

2004 Annual Report



Forest Health in Alberta

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Annual Report

2004

Alberta

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Forest Health Vision

*A healthy, sustainable forest landscape that fulfils the social,
economic and environmental aspirations of all Albertans.*



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Acknowledgements and Summary

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Summary

This is the 2004 annual report on forest health conditions in Alberta. It contains details of pest conditions, pest management programs and activities to increase forest health awareness.

In 2004, most of the forest pests that are routinely monitored in the province declined.

The populations of the spruce budworm, which is the main defoliator of spruce forests in Alberta, collapsed in northwestern Alberta in 2004. This collapse was widespread and may have been caused by the actions of a combination of biotic and abiotic agents. The total defoliated (gross and net) area declined from 158 258 hectares in 2003 to 30 651 hectares in 2004. This is an 81% decline. The severity of defoliation declined similarly.

Similarly, the large aspen tortrix populations collapsed across the province. However, the forest tent caterpillar populations increased especially in the northwest. The aspen defoliation was scattered over a gross area of 632 810 hectares, compared to 5 414 276 hectares in 2003. This is an 88% decline in affected area.

The mountain pine beetle infestations continued but were kept at bay by the aggressive management action spearheaded by the Department of Sustainable Resource Development (SRD). The number of green-attack trees outside the national parks declined from 1 316 in 2003 to 408 in 2004. However, this pest continues to pose a serious threat to the lodgepole pine resource in Alberta. In 2004, beetle attack was detected near Crowsnest Pass in southwestern Alberta, the first such detection during the current outbreak. Mountain pine beetle infestations in Alberta are expected to increase in 2004, since increased mountain pine beetle activities are being reported from adjoining jurisdictions of British Columbia and Montana in areas close to the borders with Alberta. The SRD is working in close cooperation with their counterparts in these jurisdictions to minimize the risk of beetle infestations in Alberta.

Drought and other disorders killed trees in northern Alberta.

Education and awareness, a ministerial order and a cut and burn program was used to manage the mountain pine beetle in the province.

Alberta Invasive Species Council formulated an Invasive Plant Strategy in 2004. The provincial invasive plant management is composed of education and awareness, and surveys and control programs. Several hundred sites were surveyed. Biological, chemical and mechanical means were used to control these pests.

The Forest Health Section produced posters, brochures, and a mountain pine beetle management guide to increase awareness. The forest health web site was updated to include maps, newsletters, reports, survey data and a web-based forest pest damage diagnostic system. A forest health teacher's guide was produced as well.

The spruce budworm population is expected to collapse in northwestern Alberta in 2005. Tree kill in budworm infested stands is expected to continue. The spruce budworm population in northeastern Alberta is expected to decline in 2005. The forest tent caterpillar populations are expected to rise barring unforeseen weather conditions. More mountain pine beetle infestations are expected in areas close to Alberta-B.C. border.

The regional forest health officers provided training and technology to help the industry and other personnel in forest health-related subjects.

A field study on impact of woodborer damage was completed and another on Armillaria root disease was formulated in 2004.



Introduction

This is a report on forest insect and disease pests and invasive plants monitored in Alberta's forests in 2004. It also contains the predictions for some major forest pests in 2005. The forest pest management programs carried out in Alberta in 2004 are also described in this report. In addition, this report contains the details of programs used to increase forest health awareness and to provide training. The progress of the field trials and technology development is also reported here.

The Forest Health Section of the Department of Sustainable Resource Development (SRD) manages the health of Alberta's forests. This is accomplished through effective insect, disease and invasive plant pest detection and management strategies that recognize shared responsibility with industry, municipal and federal governments.

The Department of Community Development is responsible for provincial parks and the federal government is responsible for forest health issues in national parks. Urban forest pests are the responsibility of municipal governments.

The forest health program in Alberta is managed by the provincial headquarters with the assistance of four regional forest health officers (FHO) based in three corporate regions -Northeast Corporate Region (Tom Hutchison), Northwest Corporate Region (Mike Maximchuk) and Southwest Corporate Region (Daniel Lux and Erica Lee). Embedded within each corporate region are several corporate areas. In this report, where applicable, the terms "region" and "area" refer to corporate region and corporate area respectively.



Many other forest pests, besides those reported here, affect forested Crown land in Alberta.

These include some major diseases such as the lodgepole pine dwarf mistletoe, rusts, cankers caused by pathogens, and stem and root rots like *Armillaria* root disease. As well, insect pests, e.g., terminal weevils, many species of defoliators, bark beetles including the spruce beetle, and root collar weevils are known to attack forest trees in the province. However, only details of those pests that were monitored in 2004 are reported here.

