THE 1977 SPRUCE BUDWORM SITUATION IN ONTARIO

PART A: DAMAGE AND FORECASTS

PART B: AERIAL SPRAYING OPERATIONS

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We wish to remind all management and unit foresters, industrial or provincial, that if they require more specific information than is contained in this report about spruce budworm conditions in their districts they should contact the appropriate Survey field technician or write to the Head, Forest Insect and Disease Survey Unit, Great Lakes Forest Research Centre.

ABSTRACT

The spruce budworm situation eased somewhat in Ontario in 1977. Infestations declined in southern and northeastern Ontario but worsened in northwestern Ontario. Part A of this report describes changes in the infestations in 1977 and forecasts, in cartographic and tabular form, the damage liable to occur in 1978. Part B describes aerial spraying operations covering 4 260 ha (10,527 acres) which were conducted against the spruce budworm in Ontario in 1977.

RÉSUMÉ

En 1977, l'infestation de la tordeuse des bourgeons de l'épinette s'est assez apaisée dans l'Ontario. Les infestations ont décliné dans le sud et le nord-est de l'Ontario mais ont empiré dans le nord-ouest de l'Ontario. La partie A de ce rapport décrit les fluctuations des infestations survenues en 1977 et prévoit, en se basant sur des cartes et des tableaux, les dégâts probables en 1978. La partie B décrit les arrosages aériens effectués contre la tordeuse des bourgeons de l'épinette dans l'Ontario en 1977 sur une superficie de 4 260 ha (10,527 acres).

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COVER PHOTOGRAPH

One major result of spruce budworm infestations is the killing of stands of balsam fir. The cover photograph depicts this transition by budworm from healthy living stands to dead stands that are difficult to salvage or manage, and that represent a potential fire hazard. (Cover prepared by A.A. Harnden).

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FIGURES

PART A: DAMAGE AND FORECASTS

INTRODUCTION

Ontario has experienced 11 consecutive years of spruce budworm (*Choristoneura fumiferana* [Clem.]) infestations within the province since 1967. In 1971, the first of what has developed into an annual series of reports on the status of the spruce budworm in Ontario was prepared by the Forest Insect and Disease Survey (FIDS) Unit of the Great Lakes Forest Research Centre (GLFRC) in Sault Ste. Marie. The purpose of these reports is to provide forest managers with timely, accurate information about Canada's most important forest insect pest on a province-wide basis. This report, the eighth in the series, describes the 1977 spruce budworm situation in Ontario and provides damage forecasts for 1978. Also included are the best available information, data and maps describing budworm-caused tree mortality to date.

OVERALL SITUATION, 1977

The spruce budworm situation in Ontario eased somewhat in 1977. Aerial and ground surveys showed moderate-to-severe defoliation of balsam fir (*Abies balsamea* [L.] Mill.) and white spruce (*Picea glauca* [Moench] Voss) trees throughout a total area of approximately 14.09 million ha (34.81 million acres) (Figure 1), a decrease of some 660 000 ha (1.64 million acres) from the area mapped in 1976. On a regional basis, there was a decrease of 240 000 ha (590,000 acres) in 1977 in southern Ontario, a decrease of 570 000 ha (1.42 million acres) in northeastern Ontario and an increase of 150 000 ha (372,000 acres) in northwestern Ontario. Over all, the changes amounted to a net decrease of 660 000 ha (1.64 million acres).

Listed below are the areas, expressed in hectares (1 ha = 2.471 acres), that have been mapped as moderately to severely defoliated each year for the three regional outbreaks since their eruption in 1967. Since the metric conversion factor used in earlier reports was 1 ha = 2.5 acres, the figures below differ slightly from those presented in the 1974, 1975 and 1976 reports.

Year	Southern	Northeastern	Northwestern	Total
1967	60,704	3,035	16,188	79,927
1968	121,408	202,347	0	323,755
1969	310,805	667,746	1,619	980,170
1970	647,511	2,104,411	52,610	2,804,532
1971	1,821,125	3,480,372	52,610	5,354,107
1972	2,347,228	5,422,906	28,329	7,798,463
1973	2,428,167	5,058,681	4,047	7,490,895
1974	2,225,820	7,486,847	4,735	9,717,402
1975	2,428,167	11,007,689	18,211	13,454,067
1976	647,511	14,042,898	61,514	14,751,923
1977	407,932	13,468,231	211,979	14,088,142

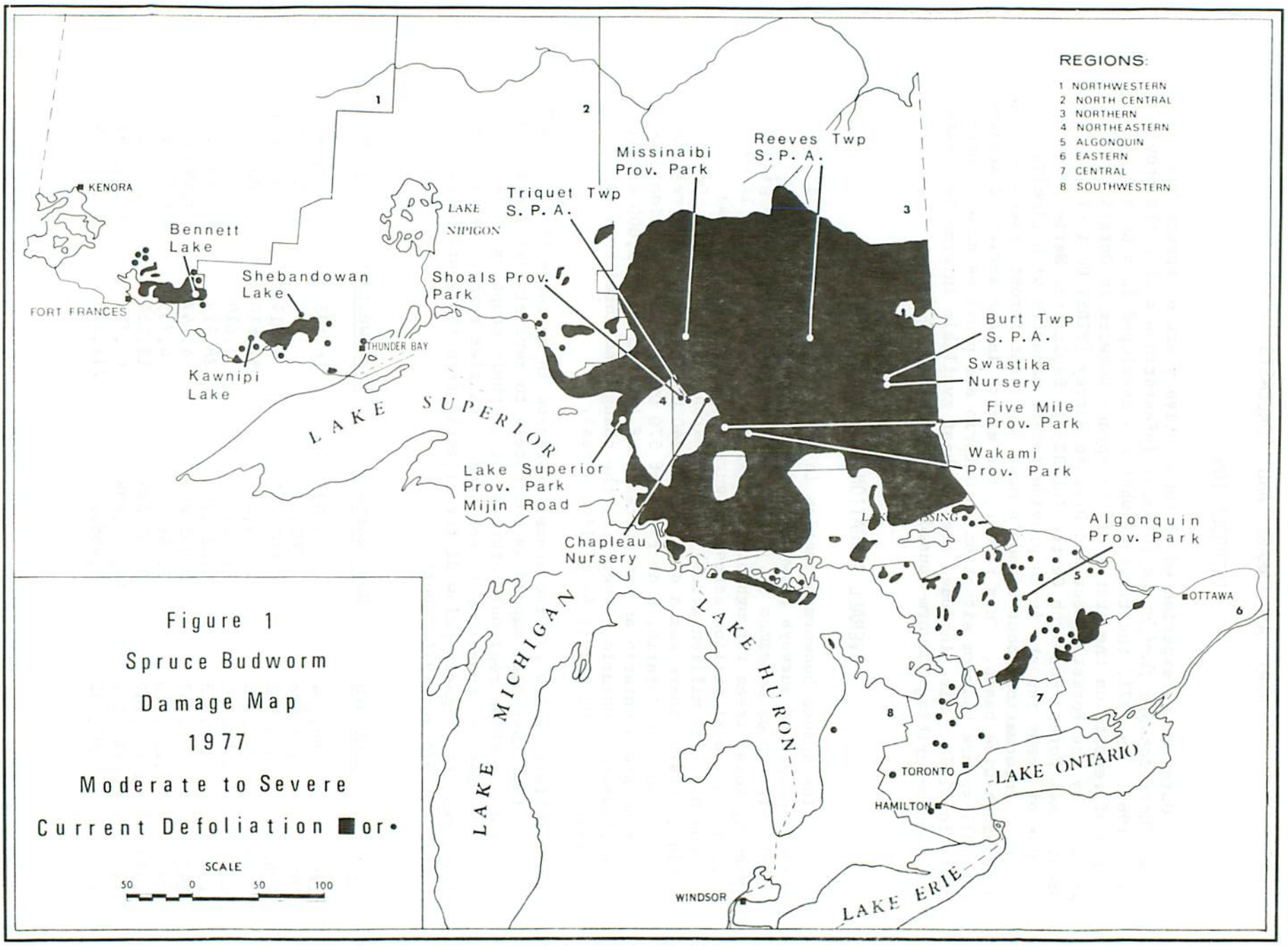


Figure 1

Spruce Budworm

Damage Map

1977

Moderate to Severe

Current Defoliation ■ or •

Very warm, sunny weather in May speeded up larval growth with the result that development was a week or more ahead of normal by the end of May. This was followed by a cool, wet period through most of June that slowed development somewhat. In fact, frosts occurred on several nights during the period 3-10 June and caused moderate-to-severe damage to new growth of balsam fir and white spruce trees located in valley bottoms or in pockets where cold air was trapped. This type of damage was noticed throughout Wawa, Sault Ste. Marie, Blind River and Chapleau districts. Impact on budworm populations was variable and probably related to the severity of frost.

Egg-mass surveys were carried out in the province starting in late July and continuing through most of August. In all, 633 locations were sampled as follows: 117 in southern Ontario, 258 in northeastern Ontario, 45 in north central Ontario and 213 in northwestern Ontario. Over all, egg-mass counts increased by approximately 40% in 1977 over the 1976 counts. Infestation forecasts for 1978 are based primarily on this extensive egg-mass survey; details follow.

In Manitoba, a 607 ha (1,500 acre) infestation detected in 1976 in the Whiteshell Provincial Park, about 40 km (25 miles) west of the Manitoba-Ontario border, did not change appreciably in 1977. Other large infestations were present further to the west in the Interlake area north of Winnipeg. In Minnesota, some 60 704 ha (150,000 acres) of defoliation were reported in 1977, a sharp decline from the 641 845 ha (1,586,000 acres) of defoliation and tree mortality reported in 1976.

Southern Ontario

Situation in 1977: In southern Ontario, which is defined as that part of the province south of the French River, Lake Nipissing and the Mattawa River, the gross area affected declined from 647 511 ha (1.6 million acres) in 1976 to 407 932 ha (1,008,000 acres) in 1977 (Figure 2). The outbreak in southern Ontario continued its division into smaller segments so that approximately 50 pockets of moderate-to-severe defoliation ranging in size from a few hundred hectares to 80 939 ha (200,704 acres) were mapped in 1977. Infestations in southern Ontario in 1977 were for the most part confined to the Algonquin Region and consisted of the remnants of previous larger infestations. For example, an infestation located at the intersection of the Pembroke, Tweed and Bancroft districts that covered some 255 000 ha (630,000 acres) in 1976 shrank to 80 939 ha (200,704 acres) in 1977.

