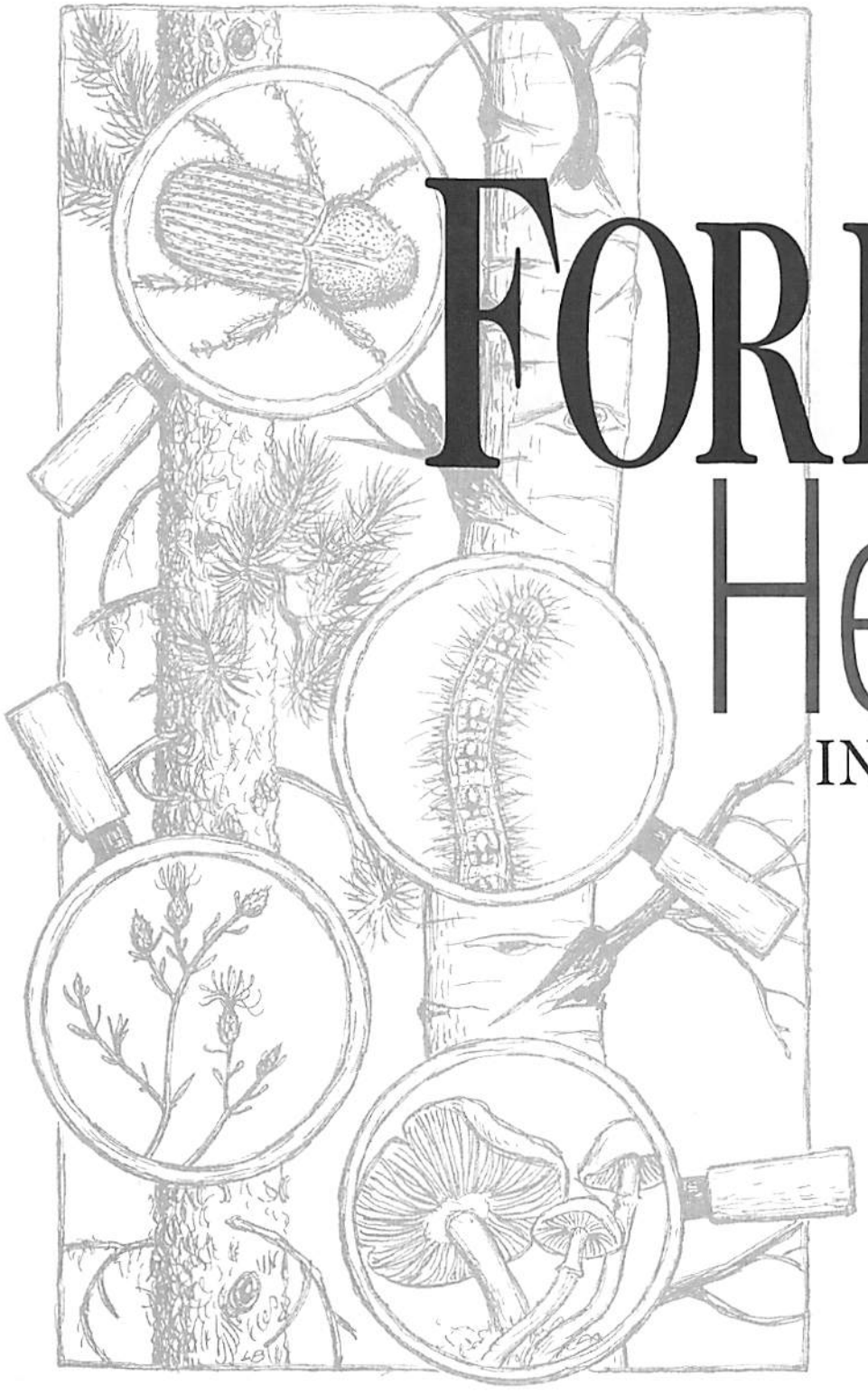
1997 ANNUAL REPORT



FOREST Health IN ALBERTA

1997
ANNUAL
REPORT

FOREST Health IN ALBERTA

S. K. Ranasinghe, M. Maximchuk,
C. Kominek, and R. Stronach

Department of Environmental Protection
Land and Forest Service
Forest Protection Division
Forest Health Branch

Alberta
ENVIRONMENTAL PROTECTION

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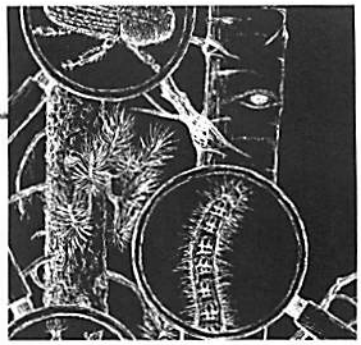


DIRECTOR'S Message

Management of our natural resources has changed recently due, in part, to the continuous reduction of federal and provincial budgets, and an increasing awareness of insect and disease impacts on sustainability. The ability of natural resource managers to respond to epidemics and manage risk is critically dependent on the timely availability of information.

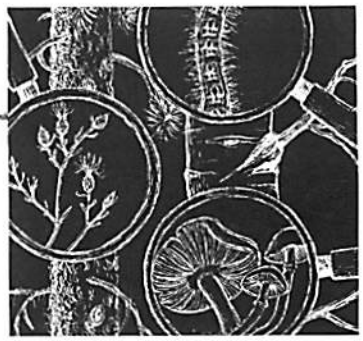
This, the first edition of "Forest Health in Alberta", is designed to fill the void left by the Forest Insects and Disease Survey that was lost through the restructuring of the Canadian Forest Service. It will also provide information on forest health programs and initiatives of the Forest Health Branch of Land and Forest Service.

As with most organizations, the Forest Health Branch of Land and Forest Service has been downsized and reorganized. The operational aspects of Forest Health have been transferred to the regions. This should improve communications and efficiency at the region and district level. The Forest Health Branch in Edmonton will continue to provide scientific expertise and coordinate Forest Health programs and issues at the provincial level. The Branch will continue to foster close working relationships with industry, the University of Alberta Entomology Program, the Alberta Research Council, and the Canadian Forest Service, and will continue to represent Alberta at the national level.

I would like to acknowledge the efforts of the Forest Health group, Sunil Ranasinghe, Mike Maximchuk, Christine Kominek, and Rob Stronach in producing the Annual Report on Forest Health in Alberta in 1997. Not only have they done an excellent job in producing the report, but they did so on their own initiative. This initiative will provide an opportunity to get information out to resource managers and others in a timely manner.

Kelly O'Shea

Director, Forest Protection



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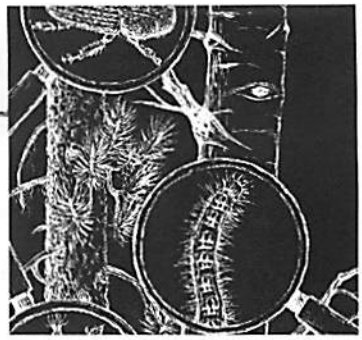


FOREWORD

Forest pests are a major source of natural disturbances in forest ecosystems. During 1988-1992, forest pest-caused losses in Alberta were estimated to be 7.273 million cubic metres; an amount equal to nearly 60% of the timber harvested in the province during this period. Thus, forest health concerns are an important component of sustainable forest management.

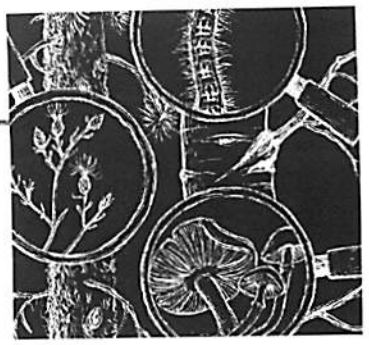
The Forest Health Branch (previously Forest Insect and Disease Management Branch) was created within the Forest Protection Division in 1987 with a mandate to address forest insect and disease concerns within the province. This Branch has been involved in monitoring forest pests, carrying out forest pest surveys in collaboration with the Forest Insect and Disease Survey (FIDS) of Northern Forestry Centre, Canadian Forest Service, Natural Resources Canada, and managing major forest pest outbreaks in Alberta. In 1997, the Branch mandate was extended to include managing noxious and restricted forest weeds in the forest management area of the province, as well.

Until 1995, FIDS reported summaries of forest insect and disease conditions within the Northwest Region including Alberta. Unfortunately, these reports ceased to be published with the disbandment of FIDS in 1995. However, it is imperative that resource managers and the general public be aware of pest detection and monitoring, pest survey records, and pest management programs carried out within the province. The purpose of this report is to fulfill that need.

This is the first annual report on forest health in Alberta published by the Forest Health Branch. The main objective of this report is to keep the resource managers and the general public informed about current forest health related issues in the province. This report contains details

about current forest pest conditions and predictions on future pest infestations, results of forest pest monitoring and surveys, and forest pest management programs carried out within the province. In addition, details of field trials and other programs carried out during the year are also reported. The current issue deals with forest insects, diseases and other damaging agents. Details on forest weeds will be included as they become available in the future.

NOTE: The mention of certain manufactured products does not necessarily imply endorsements, nor does the exclusion of other products necessarily imply their disapproval by Alberta Environmental Protection.



