing advice and extension on forest insect and disease conditions; (5) developing and testing survey techniques; (6) and conducting related biological and impact studies.

Correspondence and inquiries with respect to forest pest problems, and requests for publications can be directed to:

from: October to May

Pacific Forestry Centre
Canadian Forest Service
506 West Burnside Road
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from: June to September

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Definitions

During aerial surveys, bark beetle and defoliator damage has been quantified within damage classes and reference to these classes appear intermittently throughout the report:

Bark beetle mortality classes:	light	- 10% or less of stand recently killed
	moderate	- 11-29% of stand recently killed
	severe	- 30%+ of stand recently killed

Aerial survey defoliation classes:

Light - discoloured foliage barely visible from the air; some branch and upper crown defoliation

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

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

In tables the common names of trees are abbreviated to nationally used conventions; in alphabetical order they are:

aL - alder
alF - alpine fir
bCo - black cottonwood
bS - black spruce
DF - Douglas-fir
lP - lodgepole pine

tA - trembling aspen
sA - Sitka alder
W - willow
wB - white birch
wH - western hemlock
wrC - western red cedar
wS - white spruce

Final copies of infestation maps produced during aerial surveys were digitized into the FIDS in-house geographical information system (GIS). Computer-generated copies of these maps were sent to various co-operators and are available by request through FIDS.

TSA boundaries for the Prince George Forest Region have been included in Appendix III.

Introduction

This report summarizes the findings of two Forest Insect and Disease Survey (FIDS) technicians during summer and fall field studies in the Prince George Forest Region in 1994. 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 surveying of 47 young stands throughout the region; the monitoring of already known or recently reported infestations or 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 25 to October 1 during which over 220 insect and disease collections were sent to the Pacific Forestry Centre (PFC) for identification or confirmation (Figure 1). Some of these were added to the extensive permanent collections in the PFC Insectary and Herbarium.

In co-operation with the British Columbia Forest Service the two FIDS technicians flew approximately 36 hours of fixed-wing and 25 hours of helicopter time, for aerial and aerially accessed ground surveys during the 1994 season (Figure 1).

Summary of Pest Conditions

The area of **spruce beetle**-killed trees increased to over 72 000 ha with cumulative mortality of 1 225 000 m^3 from southeast of Prince George to north of Fort Nelson. The majority of the dead trees, 58 000 ha, were recorded in the Mackenzie and Dawson Creek forest districts. **Eastern spruce budworm** defoliation of spruce and fir increased to 173 000 ha in the Fort Nelson and Fort St. John forest districts after a small increase in 1993. Defoliation by mature **two-year-cycle spruce budworm** decreased to 71 000 ha mostly in the Prince George and Robson Valley forest districts.

Lodgepole pine mortality due to 1993 **mountain pine beetle** attacks increased by about 40% to 17 000 ha. Most of the mortality was in the Fort St. James Forest District with over 13 000 ha recorded.

The area containing mature alpine fir killed by **balsam bark beetle** mostly in the Fort St. James Forest District increased to 33 000 ha.

Tree mortality due to attacks by the **Douglas-fir beetle** decreased by approximately 30% to 2500 ha after eight consecutive years of increase.

Surveys of 47 young stands at widespread locations found a variety of diseases and insects. The most common of these were **stem rusts, spruce weevil** and **adelgids. Environmental damage** and **stem rusts** were common at four lodgepole pine plantations established in 1986 in a joint **Canada-Sweden project.** Pest surveys were initiated in the **McGregor Model Forest. Spruce weevil** populations were monitored in 18 stands throughout the region in the second year of a cooperative project between the BCFS and the Canadian Forest Service. An estimated average 7% of the white spruce were currently attacked by the spruce leader weevil. Three new and one old **bio-monitoring plot** were examined

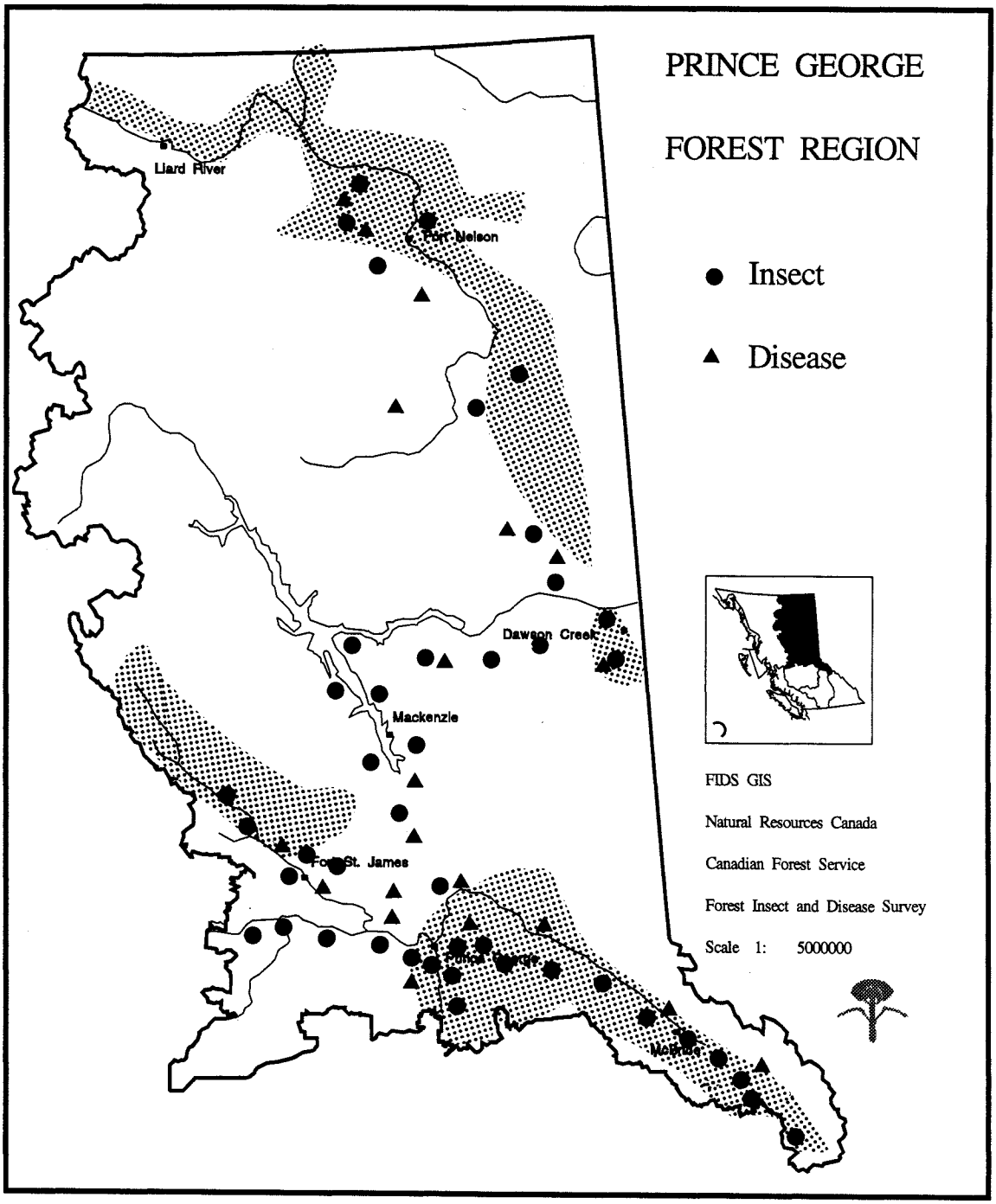

Figure 1. Location where one or more forest insect and disease samples were collected and areas covered by aerial surveys to map bark beetle and defoliator infestations in 1994.

for changes to forest trees, ground vegetation, and soils that might result from acidification of precipitation.

Defoliation of mature to overmature western hemlock and western red cedar by the **western hemlock looper** caused tree mortality over 35 000 ha. Current defoliation, mostly moderate, was mapped over 5 000 ha. More than 60% of the damage occurred in the Prince George Forest District with the remainder in the Robson Valley Forest District. **Black army cutworm** populations decreased with only one report of cutworm defoliation of seedlings at a site south of Prince George.

Forest tent caterpillar defoliated 40 000 ha in stands dominated by trembling aspen, a similar area to 1993. **Large aspen tortrix** defoliated trembling aspen over several thousand hectares in the Nechako River Valley. No adult male **gypsy moths** were trapped in 42 pheromone-baited traps placed in provincial parks, rest areas and private campgrounds. For the first time **satin moth** was detected in the Prince George Forest Region. Widespread willow mortality caused by the **poplar-and-willow borer** increased for the fourth consecutive year in the Prince George Forest Region.

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

Spruce Pests

Spruce beetle
Dendroctonus rufipennis

The BCFS reported spruce beetle killed white spruce over approximately 72 000 ha up from an estimated 51 000 ha in 1993 (Table 1). These figures include areas of very light and old attack in spruce stands that the BCFS considers to be under risk of attack. The major increase in area occurred in the Mackenzie TSA which had reported 40 000 ha of infestation last year (Figure 2). Increases were also noted in the Prince George TSA. Decreases in area of attack were noted in the McBride and Dawson Creek TSA's. No significant spruce beetle attack was noted in the Fort Nelson or the Fort St. John TSA's for the second consecutive year. Timber loss has been estimated at over 1 225 000m^3 of recently killed white spruce. Infestations ranged in size from single trees to several hundred hectares.

Table 1. Timber supply area (TSA), cumulative area and volume of white spruce recently killed by spruce beetle, Prince George Forest Region, 1993-94.

TSA	Area (ha)		Volume (m^3)	
	1994	1993	**1994**	1993
Mackenzie	**53 400**	40 900	**1 044 000**	1 036 000
Dawson Creek	**5 500**	6 800	**83 000**	94 000
Prince George	**12 900**	2 850	**108 000**	88 000
McBride	-	190		3 000
Regional Totals	**71 800**	**50 740**	**1 235 000**	**1 221 000**