In the Eastern Region, sizeable infestations persisted in Denbigh, Ashby, Effingham, Tudor and Lake townships, Tweed District and in Pakenham Township, Lanark District. Small pockets of medium-to-heavy infestation occurred at scattered locations in LaRose Forest, Cornwall District; in Goulbourn, Huntley and Fitzroy townships, Ottawa District; and in Oxford Township, Brockville District.

In the Algonquin Region, new pockets of light defoliation were observed on white spruce in Biggar, Devine, McCraney and Hunter townships in the western part of the Algonquin Park District. Moderate defoliation extended through the central part of the district from Boyd Township in the north through Bishop and Freswick townships to the south end of Opeongo Lake in Sproule Township. Several pockets of moderate-to-severe defoliation were scattered throughout this area, particularly in Pentland, Osler and Lister townships. The large area of severe defoliation reported in 1976 in Anglin, Dickson and Preston townships broke up into a number of small areas of light and moderate defoliation. South of Hwy 60 the infestation intensity declined from high in 1976 to light in Canisbay and Lawrence townships, and southwest of Lower Hay Lake in Clyde and Bruton townships. In the southeastern part of Algonquin Park defoliation was generally light with one pocket of moderate defoliation straddling the Clancy and Guthrie township line. In the Bancroft District, populations increased east of Hwy 62 and pockets of light defoliation were observed in Ashby, Mayo, Limerick, Dungannon, Monteagle and Cashel townships. Small pockets of severe defoliation were found in Ashby, Limerick, Wollaston and Faraday townships. In Pembroke District, small pockets of moderate-to-severe defoliation were observed in Sherwood, Lyndoch, Raglan, Griffith, Matawatchan and McNab townships. Light defoliation occurred in Alice, Grattan, Stafford and Wilberforce townships. In most of the infestations reported for the eastern part of the Algonquin Region, defoliation was very spotty and varied considerably within the infested stand. The numbers of budworm larvae were much lower on balsam fir than on white spruce in stands with both host species present. A sixth-instar larva was collected on white spruce at the Petawawa Forest Experiment Station as early as 22 May, pupae were collected on 26 May, and numerous adults (moths) were observed on 15 June.

There was a recurrence of the large infestation in the southeast corner of the North Bay District in Cameron and Papineau townships, although it was reduced in extent. In the western part of the Algonquin Region, several pockets of new defoliation and infestations that increased in size were found in the Bracebridge and Parry Sound districts. New infestations were observed in Ferrie, Lount, Chapman, Croft, Ryerson and McMurrich townships in the Parry Sound District. Population increases occurred in and adjacent to Grundy Lake Provincial Park in Mowat and Blair townships and in Christie, Monteith and Spence townships. A small pocket of severe defoliation persisted in McConkey Township and in Patterson Township in the North Bay District south of Lake Nipissing. In the Bracebridge District, pockets of moderate-to-severe defoliation were observed near Bernard and Pickerel lakes in Armour, Strong, Proudfoot and Joly townships. Two other small new pockets of severe defoliation occurred in the northeastern part of Joly Township and near Lake Vernon in Stisted Township. In the Minden District, there was a slight extension westward from the Cavendish, Galway, Harvey and Somerville township infestations. Severe defoliation persisted in Monmouth and Carden townships.

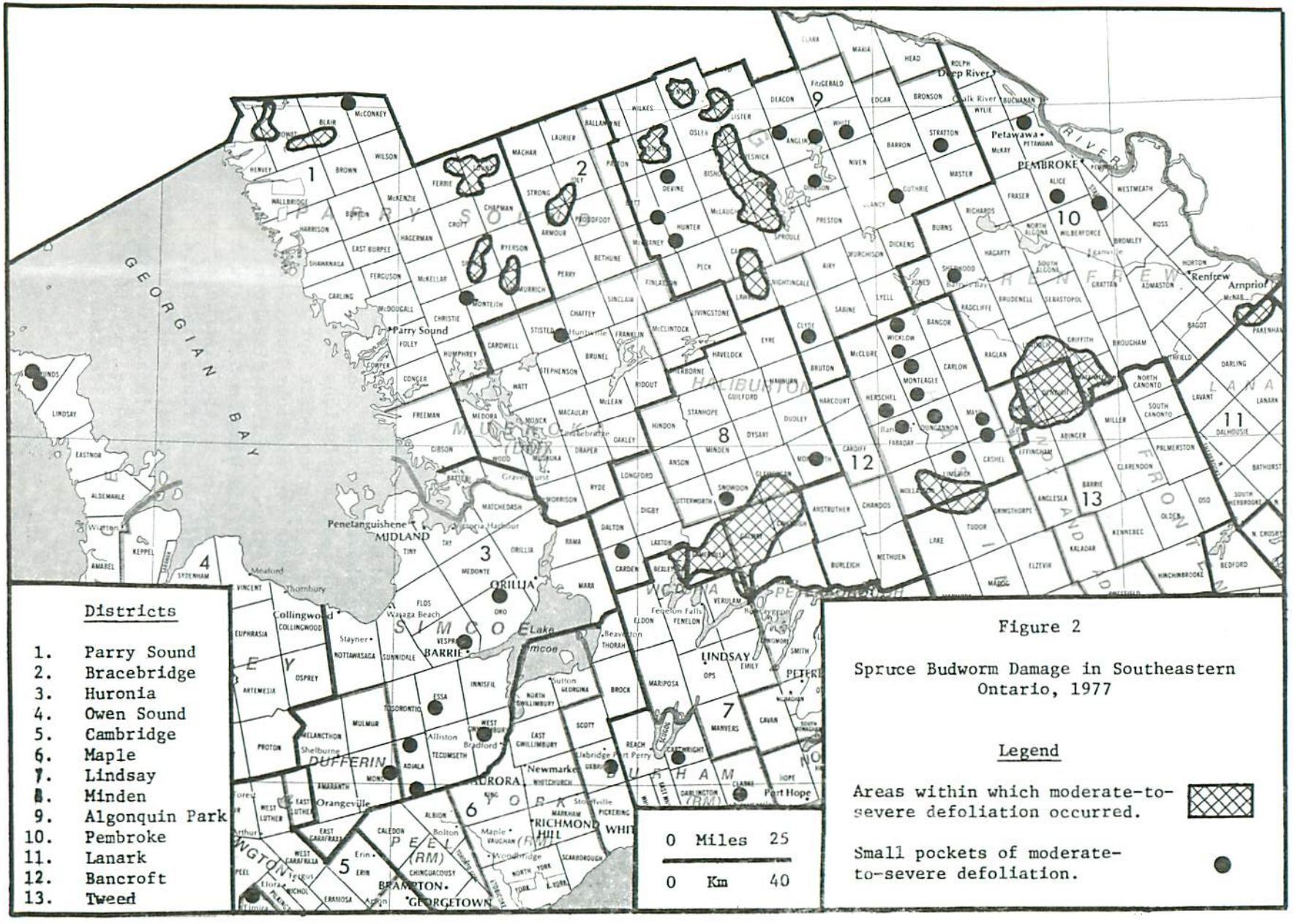


Figure 2

Spruce Budworm Damage in Southeastern Ontario, 1977

In the Central Region, little change was observed in population levels of the spruce budworm in 1977. In Huronia District, heavy infestations persisted in white spruce plantations in Vespra, Oro and Mono townships while small pockets of new heavy infestation were observed on planted white spruce in Adjala Township and at the Canadian Forces Base Borden. In the Maple District, infestations declined in white spruce plantations in Albion Township but persisted at a high level in the Uxbridge County Forest in Uxbridge Township. In the Cambridge District, heavy infestations were observed on planted white spruce in Woolwich Township and in a Christmas tree plantation in Ancaster Township. Infestations on ornamentals in urban areas prompted numerous inquiries from the public. In the Lindsay District, heavy infestations occurred in a white spruce seed orchard at Orono and moderate-to-severe damage was evident on balsam fir and white spruce trees in Balsam Lake Provincial Park in Bexley Township. Moderate damage persisted on planted white spruce in Cartwright Township.

Little change was noticed in population levels in the Southwestern Region. In the Owen Sound District, heavy infestations that occurred in Lindsay and St. Edmunds townships declined to medium intensity. Little defoliation was observed in the other districts in the Region (Aylmer, Simcoe, Chatham and Wingham).

Spraying operations were not necessary in Algonquin Provincial Park in 1977 because of low populations. However, the provincial tree nursery at Midhurst and nearby Springwater Park were sprayed with a mistblower. Please refer to Part B of this report for further details.

Infestation Forecasts for 1978: Spruce budworm egg-mass counts and defoliation surveys were carried out in southern Ontario during August, 1977. Foliage samples were collected from a total of 117 locations, egg masses were counted, defoliation was estimated and damage forecasts for 1978 were prepared. See Table 1 for detailed results and Figure 3 for area forecasts.

In southern Ontario, egg-mass numbers increased over all by about 32% in comparison with counts made in the same locations in 1976. However, this figure indicating an increase may be deceptive because a closer look at the data shows that the increase is due largely to a buildup on white spruce, whereas populations have continued to decline on balsam fir. Most of the buildup on white spruce apparently occurred in the Pembroke District; there was a slight decrease on balsam fir although increases on white spruce occurred elsewhere, namely in Lanark, Ottawa, Owen Sound, Parry Sound and Wingham districts. Decreases in egg-mass counts were most pronounced in the Algonquin, Bancroft, Bracebridge, Huronia, Maple, Minden and Tweed districts. Increases occurred in Pembroke, Parry Sound, Ottawa, Lanark and Cornwall districts. The average egg-mass count on balsam fir in southern Ontario in 1977 (56 locations) was 68 egg masses per 9.29 sq. m (100 sq. ft) of foliage and the average count on white spruce (61 locations) was 279. The