ACKNOWLEDGEMENTS

Most of the information presented in this report has been collected under the direction of the Forest Health Officers by the Forest Protection Technicians (FPT) in the LFS Districts working with summer field crews. The following Forest Health Technicians from the Northern Forestry Centre, Canadian Forest Service also contributed to aerial surveys: Roger Brett, Howard Gates and Jim Weber. High Level Forest Products and Millar Western Industries helped with spruce budworm surveys in 1997. Information on satin moth was provided by Chris Saunders of the City of Edmonton. Janet Feddes-Calpas of Alberta Agriculture, Food and Rural Development provided data on Dutch elm disease. Lorna Bennett and Karen Plante of Creative and Print Production Services, Alberta Environmental Protection produced the report, with Lorna providing the artwork for the cover and Karen providing the design and layout.

SUMMARY

During 1997, spruce budworm defoliation in the province was at its lowest level in 10 years. No budworm defoliation was seen in most of the areas sprayed to date. There was some increase in budworm defoliation in unsprayed areas. The budworm defoliation in the Wood Buffalo National Park increased substantially during 1997. Budworm moth surveys with pheromone-baited traps showed that in areas with no current defoliation 77% of the plots scattered across the province have no risk of an outbreak, 20% of the plots have a moderate risk and 3% of the plots have a high risk of an outbreak in 1998. The results of the second instar budworm surveys, carried out in areas with current defoliation and vicinities, predict drastic reduction in budworm defoliation in 1998 in areas sprayed in 1997. However, most of the unsprayed areas are expected to have moderate to severe budworm defoliation in 1998.

No mountain pine beetle-killed trees were observed during the annual aerial survey in southwestern Alberta. A ground survey with pheromone-baited trees showed relatively high beetle activity in the Foothills District of the Northern East Slopes Region. Beetle activity was low in the Southern East Slopes Region.

During 1997, no new spruce beetle infestations were detected. A ground survey using pheromone-baited beetle traps showed endemic level populations in the Mackenzie District.

Larch sawfly defoliated large tracts of larch in the Upper Hay District.

Among the aspen defoliators, forest tent caterpillar defoliation in 1997 was significantly lower than in 1996. However, aspen leaf roller defoliation increased in the Northwest Boreal Region. There was no large aspen tortrix defoliation in the province in 1997. Satin moth infestations are still localized around Edmonton. The sprearmarked black moth, an

occasional pest, defoliated white birch stands in the Upper Hay District. No gypsy moths were detected during a provincewide ground surveillance programs with pheromone-baited traps.

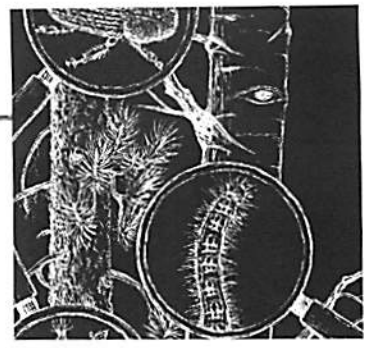
In 1997, spruce needle rust, leaf spot diseases and twig blights were widespread in northern Alberta. Dutch elm disease has not been detected in the province although one of its vectors has been repeatedly trapped in urban areas of Alberta.

A biological insecticide, Thuricide 48LV®, was aerially sprayed over 20068 ha of budworm-infested forest stands in the Upper Hay District. This spraying effectively controlled the infestation. Another insecticide, Mimic 240LV®, was field-tested and found to be effective in controlling spruce budworm infestations in Alberta.

Forest tent caterpillar sex pheromone and three types of pheromone traps were field-tested on their use in tent caterpillar ground surveys. At low population levels experienced during 1997, Delta® traps baited with the sex pheromone were effective in monitoring tent caterpillar moth populations.

Integrated Pest Management (IPM) groups were set up in three corporate regions during 1997.

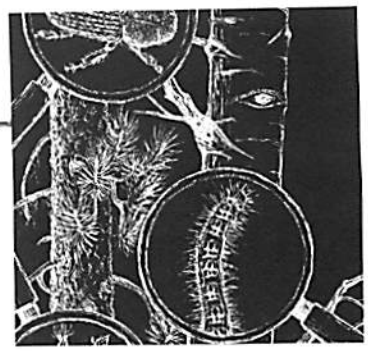
The Forest Health Branch produced three videos and two posters on forest pests. It is in the process of updating the websites. This Branch continued to provide training on forest health-related matters.



INTRODUCTION

The Forest Health Branch of the Land and Forest Service is responsible for forest health concerns within the Green Area of the province. The operational forest health programs, including carrying out annual forest health surveys and managing forest pests, are carried out by the four corporate regions.

This report summarizes the forest pest conditions in Alberta in 1997 and predictions for 1998. The details of the operational pest management programs and field trials are also given. In addition, other programs geared towards increasing awareness through training, and production of audio-visual material are also discussed.



PEST CONDITIONS and Predictions for 1998

SPRUCE BUDWORM

Choristoneura fumiferana (Clemens)

This is the most serious defoliator of spruce/fir forests in the province. The current outbreak of this cyclical pest was detected in 1987 along the Peace River near Eaglesham in the Wapiti River District, Northwest Boreal Region. In 1995, the extent of budworm defoliation within the forest management area in Alberta reached its peak at 203 011 ha.

In the Northwest Boreal Region, budworm outbreaks have been recorded in the recent past near Hawk Hills and Dunvegan in the Mackenzie District, and along Chinchaga River, Sousa Creek, Negus Creek, Hay River, Amber River, Steen River, Yates Creek, Meander River, James Creek, Shekelie River, Dizzy Creek, and Jackpot Creek, and in the John D'or Prairie in the Upper Hay District. In addition, budworm-defoliated stands have been found in the Paddle Prairie Metis Settlement.

In the Northeast Boreal Region, budworm outbreaks have been recorded along the Athabasca and Algar rivers in the Waterways District, and along the Athabasca and House rivers in the Athabasca District.

Aerial Surveys in 1997

Following aerial surveys carried out in 1997 in the Northwest Boreal Region, the extent of budworm defoliation was estimated at 33 146 ha, the lowest level in 10 years. This was a 64% reduction in budworm-defoliated area, compared to that observed in 1996. No defoliation was seen in most of the areas sprayed to date.

Within the Upper Hay District, 23 586 ha were severely defoliated and 1020 ha were moderately defoliated. Most of the areas sprayed in 1996, including those north of the Paddle Prairie Metis Settlement, west of Zama Lake along the Hay River, southwest of the Meander River along the Hay River, north of the Adair Fire Lookout, and around the Amber Fire Lookout, had no visible defoliation in 1997. Most of the stands sprayed between 1992 and 1995 also had no budworm defoliation in 1997. A significant area along the West Sousa Creek had severe defoliation in spite of being sprayed in 1991 and in 1995 (Fig. 1).