The surveys reported in this document were conducted for operational purposes within the forested Crown land and may not cover the entire forested provincial land base. Although every effort is made to ensure that all information reported in this document is accurate and complete, its integrity is not guaranteed.¹

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Forest Pest Conditions in 2004

Insects

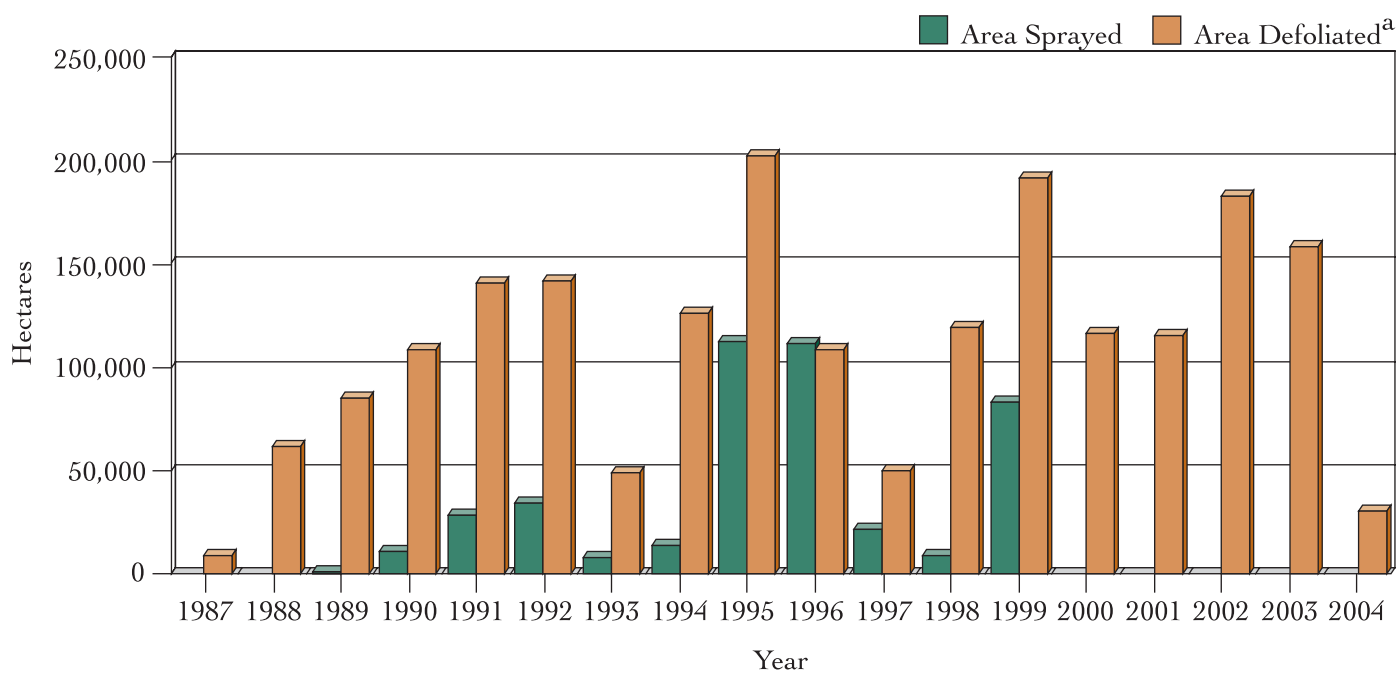
Conifer Pests

Defoliators

Spruce Budworm

Choristoneura fumiferana (Clemens)

The current outbreak of the spruce budworm in northern Alberta was first reported in the Chinchaga River area in 1987. Since then, this infestation expanded to cover large tracts of white spruce in the Northwest and Northeast regions. Between 1989-1999, aerial spraying of insecticides (Figure 1) and re-scheduled harvesting were used to manage this infestation.



^a Forested Crown Land

Figure 1

Number of hectares in forested Crown land annually defoliated by the spruce budworm, and the number sprayed to control the budworm during the current outbreak in Alberta.



Current Conditions

Aerial surveys were carried out in 2004 to estimate the extent and severity of spruce budworm-caused defoliation visible from the air. The procedure used for these surveys is described in the “Forest Health Aerial Survey Manual” (Ranasinghe and Kominek, 1999). The severity of budworm defoliation was rated either as moderate (36 - 70% defoliation of new buds) or severe (over 70% defoliation of new buds).