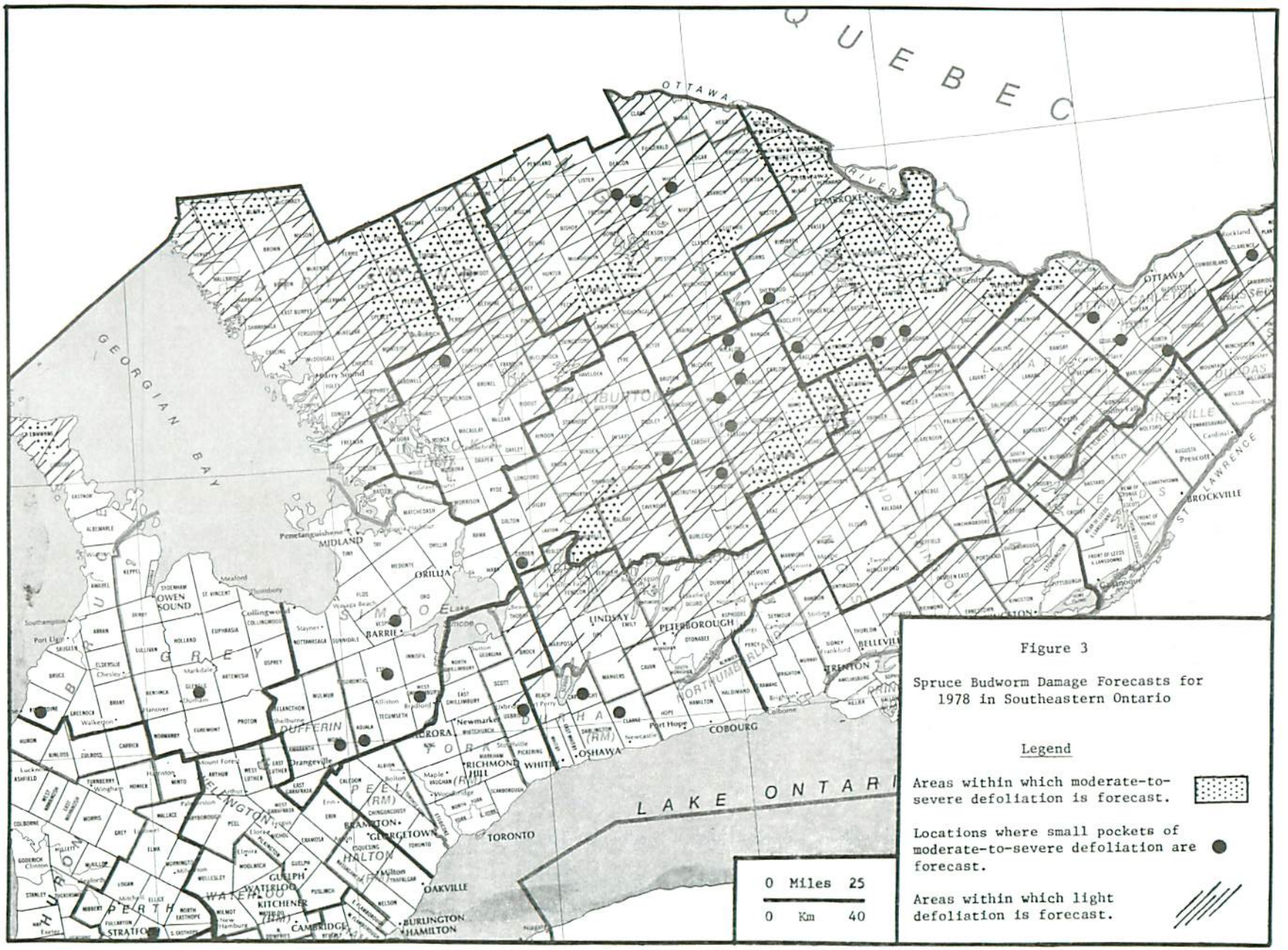


Figure 3

Spruce Budworm Damage Forecasts for 1978 in Southeastern Ontario

Legend

Areas within which moderate-to-severe defoliation is forecast.

Locations where small pockets of moderate-to-severe defoliation are forecast.

Areas within which light defoliation is forecast.

Table 1. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978.

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Algonquin Park District (20 locations)				
Airy Twp - East Gate	wS	5	0	0
Biggar Twp	bF	2	31	L-M
Bruton Twp	bF	2	20	L-M
Canisbay Twp - Cache Lake	bF	2	19	L-M
- Lake of Two Rivers	wS	5	73	M-S
Clara Twp - Dieux Rivières	bF	6	24	L-M
Clyde Twp	bF	5	72	M-S
Deacon Twp - North River	bF	2	34	L-M
Hunter Twp	bF	2	48	L-M
Dickens Twp	bF	2	20	L-M
Finlayson Twp - Oxtongue River	bF	0	0	0
Freswick Twp - Hogan Lake	bF	2	23	L-M
Guthrie Twp - North of Basin Depot	wS	8	87	M-S
Head Twp - Grant Creek	wS	2	16	L-M
Preston Twp - Tattler Lake	bF	10	56	L-M
Sproule Twp - Opeongo Lake Rd	wS	17	136	M-S
Stratton Twp - Achray (Plot C)	bF	3	28	L-M
- Lone Creek	bF	5	0	0
White Twp - Otterpaw Creek	bF	16	176	M-S
Wilkes Twp - Wilkes Lake	bF	5	19	L-M
Aylmer District (1 location)				
London Twp - City of London	wS	1	18	L-M

(cont'd)

Table 1. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Bancroft District (4 locations)				
Ashby Twp	bF	45	169	M-S
Chandos Twp	bF	19	132	M-S
Faraday Twp	bF	28	283	S
Wicklow Twp	bF	3	41	L-M
Bracebridge District (12 locations)				
Armour Twp - Pickerel Lake	wS	25	12	L-M
Bethune Twp	bF	10	0	0
Brunel Twp - south of Huntsville	bF	2	0	0
Butt Twp	bF	0	0	0
Cardwell Twp	bF	2	0	0
Chaffey Twp - Arrowhead Prov. Pk	bF	0	0	0
Joly Twp - Paisley Lake	bF	50	95	M-S
Macaulay Twp - OMNR Forest Management Unit, Bracebridge	bF	0	0	0
Monck Twp - Bardsville	bF	25	0	0
Oakley Twp - Clear Lake	bF	2	0	0
Ridout Twp	bF	2	0	0
Sinclair Twp - Bella Lake	bF	0	9	L-M
Brockville District (1 location)				
Oxford Twp - OMNR Tree Nursery, Kemptville	wS	3	99	M-S

(cont'd)

Table 1. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Cambridge District (2 locations)				
Beverly Twp	wS	2	35	L-M
Binbrook Twp	wS	2	14	L-M
Chatham District (1 location)				
Sarnia Twp - City of Sarnia	wS	1	59	L-M
Cornwall District (3 locations)				
Cambridge Twp - 3.2 km (2 miles) north of Casselman	wS	3	0	0
- Larose Forest, Spruce Rd	wS	2	169	M-S
Clarence Twp - Larose Forest	wS	15	66	L-M
Huronia District (5 locations)				
Essa Twp	wS	4	0	0
Vespra Twp - Jct. Hwy 26 & 27	wS	64	237	M-S
- OMNR Tree Nursery Windbreaks, Midhurst[b]	wS	2	130	M-S
- OMNR Tree Nursery Windbreaks, Midhurst[b]	nS	5	187	M-S
- OMNR Tree Nursery Windbreaks, Midhurst[b]	blS	2	69	M-S

(cont'd)

Table 1. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Lanark District (3 locations)				
Dalhousie Twp - northeast of Dalhousie Lake	bF	4	11	L-M
Lavant Twp - Robertson Lake	wS	1	40	L-M
Pakenham Twp	wS	38	1575	S
Lindsay District (2 locations)				
Cartwright Twp	wS	52	37	L-M
Clarke Twp - OMNR Tree Nursery, Orono	wS	49	250	S
Maple District (3 locations)				
Albion Twp	wS	15	94	M-S
Uxbridge Twp	wS	80	197	M-S
Vaughan Twp	wS	4	32	L-M
Minden District (7 locations)				
Carden Twp	wS	38	31	L-M
Cavendish Twp - Pencil Lake	bF	10	12	L-M
Glamorgan Twp - Koshlong Lake	bF	3	11	L-M
Guilford Twp	bF	10	8	L-M
Harvey Twp - Nogies Creek	bF	95	18	L-M
Minden Twp	bF	3	24	L-M
Somerville Twp	bF	95	283	S

(cont'd)

Table 1. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Ottawa District (5 locations)				
Fitzroy Twp - Lot 6, Con. IV	wS	9	192	M-S
Goulbourn Twp - Hwy 7	wS	6	281	S
Huntley Twp - Lot 16, Con. IV	wS	10	81	L-M
North Gower Twp	wS	3	174	M-S
Torbolton Twp - Lot 20, Con. I	wS	2	74	M-S
Owen Sound District (2 locations)				
Glenelg Twp	wS	24	77	M-S
St. Edmunds Twp	wS	58	1389	S
Parry Sound District (13 locations)				
Blair Twp - Blair Camp	wS	50	114	M-S
- Lost Channel	bF	95	447	S
Burton Twp	bF	5	0	0
Christie Twp	bF	50	27	L-M
Croft Twp	bF	2	13	L-M
Ferguson Twp	bF	10	34	L-M
Lount Twp	wS	95	768	S
McConkey Twp	wS	30	64	M
McKenzie Twp	bF	2	44	L-M
McMurrich Twp - Doe Lake	bF	0	16	L-M
Mowat Twp - Grundy Prov. Pk	wS	95	448	S
Ryerson Twp	bF	2	0	0
Spence Twp	bF	95	338	M-S

(cont'd)

Table 1. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Pembroke District (25 locations)				
Admaston Twp - Bonnechere River	wS	13	562	S
Alice Twp	bF	27	49	L-M
Bromley Twp	wS	5	984	S
Brougham Twp	bF	5	114	M-S
Brudenell Twp	bF	5	43	L-M
Grattan Twp	wS	24	187	M-S
Griffith Twp	wS	48	1244	S
Matawatchan Twp	bF	23	236	M-S
McNab Twp	wS	6	208	M-S
Raglan Twp	wS	16	773	S
Richards Twp - Round Lake	bF	2	32	L-M
Rolph Twp	wS	2	353	S
Ross Twp - Boundary	wS	5	314	S
- Garage	wS	12	1050	S
Sherwood Twp - west of Barry's Bay	wS	27	339	S
South Algona Twp - Ruby	bF	3	205	M-S
Stafford Twp - Micksburg	wS	22	389	S
- NPV, Rankin	wS	7	168	M-S
- NPV, Rankin	bF	10	139	M-S
Westmeath Twp - east of Westmeath	bF	7	136	M-S
- Quarry	wS	15	395	S
Wilberforce Twp - northwest of Douglas	wS	33	627	S
- 1.6 km (1 mile) north of Rankin	wS	12	1030	S
Wylie and Buchanan Twp (Petawawa Forest Exp. Stn)				
- Deluthier Rd, 1971 NPV (Plot G)	wS	8	146	M-S
- Orange Rd, (check plot)	wS	2	87	M-S

(cont'd)

Table 1. Southern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (concl'd)

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978
Simcoe District (1 location)				
South Walsingham Twp - OMNR Tree Nursery, St. Williams	wS	5	149	M-S
Tweed District (5 locations)				
Clarendon Twp	wS	5	29	L-M
Denbigh Twp - Slate Falls Rd	bF	30	128	M-S
Effingham Twp - Massanoga Rd	bF	68	166	M-S
- OMNR Tree Seed Production Plot	rS	21	178	S
Tudor Twp	wS	50	277	S
Wingham District (2 locations)				
Colborne Twp - Auburn	wS	1	51	L-M
Downie Twp	wS	1	146	M-S

[a] S = severe, M = moderate, L = light, 0 = nil

[b] Ground spray, Fenitrothion, 1977

highest egg-mass count recorded in southern Ontario in 1977 was from a white spruce sample collected in Pakenham Township in the Lanark District where the count was 1,575 egg masses per 9.29 sq. m (sq. ft).