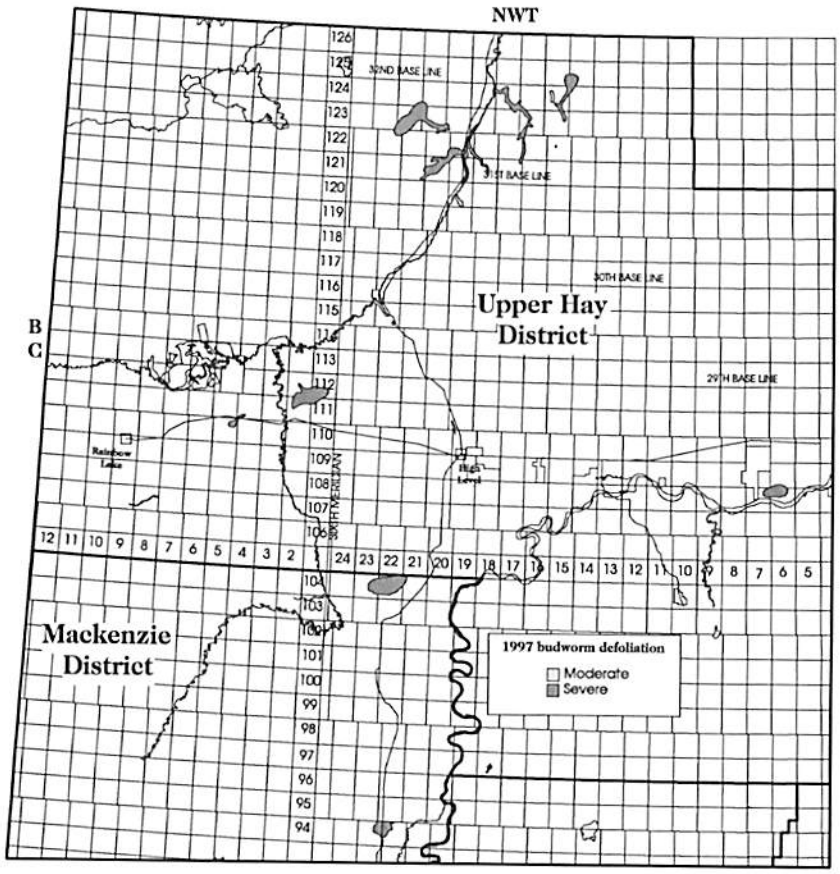


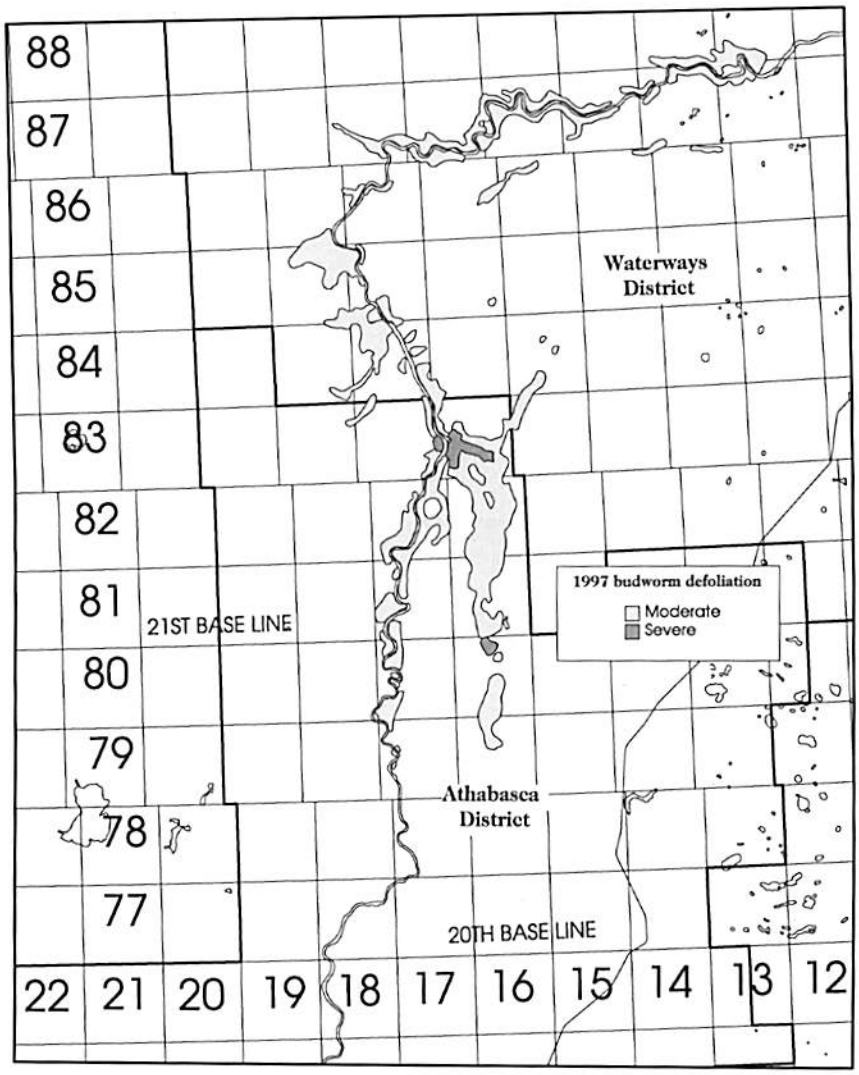
Figure 1 *Spruce budworm-defoliated areas in the Northwest Boreal Region in Alberta, 1997.*

Unsprayed areas northwest of High Level, along the Shekelie and Steen rivers, had reduced levels of budworm defoliation. John D'or Prairie was the only area where defoliation increased compared to that in 1996; here 2037 ha were severely defoliated compared to 771 ha moderately defoliated in 1996. The defoliated area along the James and Perry creeks increased slightly although the defoliated area along the Yates River remained approximately the same as it was in 1996. The defoliated areas along the Dizzy and Little Rapids creeks were noticeably reduced in 1997 (Fig. 1).

Budworm defoliation within the Mackenzie District was 8540 ha, approximately the same as it was in 1996. This defoliation was found along Highway 35 near Hawk Hills, north of the Peace River by the Dunvegan Historical Park, and in the Paddle Prairie Metis Settlement. All these areas were severely defoliated. In the Metis Settlement, however, stands sprayed in 1996 were not defoliated in 1997 (Fig. 1).

In the Northeast Boreal Region, budworm defoliation was observed along the Athabasca and House rivers. The extent of this defoliation, excluding the area north of Fort Chipewyan, was estimated at 16 910 ha (Fig. 2).

The extent of spruce budworm outbreak in the Wood Buffalo National Park increased considerably compared to that in 1996. Most of the defoliation occurred along the Peace River west of Peace/Athabasca River confluence. This outbreak was estimated at 134 707 ha. (Fig. 3). The spruce budworm outbreak in Cypress Hills Provincial Park was determined to be light and therefore was not surveyed in 1997.



Aerial surveys were conducted through the cooperative efforts of CFS and LFS.

Figure 2 *Spruce budworm-defoliated areas in the southern section of the Northeast Boreal Region in Alberta, 1997.*

Aerial surveys were conducted through the cooperative efforts of CFS and LFS.

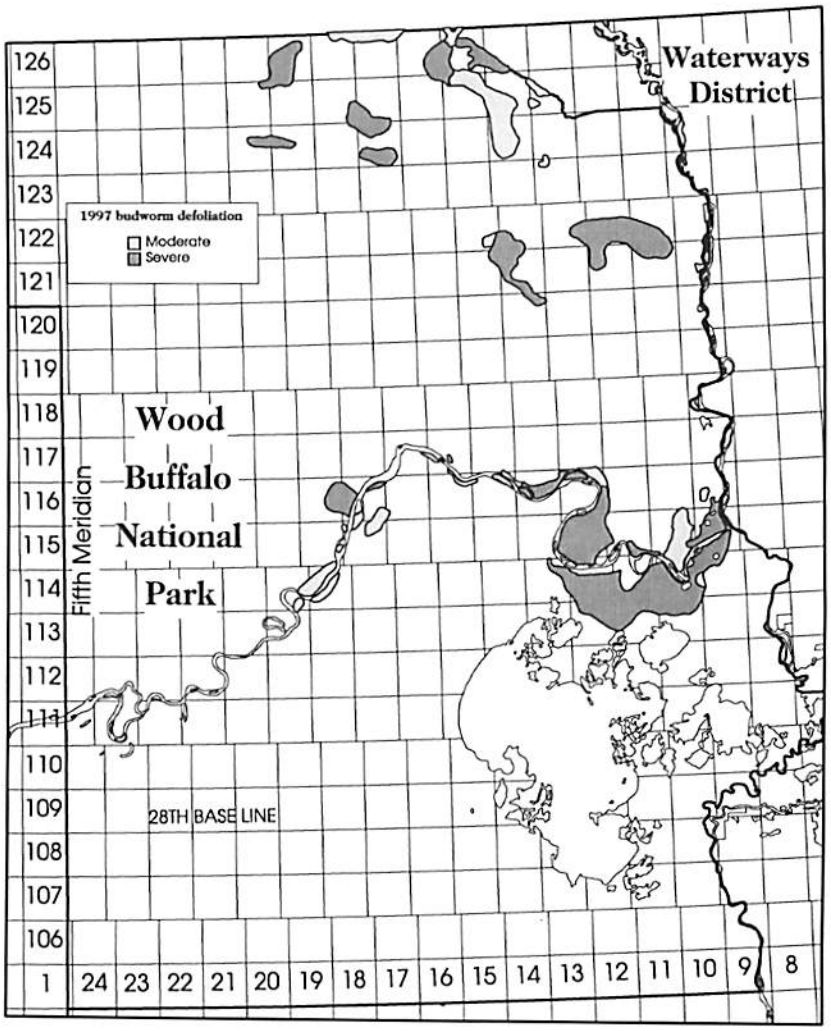


Figure 3 *Spruce budworm-defoliated areas in the northern section of the Northeast Boreal Region and Wood Buffalo National Park in Alberta, 1997.*

Moth Surveys with Pheromone Traps

In 1997, spruce budworm male moth populations were surveyed provincewide. The objective of this survey was to predict any impending budworm outbreaks in high-risk forest stands. Multi-Pher I® traps (le Groupe Biocontrole, Ste-Foy, Quebec) baited with the female sex pheromone, Biolure® (Consep Membranes Inc., Bend, Oregon), were used to trap male budworm moths. The trapping procedure is described in the "Spruce Budworm Sampling Manual" (Kominek and Ranasinghe 1996).

Altogether, 129 survey plots were established across the province (Fig. 4). In three plots, the average moth catch per trap exceeded 2000 moths. These three sites are expected to have a high risk of an outbreak in 1998. Two of these plots were located in the Mackenzie District (Near Hawk Hills and at Dunvegan); the other plot was located in the Athabasca District.

In 25 other survey plots, the average moth catch per trap varied between 500–2000 moths. These sites are expected to have moderate risk of an outbreak in 1998. Twenty-two of these plots were in the Upper Hay District with most occurring in the Steen River and Indian Cabin areas. Two other plots were in the Waterways District and another was in the Athabasca District.

The remaining 96 plots were located across the province, including the Northern East Slopes and Southern East Slopes regions. These plots had average catches below 500 moths per trap resulting in the expectation that the risk of an outbreak occurring in 1998 would be low. One plot in the Southern East Slopes Region had no moth catch, indicating no risk of an outbreak 1998. In four other plots, the traps were either missing or damaged by bears.