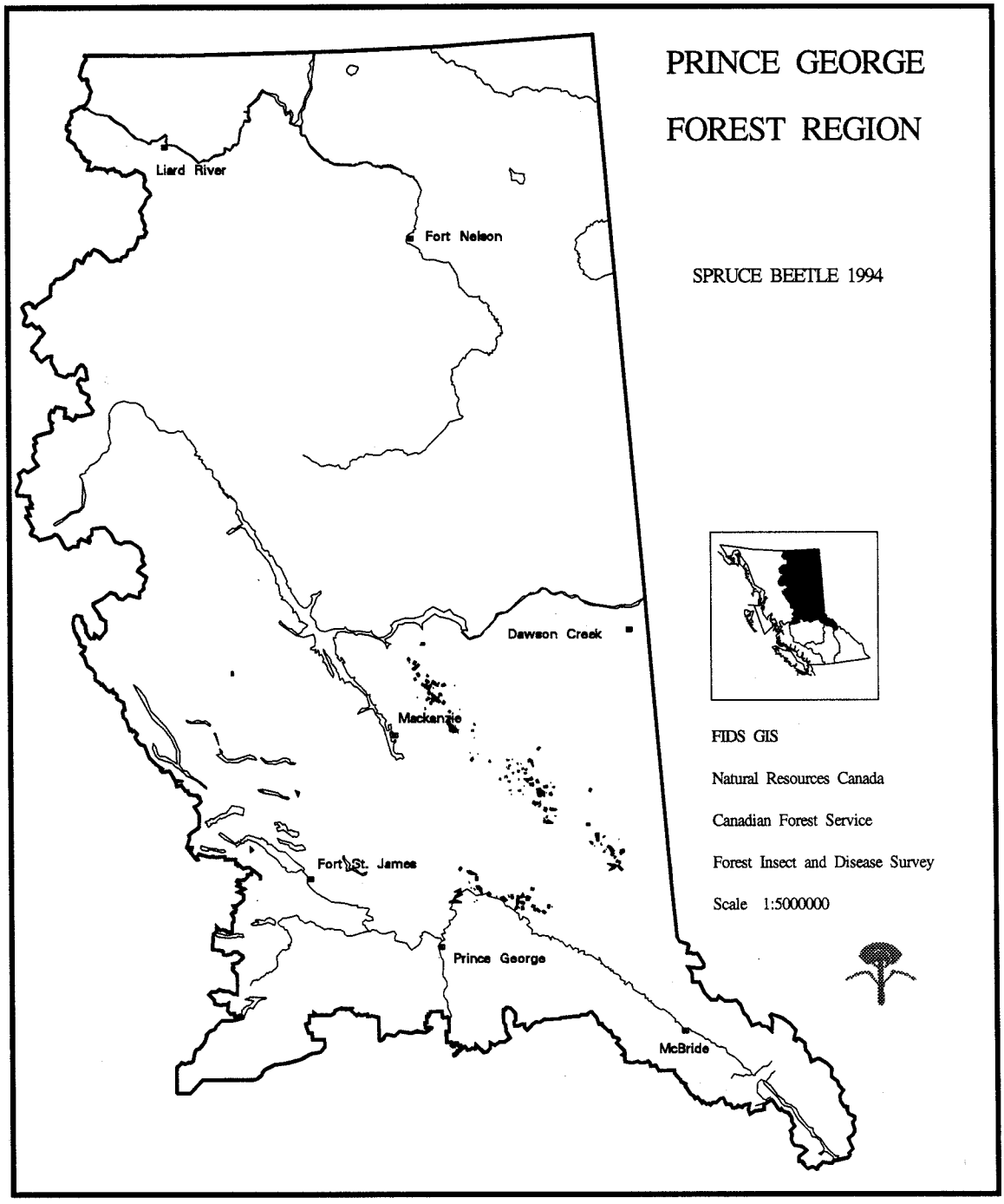

Figure 2. Areas of white spruce killed by spruce beetle determined by aerial and ground surveys in 1994.

The few beetle broods that could be found in the Summit Lake area of the Prince George Forest District were in a two-year-cycle. Attacks were generally light, with pitch outs and re-attacks of 1993 strip attacks common. In the Mackenzie Forest District broods were also in a two-year-cycle but the larvae were more numerous. Populations seem to be decreasing in all areas except for the Mackenzie Forest District.

Mackenzie TSA

The area of white spruce killed by spruce beetle increased by almost 13 000 ha to more than 53 000 ha. The increase in area of attack was concentrated in the Akie River drainage northwest of Williston Lake and along the Osilinka River west of Omineca Arm. Spruce beetle-killed trees were noted as far north as Fox Lake and south to Tudyah Lake, east to Germansen Lake and west to the Dawson Creek Forest District boundary. Areas of attack in the southern portion of the district were concentrated in the Clearwater River drainage northeast of Mackenzie, around Burden Lake and along the Manson River. Further north areas of attack were noted between Omineca Arm and Ingenika arms along the westside of Williston Lake and in the Ospika River drainage on the eastside. The most northerly infestations were mapped around the junction of the Finlay and Kechika rivers.

Dawson Creek TSA

The area of spruce beetle attack decreased about 1 000 ha to 5 500 ha, decreases were general throughout the 1993 areas of infestation. Infestations continued in basically the same areas as 1993, between the Hart Range and the Rocky Mountain foothills south of the western arm of Williston Lake. Infestations were noted in the following drainages; Pine, Wolverine, Sukunka rivers, Moberly, Eleven Mile, Carbon, McNairn, Silver Sands, Big Boulder, Peck, Callazon, Windfall, Imperial, Red Deer and and Fisher creeks.

Prince George TSA

The area of spruce beetle infested white spruce increased to more than 12 000 ha of mostly light infestation in the Prince George TSA in 1994. Mortality in the Prince George Forest District increased to approximately 7000 ha from 1620 ha and in the Fort St. James Forest District to 5 200 ha.

The largest infestations in the Prince George Forest District were recorded in the McGregor, Parsnip, Hominka, Anzac and Missinka River drainages and along Herrick and Huble creek drainages. For the first time in several years spruce beetle infestation information within T.F.L. 30 has been included in the Prince George Forest District. Over 2000 ha of mostly grey attack was noted in the TFL with areas of infestation mapped along Huble Creek, along the southside of the West Torpy River at higher elevations and in the Limestone and Averil Creek drainages. Scattered patches of attack were again noted southeast of Prince George along the Willow River and Naver, Rob and Haggen creeks and around Ahbau Lake. In the northern portion of the district, widely scattered mostly old attacks were noted around Carp and Summit lakes.

The area of spruce beetle infestations in the Fort St. James Forest District increased to more than 5 000 ha of very light mostly old attacks. The majority of the attack was in the Omineca drainage near the Mackenzie District boundary around Inzana Lake and along Silver Creek and Fall River.

Fort St. John/McBride/Fort Nelson TSA's

Widely scattered individual beetle attacked trees were noted during ground surveys in all three forest districts.

General

The B.C. Forest Service has proposed accelerated logging in both standing infested timber and areas of infested blowdown, along with follow up trap tree programs as well as removal of existing trap trees. This will occur over the next few years in order to control beetle populations and thus reduce subsequent mortality.

Eastern spruce budworm
Choristoneura fumiferana

Eastern spruce budworm populations increased slightly for the second consecutive year in this the eleventh year of the current outbreak (Figure 3). The area of white spruce and alpine fir defoliation increased to 173 000 ha up from 169 000 ha of mainly light feeding in the Fort Nelson and Fort St. John forest districts. Severe defoliation was last reported in 1990 when over 28 000 ha were observed during aerial surveys.

Budworm feeding continued in many of the same areas as in 1992-93 in the Fort Nelson and Fort St. John forest districts (Figure 4) from Fort Nelson to the Northwest Territories and west to the Rabbit River. The largest area of defoliation was along the Fort Nelson river between Klua Creek and the Snake River. There was a increase in area damaged along Kledo Creek and the Snake River. The infestation extended down the Fort Nelson and Fontas rivers into the Fort St. John Forest District where 6500 ha of light defoliation was recorded.

Spruce and fir foliage were examined for egg masses in order to predict budworm populations for 1995. The relatively accurate prediction for 1994 included static populations with mainly light defoliation. Through cooperation with the B.C. Forest Service, egg mass samples were obtained from white spruce at three locations; Liard River, Snake River and Clarke Lake. The number of egg masses per $10m^2$ of foliage averaged 180, range (145-226), the lowest number since 1989 (Table 2).

Table 2. The average number of egg masses on white spruce and alpine fir by year and the amount of defoliation the following year, in the Fort Nelson Forest District 1988-94.

Year	Average #egg masses per $10m^2$ of foliage	Defoliation the following year Area (ha)			
		Light	Moderate	Severe	**Total**
1988	unknown	41 380	71 070	11 290	**123 740**
1989	1000+	172 285	197 470	28 400	**398 155**
1990	400+	221 000	24 000	-	**245 000**
1991	230	132 000	-	-	**132 000**
1992	290	128 850	34 670	-	**163 520**
1993	330	173 000	-	-	**173 000**
1994	180		defoliation in 1995		

Based on previous years data the numbers suggest slightly decreasing populations causing only light defoliation for 1994. Light defoliation over a reduced area was recorded in 1991 after 400 egg masses were collected the previous year. Populations continued to decline in 1992 after an average 230 egg masses were found and a small increase in 1993 after 290 egg masses were recorded. The area of infestation continued to increase in 1994 with 330 egg masses found.

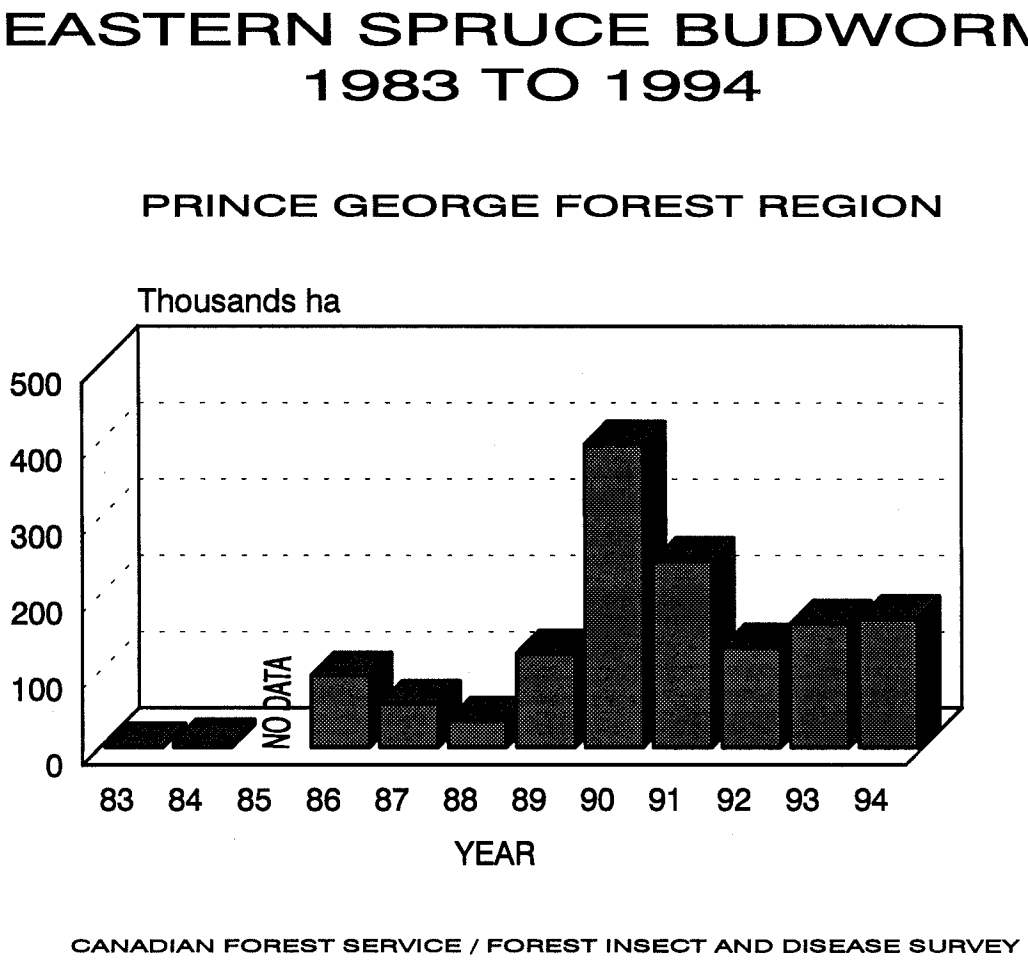

Figure 3. Eastern spruce budworm defoliation (1000 ha) in spruce/balsam stands.