In spite of the overall increase in egg-mass counts, it is likely that the extent of infestation will diminish further in 1978 (compared to 1977). Trace or light defoliation should occur generally throughout the Algonquin Region, interspersed with many small pockets of moderate-to-severe defoliation. Moderate-to-severe defoliation should occur on white spruce in the northern and central parts of the Pembroke District. Small pockets of moderate-to-severe defoliation on balsam fir and white spruce should occur throughout much of the Bancroft District, central Algonquin Park District, south Minden District and the northern sections of the Parry Sound and Bracebridge districts. Elsewhere in southern Ontario, i.e., throughout the Eastern, Central and Southwestern regions, scattered individuals or groups of white spruce trees (ornamentals, plantations or natural stands) will likely experience trace or light defoliation although moderate levels may occur in a few cases.

Tree Mortality: The location and extent of spruce budworm associated tree mortality in fir-spruce stands in southern Ontario have been aerially mapped and ground checked by Survey field technicians since 1974. Trees or stands that are considered dead or moribund are identified from the air by their grey color which appears after several consecutive years of severe defoliation. However, not all trees in such "grey" stands are necessarily dead and ground cruises are required to establish (approximately) the degree of mortality. These checks or ground cruises consist of examining 100 balsam fir trees (and white spruce where that species is a major component of the stand) to determine their condition (i.e., live, dead or dead top) and the percentage of tree mortality. All trees checked are dominants or codominants within the stand and 8.9 cm (3.5 in.) DBH or larger.

On the basis of this type of aerial mapping and subsequent ground checking, areas with significant balsam fir tree and top mortality following the 1977 field season are shown in Figure 4. In 1976, aerial observers mapped 14 areas totalling approximately .647 million ha (1.6 million acres) where mortality was present. In 1977, the area within which tree mortality was present increased. As detail was lost in presenting such information at the scale of Figure 4 it was considered necessary to generalize further our interpretation of the information. A gross area of about 1 315 257 ha (3,250,000 acres) within which balsam fir tree or top mortality was present in 1977 is shown on Figure 4. A figure of 688 000 ha (1.7 million acres) was incorrectly quoted in the 1977 fall Survey Bulletin. The increase from .647 million ha (1.6 million acres) in 1976 to 1 315 257 ha (3,250,000 acres) in 1977 is the result of a real increase in the area with tree mortality but, even more, is due to a

generalized depiction of the information on a small-scale map. Areas where mortality is present are in Algonquin Park, Bancroft, Parry Sound, Minden, Pembroke and Tweed districts. Some 33 ground checks were made throughout these six districts in August or September, 1977. Mortality levels are quite variable from stand to stand. Over all they average 45-50%. Increases in mortality from 1976 to 1977 averaged about 8-9%. Significant amounts of white spruce mortality could not be found with the exception of two or three instances such as at Achray or Lone Creek in Stratton Township, Algonquin Park District or in Griffith Township, Pembroke District. A summary of all the spruce budworm-associated tree mortality based on 100 tree ground checks for the past four years for southern Ontario is presented in Table 2.

Northeastern Ontario

Situation in 1977: In 1977, the budworm outbreak in northeastern Ontario, as indicated by the extent of current defoliation, declined somewhat from a high of 14.04 million ha (34.7 million acres) in 1976 to 13.47 million ha (33.28 million acres). Virtually all of the Northeastern and Northern regions are infested as are parts of the eastern section of the North Central Region (Figure 5). In 1977 a general spread, up to 64 km (40 miles) in some instances, occurred northward from the 1976 boundary of the outbreak in Hearst, Kapuskasing and Cochrane districts. However, these increases which totalled approximately 1.48 million ha (3.66 million acres) were offset by reductions of infestation boundaries in Gogama, Sudbury, North Bay and Espanola districts and by the exclusion of two large areas in the western part of the outbreak that were considered not to be sufficiently infested any longer. The larger of these two areas includes the southeast corner of the Wawa District, the southwest portion of the Chapleau District and the northern part of the Sault Ste. Marie District. Much of the balsam fir in this area of some 850 000 ha (2.1 million acres) is dead or dying and budworm populations have collapsed. Balsam and spruce that have survived appeared green in 1977 and, at most, were only lightly infested this year. The second area now considered to be relatively free of infestation is located in the northern segment of the Blind River District. This area, which totals about 170 000 ha (420,000 acres), is part of the area burned in 1948 by the Mississagi-Chapleau fire. Budworm populations have declined in the young, scattered balsam fir stands in this area. Both of these changes could be interpreted as signs of a general collapse of infestations, particularly in the western part of the outbreak.

There was no lessening in intensity of attack in the eastern part of this outbreak, i.e., in Timmins, Kirkland Lake and Temagami districts where defoliation was generally severe and backfeeding was observed in many locations. In other districts, in the north (Hearst, Kapuskasing and Cochrane), central (Chapleau, Gogama), and southern (Espanola, Sudbury and North Bay) part of the outbreak, heavy populations and severe defoliation generally materialized as forecast. There does not appear to have

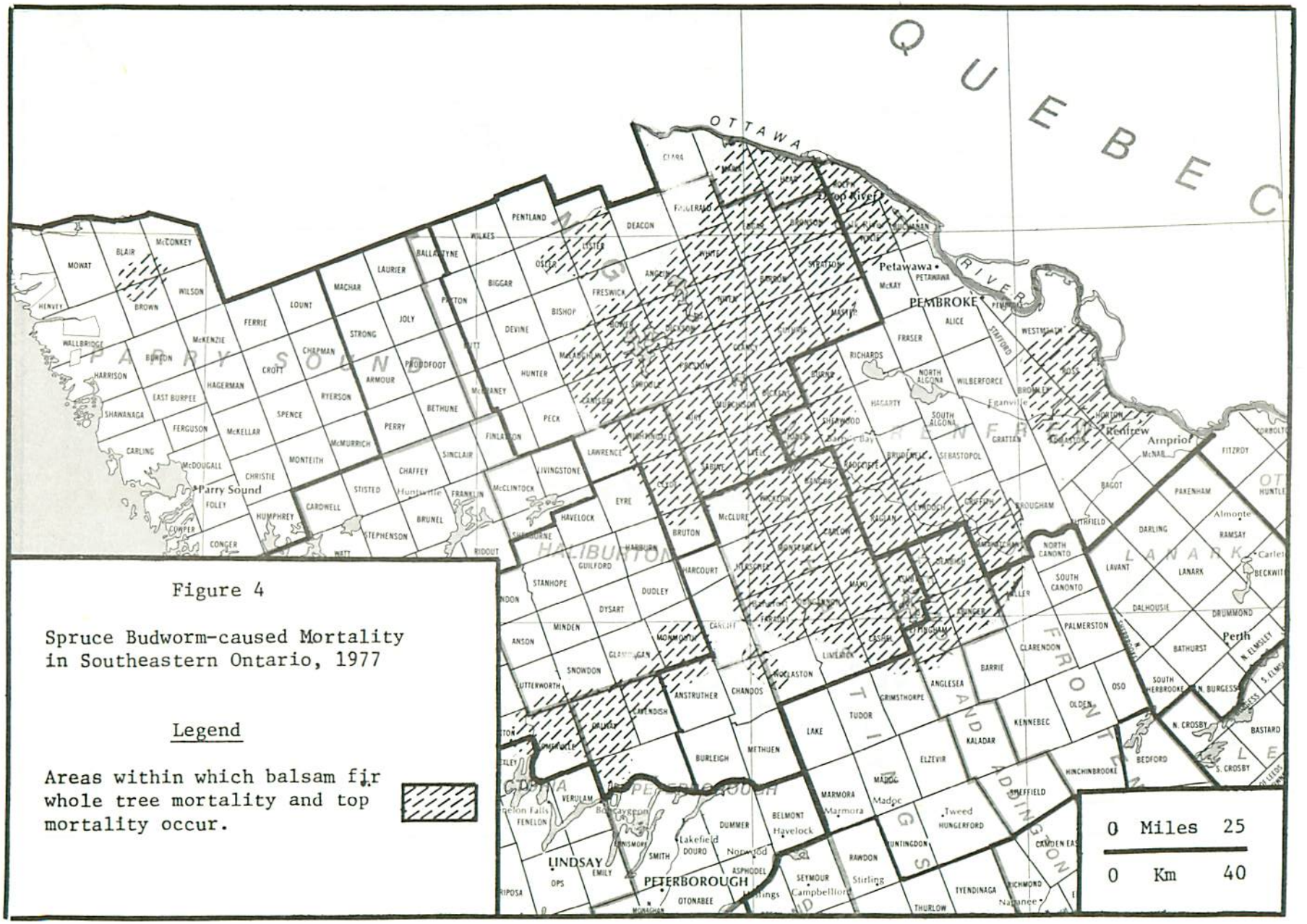
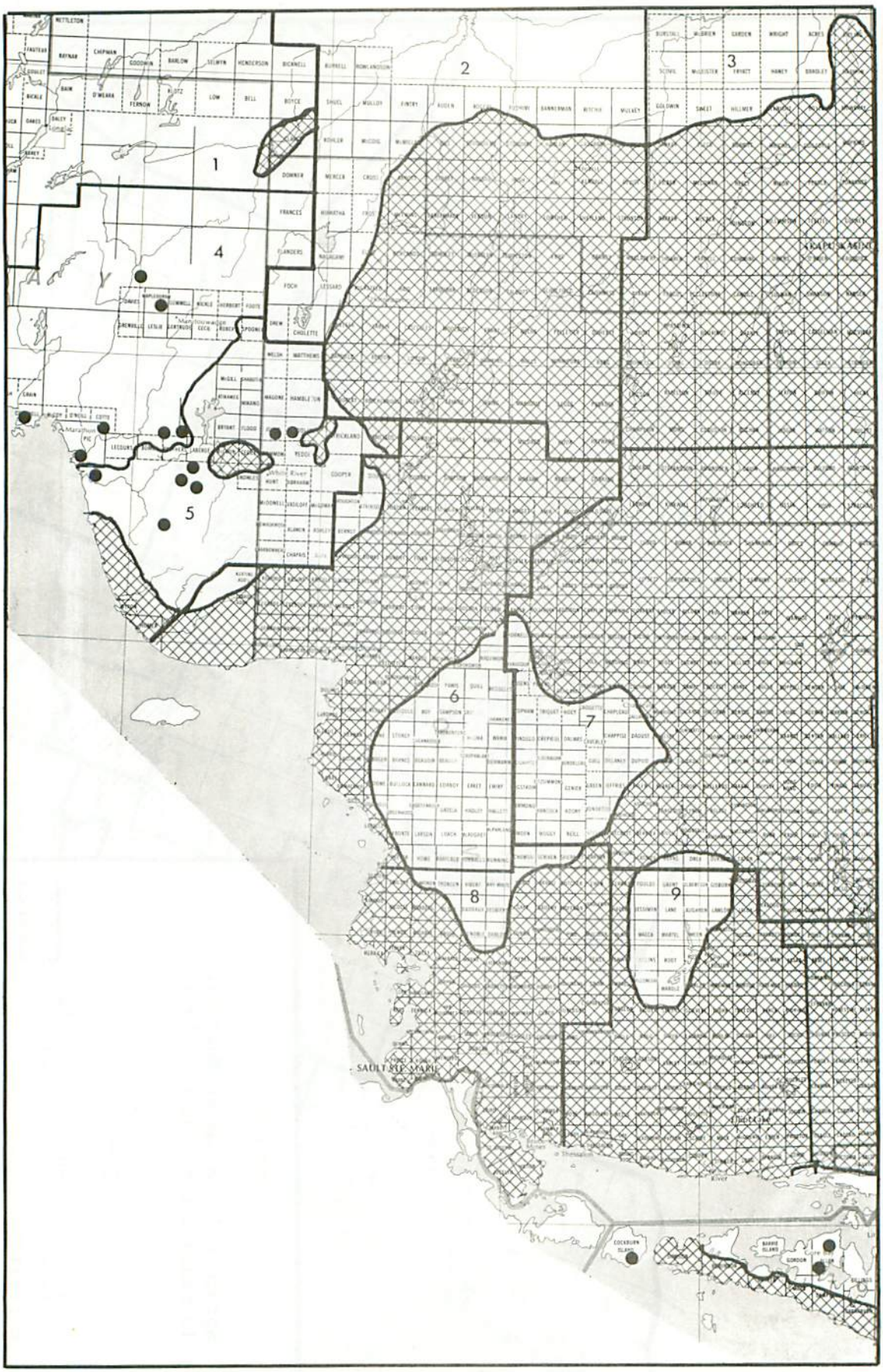