Two of the three high risk pheromone trap plots were followed up with second instar (L2) larval surveys. The L2 counts confirmed the prediction for high risk of an outbreak, i.e., severe defoliation, in one plot

in the Northwest Boreal Region, but predicted only moderate risk of an outbreak, i.e., defoliation in the plot in the Northeast Boreal Region. Twenty-two out of the 25 sites where moderate risk of an outbreak was predicted for 1998, were followed up with L2 surveys. The L2 counts confirmed that moderate defoliation would occur at 7 of these sites in 1998; however, defoliation is expected to be severe at 10 sites and light at the remaining 5 sites.

Figure 4 *Spruce budworm moth catches in pheromone-baited traps in Alberta, 1997.*

Second Instar (L2) Larval Surveys

Second instar (L2) larval surveys were carried out in areas that were defoliated by spruce budworm during the 1997 outbreak and in the vicinity of these areas, to predict the level of defoliation expected in 1998.

In the Northwest Boreal Region, 169 plots were established. In this region, the results of the L2 survey predict a drastic reduction in the area expected to be defoliated by spruce budworm in 1998. In the Upper Hay District, almost all stands sprayed in 1997 are expected to have either nil or light defoliation in 1998. However, moderate to severe defoliation is expected in 1998 in previously sprayed areas along the Chinchaga River, Sousa Creek and in the John D'or Prairie. The unsprayed areas in the northeast portion of this district, mainly located in the Steen River and Indian Cabin areas, will continue to have severe defoliation in 1998 (Fig. 5).

In the Mackenzie District, the results of the L2 survey predict severe defoliation in 1998 in the currently defoliated areas near Hawk Hills. In the Paddle Prairie Metis Settlement, the unsprayed areas are expected to be moderately to severely defoliated in 1998.

In the Northeast Boreal Region, the results of the L2 survey predict either nil or light defoliation in 1998 in most of the currently defoliated stands. In the Athabasca District, a few stands near Stoney Rapids along the Athabasca River, and south of Indian Cemetery along the House River will have moderate defoliation in 1998. Light defoliation is expected in 1998 in the other stands currently defoliated. In the Waterways District, severe defoliation is expected in an area east of Indian Cemetery along a tributary of House River, near Grande Fire Lookout, and close to where the Algar and Athabasca rivers meet. Light to moderate defoliation is expected in an area close to Horse River and north of Grande Fire Lookout (Fig. 6).

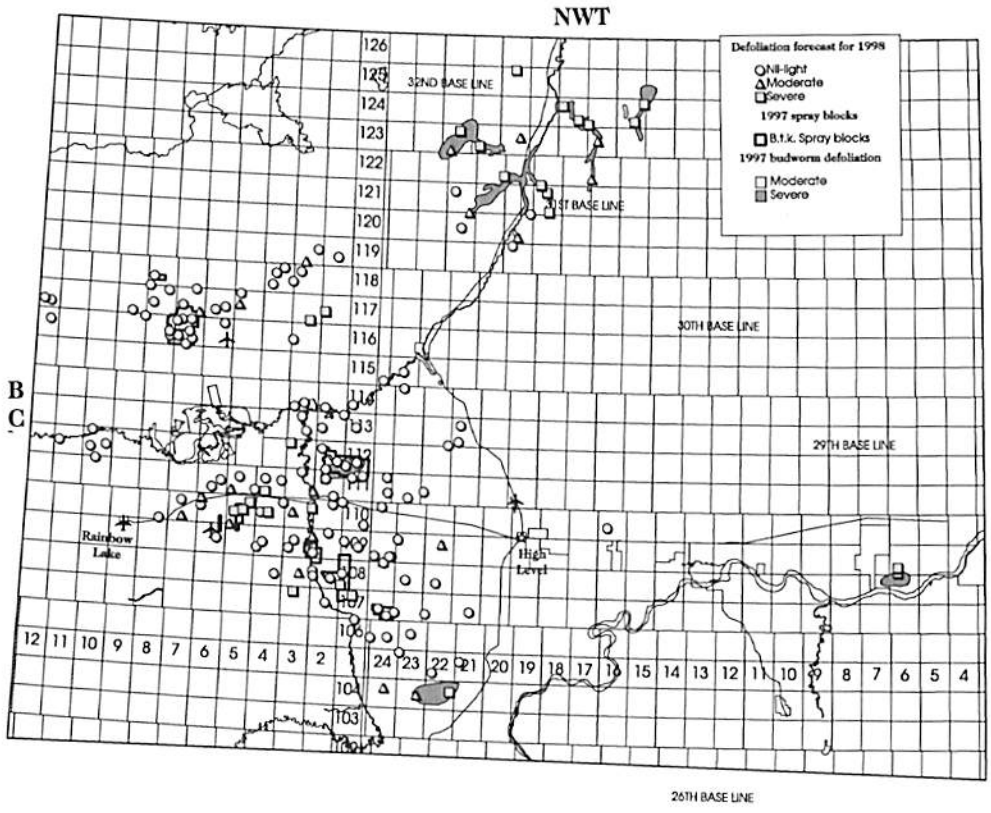
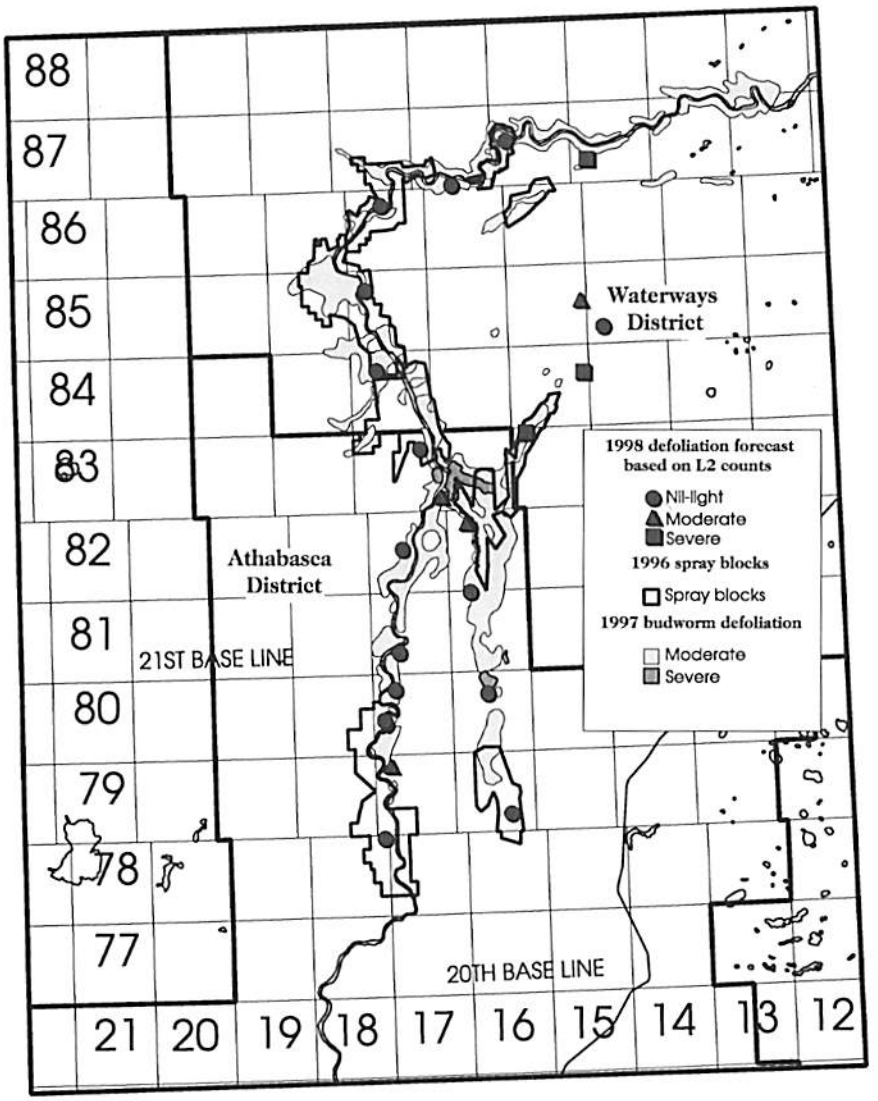


Figure 5 *Spruce budworm defoliation forecast for 1998 based on second instar (L2) larval counts, Northwest Boreal Region, Alberta.*



Aerial surveys were conducted through the cooperative efforts of CFS and LFS.

Figure 6 *Spruce budworm defoliation forecast for 1998 based on second instar (L2) larval counts, Northeast Boreal Region, Alberta.*

MOUNTAIN PINE BEETLE

Dendroctonus ponderosae Hopkins

Aerial Surveys

No mountain pine beetle-killed trees were observed during an aerial survey carried out in August jointly by the Land and Forest Service (LFS), Canadian Forest Service (CFS) and Parks Canada. The area surveyed included mainly the river valleys in the foothills bordering BC in southwestern Alberta.

Beetle Surveys with Pheromone Baits

In southwestern Alberta, high–risk, lodgepole pine (*Pinus contorta* Dougl. var. *latifolia* Engelm.) stands were monitored for mountain pine beetle activity. A two-component mountain pine beetle aggregation pheromone (Phero Tech Inc., BC) tree bait was used. The procedure for deploying these pheromone baits is described in "Mountain Pine Beetle Pheromone Sampling Manual 1997" (Kominek and Ono 1997).