The spatial distribution of the budworm-defoliated areas in the province is shown in Figure 2. The budworm-defoliated area shown on this map is a drastic reduction compared to the area defoliated in 2003 (Table 1).

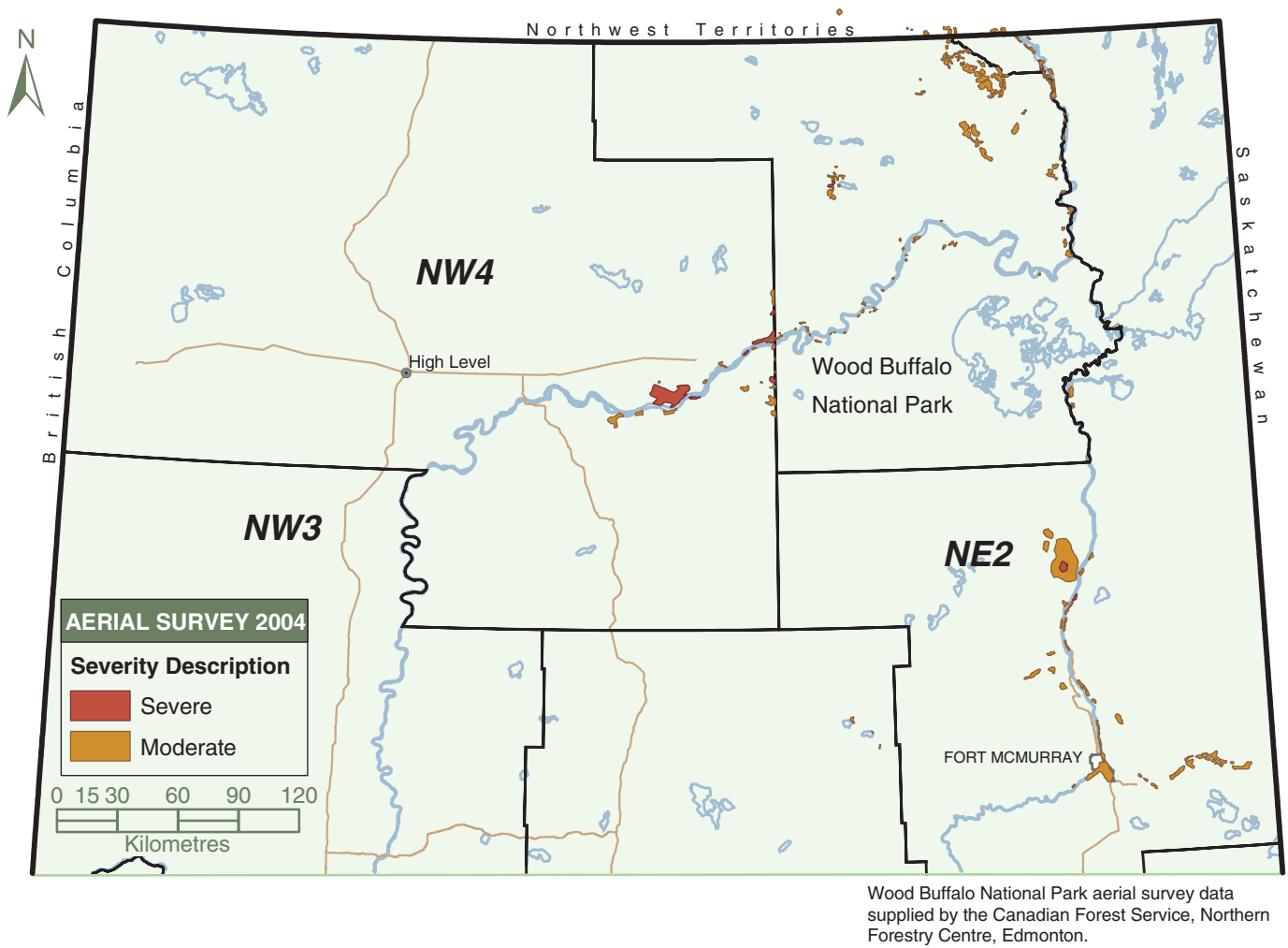


Figure 2
Spatial distribution of aerially visible spruce budworm defoliation in Alberta, 2004.