Figure 4

Spruce Budworm-caused Mortality in Southeastern Ontario, 1977

Legend

Areas within which balsam fir whole tree mortality and top mortality occur.


1
2
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SAULT STE MARIE
Manitouwadge
Marathon
Pic
White River
Wawa
Hawk Junction
Dubreuilville
Chapleau
Foleyet
Cochrane
Timmins
Kapuskasing
Hearst
Longlac
Geraldton
Nipigon
Thunder Bay
Kenora
Fort Frances
Dryden
Sioux Lookout
Red Lake
Pickle Lake
Ignace
Atikokan
Kenogami River
Albany River
Moose River
Missinaibi River
Mattagami River
Abitibi River
Kapuskasing River
Groundhog River
Pic River
Cockburn Island
Barrie Islands
Gordon

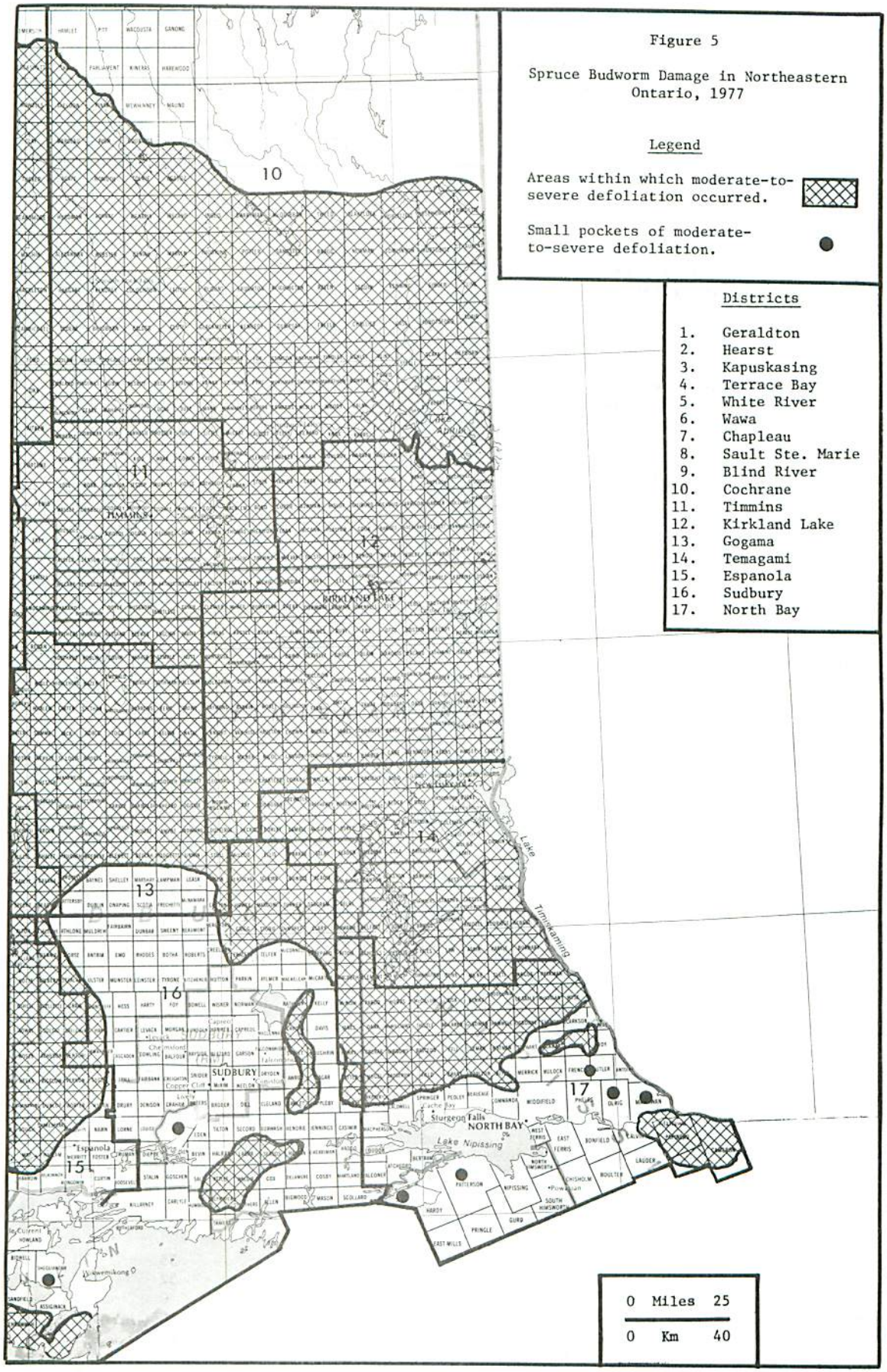


Figure 5
Spruce Budworm Damage in Northeastern Ontario, 1977
Legend
Areas within which moderate-to-severe defoliation occurred.
Small pockets of moderate-to-severe defoliation.
Districts
1. Geraldton
2. Hearst
3. Kapuskasing
4. Terrace Bay
5. White River
6. Wawa
7. Chapleau
8. Sault Ste. Marie
9. Blind River
10. Cochrane
11. Timmins
12. Kirkland Lake
13. Gogama
14. Temagami
15. Espanola
16. Sudbury
17. North Bay
10
11
12
13
14
15
16
17
SUDBURY
NORTH BAY
Sturgeon Falls
Lake Nipissing
Lake Timiskaming
0 Miles 25
0 Km 40

Table 2. Southern Ontario - Summary of spruce budworm-associated tree mortality based on 100 tree ground checks for the past four years.

Location	Host	Tree mortality (%) 1974	1975	1976	1977
Algonquin Park District					
Canisbay Twp - Wildlife Station	bF	25		32	41
- Madawaska River	bF	55			
Clyde Twp - Cauliflower Lake	bF				37
Nightingale Twp - Rock Lake	bF		49	33	39
Preston Twp - Annie Bay Dam	bF	38		41	
- Booth Lake	bF	52	71	78	84
- Kitty Lake	bF	25	68		
- Shirley Lake	bF	24			
Sabine Twp - Hwy 127, Hay Lake Rd	bF			49	61
Stratton Twp - Achray	bF	50		56	
- "	wS	57			
- Achray, Plot A	bF				50
- " " "	wS				13
- " Plot B	bF				70
- " " B	wS				36
- Lone Creek	bF	80	92		
- " "	wS	16	50		
Bancroft District					
Carlow Twp - New Carlow	bF	36			
Dungannon Twp	bF			34	41
Faraday Twp	bF		24		
Herschel Twp	bF			21	29
Mayo Twp	bF			14	21
McClure Twp	bF	15		21	
Monteagle Twp	bF	39			
Wicklow Twp	bF		45	49	63
Lanark District					
Pakenham Twp	wS				0
Minden District					
Cavendish Twp	bF	32		45	51
Galway Twp - Bass Lake	bF	47		68	79
- Crystal Lake	bF	10			45
Harvey Twp	bF	15			51
Monmouth Twp	bF			60	63
Somerville Twp - Victoria Co. Forest	bF	31		37	48
Parry Sound District					
Blair Twp	bF				4
Pembroke District					
Griffith Twp	bF	36	57		68
" "	wS				39
Matawatchan Twp - Camel Chute	bF		38	43	52
- Camel Chute	wS		10		
Wylie Twp - PFES	bF		65		
Tweed District					
Abinger Twp - Hwy 41	bF			35	40
- Lot 27, Con XI	bF			32	41
- " " " "	wS			0	0
Ashby Twp	bF			6	8
Denbigh Twp - Slate Falls Road	bF		18	24	34
- North of Denbigh on Hwy 41	bF		5		7
- South " " " "	bF		4		6
- " " " " "	wS				0
Effingham Twp	bF			8	8

been any significant extension or spread of the main outbreak (based on 1977 defoliation) in a westerly direction from the Wawa and Hearst districts, although infestations are present in the White River, Terrace Bay and Geraldton districts. These latter items will be described in greater detail in the North Central Ontario section of this report.