In the Northern East Slopes Region, 20 plots with pheromone-baited trees were established (Fig 7). In the Foothills District, 10 out of 17 plots had trees with beetle hits. High numbers of beetle hits per tree were recorded at Jackpine River/Spider Creek (7 to 60 hits), Upper Sheep Creek (2 to 35 hits), Morkill Pass (4 to 22 hits), and Beaverdam Pass (0 to 17 hits). These numbers indicate relatively high beetle activity in this area. This is of concern because there is no mountain pine beetle activity reported in the corresponding area across the border in BC.

In the Southern East Slopes Region, 36 plots with pheromone-baited trees were established (Fig. 7). In the Crowsnest District, 3 out of 20 plots had beetle attacks ranging from 1 to 6 hits per tree. These three

plots with beetle hits were located at Smoky River-Rockslide Creek, Tent Mountain Walk and Tent Mountain Drive.

In the Bow District, 1 out of 10 plots had a tree with a single beetle hit. This plot was located at AB/BC Boundary. None of the six plots established in the Clearwater District had any beetle hits. The risk of a mountain pine beetle infestation in 1998 in this region appears to be remote. All the trees with pine beetle hits will either be debarked or cut and burned before the spring of 1998.

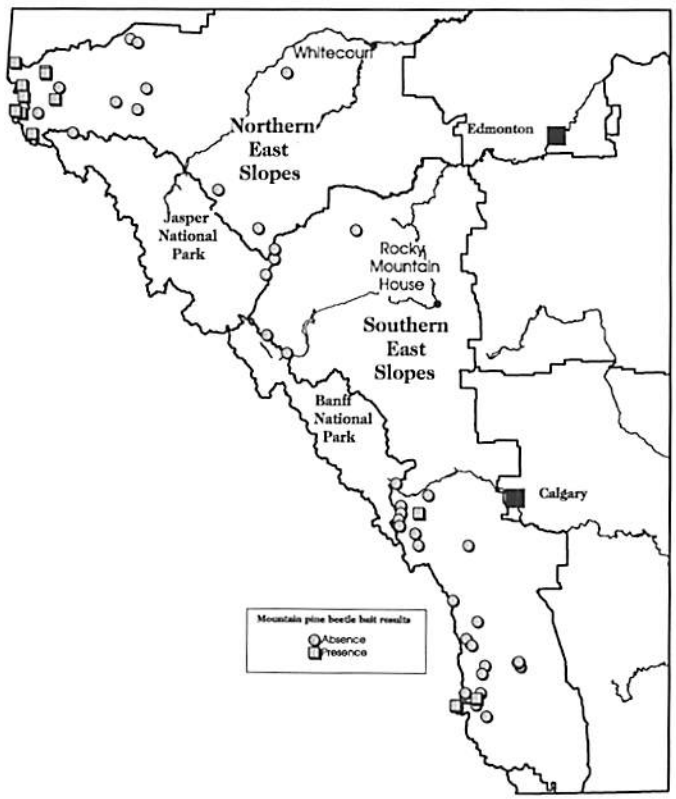


Figure 7 *Mountain pine beetle hits in plots with pheromone-baited trees in Alberta, 1997.*

SPRUCE BEETLE

Dendroctonus rufipennis [Kirby]

Aerial Surveys

No new spruce beetle infestations were detected during the aerial surveys carried out in 1997 within the forested area monitored by LFS.

Use of Pheromones to Monitor Beetles

In the Mackenzie District, Northwest Boreal Region, traps baited with spruce beetle pheromones were used to monitor spruce beetle populations in six, high risk spruce stands (Fig. 8). At each monitoring site, two Lindgren funnel traps baited with three component pheromone lures (Phero Tech Inc., BC) were set up in mid-May, before the peak flight period.

At the end of the trapping period in late July, trap catches were used to calculate a beetle index, i.e., number of beetles per trapping day (Herb Cerezke, personal communications). The beetle index varied from 0–0.31 indicating endemic level beetle populations in these spruce stands. It is worth noting that traps at all six monitoring sites had substantial catches of predatory checker beetles.

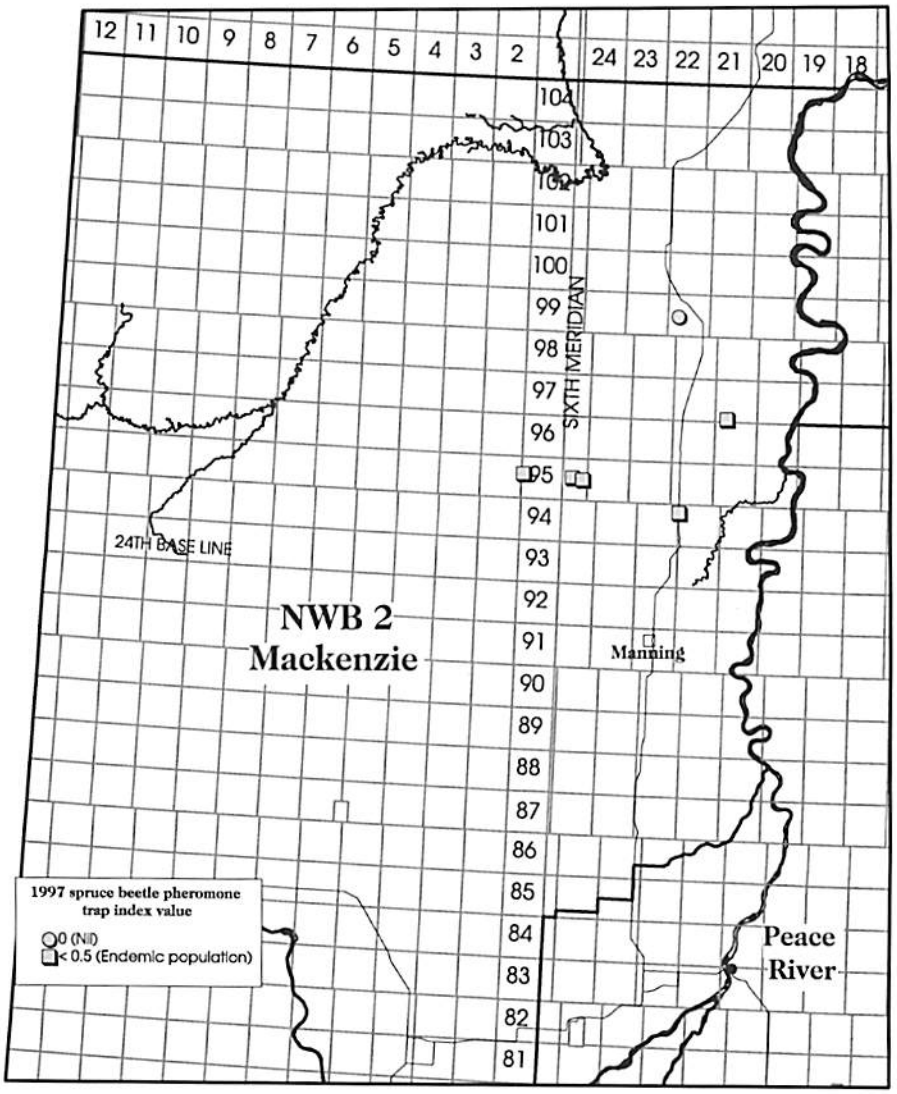


Figure 8 *Spruce beetle pheromone trap locations and results, Northwest Boreal Region in Alberta, 1997.*

LARCH SAWFLY

Pristiphora erichsonii [Hartig]

Larch sawfly defoliated large tracts of tamarack (*Larix laricina* [Du Roi] K. Koch) in the Upper Hay District, Northwest Boreal Region. This defoliation was observed in an area extending from south of the Steen River to the Northwest Territories, and from the Wood Buffalo National Park to Cameron Hills.

FOREST TENT CATERPILLAR

Malacosoma disstria Hübner

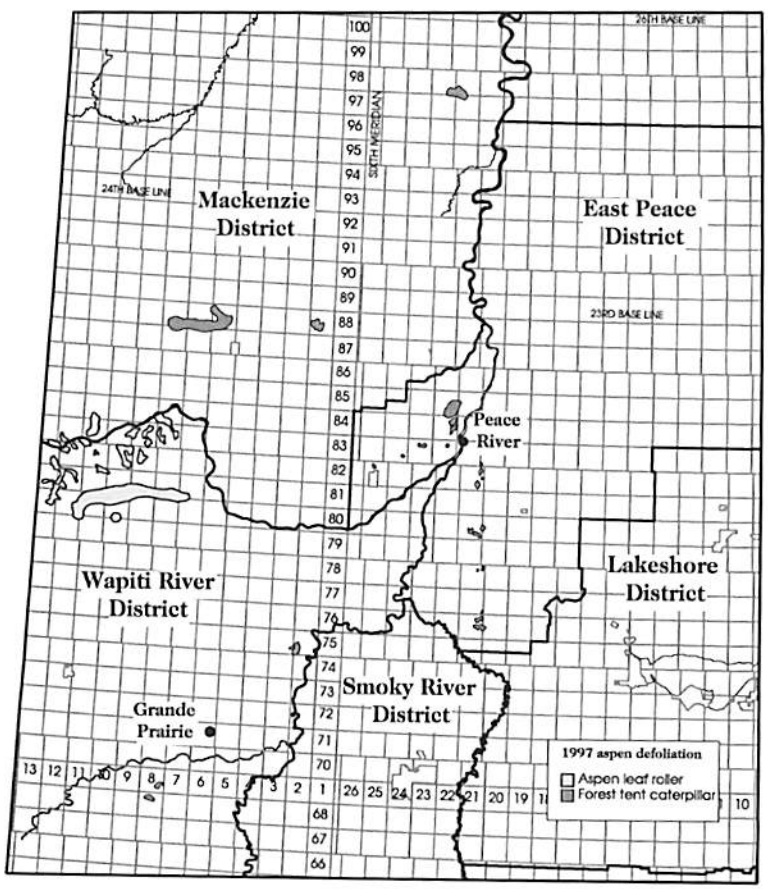
Aerial Surveys

During the summer of 1997, tent caterpillar defoliation within the forested area was aerially surveyed. These surveys were carried out jointly by forest health technicians of CFS and field personnel of LFS.