The reduction in defoliated area was more pronounced in the northwestern part of the province. A noteworthy reduction of defoliated area was also observed in Wood Buffalo National Park. The collapse of budworm populations was confirmed by lack of second instar larvae in some study plots located in northwestern Alberta². The reason/s for this sudden reduction in budworm-defoliated area is not clear. While some temperature anomalies resulting in alternate cooler and warmer conditions have been recorded in May 2004 in the budworm-defoliated areas of northwestern Alberta, this may not explain the sudden collapse of budworm populations. The lack of second instar larvae suggests either lack of or high mortality of eggs laid in 2003 fall that eventually would have hatched to produce 2004 larval population. The lack of eggs may be a result of either high moth mortality due to natural factors or low

moth fecundity due to lack of nutrients in 2003. The lack of nutrition may be attributed to large-scale spruce tree kill reported in areas that had many consecutive years of severe defoliation. Relatively high incidence of *Noosema* sp. populations was recorded from spruce budworm larval samples collected in northwestern Alberta for another study³. It was also interesting that populations of *Choristoneura conflictana*, closely related to the spruce budworm, also collapsed in northwestern Alberta in 2004. It is likely that the 2004 budworm populations were reduced by a combination of factors such as lack of vigour, natural enemies, poor nutrients and inclement weather conditions that precipitated the collapse.

Table 1 shows a comparison of the extent of budworm defoliation by each severity category in Alberta in 2003 vs. 2004.

Table 1

The extent of spruce budworm defoliation by severity categories in Alberta, 2003 vs. 2004

Corporate Region	Defoliation (ha)					
	2003			2004		
	Moderate	Severe	Regional Totals	Moderate	Severe	Regional Totals
Northwest	25 026	81 078	106 104	3 165	5 987	9 152
Northeast	12 235 3 077 ^b	6 476 30 366 ^b	18 711 33 443 ^b	17 080 3 105 ^b	690 624 ^b	17 770 3 729 ^b
Provincial Sub-Totals	37 261 3 077 ^b	87 554 30 366 ^b		20 245 3 105 ^b	6 677 624 ^b	
Grand Totals			124 815 33 443 ^b			26 922 3 729 ^b

^a Excluding national parks; net area unless indicated otherwise

^b Gross area

² Andu Yohannes, Forest Health Technician, Canadian Forest Service, Northern Forestry Centre.

³ Kees van Frankenhuyzen, Research Scientist, Great Lakes Forestry Centre, Canadian Forest Service, Sault Ste Marie, Ontario



These figures show a 78% drop in the total budworm-defoliated area in the inventoried spruce forest in northern Alberta in 2004 compared to the area defoliated in 2003. The reduction in defoliated area was more pronounced in the Northwest Region (NW) than in the Northeast Region (NE). Similarly, in the non-inventoried spruce forest, budworm-defoliated area declined by about 89%. At the provincial level the severely defoliated area was reduced by 98% in non-inventoried stands and by 92% in inventoried stands between 2003 and 2004. During this period, the moderately defoliated area decreased by 46% in inventoried stands but slightly increased (0.9%) in non-inventoried stands.

Northeast Corporate Region (NE)

The spruce budworm defoliation was surveyed on July 19-20 and on August 4 in this region by using fixed-wing aircraft. This survey was concentrated on major river drainages in this region.

The results of this survey are shown on Figure 2 and Table 2.

Table 2

The extent of spruce budworm defoliation in each severity category in the Northeast Corporate Region, 2003 vs. 2004^a

Defoliated Area	Defoliation (ha)					
	Moderate	2003 Severe	Area Total	Moderate	2004 Severe	Area Total
South of lat. 58 N ^b	12 235	6 476	18 711	17 080	690	17 770
	364 ^c	5 959 ^c	6 323 ^c	-	-	-
North of lat. 58 N ^d	2 713 ^c	24 407 ^c	27 120 ^c	3 105 ^c	624 ^c	3 729 ^c
Regional Totals	12 235	6 476	18 711	17 080	690	17 770
	3 077 ^c	30 366 ^c	33 443 ^c	3 105 ^c	624 ^c	3 729 ^c

^a Excluding national parks; net area unless indicated otherwise

^b Lac La Biche Corporate Area and part of Waterways Corporate Area

^c Gross area

^d Part of Waterways Corporate Area

In 2004, no budworm defoliation was observed south of Fort McMurray. However, a large number of white spruce in Fort McMurray were severely defoliated by the budworm. The largest patch of defoliation was found west of McClelland Lake between Athabasca River and Birch Mountain. Several patches of moderate defoliation were found along the Clearwater River drainage and immediately north of Fort McMurray. There were two patches of moderate defoliation along the McKay River and another two patches of moderate defoliation were found along the Steepbank River. Ten patches of either moderate or severe defoliation were found along the Athabasca River between the confluences of Steepbank and Firebag rivers (Figure 2).