Moderate-to-high numbers of ground beetles, *Calosoma frigidum* Kby., were observed feeding on budworm larvae in Gaudette Township (near Searchmont) and LaVerendrye Township, both in the Sault Ste. Marie District, and in the Mashagama Lake area of the Blind River District. It is not known what impact this type of predation had on budworm populations in the areas mentioned.

Several observations that were made in the Chapleau and Gogama districts are probably representative of the outbreak as a whole. Larval development was about two weeks ahead of normal in 1977 in these districts. For example, most larvae were fourth instar by 23 May and sixth instar by 6 June. The first pupae were found on 31 May in Marquette Township, Gogama District. Larval population levels were generally high enough to cause moderate-to-severe defoliation over most of the area in the two districts. However, a portion of the southwest corner of the Chapleau District was not included. Here, light defoliation occurred, and was generally interspersed with small pockets of heavier damage. Defoliation was extremely variable on a tree to tree basis where this light damage prevailed. Aerial mapping of defoliation was difficult because of this variability and the heavy mortality of balsam fir that had occurred prior to 1977. In the remainder of the district, mapping was much easier since there was less variation and defoliation was more uniform at moderate-to-severe levels.

For the second consecutive year there were fairly high numbers of spruce coneworm (*Dioryctria reniculelloides* Mut. and Mun.) larvae feeding with spruce budworm on white spruce. In some instances the numbers of this coneworm were close to the numbers of budworm. Catches of adult budworm moths by light trap indicate that the flight peaked about 6 July. In comparison with 1976, the actual number of moths caught was many times greater and the flight was considerably longer.

A total of 4 260 ha (10,527 acres) was sprayed by OMNR in Wawa, Chapleau and Kirkland Lake districts in 1977 to minimize damage in high-value forest areas. Please refer to Part B for further details.

Infestation Forecasts for 1978: Egg-mass counts were obtained for 258 locations throughout northeastern Ontario in August, 1977 (Table 3). On the basis of locations that were sampled in 1976 and 1977 (a total of 241 locations were common to both years), egg-mass counts increased by nearly 40%. This increase in northeastern Ontario is probably more significant than the

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978.

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Blind River District (16 locations)				
Albanel Twp (169)	bF	90	85	M-S
Bouck Twp (150)	bF	15	68	M
Bridgland Twp				
- Plot 2, 1976 NPV	wS	98	291	S
- Plot 3, 1976 NPV	wS	94	238	M-S
Bright Twp	bF	88	1173	S
Dagle Twp (1F)	bF	99	400	S
Kirkwood Twp				
- OMNR Tree Nursery	wS	65	369	S
- Plot 1, 1976 NPV[b]	wS	94	56	L-M
- Plot 5, 1976 IGR	wS	99	131	M-S
- Plot 5, 1976 IGR	bF	88	95	M-S
LeFroy Twp				
- Plot 6, 1976 IGR	wS	87	125	M-S
Morin Twp	bF	99	396	S
Parkinson Twp	wS	87	146	M-S
Raimbault Twp (157)				
- Mississagi Prov. Pk	bF	58	205	M-S
Spragge Twp	bF	2	0	0
Timbrell Twp (3F)	bF	73	81	M
Chapleau District (43 locations)				
Abney Twp - Spanish Lake	bF	81	569	S
Barclay Twp				
- Missinaibi Prov. Pk[c]	bF	78	1305	S
- Missinaibi Prov. Pk[c]	wS	88	1126	S
Birch Twp (9D)	bF	14	335	S
Bliss Twp (36) - Prim Lake	bF	34	1235	S
Bordeleau Twp (12H)				
- Gale Lake	bF	8	121	M-S
Borden Twp	bF	18	1285	S

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Chapleau District (cont'd) (43 locations)				
Brutus Twp	bF	91	1346	S
Caouette Twp (32)	bF	8	704	S
Carew Twp	bF	53	661	S
Carruthers Twp (8F) - Prairie Grass Lake	bF	100	555	S
Chapleau Twp	wS	8	894	S
Cull Twp (12G) - Sample Lake	bF	38	514	S
Denyes Twp - Denyes Lake	bF	95	906	S
Fawn Twp	bF	32	621	S
Foleyet Twp	bF	98	976	S
Genoa Twp	bF	71	926	S
Halsey Twp - Nemegos Rd	bF	7	485	S
Hancock Twp (Twp 22, R 17)	bF	12	486	S
Horwood Twp - Horwood Lake	bF	35	1507	S
Iris Twp	bF	25	771	S
Ivanhoe Twp - Ivanhoe Prov. Pk	bF	99	1205	S
Ivy Twp - Miniwaski Lake	bF	14	301	M-S
Kapuskasing Twp	bF	52	228	M-S
Kirkwall Twp - Dunrankin Lake	bF	95	759	S
Leeson Twp - Janner Bay	bF	87	1998	S
Lincoln Twp - Lincoln Lake	bF	81	1656	S
Lloyd Twp - Makonie Lake	bF	98	983	S
Margaret Twp	bF	78	969	S
Montcalm Twp - Elf Lake	bF	98	1830	S
Neelands Twp (11B) - Wakami Prov. Pk (Site 45)[c]	bF	8	596	S
Ossin Twp - Komak Lake	bF	90	879	S
Oswald Twp	bF	99	2743	S
Penhorwood Twp	bF	99	3136	S

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Chapleau District (cont'd) (43 locations)				
Peters Twp - Shoals Prov. Pk[e]	bF	7	334	S
Reaney Twp (11D) - Five Mile Prov. Pk (Plot 4)[e]	bF	4	125	M-S
Reeves Twp - OMNR Tree Seed Production Plot[c]	wS	99	1060	S
Sadler Twp	bF	99	973	S
Sandy Twp	bF	33	882	S
Triquet Twp - OMNR Tree Seed Production Plot[c]	wS	18	521	S
- OMNR Tree Seed Production Plot[c]	bF	10	450	S
Whigham Twp	bF	49	1366	S
Whitehead Twp (10F) - Vezina Lake	bF	45	714	S
Cochrane District (10 locations)				
Adair Twp	bF	82	63	L-M
Adanac Twp - Mile 23	bF	15	270	M-S
Blakelock Twp - Mikiwan Lake	bF	69	266	M-S
Bonis Twp	bF	49	157	M-S
Colquhoun Twp - Greenwater Prov. Pk	bF	23	114	M-S
Freele Twp	bF	49	71	L-M
Laughton Twp	bF	55	694	S
Pinard Twp - Abitibi Canyon	bF	70	775	S
Swartzman Twp	bF	60	118	M-S
Sydere Twp - Mile 8	bF	41	623	S

(cont'd)

Table 3 Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Espanola District (18 locations)				
Baldwin Twp	bF	2	23	L-M
Bidwell Twp	bF	27	290	S
Burpee Twp	bF	52	305	S
Campbell Twp	bF	52	362	S
Cockburn Island	bF	22	20	L-M
Comox Twp - Comox Lake	bF	42	202	M-S
Craig Twp - Bluewater Lake	bF	23	273	S
Dawson Twp	bF	63	124	M-S
Gough Twp	bF	2	221	M-S
Manitoulin Island				
- Plot F, 1974 NPV	wS	65	1057	S
- Plot H, 1974 NPV	wS	53	585	S
Monestime Twp (J)				
- Russian Lake	bF	3	15	L-M
Oshell Twp (B)	bF	5	186	M-S
Plourde Twp (M)				
- Plaunt Rd	bF	55	124	M-S
Rowat Twp (A)				
- West Branch Rd	bF	28	397	S
Salter Twp				
- South check plot	bF	81	196	M-S
Tehkummah Twp	bF	90	824	S
Weeks Twp (119)	bF	10	73	M-S
Gogama District (13 locations)				
Beulah Twp - Meteor Lake	bF	62	433	S
Edinburgh Twp	bF	73	1143	S
Garvey Twp	bF	94	902	S
Hazen Twp	bF	73	1789	S
Macmurchy Twp	bF	78	1205	S
Marquette Twp	bF	82	504	S

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Gogama District (cont'd) (13 locations)				
Middleboro Twp	bF	78	2818	S
Miramichi Twp	bF	30	276	M-S
Potier Twp	bF	95	536	S
Scotia Twp	bF	10	299	M-S
St. Louis Twp	bF	93	1818	S
Stull Twp	bF	65	334	M-S
Togo Twp	bF	53	874	S
Hearst District (15 locations)				
Alderson Twp - Mawgi Lake	bF	8	13	L-M
Caithness Twp - Big Pike Lake	bF	59	200	M-S
Cholette Twp - Obakamiga Lake	bF	9	0	0
Derry Twp - Cameron Lake	bF	45	71	M-S
Farquhar Twp	bF	17	59	M-S
Frost Twp - Nagagamisis Prov. Pk	bF	11	97	M-S
Gourlay Twp - Gourlay Lake	bF	5	16	L-M
Kohler Twp	bF	10	57	L-M
Lowther Twp	bF	18	0	0
McMillan Twp	bF	47	67	L-M
Minipuka Twp - Goat Lake	bF	90	306	M-S
Mulvey Twp	bF	32	108	M-S
Staunton Twp	bF	23	138	M-S
Stoddart Twp	bF	20	0	0
Wicksteed Twp - .8 km (.5 mile) south of Hornepayne	bF	15	14	L-M