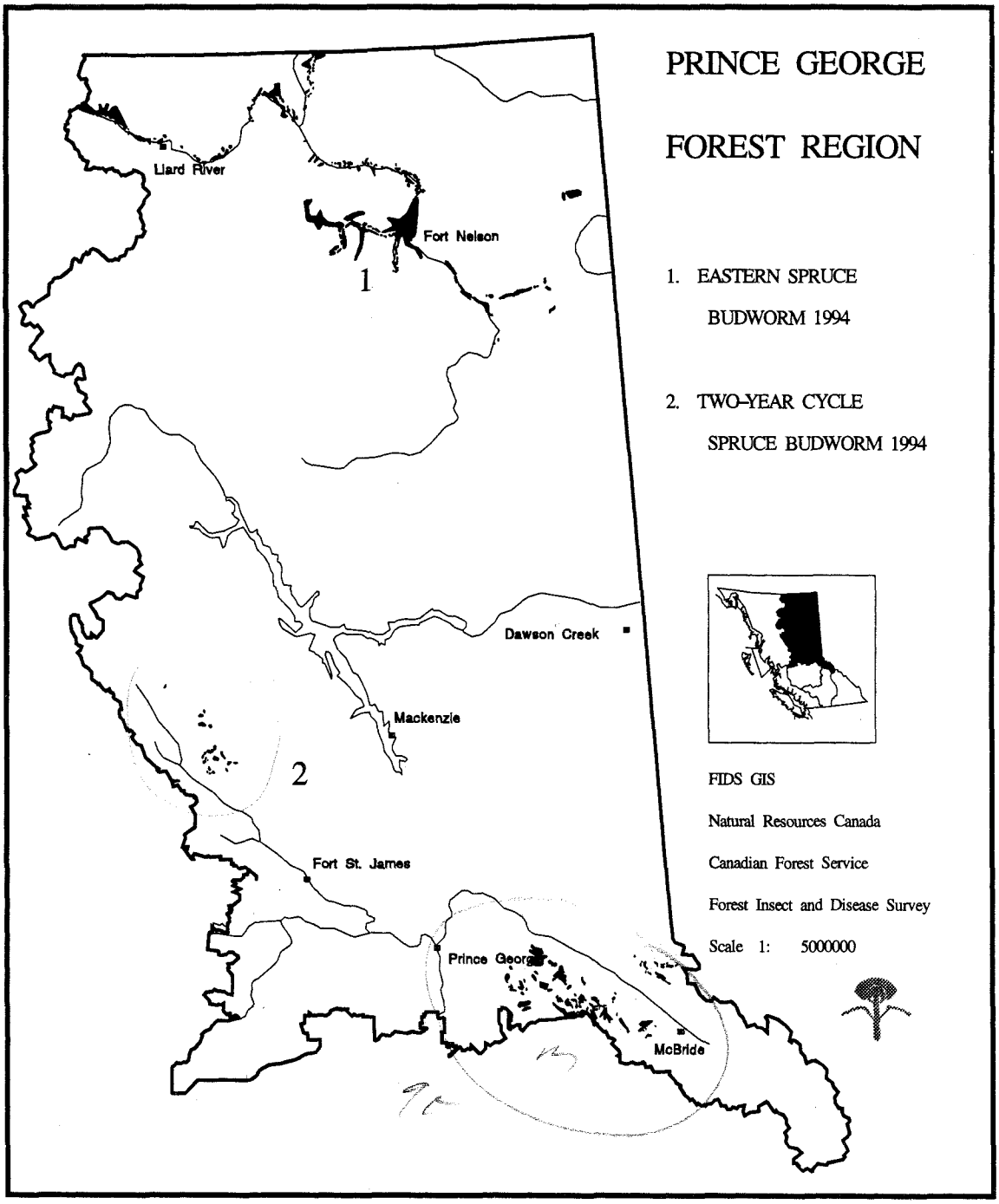

Figure 4. Areas where current defoliation of spruce/balsam stands by eastern spruce budworm and two-year cycle spruce budworm was detected during aerial surveys in 1994.

Two-year-cycle spruce budworm
Choristoneura biennis

Two-year-cycle spruce budworm, defoliated spruce-balsam stands over 71 000 ha, down from 97 000 ha in 1993 and 104 000 ha in 1992 (Figure 4). Light defoliation was mapped over 44 500 ha in the Prince George Forest District, 18 500 ha in the Robson Valley Forest District and 8 000 ha in the Fort St. James Forest District. Defoliation in the Prince George and Robson Valley forest districts was caused by mature larvae and in the Fort St. James District by immature (off cycle) larvae.

In the Prince George Forest District defoliated stands were recorded in 42 infestations south of the Fraser River. Feeding was noted in the Willow River drainage around Slender, Narrow, Wendle and Stony Lakes, between Haggen and Littlefield creeks, and in the Slim, Everett and Hungary creek drainages in the eastern section of the district.

Budworm feeding was recorded in the Robson Valley Forest District in 52 infestations from Forgetmenot Creek in the west to the Dore River in the east. The largest areas of defoliation were mapped in the Goat and Milk River drainages and along North Star Creek. Other areas of feeding were the Morkill River, Cushing and Macleod creeks.

Feeding by immature larvae in the Fort St. James Forest District was noted in 22 separate infestations, at the western end of Tchentlo Lake and around Purvis, Tsayta and Takatoot lakes.

Impact

The greatest impact will probably be on immature understory white spruce and alpine fir which is usually the most severely defoliated age class. Complete defoliation of 1-5 m trees was noted in previous years when only light defoliation occurred in the overstory. Unconfirmed reports of mature tree mortality around Narrow Lake have been received. Growth loss with occasional scattered top-kill is expected to be the main impact.

Previous studies indicate that incremental growth can be reduced by over 75% when severe defoliation has occurred. When severe defoliation occurs for several successive years, the added stress could predispose the large diameter spruce trees to beetle attack.

Forecast

Two-year-cycle budworm egg mass counts have not proven to be successful in predicting population fluctuations, unlike the fairly accurate predictions that can be made from western spruce budworm egg masses. The percentage of infested buds in 1995 would probably give a good indication of population levels expected in 1996, though inaccessibility will limit the coverage of this type of survey. Next year will be the feeding year for the immature larvae in the Prince George and Robson Valley forest districts and defoliation will be greatly reduced from this year. However 1995, an odd year, is considered to be the major feeding of the "off-cycle" budworm north of latitude 54°30' in the Fort St. James and Mackenzie forest districts. The two-year-cycle budworm defoliation recorded in 1994 an even year is classified as "on-cycle" budworm.

The Forest Insect and Disease Survey (FIDS) will continue to monitor the two-year-cycle budworm through larval sampling, bud counts and aerial surveys.

Pine Pests

Mountain pine beetle
Dendroctonus ponderosae

The area of recorded lodgepole pine mortality due to attacks by the mountain pine beetle increased to almost 17 000 ha from 12 000 ha in 1993 (Figure 5).

For the third consecutive year over eighty percent of beetle caused mortality occurred in areas of chronic infestation in the Fort St. James Forest District in the Prince George TSA (Figure 6). The area of attack increased to 13 600 ha from 11 300 ha and the volume of trees killed increased to 550 000 m^3 (Table 3). A significant increase in the area of attack also occurred in the Prince George Forest District where over 3 000 ha of attack was recorded up from only 400 ha in 1993. In the Vanderhoof and the Robson Valley forest districts the area of recently attacked trees decreased by half to 215 ha and 150 ha respectively.

Table 3. Timber supply area (TSA), forest district, area and volume of lodgepole pine recently killed by mountain pine beetle 1993-94, Prince George Region, 1994.

TSA and Forest District	Area (ha)		Volume (m^3)	
	1993	**1994**	1993	**1994**
Prince George TSA				
Fort St. James	11 300	**13 600**	470 000	**550 000**
Vanderhoof	500	**215**	25 000	**8 000**
Prince George	410	**3 000**	21 000	**75 000**
TSA Total	12 210	**16 815**	516 000	**633 000**
McBride TSA				
Robson Valley	400	**150**	30 000	**11 000**
TSA Total	400	**150**	30 000	**11 000**
Regional Total	12 610	**16 965**	546 000	**644 000**

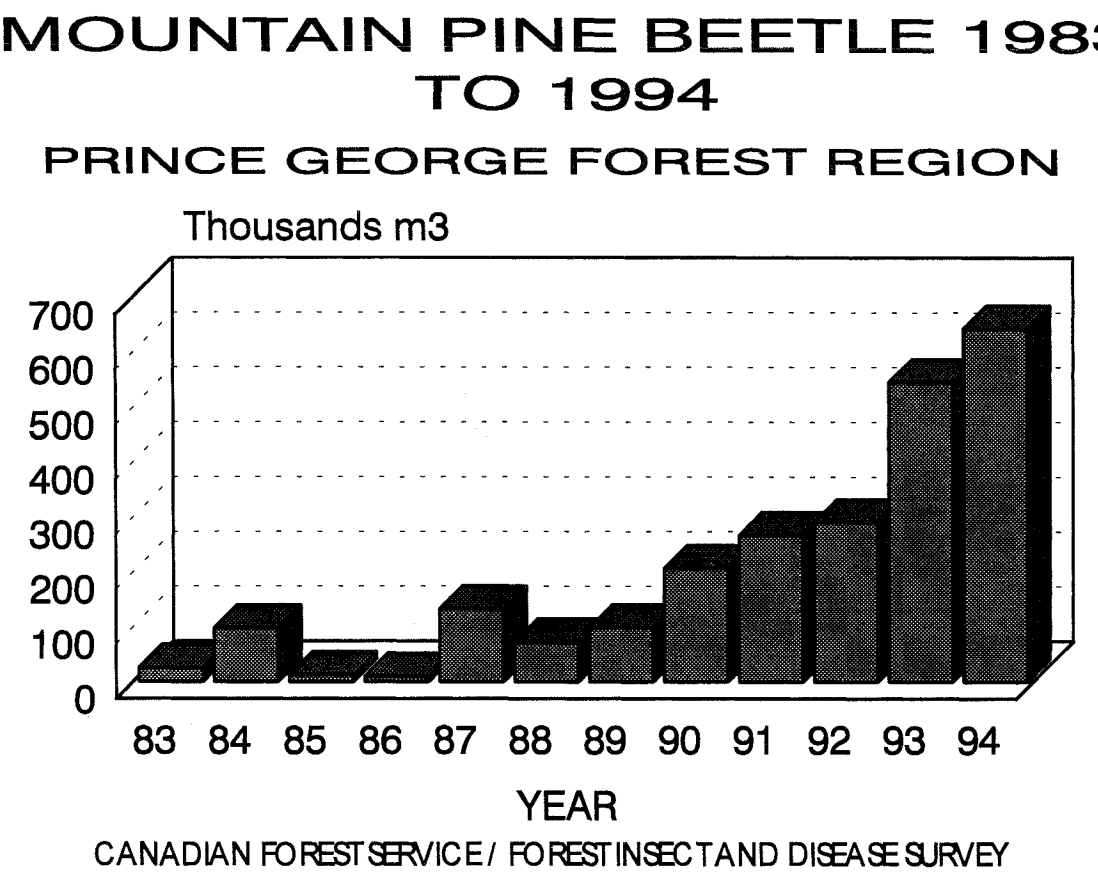

Figure 5. Lodgepole pine volume loss (1000 m^3) caused by mountain pine beetle.

Fort St. James Forest District

The area of recently killed lodgepole pine increased to over 13 000 ha from 11 000 ha in 1993 and 8100 ha in 1992. Severe mortality was mapped over 3600 ha and moderate over 9800 ha. Most of the increase in mortality, occurred in 91 infestations over 5500 ha along the Skeena and Sustut rivers and around Bear Lake. Approximately 6000 ha in 78 infestations were mapped along Takla Lake between Lovell Cove and Middle River, along both sides of the Northwest Arm of Takla Lake and around Witch Lake. In the southern portion of the district lodgepole pine mortality was scattered around Trembleur, Hatdudatehl, Tarnezell, and Cunningham lakes.

Vanderhoof Forest District

Mountain pine beetle populations decreased to 215 ha from an estimated 500 ha last year. Infestations remained in basically the same areas as last year around Francois, Fraser, Knewstubb and Johnny Lakes. The reduction in area of attack can probably be attributed to the aggressive beetle management of the BCFS in Vanderhoof. Sanitation and salvage logging in conjunction with pheromone baiting and cut and burn projects have been used to control the spread of the beetle.