In 2004, the extent of defoliation in the area south of latitude 58° N in this region remained about the same as that in 2003. However, between 2003 and 2004 the moderately defoliated area increased by 40% while the severely defoliated area decreased by 89%. In the area north of latitude 58° N, the gross defoliated area was reduced by 86% compared to that in 2003. This is due to a reduction in the severely defoliated area (Table 2).

Northwest Corporate Region (NW)

An aerial survey was carried out between July 21 and September 1, 2004 to record the distribution and extent of spruce budworm defoliation in this region. The results of this survey are shown on Figure 2 and Table 3.

In 2004, spruce budworm defoliation was recorded in the Lesser Slave (NW2) and Upper Hay (NW4) areas of this region. No budworm defoliation was observed in the Peace (NW3) Area. In NW2 Area moderate defoliation was found over 263 hectares

located near Chipewyan Lakes.

In NW4 Area budworm defoliation was confined to a stretch located between John D’or Indian Reservation and Wood Buffalo National Park along the Peace River. A total of 8 889 hectares were defoliated in this area; 2 902 hectares of this area were moderately defoliated and 5 987 hectares were severely defoliated (Figure 2).



In this region, there was a 91% reduction in the budworm-defoliated area in 2004 compared to that in 2003. In 2004, the moderately and severely budworm-defoliated areas in this region dropped by 87% and 93% respectively compared to the areas defoliated in 2003 (Table 3).

Table 3

The extent of spruce budworm defoliation in each severity category in 2003 vs. 2004 in the Northwest Corporate Region^a

Corporate Area	Defoliation (ha)					
	Moderate	2003 Severe	Area Total	Moderate	2004 Severe	Area Total
Upper Hay (NW4)	22 277	66 429	88 706	2 902	5 987	8 889
Peace (NW3)	321	14 492	14 813	-	-	-
Lesser Slave (NW2)	2 428	157	2 585	263	-	263
Regional Totals	25 026	81 078	106 104	3 165	5 987	9 152

^a Net area defoliated; national parks excluded



Tree Mortality in Budworm-infested Stands

The FHO of the Northwest Region observed relatively large-scale spruce tree kill during aerial surveys on budworm defoliation. Tree kill appears in stands with at least eight consecutive years of moderate to severe budworm defoliation. At the beginning the understory trees succumb and by the 10th consecutive year of defoliation the co-dominant and dominant trees die. Budworm-killed trees were found along the Negus Creek, within Paddle Prairie Metis Settlement, drainages of the Shekilie River, Hay River, Dizzy Creek, Little Rapids Creek, Steen River and Yates River. The tree mortality and volume loss observed in two permanent sample plots located along the Steen River are shown on Table 4.

Normally spruce budworm defoliation kills 25- 50% of white spruce in eastern Canada (MacLean and Erdle, 1984). Sewall Co. (1983) reported 18 - 40% tree kill in mature white spruce stands defoliated by the spruce budworm in Maine. The percent of white spruce kill observed in these permanent sample plots is much higher. However, the mortality figures reported here are preliminary figures based on field observations. Further investigations are necessary to firmly establish spruce budworm defoliation as the cause of the observed tree kill in these sample plots.

Table 4

Tree mortality and volume loss in two permanent sample plots in northwestern Alberta with 10 cumulative years of moderate - severe spruce budworm defoliation

Plot No.	Trees Standing		Merchantable Volume	
	No.	% Dead	Total (m ³)	% Dead
331 ^a	69.75	63.65	26.86	47.29
332 ^b	138.67	80.00	25.73	58.25
Average	104.21	71.83	26.30	52.77

^a Mean of four plots; plot area 809 m²

^b Mean of three plots; plot area 809 m²

Southwest Corporate Region (SW)

In 2004, there were unconfirmed reports of spruce budworm defoliation in the Porcupine Hills and Kananaskis Country. These areas are infested with the two-year cycle budworm.

Wood Buffalo National Park

Spruce budworm defoliation in Wood Buffalo National Park was aerially surveyed in the summer⁴. The defoliated area (Figure 2) was not estimated but has visually dropped significantly compared to the area defoliated in 2003.



⁴ Roger Brett, Forest Health Technician, Canadian Forest Service, Northern Forestry Centre, Canadian Forest Service, Natural Resources Canada, Edmonton, Alberta