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Kapuskasing District (15 locations)				
Bourinot Twp - Mile 33	bF	72	657	S
Cumming Twp	bF	50	893	S
Cromlech Twp - Brunswick Lake	bF	37	1111	S
Fauquier Twp - Remi Lake Prov. Pk	bF	70	669	S
Fenton Twp - Mile 23 Chain of Lakes Rd	bF	58	2074	S
Fergus Twp	bF	94	562	S
Guilfoyle Twp - Guilfoyle Lake	bF	60	1550	S
Griffin Twp - Griffin Lake	bF	26	320	S
Harmon Twp - Mile 82	bF	57	728	S
Lisgar Twp - Chain of Lakes Rd	bF	90	304	M-S
McCrea Twp	bF	38	600	S
Nixon Twp	bF	93	1038	S
Opasitika Twp - Rufus Lake	bF	92	1397	S
Stringer Twp - Groundhog River	bF	42	344	M-S
Tucker Twp	bF	48	1095	S
Kirkland Lake District (22 locations)				
Alma Twp	bF	95	721	S
Ben Nevis Twp	bF	100	687	S
Blain Twp	bF	100	221	M-S
Bowman Twp	bF	5	0	0
Burt Twp - OMNR Tree Nursery, Swastika[c]	wS	51	998	S

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Kirkland Lake District (cont'd) (22 locations)				
Corkill Twp	bF	60	236	M-S
Dack Twp	bF	95	238	M-S
Eby Twp	bF	100	164	M-S
Hearst Twp	bF	100	318	S
James Twp	bF	75	128	M-S
Katrine Twp	bF	65	224	M-S
Lamplugh Twp	bF	100	341	S
Maisonville Twp	bF	100	203	M-S
Marriott Twp	bF	100	314	M-S
Milner Twp	bF	80	532	S
Montrose Twp	bF	90	394	S
Mulligan Twp	bF	85	158	M-S
Pacaud Twp	bF	80	550	S
Rattray Twp	bF	80	626	S
Truax Twp	bF	96	628	S
Tyrell Twp	bF	10	197	M-S
Yarrow Twp	bF	43	462	S
North Bay District (13 locations)				
Calvin Twp	bF	52	127	M-S
Cameron Twp	bF	38	99	M-S
Clement Twp	bF	84	528	S
Commanda Twp	bF	23	51	L-M
Crerar Twp	bF	8	185	M-S
East Mills Twp	bF	2	29	L-M
Jocko Twp	bF	33	740	S
Mattawan Twp - Hwy 533, 16 km (10 miles) north of Mattawa	bF	48	92	M-S
Notman Twp	bF	78	2069	S
Patterson Twp - Restoule Prov. Pk	bF	7	22	L-M
Phelps Twp	bF	3	69	M-S
South Himsworth Twp	bF	18	176	M-S
Thistle Twp	bF	100	750	S

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Sault Ste. Marie District (18 locations)				
Aberdeen Additional Twp	bF	34	0	0
Butcher Twp (7H)	bF	78	12	L-M
Fenwick Twp	bF	53	58	L-M
Fisher Twp	bF	93	220	S
Gapp Twp (23, Rge 13) - Hanes Lake	bF	62	34	L-M
Gaudette Twp - Abitibi Plantation, (Tree Seed Orchard)[c]	wS	27	24	L
Gaudette Twp - Whitman Dam Rd, Pheromone spray, 1975	wS	12	48	M
Herrick Twp - Pancake Prov. Pk	bF	21	119	M-S
Haviland Twp	bF	78	79	M-S
Jollineau Twp (3H) - Mile 20	bF	94	16	L-M
Palmer Twp	bF	13	87	M-S
Pine Twp (5H) - Tujak Lake	bF	52	132	M-S
Prince Twp	bF	11	12	L-M
Shields Twp	bF	20	13	L-M
Tarbutt Additional Twp	bF	83	324	S
Tarentorus Twp	bF	15	0	0
Vibert Twp (25, Rge 14) - Wart Lake	bF	22	37	L-M
Whitman Twp	bF	86	15	L-M
Sudbury District (17 locations)				
Antrim Twp - Halfway Lake	bF	0	50	L-M
Beaumont Twp - Helen Lake	bF	13	372	S
Creelman Twp	bF	17	144	M-S
Davis Twp	bF	22	82	M-S

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Sudbury District (cont'd) (17 locations)				
Delamere Twp	wS	7	497	S
DeMorest Twp	bF	32	349	M-S
Dunnett Twp	bF	40	486	S
Fairbank Twp	bF	3	48	L-M
Hawley Twp	bF	14	348	S
Hess Twp	bF	14	176	M-S
Howey Twp	bF	2	49	L-M
Hyman Twp	bF	8	16	L-M
Indian Reserve #6 - LaVase Lake	wS	69	413	S
Killarney Twp - Killarney Prov. Pk	bF	2	50	L-M
Muldrew Twp	bF	22	386	S
Tyrone Twp - Michaud Lake	bF	5	230	M-S
Waldie Twp	wS	62	1316	S
Temagami District (14 locations)				
Askin Twp	bF	99	715	S
Aston Twp	bF	100	159	M-S
Barr Twp	bF	65	264	M-S
Belfast Twp	bF	75	531	S
Dane Twp	bF	95	669	S
Flett Twp	bF	80	740	S
Gamble Twp	bF	100	339	S
Gillies Limit Twp	bF	64	557	S
Parker Twp	bF	70	556	S
Rorke Twp	bF	95	406	S
Shelburne Twp	bF	50	1360	S
South Lorrain Twp	bF	75	165	M-S
Strathy Twp	bF	70	45	L-M
Torrington Twp	bF	96	356	S

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Timmins District (9 locations)				
Bartlett Twp - Texmont Rd	bF	100	1159	S
English Twp - English Lake	bF	95	1057	S
Evelyn Twp	bF	95	475	S
Hassard Twp	bF	100	347	S
Langmuir Twp	bF	100	275	S
McKeown Twp	bF	100	2791	S
Pharand Twp	bF	100	1940	S
Robb Twp	bF	100	685	S
Sewell Twp - Lapierre Rd	bF	100	1186	S
Wawa District (35 locations)				
Abigo Twp - Apisabigo Lake	bF	99	1277	S
Asselin Twp (30, Rge 19) - Gargantua Rd at Hwy 17[c]	bF	78	190	M-S
Bailloquet Twp (30, Rge 24) - Black Trout Lake	bF	90	248	S
Barager Twp (29, Rge 19) - Sand River #2	bF	89	77	M-S
- Sand River #2	wS	68	245	S
Barnes Twp (28, Rge 19) - Sand River #3	bF	99	196	M-S
- Sand River #3	wS	99	484	S
Brimacombe Twp (30, Rge 18) - Camp 101	bF	26	165	M-S
Bullock Twp (28, Rge 18) - Callahan Lake	bF	4	44	L-M
Challener Twp	bF	98	2415	S
Cudney Twp - Esnagi Lake	bF	98	663	S
Debassige Twp (26, Rge 25) - Manitowik Lake	bF	38	657	S
Dunphy Twp (28, Rge 27)	bF	80	438	S

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Wawa District (cont'd) (35 locations)				
Eaket Twp (25, Rge 18)				
- Tikamaganda Lake	bF	1	84	M-S
Echum Twp (43)				
- Ogasiwi River	bF	59	404	S
Esquega Twp (28, Rge 24)				
- Hawk Junction	bF	23	11	L-M
Goodwillie Twp (29, Rge 17)				
- Sand River #1	bF	97	54	M-S
- Sand River #1	wS	99	512	S
Home Twp	bF	4	9	L-M
Labelle Twp (29, Rge 16)				
- Agawa Prov. Pk	bF	2	0	0
Lalibert Twp (30, Rge 26)	bF	79	256	S
LaRonde Twp (31, Rge 21)				
- Old Woman Bay Prov. Pk[c]	bF	2	52	L-M
Maness Twp (27, Rge 23)	bF	7	69	M-S
Mishi Lake	bF	13	14	L-M
Miskokomon Twp (25, Rge 23)	bF	10	328	S
Pearkes Twp	bF	67	395	S
Peever Twp (28, Rge 15)				
- Crescent Lake Campground	bF	6	17	L-M
Peterson Twp (30, Rge 21)				
- Rabbit Blanket Campground[c]	bF	63	0	0
Simpson Twp - Oba Lake	bF	96	629	S
Stone Twp (29, Rge 20)				
- Mijin Lake Landing[d]	bF	94	126	M-S
Stoney Twp (28, Rge 20)				
- Sand Lake	bF	83	33	L-M
- Sand Lake	wS	89	212	M-S
Tiernan Twp (30, Rge 20)				
- Junior Ranger Camp[d]	bF	81	67	M
- Mijin Rd at Branch Rd north[d]	bF	98	95	M-S

(cont'd)

Table 3. Northeastern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (concl'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Wawa District (cont'd) (35 locations)				
West Twp (46) - Renabie Rd	bF	95	326	S