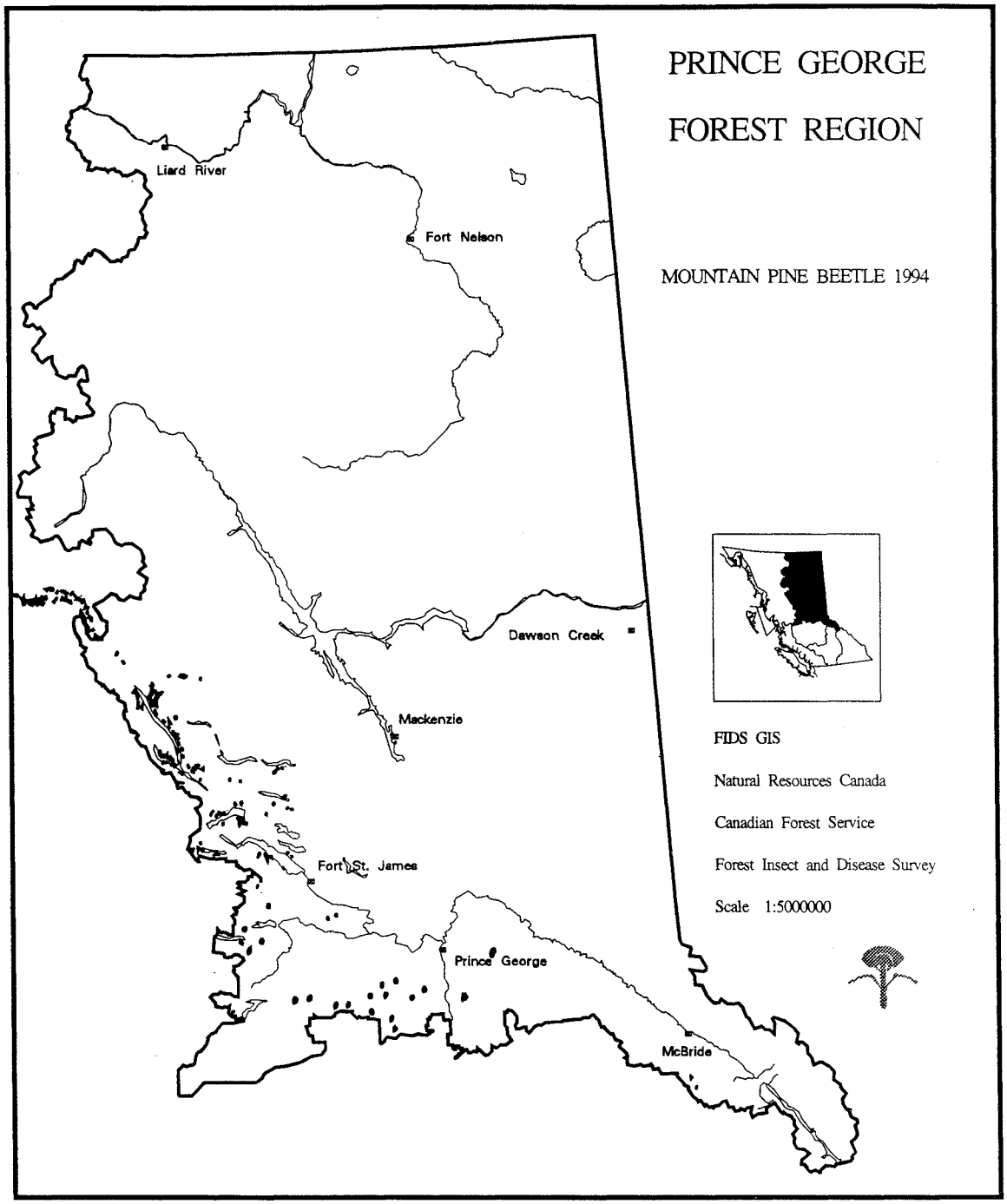

Figure 6. Areas of lodgepole pine killed by mountain pine beetle determined by aerial and ground surveys in 1994.

Prince George Forest District

Lodgepole pine mortality has increased for the fifth consecutive year in the Prince George Forest District with 3 000 ha recorded, up from 410 ha in 1993, 180 ha in 1992, 165 ha in 1991, 125 ha in 1990 and 80 ha in 1989. The majority of the attack occurred again along the Blackwater and Chilako rivers between the Fraser River and the Vanderhoof District boundary. Infestations were also mapped around Naltesby Lake and Mt. Baldy Hughes and along Wansa Creek.

Robson Valley Forest District

The area of recently killed lodgepole pine decreased to 150 from over 400 ha in 1993. The sixteen infestations were mapped along the westside of McNaughton Lake from Hugh Allan to Yellowjacket Creek and near the headwaters of the Raush River. The populations in these areas have been active for several years, Salvage and sanitation logging by the BCFS is helping to reduce infestation levels.

In the Mt. Robson corridor area, B.C. Parks and BCFS plan to dispose of approximately 70 beetle infested trees in the Shale hill and Swift Current Creek areas. Most of these trees had been baited with a beetle attractant, the baiting program will continue next year but at reduced levels. Populations appear to be on the decline in the park itself but on the increase outside the western boundary.

Alpine Fir Pests

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

Balsam bark beetle killed over 33 000 ha of alpine fir trees, similar to almost 30 000 ha recorded last year.

The majority of dead trees were mapped in the Fort St. James Forest District with light mortality mapped over 32 000 ha. Approximately 12 000 ha were recorded in 26 infestations along the eastside of Takla Lake from Takla Narrows north to Elmore Creek. Further to the north over 9 000 ha in 70 infestations occurred along the Skeena, Sustut, Mosque and Omineca Rivers. Widespread scattered attacks covering almost 6 000 ha were noted in the Nation River-Nation Lakes drainages. In the eastern portion of the district almost 4 500 ha of mortality was noted in a single infestation northwest of Salmon Lake. The largest decrease in area of attack was in the south where only 900 ha, down from 2300 ha, of mortality were mapped in the Inzana, Trembleur, and Whitesail lakes area.

In the Mackenzie Forest District mortality was reported over a wide area. However, no actual area figures are available due to lack of aerial mapping. The Forest Service estimates that the infestations have expanded for the fourth consecutive year to more than 10 000 ha. Infestations continued in the Nation Bay-Mt. Bisson area, around Boulder, Phillips and Wasi lakes and along the Omineca River and Akie rivers.

In the Robson Valley Forest District the area of mortality decreased by 70% to about 700 ha, in 20 infestations. The majority of the area was recorded along the Raush and Morkill rivers, and in the Moose Lake drainage.

Balsam bark beetle is a chronic problem in most districts in this region, and populations usually fluctuate little from year to year. However, over the last three years the balsam bark beetle has been widely reported throughout the Prince George Region in stands where alpine fir is a major component of the forest, especially in the Fort St. James and Mackenzie forest districts.

FIDS will continue to monitor this pest in 1995.

Douglas-fir Pest

Douglas-fir beetle
Dendroctonus pseudotsugae

The area of mortality due to attacks by the Douglas-fir bark beetle decreased to approximately 2 500 ha from 3 600 ha in 1993, after eight consecutive years of increase (Figure 7). Decreases occurred in all Forest Districts where the beetle was mapped in 1993 except for the Prince George Forest District (Figure 8). The area of attack increased drastically in the Prince George District from 350 ha to 1300 ha this year. In the Fort St. James District beetle attacks decreased to 460 ha from almost 1800 ha and in the Robson Valley District to 730 ha from 1500 ha.

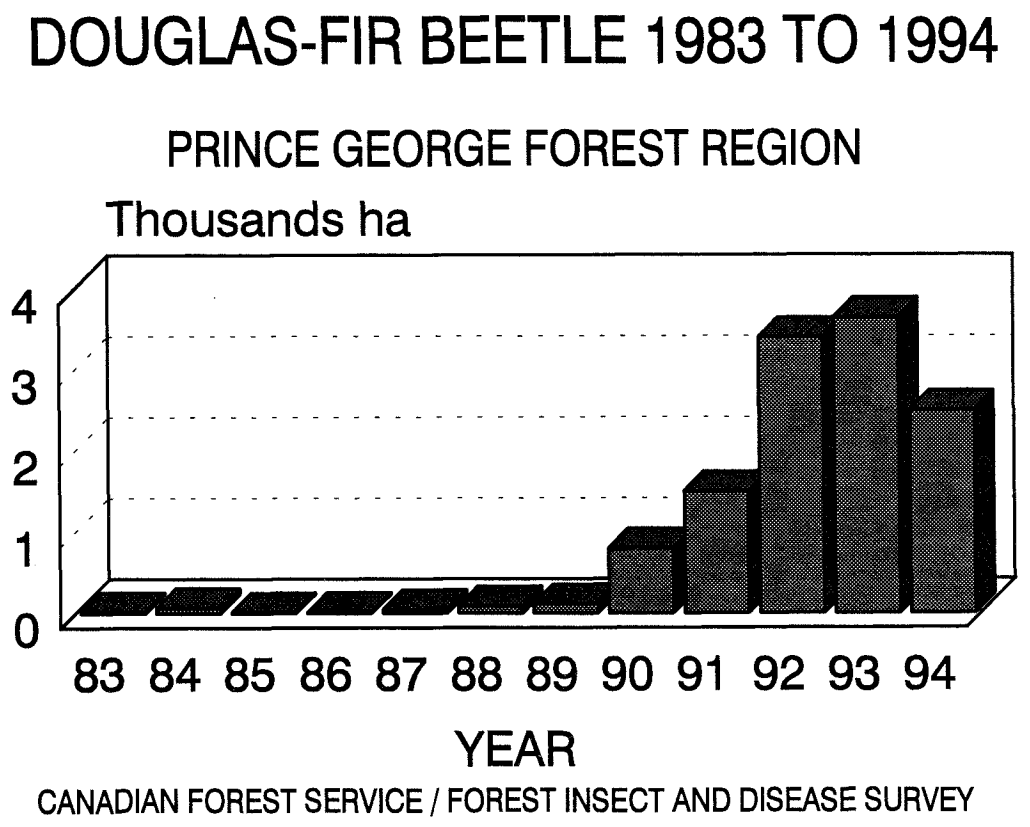

Figure 7. Douglas-fir beetle caused mortality (1000 ha) in mature Douglas-fir stands.