In the Northwest Boreal Region, defoliation by forest tent caterpillar was observed over an area of 28 518 ha. (Fig. 9). Within this area, 3454 ha had severe defoliation, 1379 ha had moderate-to-severe defoliation, 2969 ha had moderate defoliation, 562 ha had light-to-moderate defoliation, and 20 154 ha had light defoliation.

Aerial surveys in the Northwest Boreal Region showed that forest tent caterpillar defoliation in 1997 was significantly lower than the 91 761 ha defoliation in 1996. This decline, at least in part, may be due to inadvertent recording of aspen leaf roller damage as forest tent caterpillar defoliation in 1996. As well, some aspen defoliation thought to have been caused by forest tent caterpillar in 1997 may actually have been caused by large aspen tortrix.

In the Wapiti River District, forest tent caterpillar defoliation was observed southwest of the town of Gloverdale near Wilson Lake, and east of Highway 733 near Smoky and Bad Heart rivers. In the Mackenzie District, one relatively large area of defoliation was found in Clear Hills north of Worsley; smaller patches of defoliation were found along Whitemud River and north of Nina Lake in Hawk Hills. In the East Peace District, defoliation was observed northwest of the town of Peace River, in Brownvale, Grimshaw, and near Nampa, Jean Cote and Guy (Fig. 9).



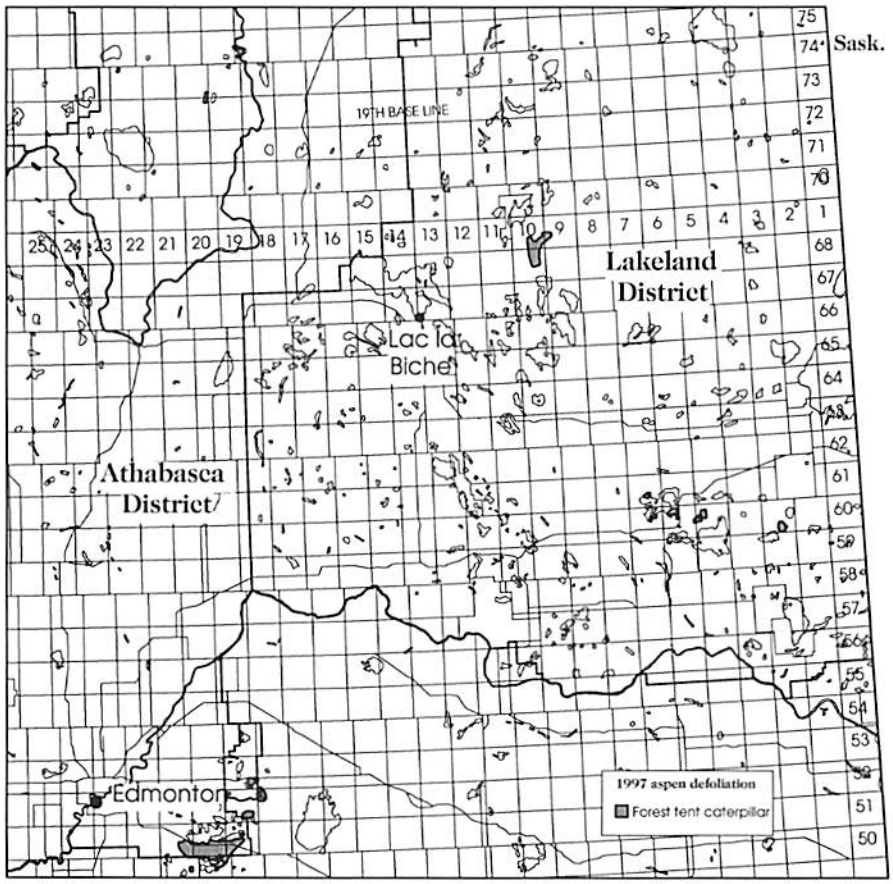
Aerial surveys were conducted through the cooperative efforts of CFS and LFS.

Figure 9 *Forest tent caterpillar and aspen leaf roller defoliation in the Northwest Boreal Region in Alberta, 1997.*

In the Northeast Boreal Region, forest tent caterpillar defoliation was observed over an area of 17 346 ha (Fig.10). Within this area, 447 ha had moderate defoliation, 429 ha had light-to-moderate defoliation, and 16 470 ha had light defoliation. The largest area of defoliation was observed south of Highway 14 near Calling and Hastings lakes, and near Antler Lake in the White Area of the Athabasca District. There were small patches of defoliation along the Athabasca River north of McMillan Lake, near Rock Island Lake, south of the Athabasca River in Smith, near Touchwood Lake, and northeast of Calling Lake in this district. In the Lakeland District, small patches of defoliation were observed in the Lindbergh area.

Predictions for 1998

Predictions on forest tent caterpillar defoliation for 1998 are unavailable because no egg band surveys were carried out in 1997.



Aerial surveys were conducted through the cooperative efforts of CFS and LFS.

Figure 10 *Forest tent caterpillar defoliation in the Northeast Boreal Region in Alberta, 1997.*

ASPEN LEAF ROLLER

Pseudexentera oregonana [Walsingham]

Aspen leaf roller is an occasional pest that defoliates aspen. There was no record of aspen defoliation by this pest in 1996. This may be due to inadvertent reporting of aspen leaf roller defoliation as forest tent caterpillar defoliation in 1996.

During aerial surveys carried out in the Northwest Boreal Region in 1997, an estimated 51 852 ha of aspen leaf roller defoliation was recorded (Fig. 9). Within this area, 2829 ha had light defoliation, 5446 ha had moderate defoliation, 14 144 ha had moderate-to-severe defoliation and 29 433 ha had severe defoliation. Aspen leaf roller defoliation was located mainly in the Wapiti River District east of the BC border along the Peace River, to east of Cleardale and south to Moonshine Lake Provincial Park. Some aspen leaf roller defoliation was observed in the adjoining area west of Clear River near Bear Canyon in the Mackenzie District.

LARGE ASPEN TORTRIX

Choristoneura conflictana [Walker]

No large aspen tortrix defoliation was recorded in 1997. However, this pest was observed during ground surveys in areas west of Hines Creek in the Mackenzie District, Northwest Boreal Region.

SPEARMARKED BLACK MOTH

Rheumaptera hastata [Linnaeus]

Spearmarked black moth is an occasional pest of birch and other broadleaf tree species. It is considered to be a minor pest.

Spearmarked black moth larvae defoliated white birch (*Betula papyrifera* Marsh.) stands in the Upper Hay District, Northwest Boreal Region, in 1997. This damage was observed around Mount Watt and along Zama Ridge near Rainbow Lake. This was the second year of white birch defoliation by this occasional pest. Similar damage was observed near Keg Fire Lookout, and along the Chinchaga River in the Mackenzie District. However, the cause of this damage was not confirmed.

GYPSY MOTH

Lymantria dispar [Linnaeus]

Use of Pheromones to Detect Gypsy Moths

At present, there are no known gypsy moth infestations in Alberta. However, this pest is found in BC and has the potential of being introduced into Alberta. Annually, the Canadian Food Inspection Agency carries out a program to detect this pest in Alberta. This is done by setting up traps baited with gypsy moth pheromone throughout the province. This program is carried out in collaboration with several agencies including LFS.

The Forest Health Branch of LFS coordinated setting up of 50 pheromone traps in 1997. No gypsy moths were caught in 1997 in traps set up under this program in all four forest regions.

SATIN MOTH

Leucoma salicis [Linnaeus]

The satin moth was first detected in Alberta in 1994 although it may have been present for a few years before that. It was detected in Edmonton and St Albert but still has not been reported in the Green Area. Recently, this pest has reportedly killed large tracts of aspen in BC where it has been known for several decades.

The satin moth infested wild stands of balsam poplar, *Populus balsamifera* Linnaeus, in Edmonton showing its adaptability to native-poplars. This species has now established throughout the Edmonton Region. In 1995, the City of Edmonton sprayed some affected stands with permethrin (Ambush®). These sprayed stands had no defoliation in 1997. There is no pheromone commercially available as a bait to monitor satin moth populations. The city is looking at alternative control methods, such as the use of braconid parasites to keep this pest under control.

DISEASES OF

Conifers

Spruce needle rusts were widespread in the Northeast Boreal Region. Unusually wet spring and summer conditions may have been a factor in the occurrence of these diseases. Other common diseases included western gall rust (*Endocronartium harknessii* [J. P. Moore] Y. Hirat.), and root rots (*Armillaria* spp. and *Inonotus tomentosus* [Fr.] Gilbn.).