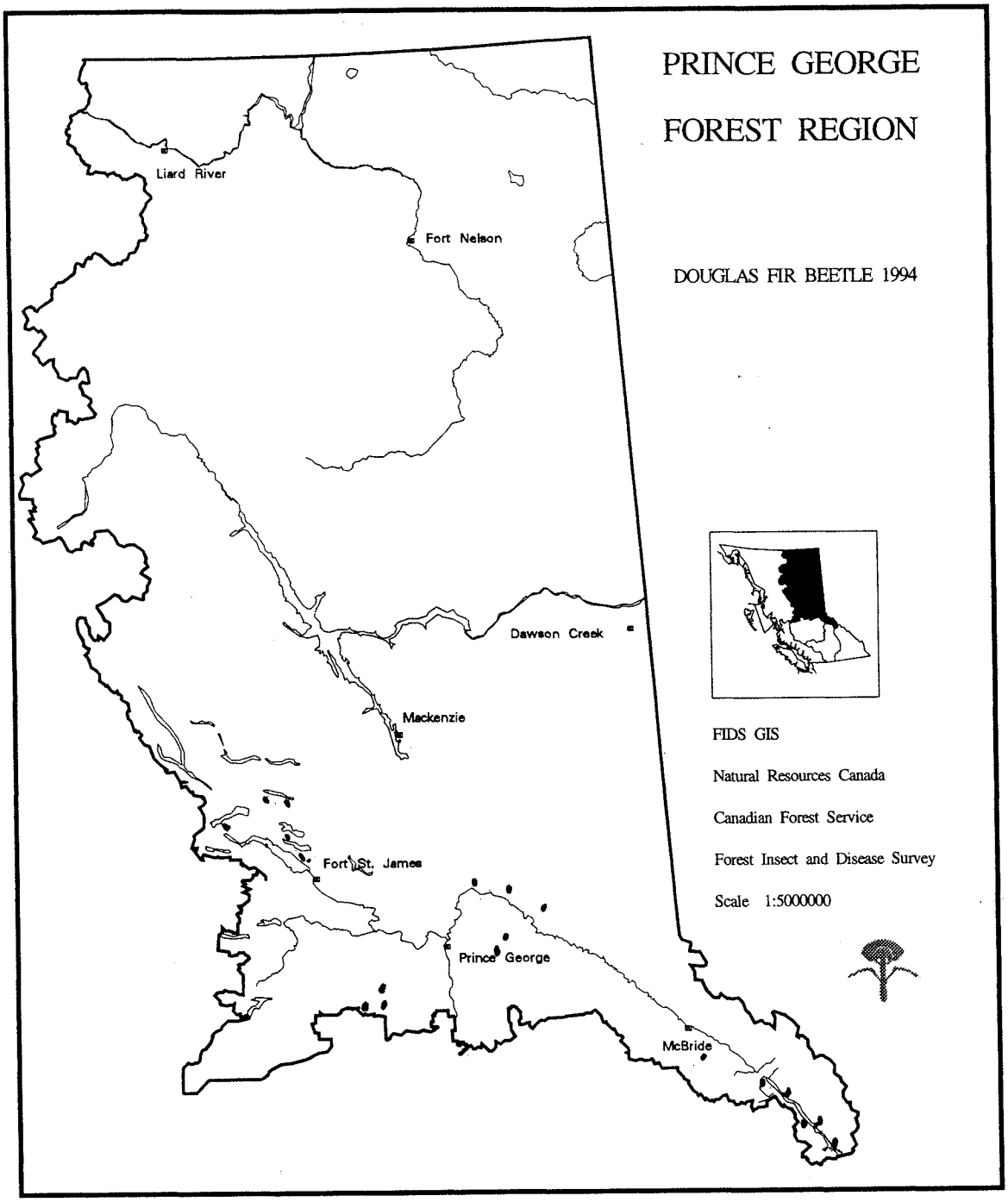

Figure 8. Areas of Douglas-fir killed by Douglas-fir beetle determined by aerial and ground surveys in 1994.

Fort St. James Forest District

Volume losses due to Douglas-fir beetle attacks were estimated to be 15 000 m^3 in 27 infestations. Infestations continued in some of the same areas as last year. Mortality was mapped along the west side of Stuart Lake from just north of Fort St. James to Pinchi, north of Whitefish Lake and between Hatdudatehl and Inzana Lakes.

Prince George Forest District

An estimated 21 000m^3 of timber was killed by the Douglas-fir beetle in this district. Most mortality occurred in areas of chronic infestation along the Blackwater River, around Naltesby Lake, and in the Wansa Creek drainage. Infestations continued around Arctic and Summit lakes. New infestations were recorded along the Bowron River and Vama Vama Creek. Light scattered attacks were also noted in the Humbug and Goodson creek drainages.

In T.F.L. 30 (McGregor Model Forest) Douglas-fir beetle killed mature trees over more than 150 ha. Dead trees were mapped in 13 infestations on mostly southern slopes around Averil Lake and along the north shore of the Fraser River near Eden and Limestone Creeks.

Robson Valley Forest District

Beetle-caused Douglas-fir mortality was estimated at 12 000 m^3 in 40 mostly moderate infestations along McNaughton Lake. Infestations occurred along the east side of the lake concentrated around Dawson and Hugh Allan creeks. Scattered patches of attack were also noted along the west side of the Lake at Grouse Creek. Attacks continued near the headwaters of the Raush River.

The B.C. Forest Service continues to use trap trees, pheromone traps and logging of selected sites to combat this pest.

Special Directed Surveys

Pests of young stands

A total of 47 plantations between 5 and 25 years old were surveyed for pest problems in 1994. The most frequently occurring pests are summarized in Table 4. Pest of low incidence, (<1%), and importance have been excluded.

Of the 47 stands examined only five were placed in the most severe impact category (Appendix I) that suggests a more intensive survey of the stand should be conducted. The remaining stands fell into categories that suggest reassessment in 2-4 years could be warranted.

The most damaging pests encountered were the blister rusts, *Cronartium coleosporioides, C. comptoniae, C. comandrae,* and *Endocronartium harknessii* which infected pine trees in 16 of the 36 stands with a lodgepole pine component. Spruce weevil, *Pissodes strobi* was also a significant pest infesting spruce leaders at 27 of the 38 spruce sites.

Table 4. Summary of pests of young stands, Prince George Forest Region, 1994

Host/pest	No. stands affected	Trees affected %[1]		Severity index[2]
		Average	Range	
Lodgepole pine - 2186 trees in 36 stands, 1811 trees were pest free				
Warrens root collar weevil	2	1	1	5 - 6
Blister rusts	5	1	1	3 - 6
Mammals	5	1	1	3 - 6
Scleroderris canker	1	1	1	5
Western gall rust	11	4	1 - 19	3 - 5
Abiotic	2	3	1 - 4	3 - 4
Pine midge	3	8	1 - 18	3
Giant conifer aphid	1	1	1	2 - 3
Lophodermella needle cast	1	100	100	2
Northern pitch twig moth	3	1	1	2
White spruce - 4816 trees in 38 stands, 2621 trees were pest free				
Root rots	5	1	1 - 3	5 - 6
Spruce weevil	27	12	1 - 32	4
Mammal	4	1	1 - 3	3 - 4
Abiotic	11	5	1 - 16	3 - 4
A spruce rust	1	19	19	2 - 3
Spruce gall adelgid	19	32	1 - 76	2 - 3
Giant conifer aphid	2	2	1 - 3	2 - 3
Douglas fir - 73 trees in 3 stands; 57 trees were pest free				
Spruce gall adelgid	1	4	4	2 - 3
Alpine fir - 181 trees in 14 stands; 125 trees were pest free				
Abiotic	1	2	2	3 - 4
Mammal	1	4	4	2 - 3
2-year spruce budworm	1	5	5	2
Fir-fireweed rust	5	2	1 - 2	2
Western red cedar - 136 trees in 3 stands; 96 tree pest free				
Mammal	2	6	5 - 6	2 - 3
Western hemlock - 5 trees in 1 stands; 5 trees were pest free				
Pest free	1	100	100	1
Aspen - 751 trees in 20 stands; 718 trees were pest free				
Mammal	1	1	1	3

[1] % of trees affected includes all trees from stands in which the pest occurred.

[2] Severity index:

1. pest free
2. minor damage, minimal impact
3. significant loss of current growth potential
4. net volume loss or loss of significant long-term growth potential
5. life-threatening or severely deforming
6. recently dead

Joint Canada-Sweden lodgepole pine trials

Four trial sites planted with lodgepole pine, Scots pine and Siberian larch established in 1986 in the Prince George Forest Region, were examined by FIDS during the course of regular surveys from May to September 1994. The following is a summary of conditions found during the surveys.

Fort St. James, Teardrop Road

Western gall rust, *Endocronartium harknessii,* remains the most serious pest at this site infecting an estimated 4% of the lodgepole pine stems. Branch cankers were found on 16% of the lodgepole pine and 2% of the Scots pine. **Pine needle cast**, *Lophodermella concolor,* severely infected old foliage on 7% of the lodgepole pine trees. **Pitch midge**, *Cecidomyia* sp., infested less than 5% of the leaders on 10% of the lodgepole pine. Poor form including pronounced **forks, multi-tops** and **basal sweep** were noted on 9%, 5% and 2% of the Scots pine, lodgepole pine and Siberian larch respectively, probably a result of previous **winter damage**.

Mackenzie, Nation Bay

Western gall rust infected 35% of the lodgepole pine, 23% of the trees with branch cankers and 12% with stem cankers. Current **stalactiform blister rust**, *Cronartium coleosporioides,* cankers were noted on 4% of the lodgepole pine stems.

An estimated 1% of the lodgepole pine were killed by **Warren's root collar weevil**, *Hylobius warreni.*

Poor form including dead tops was noted on 15% of the Scots pine and 25% of the Siberian larch.

Fort Nelson, Liard Highway

Multiple tops and crooks caused by previous **winter damage** occurred on 20% of the lodgepole pine. The Siberian larch and Norway spruce show good recovery from previous climatic damage. No current winter damage was recorded. Less than 1% of the Norway spruce has bud feeding by **Eastern spruce budworm** *C. fumiferana.* **Western gall rust** formed branch galls on 1% of the lodgepole pine. Pitch nodules resulting from **northern pitch twig moth** *Petrova albicapitana,* were recorded on 1% of the pine. **Pine needle cast** infected 20% of the foliage on 30% of the lodgepole pine.

Fort St. John, Halfway River

Western gall rust, branch galls were recorded on 11% of the lodgepole pine and stem galls on 1%. Scotch pine had branch galls on less than 1% of the trees. **Pine needle cast** infected 5% of the foliage on 10% of the lodgepole pine. Siberian larch and scotch pine have recovered well from previous **winter damage**. No current winter damage was recorded.

McGregor model forest, forest health surveys

The monitoring and reporting on pests in Model Forests across Canada has become an important part of the FIDS annual surveys. A report summarizing pest problems within the McGregor Model Forest is available upon request.

The information was gathered through aerial surveys, FIDS standard three-tree beatings, pheromone trapping, general stand assessments, pest assessments of the Petawawa National Forestry Institute Treatment Trial, and the **Acid Rain Early Warning System (ARNEWS)** plot near Averil Lake.

Spruce weevil population monitoring plots

A cooperative project between the BCFS and the Canadian Forest Service (Forest Insect and Disease Survey) was initiated in 1993 to monitor spruce weevil populations in the Prince George Forest Region. The objective was to estimate the proportion of weevil infested trees in susceptible spruce stands across different biogeoclimatic subzones (BGCSZ). The stands are to be remeasured annually to obtain information on population fluctuations and to determine if biogeoclimatic factors influence susceptibility of spruce to attack.

A total of 18 suitable sites were located in 9 different biogeoclimatic subzones in 5 different Forest Districts (Figure 9). Eight new sites were established in 1994 with two sites in each biogeoclimatic subzone. Ten of the sites have been surveyed for 2 consecutive years.

Attacks varied widely between biogeoclimatic subzone and even between stands within subzones. An average 7% (range 0 - 19%) of the white spruce were currently attacked by the spruce leader weevil in the 18 stands surveyed in 1994 (Table 5). In the ten stands which have been surveyed for 2 consecutive years the level of current attack was 10% compared with 13% in 1993.

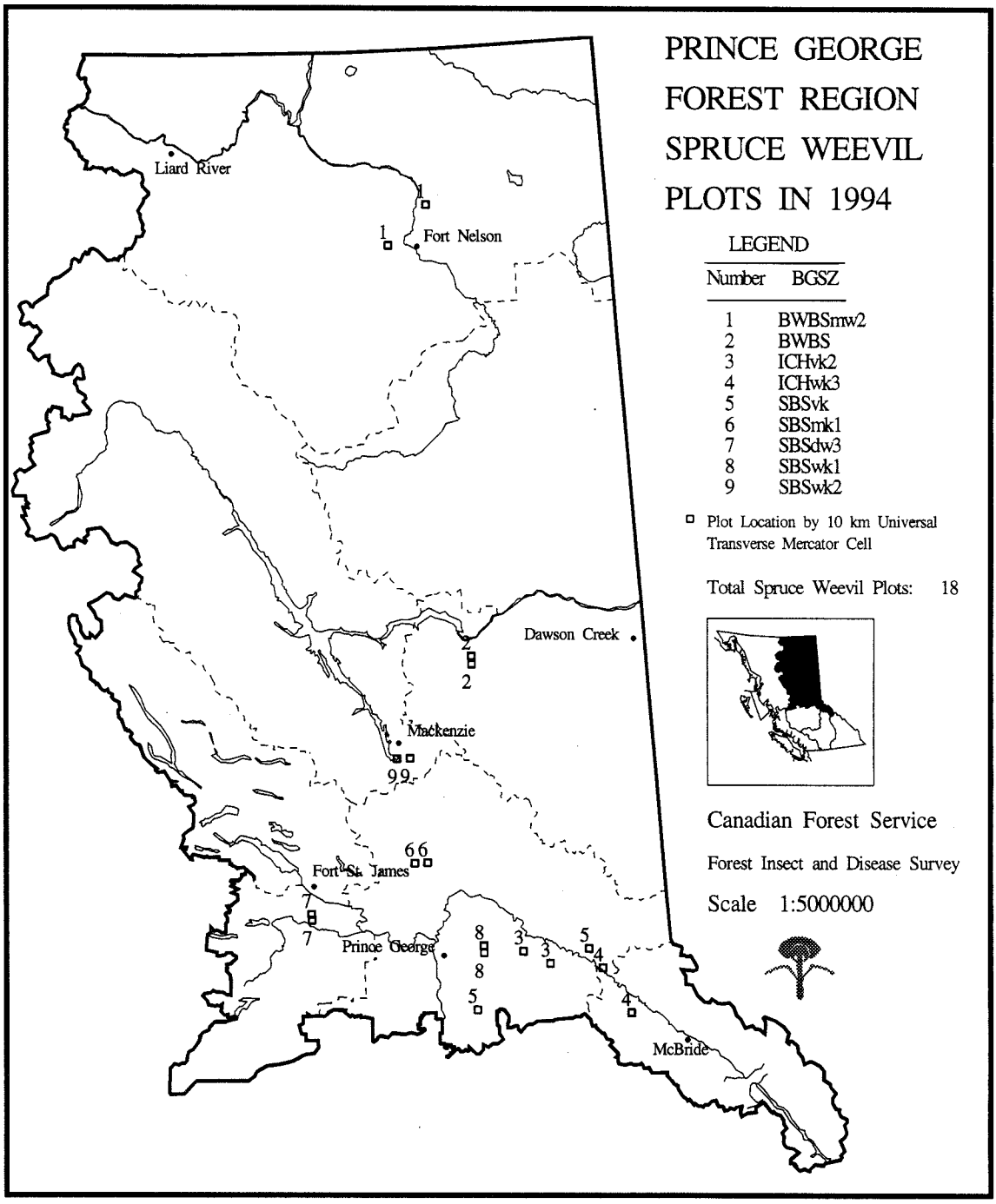

Figure 9. Location and biogeoclimatic zone of spruce weevil surveys.

Table 5. Location, biogeoclimatic subzone, stand composition, and percent weevil attack in spruce weevil monitoring plots, Prince George Forest Region, FIDS, 1994.

Location	Biogeoclimatic zone and subzone	Tree Species % of stand	% Spruce Weevil Attack	
			94	93
* Peace River	BWBS	wS - 34 wB - 20 tA - 43 bCo - 3	0	
* Johnson Cr.	BWBS	wS - 54 lP - 13 tA - 33	0	
* Ft. Nelson R.	BWBSmw2	wS - 100	2	-
Muskwa River	BWBSmw2	wS - 100	0	0
Lunate Cr.	ICHvk2	wS - 58 wB - 28 alF - 8 wrC - 6	5	20
Sugarbowl Cr.	ICHvk2	wS - 70 tA - 17 wrC - 5 bCo - 8	13	17
Goat River	ICHwk3	wS - 47 wrC - 31 wB - 11 bCo - 11	18	12
* P.O.B. Cr. Rd.	ICHwk3	wS - 83 alF - 8 lP - 3 wB - 6	7	
Jack Pine Alley 1	SBSdw3	wS - 66 lP - 30 alF - 3 tA - 1	2	3
* Jack Pine Alley 2	SBSdw3	wS - 95 lP - 4 alF - 1	3	-

(Cont'd)

Table 5. (Cont'd)

Location	Biogeoclimatic zone and subzone	Tree Species % of stand	% Spruce Weevil Attack	
			94	93
Davie Lk. Rd.	SBSmk1	wS - 67 tA - 18 lP - 11 alF - 4	19	21
Davie-Muskeg	SBSmk1	wS - 74 lP - 20 tA - 6	6	11
Vama Vama Cr. 1 *	SBSwk1	wS - 61 wB - 38 tA - 1	7	16
Vama Vama Cr. 2	SBSwk1	wS - 67 tA - 33	5	-
Gagnon Cr.	SBSwk2	wS - 74 tA - 2 lP - 1 wB - 22 alF - 1	14	20
Misinchinlinka River *	SBSwk2	wS - 63 lP - 1 wB - 22 tA - 2 alF - 1	19	-
Bowron Rd.	SBSvk	wS - 89 lP - 1 tA - 10	5	14
Goodson Cr. *	SBSvk	wS - 76 alF - 24	5	-
Average			7	13

* Sites surveyed in 1994 only

Undifferentiated Boreal White and Black Spruce (BWBS)

No weevil attacks were found at either site in this subzone.

Fort Nelson-Moist Warm Boreal White and Black Spruce (BWBSmw2)

Weevil attacks were noted in only one of the sites in this subzone. In a pure spruce plantation along the Fort Nelson River 2% of the stand was attacked. No current attack was noted at the Muskwa River site.

Slim-Very Wet Cool Interior Cedar-Hemlock (ICHvk2)

There was a decrease in the level of attack at both sites, 5% current attack at Lunate Creek down from 20% in 1993, and 13% at Sugarbowl Creek down from 17%.

Goat-Wet Cool Interior Cedar-Hemlock (ICHwk3)

The only increase in weevil attacks, 18% up from 12% in 1993, was noted at the Goat River site. At the new location on the P.O.B. Creek road an estimated 7% of the white spruce were currently attacked.

Stuart-Dry Warm Sub-Boreal Spruce (SBSdw3)

Weevil attack levels remained consistently low at the two sites in this subzone with only 2% current attack at the #1 site at Jack Pine Alley and 3% attacks recorded at the #2 site.

Mossvale-Moist Cool Sub-Boreal Spruce (SBSmk1)

Weevil attacks remained fairly constant at the Davie Lake site with 19% current attack this year compared to 21% in 1993. Attacks were reduced by almost 50% at the other site in this subzone, 6% current attack this year compared with 11% last year.

Willow-Wet Cool Sub-Boreal Spruce (SBSwk1)

The current attack in this subzone was down more than half to 7% from 16% at the Vama Vama #1 site. Weevil attacks at the new site infested 5% of the spruce leaders.

Finlay/Peace-Wet Cool Sub-Boreal Spruce (SBSwk2)

The highest average level of attack, 17%, was noted at the two locations in this subzone. Attack was found to be 14% at Gagnon Creek down from 20% in 1993, and 19% at the new site at Misinchinlinka River. The Misinchinlinka River location had the highest level of attack among the 18 stands surveyed.

Very Wet Cool Sub-Boreal Spruce (SBSvk)

Current attack was the same, 5%, at both sites in this subzone. The Bowron Road site had 14% weevil attack in 1993.

Surveys and assessments by FIDS of these stands will continue in 1995.

Bio-monitoring plots

This is the third year of the expanded bio-monitoring program in the Prince George Forest Region. One new plot was established in each of the Prince George, Dawson Creek and Fort St. John Forest Districts. In three years another detailed analysis of foliage, soils, growth rates, foliar retention and general stand condition will be completed at the 3 recent plots. Annual surveys include examinations of tree mortality, abiotic foliar symptoms and pest conditions.

The Willow River site was the only location with significant pest problems, 26% of the lodgepole pine was infested by sequoiae pitch moth, *Synanthedon sequoiae,* 18% infected by western gall rust, *Endocronartium harknessii,* and porcupine damage noted on 3%.

Monitoring will continue at the Prince George plots in 1995.

Multiple Host Pests

Western hemlock looper
Lambdina fiscellaria lugubrosa

Successive years of severe defoliation by western hemlock looper killed about 40%, (range 10-90%), of mainly old growth western hemlock and western red cedar over 35 000 ha. Current defoliation, mostly moderate, was mapped over 5000 ha. Trace levels of defoliation not visible from the air were noted in some of the stands with heavy mortality. Sixty-percent of the damage occurred in the Prince George Forest District with the remainder in the Robson Valley Forest District (Figure 10). The last recorded hemlock looper infestation in the Prince George Forest Region was in 1983 when over 800 ha of feeding was noted in the Robson Valley Forest District.

In the Prince George TSA, tree mortality occurred over 22 000 ha with current defoliation mapped over 3700 ha. Dead tress were recorded in generally the same areas as defoliation occurred in 1993; from Purden Lake in the west to Walker Creek in the east, mainly in the ICHvk2 biogeoclimatic subzone. The largest areas of mortality were in the Torpy River and Walker Creek drainages. Current defoliation was mostly in white spruce and alpine fir stands adjacent to the previously defoliated hemlock and cedar stands.

In the McBride TSA tree mortality and defoliation were recorded over approximately 14 000 ha, up slightly from 12 000 ha in 1993. New areas of defoliation occurred in the Ptarmigan Creek and LaSalle Lakes area. The largest concentrations of tree mortality were mapped between Ptarmigan and Catfish creeks and around LaSalle Lakes. No current defoliation was noted along McNaughton Lake or Hankins Creek. In 1991, the Robson Valley Forest District had the only recorded western hemlock looper defoliation in the Prince George Forest Region, with 200 ha at Hankins Creek, just south of McBride.

Forecast

Standard FIDS, three-tree beating samples at five locations within the infested stands averaged 35 larvae/beating, significantly lower than over 300 looper larvae in 1993. Mass collections of over 300 larvae were reared at the Pacific Forestry Centre to determine levels of parasites and disease. Approximately 41% of the larvae were diseased, mostly with *Entomophthora* sp., 7% of the larvae were parasitized by Diptera and Hymenoptera.

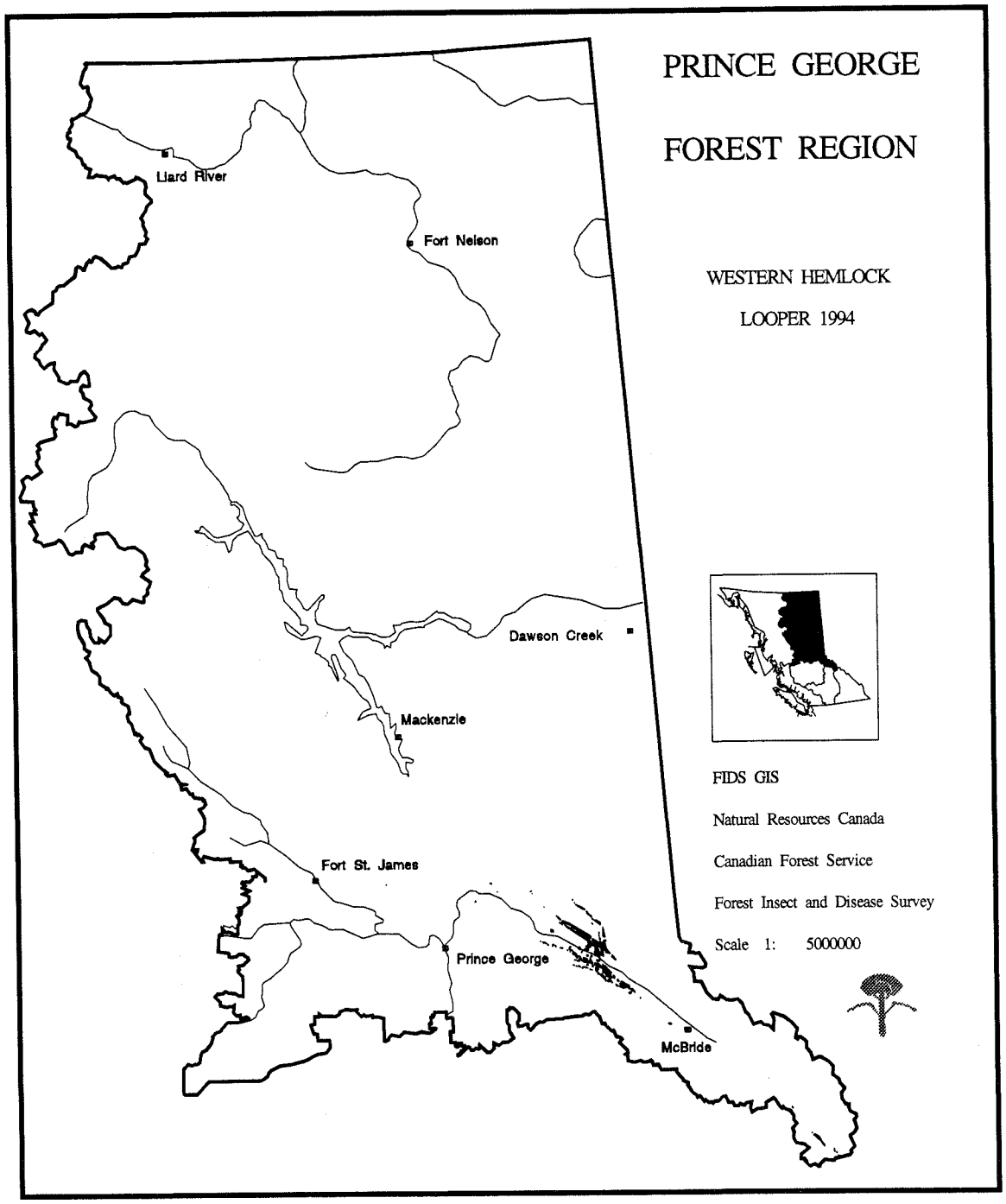

Figure 10. Areas of western hemlock and western red cedar defoliated by western hemlock looper determined by aerial surveys in 1994.