DUTCH ELM DISEASE

Ophiostoma ulmi [Buis.]

There are no native elms growing naturally in Alberta. Thus, Dutch Elm Disease (DED) is not a concern in the Green Area. However, many urban areas have elms planted as shade trees and will be affected seriously if there is a DED outbreak.

This disease has not been detected to date in Alberta. However, one of the vector species of this disease — the smaller European elm bark beetle (SEEBB), *Scolytus multistriatus* (Marsham) — has been found in Alberta on a recurring basis. These beetles have been trapped every year from 1994 to 1997 in Calgary, and from 1995 to 1997 in Edmonton and St. Albert. In 1996, beetles were trapped in Vauxhall, but not since that time.

OTHER DISEASES

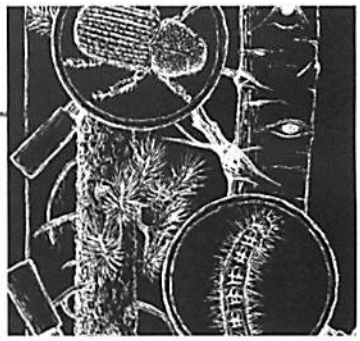
of Broadleaf Trees

In 1997, leaf spot diseases and twig blights (*Venturia* spp.) of aspen and poplar were widespread in northern Alberta. Their prevalence can be attributed to the unusually wet spring and summer conditions experienced in 1997 in Alberta. Large tracts of aspen and poplar stands with damaged leaves were found throughout the Northwest and Northeast Boreal regions. Although the damage appeared to be severe, leaf spot diseases are not known to cause significant growth losses.

OTHER DAMAGING *Agents*

Red belt was prevalent along the eastern slopes of the Rockies during 1997.

In the Southern East Slopes Region, unusually cool spring temperatures killed many aspen buds. This caused the failure of first flush.



PEST MANAGEMENT
Operations

In 1997, a formulation of the biological insecticide, *Bacillus thuringiensis* var. kurstaki (Btk) – Thuricide 48LV, (Novartis Crop Protection [Canada] Inc.) – was aerially sprayed to manage the spruce budworm outbreak in the Upper Hay District, Northwest Boreal Region. This was the eighth consecutive year of aerial spraying of Btk to control this pest outbreak in the region. Details of this spray program are found in the report, "1997 Northwest Boreal Region Spruce Budworm Management Program" by Mike Maximchuk, Forest Health Officer, Northwest Boreal Region.

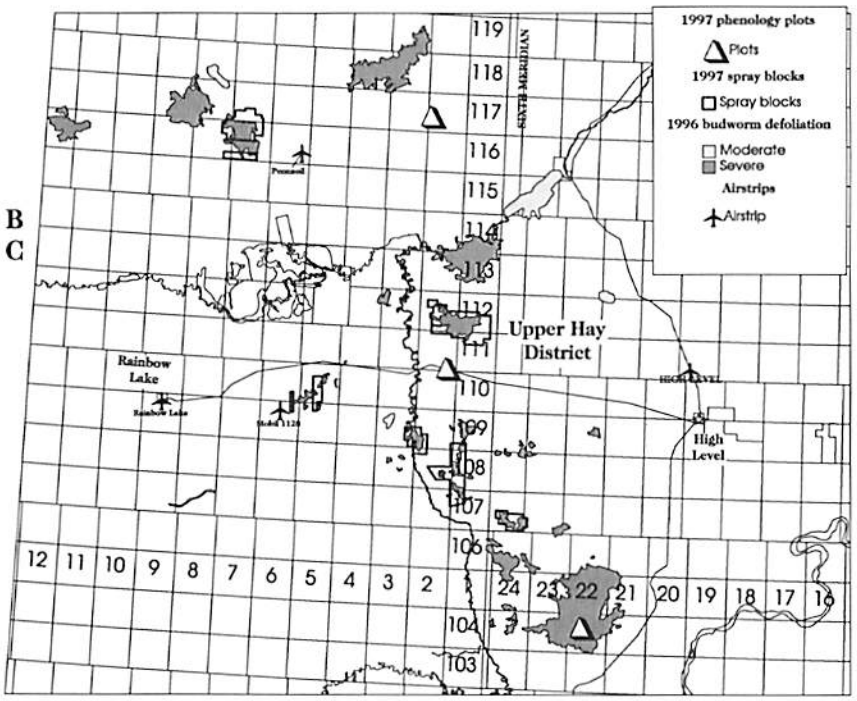
The main objective of this spraying was to keep the trees alive by reducing the budworm populations to a level that would limit any future defoliation to less than 35%. The forest stands that were sprayed were expected either to be moderately or severely defoliated by the spruce budworm in 1997, based on the results of the second instar (L2) larval surveys carried out in 1996.

Budworm, and spruce bud development (phenological observations) were monitored in relation to daily accumulation of heat units (degree-days), beginning on May 12. This was to determine when the peaks of spray-targeted stages of budworm (peak of fifth instar) and spruce buds (buds with needles flaring and caps off) occurred.

Although spruce buds were spray ready by June 6, budworms did not reach the targeted stage until June 15, i.e., about 10 days behind their normal occurrence. This was due to unseasonably cool weather. Spraying was completed by June 21, at which time the budworm larvae had reached the peak of sixth instar. Phenological observations continued until July 16 when no more budworm moths were found emerging from pupal cases.

A prespray sampling was carried out between June 4 and 8 when most budworm larvae were in second to fourth instars. The results of this sampling confirmed the abundance of budworms in the stands slated for spraying.

Altogether, 20 068 ha were sprayed with 65 242 L of Thuricide 48LV (Fig. 11). Of the sprayed area, 12 715 ha were sprayed twice with a minimum five day interval between the two sprayings, and 7353 ha were sprayed once.



Aerial surveys were conducted through the cooperative efforts of CFS and LFS.

Figure 11 *Thuricide spray blocks in the Upper Hay District in the Northwest Boreal Region in Alberta, 1997.*

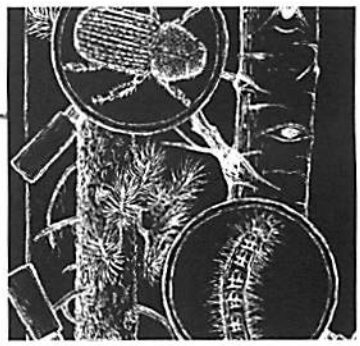
Undiluted Thuricide 48LV was sprayed at a volume of 2.0 L/ha (25.4 billion international units per ha) by using Air Tractor AT502B spray aircraft equipped with Micronair AU4000®, atomizer nozzles (Micronair Ltd., England) and a Satloc Forestar®, Differential Global Positioning System (Satloc Inc., USA).

An independent laboratory analysis of Btk samples showed that 3 out of 4 samples exceeded the potency guaranteed by the supplier, and the fourth sample had a potency marginally below. The level of microcontaminants in all the samples was acceptable and met the standards.

In the fall, an L2 survey was carried out to determine the effectiveness of aerial spraying in reducing the budworm populations. The results of this survey showed effective control of budworm populations in the sprayed plots compared to the unsprayed check plots. Budworm defoliation in 1998 is expected to be either nil to light (below 35%) in all 14 plots sprayed twice with Thuricide 48LV. Nil or light defoliation is also expected in 1998 in 3 out of 4 plots located in stands sprayed once; the other plot is expected to have severe defoliation (over 70%) in 1998.

These results were compared against the defoliation levels predicted for 1998 in 25 check plots located in unsprayed stands. These check plots and sprayed plots had comparable L2 population levels in 1996, i.e., had similar prespray budworm populations in 1997. In 1998, unsprayed check plots are expected to have either nil or light defoliation in 24% of the plots, moderate defoliation (35% to 70%) in 28% of the plots and severe defoliation (over 70%) in 48% of the plots. Thus, aerial spraying of Thuricide 48LV has resulted in reducing the budworm defoliation in most of the sprayed stands to an acceptable level.

The results of the L2 survey showed that stands sprayed in 1996, i.e., two years back, will have no visible defoliation in 1998. However, some previously sprayed areas along Chinchaga River and Sousa Creek in the Upper Hay District are expected to have moderate to severe defoliation in 1998. These two areas have had recurrent high budworm populations making them "hot spots."



FIELD
Trials

FIELD TRIAL

on Mimic

Mimic 240LV, (Rohm and Haas Canada, Inc.) was tested in a large-scale field trial to find its efficacy and field use in controlling spruce budworm outbreaks in northern Alberta. It was aerially sprayed at a dose of 70 grams a.i./ha (290 mL of pesticide mixed with 1710 mL of water). Mimic was sprayed once on 857 ha; it was sprayed twice, with five days between the two sprayings, on another 755 ha. A fixed-wing aircraft (Air Tractor AT502B) equipped with eight Micronair AU4000 atomizer nozzles and a Satloc Forestar Differential Global Positioning System was used for spraying. The technical details of this spraying are given in the report, "1997 Northwest Boreal Region Spruce Budworm Management Program," by Mike Maximchuk, Forest Health Officer, Northwest Boreal Region.

A prespray sampling carried out in early June confirmed the high budworm populations predicted by the 1996 second instar (L2) larval survey in the proposed spray blocks. The first spraying was carried out in mid-June when the budworms were at the peak of fifth instar.