Pheromone trapping using different trap types and pheromone strengths was carried out at each site, relating the number of moths to the number of larvae and eggs. Sampling by FIDS in the fall of 1993 predicted the decrease in area and intensity of defoliation in 1994.

Samples of lichen were taken this fall from five representative areas within the outbreak to determine the number and viability of overwintering eggs to help forecast damage in 1995 (Table 6).

Table 6. Location, average number, and status of western hemlock looper eggs in 1993-94 and predicted defoliation for 1995, Prince George Forest Region 1994.

Location	Avg. no. eggs per 100 g lichen								Predicted 1995[1] defoliation
	Healthy 1993-1994		Parasitized 1993-1994		Infertile 1993-1994		Old 1993-1994		
Catfish Creek	40	**4**	2	**9**	5	**1**	175	**24**	none
LaSalle Lake	40	**1**	1	**14**	0	**0**	131	**41**	none
Hungary Creek	33	**2**	1	**19**	0	**0**	60	**47**	none
Walker Creek	31	**2**	8	**16**	0	**1**	155	**38**	none
Sugar Bowl Creek	20	**6**	2	**25**	4	**1**	277	**22**	light
Average	33	**3**	3	**17**	2	**1**	160	**34**	**none**

[1] light - 5-26 eggs; moderate - 27-60 eggs; severe - 61+ eggs

The results of fall egg mass sampling showed an overall decrease in populations for 1995. Egg counts decreased by over 90% on average indicating no defoliation in most areas for next year. The only area that egg counts were at a sufficient level for defoliation to occur next year was at Sugarbowl Creek. However with only six eggs per 100 grams of lichen it is very possible that no noticeable defoliation will be recorded here either. The level of parasitized eggs increased to 82% almost six times the 1993 level.

The low numbers of larvae obtained in three-tree-beatings, the 90% decrease in egg numbers and the reduction in moths caught in pheromone traps, indicate that the looper infestation has subsided.

Impact

Nine damage appraisal plots were established in 1992 to help determine the impact of the looper, three at both Walker and Catfish creeks and three at La Salle Lake (Table 7).

Table 7. Location and percent mortality in western hemlock looper impact plots, Prince George Forest Region, 1994.

Location	Percent mortality				Percent trees with 80%+ defoliation for 2 consecutive years			
	wH	wrC	wS	alF	wH	wrC	wS	alF
La Salle Lake	100	60	25	100	90	36	0	0
Walker Creek	100	55	-	100	94	78	0	0
Catfish Creek	60	15	40	100	43	4	0	0
Average (weighted)	**80**	**35**	**35**	**100**	**79**	**31**	**0**	**0**

Tree mortality averaged 60% for all tree species in this the third year of the infestation. Mortality occurred in almost all trees that had been 80% defoliated for two consecutive years. The four alpine fir in the plots all died with less than 50% defoliation as did three of the nine white spruce trees. Top-kill, up to 5m, was note on 10% of the hemlock and 35% of the cedar. Intermediate trees were best able to withstand the looper feeding. Ambrosia beetles infested 25% of the dead western hemlock at LaSalle Lakes. Assessments of these plots will continue, as mortality can occur up to three years after defoliation ceases.

Black army cutworm
Actebia fennica

Black army cutworm populations decreased with only one report of cutworm defoliation of seedlings and herbaceous ground cover. Light feeding of pine seedlings was noted over a small area at the site of the 1992 Stoner Fire south of Prince George.

Pheromone trapping continued at several recently burned sites (Table 8) in the Prince George Forest District.

The low numbers of moth catches in conjunction with abundant herbaceous ground cover indicate no chance of defoliation in 1995 at any of the sites trapped in 1994.

Recent burns will be monitored and cutworm pheromones tested in 1995.

Table 8. Location, number of traps and number of adult male black army cutworm caught by pheromone-baited traps, Prince George Forest Region, 1994.

Location	No. of traps	No. of adults[1]	Remarks
Merton Lake	2	10 15	no defoliation predicted
Slender Lake	3	35 50 125	" " "
Summit Lake	2	175 275	" " "
T.F.L. 30	3	52 89 135	" " " " " "

[1] Levels of moth catches that indicate risk of defoliation

0-350 :no defoliation of vegetation of seedlings expected
350-600 :defoliation of vegetation is common with occasional seedling damage
600+ :high risk of vegetation and seedling defoliation

Deciduous Tree Pests

Forest tent caterpillar
Malacosoma disstria

Forest tent caterpillar defoliated more than 41 000 ha of trembling aspen, similar to the area attacked in 1993 (Figure 11). Increases in area of feeding were mapped in the Prince George and Dawson Creek forest districts and decreases in the Robson Valley Forest District.

In The Prince George Forest District tent caterpillar populations increased for the second consecutive year. Aspen trees were severely defoliated over nearly 33 000 ha in 79 infestations from Prince George Airport south to the district boundary, up from 22 000 ha in 1993 (Figure 12). Infestations were mapped along the Fraser River from Prince George to Hixon and along the Naver, Meadowbank and Ahbau Creeks. An additional 3200 ha of severe defoliation was noted along the southwest side of McLeod Lake.

In the Robson Valley Forest District the area of feeding decreased after three consecutive years of increase. Severe defoliation occurred over 4500 ha in 98 infestations down from over 16 000 ha in 1993. The damage was scattered along the Robson Valley from Rider west of McBride to Valemount in the east. The decline in populations can probably be attributed to weather, parasitism and disease.

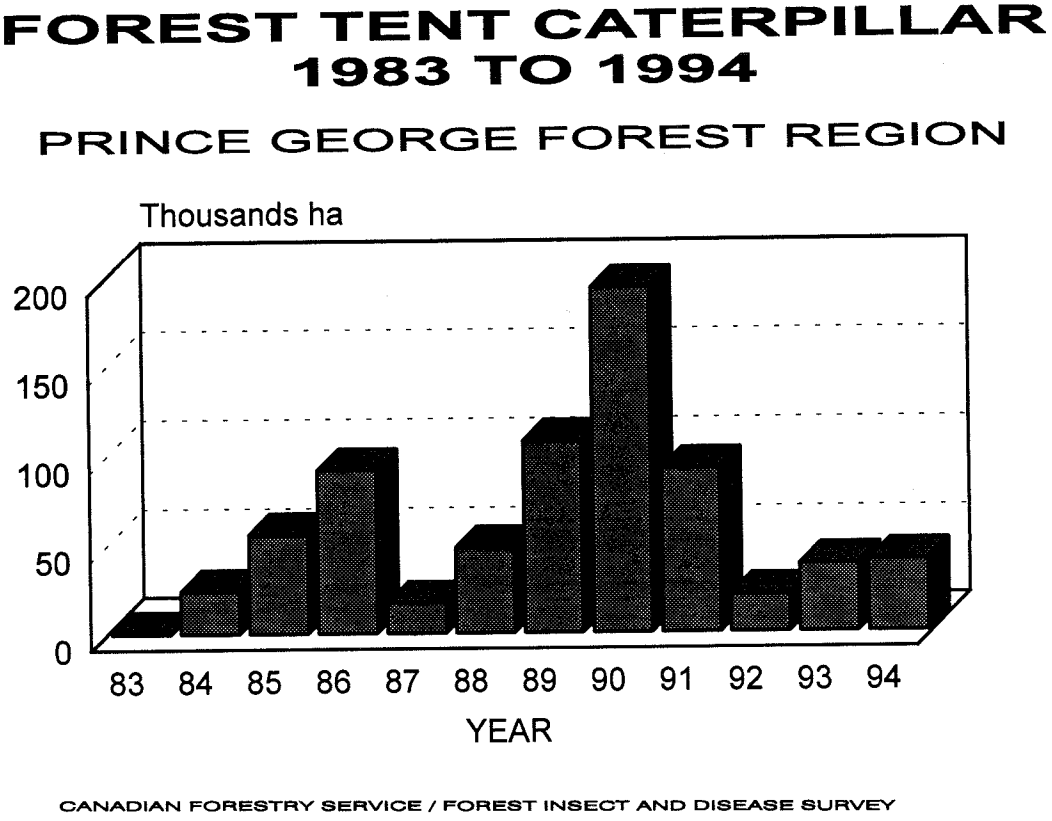

Figure 11. Forest tent caterpillar defoliation (ha) in trembling aspen stands.

Almost 1500 ha of severe defoliation was mapped in the Dawson Creek Forest District south of Taylor. Defoliation was reported in the same area in 1993.

The number of egg masses found during the 1994 fall surveys in the Prince George District remained relatively constant this year with an average 21/location (Table 9) compared with 23 last year. Egg mass counts in the McBride area decreased to 11 from 17 in 1993.

In areas around Prince George where defoliation has occurred for 3-5 years, top and branch dieback and some whole tree mortality has been recorded. Continued defoliation leads to growth loss and increased susceptibility to attacks by other insects and diseases. Forest tent caterpillars can be a nuisance to homeowners, campers, and picnickers because of their tendency to migrate in large numbers during the larval stage.

FIDS will continue to monitor forest tent caterpillar populations in 1995 and a pest report will be issued after early season sampling is completed.

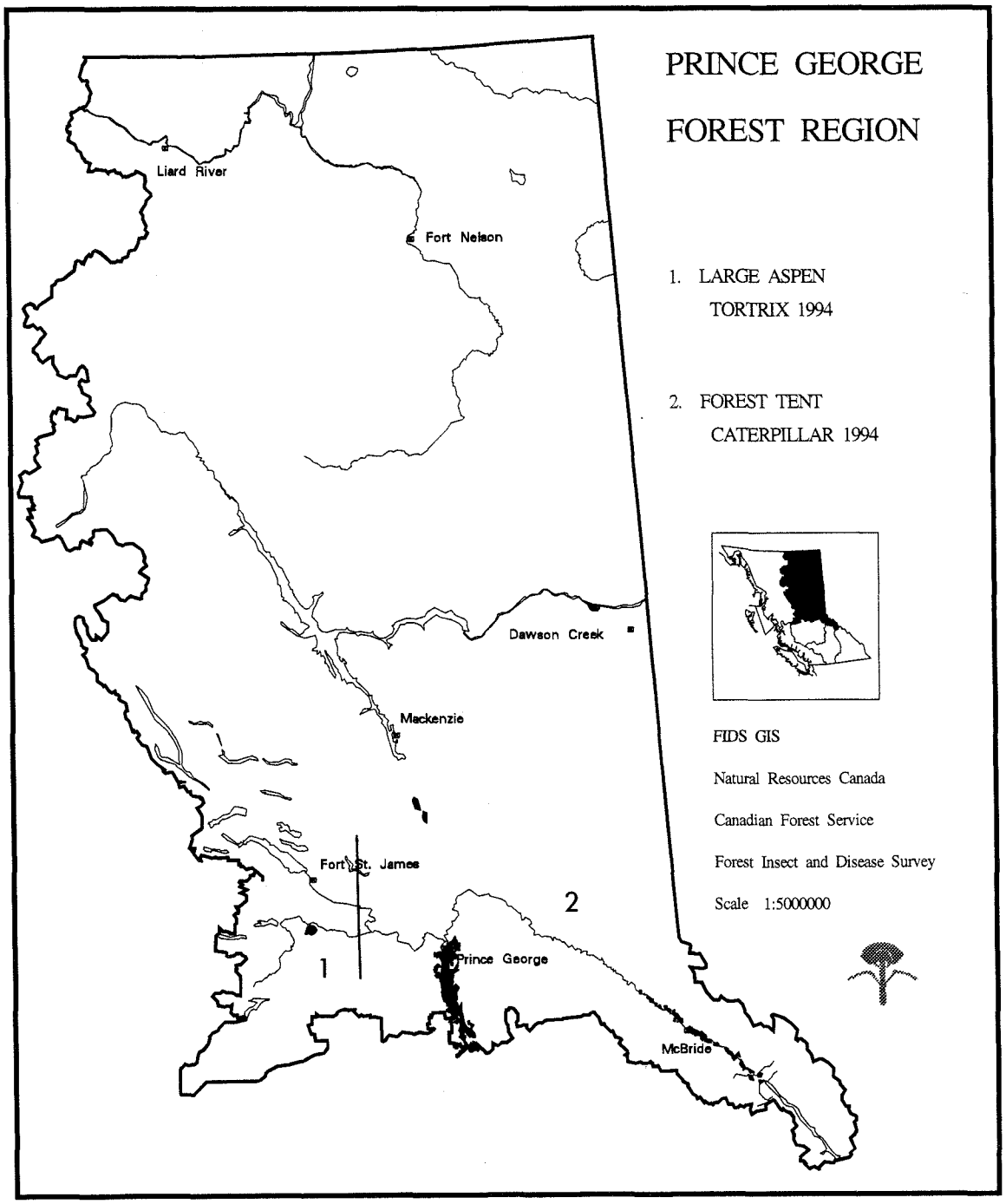

Figure 12. Areas where current defoliation of deciduous trees by forest tent caterpillar and large aspen tortix was detected during aerial surveys in 1994.

Table 9. TSA, location, dbh, number of new and old egg masses of forest tent caterpillar, and predicted 1995 defoliation, Prince George Forest Region, 1994.

TSA and location	Avg. dbh (cm)	Avg. no. egg masses/tree		Predicted defoliation 1994	Ratio of new to old egg masses	Population status
		new	old			
PRINCE GEORGE						
Strathnaver	11	10	16	severe	1:2	decreasing
Trapping Lk.	10	17	12	severe	1:1	static
Stone Cr.	11	8	9	moderate	1:1	static
Red Rock	10	8	5	moderate	2:1	increasing
Crysdale	9	64	35	severe	2:1	increasing
Average	**10**	**21**	**15**	**severe**	**2:1**	**increasing**
DAWSON CREEK						
Taylor	11	6	23	moderate	1:4	decreasing
McBRIDE						
Dunster	10	14	5	severe	3:1	increasing
Tete Jaune	10	15	5	severe	3:1	increasing
Valemount	10	12	6	severe	2:1	increasing
Croydon	10	6	4	moderate	1:1	static
Holmes River	10	5	6	light	1:1	static
Average	**10**	**11**	**5**	**severe**	**2:1**	**increasing**

Large aspen tortrix
Choristoneura conflictana

Large aspen tortrix defoliated trembling aspen over several thousand hectares, approximately the same area and in the same locations as 1993 (Figure 12).

For the second consecutive year the tortrix defoliated mostly mature aspen trees in the Nechako River Valley. Completely defoliated trees in scattered patches of 5-500 hectares were noted from just west of Vanderhoof to Fort Fraser. The scattered pattern of infestations is caused by intermixing of farmland and coniferous forests with aspen stands. The leaves webbed together with silken threads by the larvae, were very noticeable along the highway during June. Defoliation of the understory aspen and herbaceous plants was common throughout the area of infestation. Due to the high populations and lack of host material, webbing and feeding of current growth was also noted on white spruce. Conifers are not considered the usual host for the tortrix.

Feeding on plant species other than aspen was noted at several locations indicating that the populations will probably starve themselves in these areas. The large aspen tortrix needs nutrients that can only be provided by aspen; depletion of the aspen food supply is often cited as a main cause of population collapse.

The feeding may cause reduced tree vigor and growth, occasionally killing the tree top and upper branches. The last infestation in this area, 1980, covered almost 40 000 ha and extended north past Fort St. James. Infestations usually last from 2-3 years and often precede forest tent caterpillar outbreaks. Control is usually unnecessary because many natural biological agents combine to help keep populations in check. Tree mortality rarely occurs directly from larval feeding because aspen trees usually refoliate within 4-6 weeks after feeding is complete. FIDS will continue to monitor this pest in 1995.

Gypsy moth
Lymantria dispar

No adult male gypsy moths were caught in 42 pheromone-baited traps placed by FIDS throughout the Prince George Forest Region as part of a continuing interagency monitoring program. The traps were placed at provincial parks, highway rest areas, and private campgrounds. A program of trapping and egg mass surveys is carried out by CFS and the B.C. Forest Service in co-operation with Agriculture Canada to detect the establishment of this potentially serious pest.

Satin moth
Leucoma salicis

For the first time satin moth has been detected in the Prince George Forest Region. Large moth flights were noted in the Robson Valley from Valemount to McBride in late July.

The large silvery white moths were collected at several locations in the McBride-Valemount area. Egg masses were also collected in aspen stands from Swift Mountain just east of Valemount. The previous most northerly infestation of the satin moth was Avola in the Wells Gray Park area. The major hosts of the satin moth are exotic poplars. Native hosts include trembling aspen, cottonwood and occasionally it is found on willow, oak, and crabapple.

It is possible that some of the aspen defoliation by forest tent caterpillar in the Robson Valley, could be attributed to the satin moth. However, assessments in the area during June found no evidence of satin moth larvae within the infestation. This indicates that populations have only recently reached detectable levels.

Elsewhere, aspen, cottonwood and willow were defoliated in parts of the Nelson region, some for the third consecutive year. Tree mortality has reached 45% in previously defoliated stands near Golden.

The satin moth is native to Europe and Asia and was accidentally introduced to North America in the early 1900's. The first confirmed sightings were in southwestern British Columbia and New England in 1920. Since then the moth has spread throughout most of southern British Columbia.

Poplar-and-willow Borer
Cryptorhynchus lapathi

Populations of the poplar-and-willow borer increased for the fourth consecutive year in the Prince George Forest Region. Willow mortality was noted throughout the Prince George Forest Region as far north as Mackenzie. This is the most northerly record of the weevil in British Columbia. Dead, dying, and partially killed willow were seen in forest stands, roadside stands, and on private property from June to September. The weevil populations are at their highest levels ever recorded in the Prince George Forest Region.

The stems of the willow become honeycombed with larval tunnels causing "breakover." Most plants are not killed outright. Rather multi-stemmed willow clumps result as old stems are killed and new ones sprout. Though most damage is done by the larvae, adults also feed on young, succulent bark of shoots, branches, and the main stem.

This weevil was introduced to North America from Europe in the late 1800 s. It was previously thought that the borer occurred primarily south of 52° north latitude but recently populations have become established as far north as 56°.

Other Noteworthy Pests

Table 10. Other noteworthy and minor pests

Host and pest	Location	Remarks
White spruce		
A bark beetle *Dryocoetes affaber*	Ant Lake, Averil Lake	found in blowdown and trap trees
A coneworm *Hylemya anthracina*	Vama Vama Creek	infesting cones
Cooley spruce gall adelgid *Adelges cooleyi*	Prince George Forest Region	common and widespread
Fir coneworm *Dioryctria abietiverella*	Vama Vama Creek	infesting cones
Spruce needle rust ledi var. ledi	Holman Creek	scattered and Chrysomyxa occasional
Lodgepole Pine		
Atropellis canker *Atropellis piniphila*	Willow River	found at ARNEWS plot
Lophodermella needle cast *Lophodermella sp.*	Beaumont Provincial Park	50% of the foliage on 5% of the lP over 5 ha
Monterey pine ips *Ips mexicanus*	Nechako River	found in dead standing trees
Pine needle sheathminer *Zelleria haimbachi*	Red Rock	occasional and scattered
Alpine fir		
Frost damage	Purden Lake	scattered and occasional
Elm		
Elm leafminer *Agromyza aristata*	Prince George	light damage

Table 10. (Cont'd)

Host and pest	Location	Remarks
Trembling Aspen		
A flatheaded borer *Agrilus* sp.	Taylor	found with forest tent caterpillar defoliation
Armillaria root rot *Armillaria sinapina*	One Island Lake	near bio-monitoring plot
Aspen webworm *Tetralophia apostella*	Prince George, Vanderhoof	An early fall solitary defoliator. Found in forest tent caterpillar damaged stands
Hypoxylon canker *Hypoxylon novemexicanum*	Dawson Creek	found in 50 year old stand
Phellinus root rot *Phellinus tremulae*	One Island Lake	near bio-monitoring plot
Poplar canker *Valsa sordida*	Fort Nelson, One Island Lake	common in the stand
Willow		
Fir-willow rust *Melampsora abieti-capraearum*	Fort St. James	common throughout this area
Pacific willow leaf beetle *Pyrrhalta decora carbo*	Pouce coupe to Liard River area	declined from patchy light defoliation

Appendix I

PEST IMPACT CODES

-based on the sum of %trees/severity index/stand.
-SI=Severity Index i. e. SI 1 = Severity Index 1

Impact I - No Action Required

- No impact, pest-free
- These are stands where 100% of the trees were pest-free i.e. SI 1.

Impact II - Consider Reassessment in 4 years

- Minor damage, occasional significant volume losses.
- 70%>SI3
- 25%>SI4>0
- 3%>(SI5 or SI6 or SI5+SI6)>0

Impact III - Consider Reassessment in 4 years

- Significant current volume loss and potential long-term; reassess within 2 years.
- SI3 >= 70%
- 5%> (SI5 or SI6 or SI5 + SI6) >=3%
- 50%> (SI4 or SI4+SI5 or SI4+SI6 or SI4+SI5+SI6) >=25%

Impact IV - Consider conducting a more intensive survey

- Significant long-term volume losses, possibly resulting in NSR stands. Immediate action.
- 5%>SI5 or SI6 or SI5+SI6
- 50%> (SI4 or SI4+SI5 or SI4+SI6 or SI4+SI5+SI6)

Appendix II

The following related reports are available on request from FIDS.

I. Forest Health Surveys of the McGregor Model Forest, 1994.
   - i) Pests of Young Stands
   - ii) Pest surveys of the Petawawa Treatment Trials
   - iii) Forest Health Surveys of McGregor Bio-monitoring Plot

II. Spruce Weevil Population Monitoring Plots, Prince George Forest Region, 1994.

III. Proposal for Spruce Beetle Hazard Rating System in the McGregor Model Forest, 1994.

IV. Pest Surveys of the Joint Canada-Sweden lodgepole pine trials, 1994.

Detailed copies of aerial survey maps, pest reports., leaflets, monographs and other maps and reports in addition to those listed above are available from the Pacific Forestry Centre upon request.

Appendix III