An L2 survey was carried out in the fall to determine the effectiveness of these sprayings. The results showed excellent reduction in budworm populations in the sprayed plots. All six sprayed plots are expected to have either nil or light defoliation in 1998. There was no apparent difference between the plots sprayed once versus those sprayed twice. In comparison, only 24% of the unsprayed check plots located in stands that had prespray populations comparable to those in the sprayed plots, are expected to have either nil or light defoliation in 1998.

The effectiveness of a single Mimic 240LV spraying in controlling the spruce budworm may be attributed to the relatively long persistence of Mimic after spraying. If this holds true, it might be possible to control budworms with one application of Mimic 240 LV.

FIELD TESTING OF *Forest Tent Caterpillar Pheromone*

In the summer of 1997, a field trial was carried out in the Northwest and Northeast Boreal regions to:

a) test the efficacy of forest tent caterpillar sex pheromone in monitoring moth populations in Alberta; and,

b) compare the efficacy of three pheromone trap types in monitoring forest tent caterpillar moth populations.

In the Northwest Boreal Region, 15 sites were selected for this study; in 1996 five of these sites had light defoliation (below 30%), five sites had moderate defoliation (30% to 70%), and the other five sites had severe defoliation (over 70%). In the Northeast Boreal Region, five sites were selected for this study; all five sites had moderate defoliation in 1996. Three types of pheromone traps — Multi-Pher I, (Le Groupe Biocontrole, Quebec), Pherocon II®, (Great Lakes IPM Inc., USA) and Delta®, (Phero Tech Inc., BC) — were used. Two pheromone-baited traps and one unbaited (check) pheromone trap belonging to each type, were used at each site, i.e., altogether nine traps per site. The forest tent caterpillar sex pheromone was supplied by the Research and Productivity Council in Fredericton, N.B.

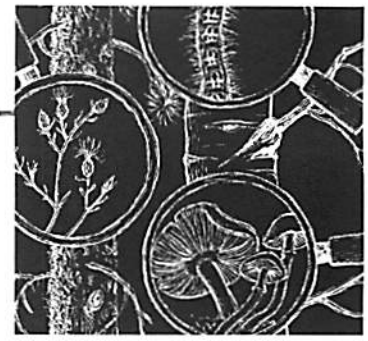
Traps were set-up in mid-to-late June when forest tent caterpillars were in their late instars. Traps were placed randomly in a zigzag pattern so that no two traps were closer than 40 m to each other. In late July, once moth flight was over, the traps were collected and the moth catch in each trap was recorded.

The trap sites had nil to light defoliation in 1997 because the tent caterpillar populations collapsed across the province.

A significantly higher number of moths per trap were found in the pheromone-baited traps compared to the number found in the unbaited check traps. Thus, forest tent caterpillar sex pheromone was effective in attracting moths at low population levels.

Delta traps had significantly higher trap catches than either the Multi-Pher I or Pherocon II traps. There was no significant difference between the trap catches in Multi-Pher I and Pherocon II traps.

Delta traps are relatively cheaper than Multi-Pher I traps and are easy to set-up in the field. However, delta traps are not reusable, unlike the Multi-Pher I traps. Under high population levels, Delta traps can get saturated with moth catches because of the limited sticky surface area, which make them low volume traps. Multi-Pher I traps are unlikely to become saturated, even at high population levels.



OTHER Programs

INTEGRATED

Pest Management Groups

Integrated Pest Management (IPM) groups have been set up in three corporate regions (Northwest Boreal, Northeast Boreal and Southern East Slopes) to foster collaboration between LFS and forest industry in managing forest health issues. In view of similar forest health issues affecting the Northern and Southern East Slopes regions, it has been proposed to have one IPM group for both these regions.

The IPM group in the Northwest Boreal Region was established two years ago. The terms of reference for this group have been developed. Forest pests prevalent in this region have been prioritized. This group has initiated development of an insect and disease monitoring program, which will identify problems to be solved through further research.

Activities planned include an assessment of current permanent sample plot systems used by the participating agencies, designing appropriate tools to monitor and sample important pests, and an assessment of aerial detection methods. Manuals will be prepared on the aerial and ground assessment of pest conditions, and on the analysis of data collected from the plots. Currently, seven forest companies are involved in this project. The cost of this three year program will be borne equally by these companies and LFS.

The IPM group in the Northeast Boreal Region has adopted terms of reference similar to those of the Northwest Boreal Region's Integrated Pest Management Group. There are four forest companies involved in

this group. The IPM group was instrumental in organizing a workshop on insect and disease identification. This workshop was successful and positive feedback was received from the LFS and industry participants.

The IPM group in the Southern East Slopes Region has their terms of reference established. This group standardized codes for data collection and discussed forest pest surveys and monitoring. This group plans to hold four meetings annually, with a guest speaker invited for each meeting to discuss a topic of interest.

TRAINING AND *Increased Awareness*

The Forest Health Branch, in association with the Strategic Management and Education Branch, has produced two videos: one on Armillaria root rot and the other on dwarf mistletoe. These videos should be available for distribution in spring. A comprehensive information package will accompany each video.

A video on aerial spraying to manage spruce budworm is also being produced. This video will document all the stages of an aerial spray program.

Posters

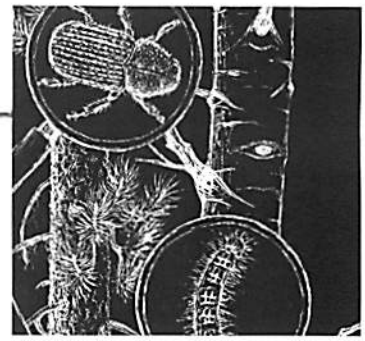
The Forest Health Branch, in collaboration with the Canadian Forest Service, produced posters on forest insects and their damage, and forest diseases and their damage. Both posters are available in English as well as in French.

Website

The Forest Protection Division is redesigning its internal and external websites. These websites will include sections on forest health such as quarantine pests of interest, forest health conditions in the province, and new publications. The redesigned site is expected to be completed by May, 1998.

Training

The Forest Health Branch personnel took part, as resource personnel, in several training programs to increase the awareness on forest insects and diseases. These included workshops on pest identification, pre-harvest silvicultural prescription, Helitack Unit leader training, and courses on forest pests.



APPENDIX 1

INFORMATION ON USE OF
Pheromones in Alberta, 1997

Forest tent caterpillar

Chemical component(s): 5Z, 7E - dodecadienol: 5Z, 7E – dodecadienal in 9:1 ratio

Lure type:	rubber septa each with 10 µg of the above mixture
Trap:	Delta Sticky trap, Multi-Pher I trap, Pherocon-II sticky trap
Pheromone source:	Research and Productivity Council, Fredericton, New Brunswick

Gypsy moth

Chemical component(s): (+)cis-7, 8-epoxy-2-methyloctadecane

Lure type/name:	laminate strip / Disparlure ®
Trap:	Delta sticky trap
Pheromone source:	Trécé Inc., Salinas, California (purchased and distributed by the Canadian Food Inspection Agency)

Mountain pine beetle

Chemical component(s): trans-verbenol, exo-brevicomin

Bait: 2-component tree-bait

Trap: not applicable

Pheromone source: Phero Tech Inc., Delta, British Columbia

Spruce beetle

Chemical component(s): frontalin, alpha-pinene, ±MCOL

Lure name: 3-component lure

Trap: Lindgren funnel trap, 8 funnels, "wet trap" option

Pheromone source: Phero Tech Inc., Delta, British Columbia

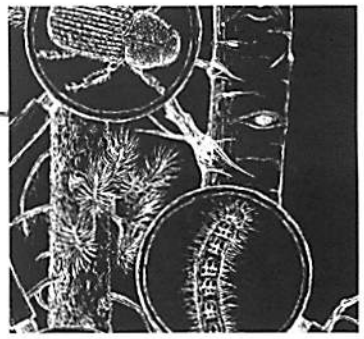
Spruce budworm

Chemical component(s): 95% E-11-tetradecenal, 5% Z-11-tetradecenal

Lure name: Biolure

Trap type: Multi-Pher I

Pheromone source: Consep Membranes Inc., Bend, Oregon, USA (purchased and distributed by C. Sanders, Natural Resources Canada, Canadian Forest Service, Sault Ste. Marie, ON)



REFERENCES

Kominek, C., 1997.

Gypsy Moth Sampling Manual. Alberta Environmental Protection, Land and Forest Service, Edmonton, Alberta.

Kominek, C. and Ono, H., 1997.

Mountain Pine Beetle Pheromone Sampling Manual. Alberta Environmental Protection, Land and Forest Service, Edmonton, Alberta.

Kominek, C. and Ranasinghe, S., 1996.

Spruce Beetle Pheromone Trapping Procedures. Alberta Environmental Protection, Land and Forest Service, Edmonton, Alberta

Kominek, C. and Ranasinghe, S., 1996.

Spruce Budworm Sampling Manual. Alberta Environmental Protection, Land and Forest Service, Edmonton, Alberta.

Maximchuk, M., 1997.

Northwest Boreal Region Spruce Budworm Management Program. Alberta Environmental Protection, Land and Forest Service, Northwest Boreal Region, Peace River, Alberta.