[a] S = severe, M = moderate, L = light, 0 = nil

[b] Aerially sprayed, NPV, 1977

[c] Aerially sprayed, Matacil, 1977

[d] Aerially sprayed, Orthene, 1977

[e] Ground spray, *B.t.* 1977

[f] Aerially sprayed, Pheromone 1977

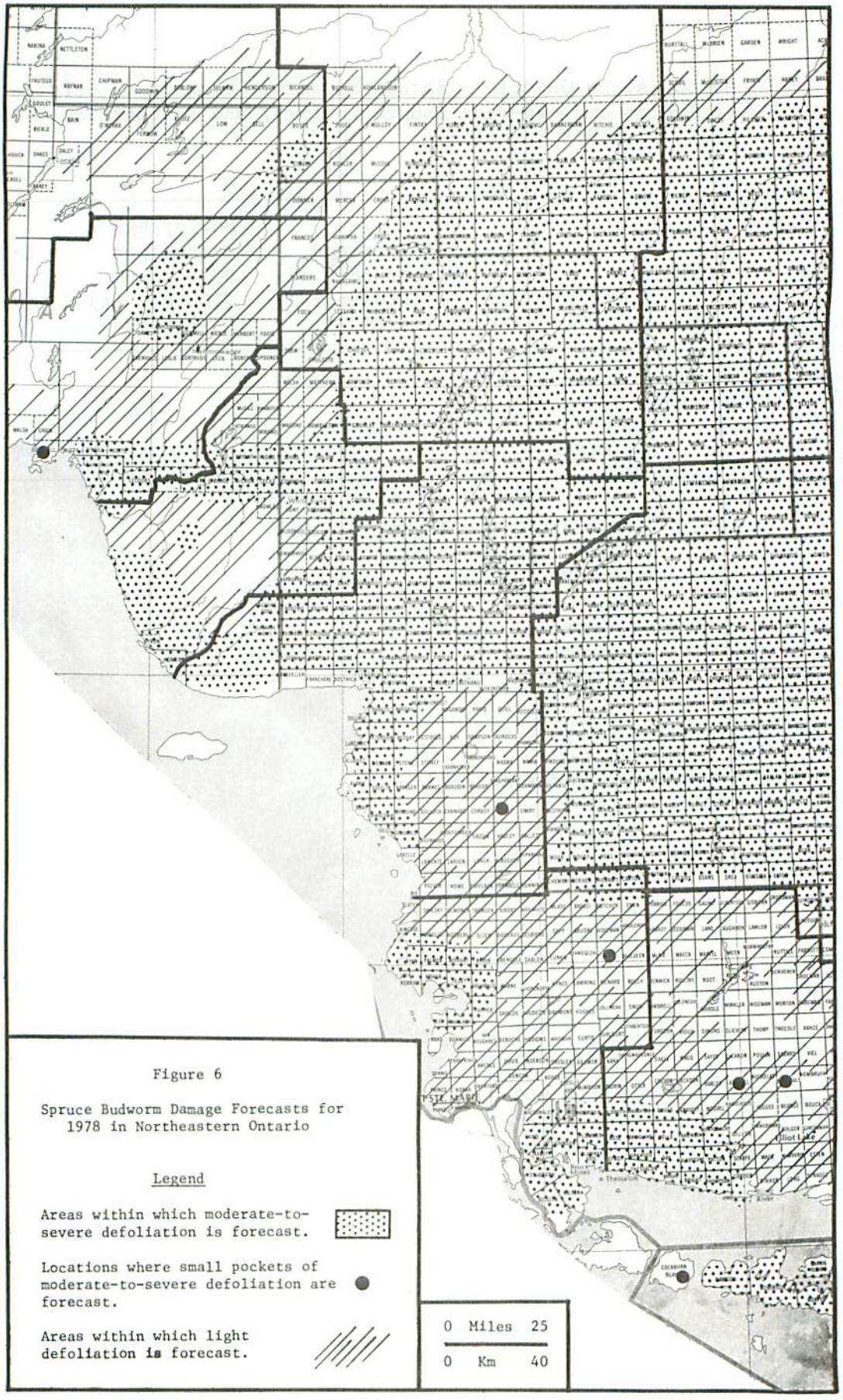
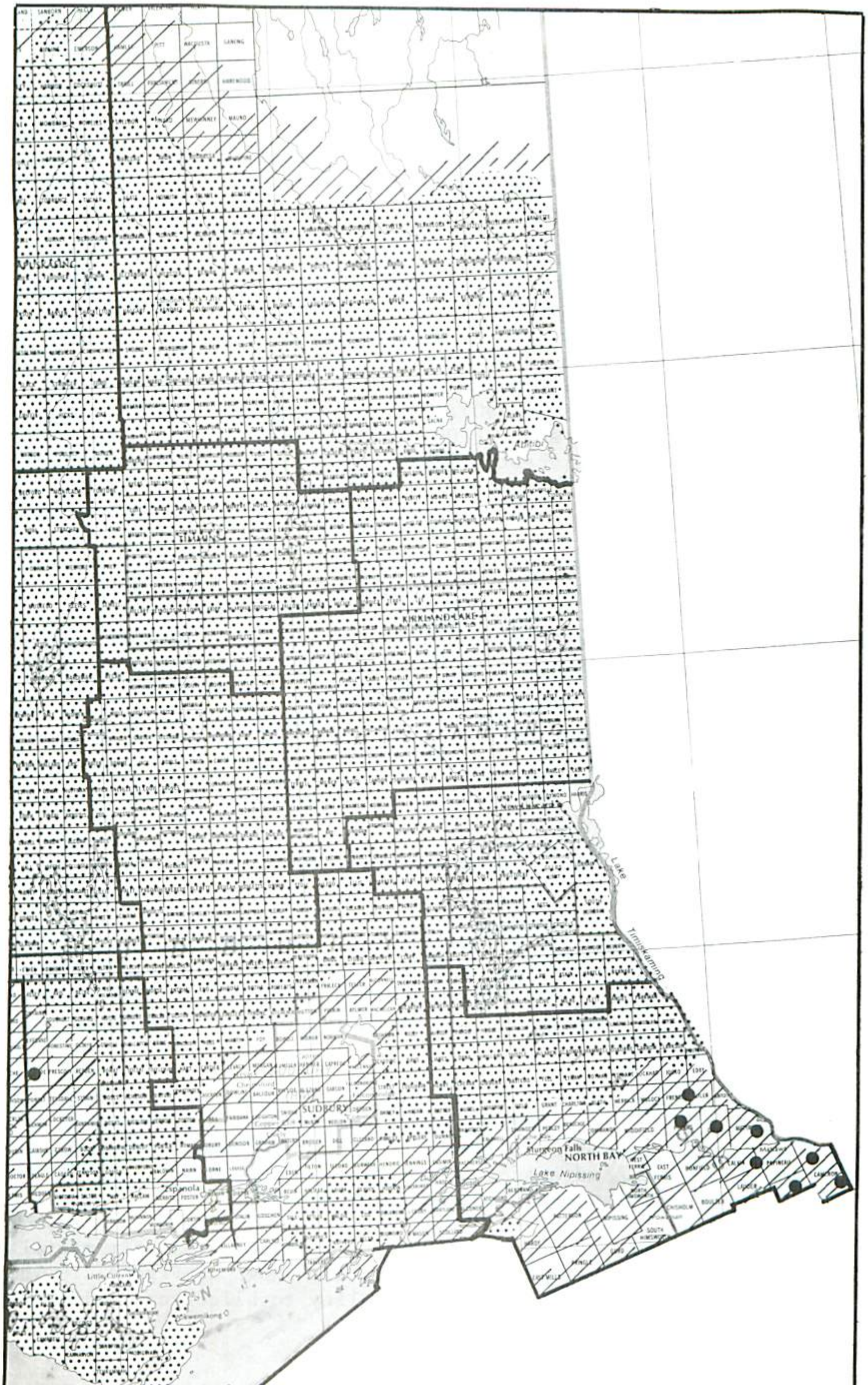


Figure 6
Spruce Budworm Damage Forecasts for 1978 in Northeastern Ontario
Legend
Areas within which moderate-to-severe defoliation is forecast.
Locations where small pockets of moderate-to-severe defoliation are forecast.
Areas within which light defoliation is forecast.
0 Miles 25
0 Km 40


KIRKLAND LAKE
Lake
Timiskaming
SUDBURY
Sturgeon Falls
NORTH BAY
Lake Nipissing

increase recorded for southern Ontario since most of the samples in northeastern Ontario are from balsam fir. In general, decreases occurred in the eastern, northeastern and southwestern districts whereas increases were the rule for the majority of districts, particularly the central ones. Percentage population increases were recorded for districts as follows: Gogama 182%, Kapuskasing 162%, Chapleau 102%, North Bay 56%, Timmins 54%, Espanola 40%, Wawa 39.6% and Sudbury 7%. Population decreases occurred in districts as follows: Temagami 15%, Blind River 21%, Kirkland Lake 32%, Cochrane 38%, Hearst 41% and Sault Ste. Marie 58%. The average egg-mass count for northeastern Ontario in 1977 was 508 egg masses per 9.29 sq. m (100 sq. ft) of foliage compared to 364 in 1976 (based on sample locations common to both years). On a district basis, the highest average egg-mass count occurred in Timmins District, 1,102 egg masses per 9.29 sq. m (100 sq. ft), closely followed by Gogama (995), Chapleau (986) and Kapuskasing (890). By contrast, the lowest average egg-mass count, 76 per 9.29 sq. m (100 sq. ft), came from the Sault Ste. Marie District. The highest single egg-mass count in northeastern Ontario, 3,136 egg masses per 9.29 sq. m (100 sq. ft), was obtained from a balsam fir sample collected in Penhorwood Township, Chapleau District.

The outbreak will probably expand somewhat in 1978 but increases on the perimeter may be offset by reductions elsewhere (Figure 6). Some spread is likely to occur along the northern and northwestern boundaries of the outbreak in Cochrane, Kapuskasing and Hearst districts although the budworm is reaching its limits in terms of available host material and possibly temperatures. There is no evidence of any significant spread to the west. Forecasts for the North Central Region, immediately to the west of Hearst and Wawa districts, will be described in the following section of this report. Populations will be lower and defoliation less in 1978 throughout most of the Sault Ste. Marie and Blind River districts and the southeastern portion of the Wawa District. Defoliation may prevail at light levels in the western and southern parts of the Espanola District, most of the central portion of the Sudbury District and the southern half of the North Bay District. Numerous, small pockets of moderate-to-severe defoliation will be scattered throughout the areas of light defoliation. Otherwise, not too much change is expected in 1978. The common situation that will be observed throughout some 14.16-16.19 million ha (35-40 million acres) in northeastern Ontario in 1978 is the destruction by budworm feeding of most of the current foliage on balsam fir and white spruce.

Tree Mortality: Aerial sketch mapping of "grey" stands which are presumed dead was carried out by FIDS field personnel during the summer of 1977. Some 108 ground checks were made to confirm the presence and amount of mortality (Table 4). Mortality data for 1976 and 1975 are also included in Table 4.

The location and extent of areas within which balsam fir mortality (whole tree and/or top mortality) is present are shown in Figure 7. This area of spruce budworm-associated tree mortality totalled some 4.168

Table 4. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on 100 tree ground checks for the past three years.

Location	Host	Tree mortality (%) 1975	1976	1977
Temagami District				
Barr Twp - Mowat Landing	bF		7	24
Best Twp	bF			11
Corley Twp - Smoothwater L. (S. end)	bF	11	56	
Delhi Twp - Wakimika L.	bF			63
Donovan Twp - Smoothwater L.	bF	15		
- Lady Dufferin L.	bF			36
Eldridge Twp	bF			19
Flett Twp - Fanny Lake	bF			10
Gillies Limit Twp - Westside Bay L.	bF		0	1
Medina Twp	bF			32
Milne Twp - Boyce L.	bF			32
Parker Twp - Florence L.	bF			28
Riddell Twp - Camp 16 Road	bF			6
Speight Twp - Mendelssohn L. (S. end)	bF	17		
- " " (N. end)	bF	36	65	81
Strathcona Twp	bF		4	
Trethewey Twp - Banks L.	bF			41
Vogt Twp	bF			21
Wallis Twp	bF		33	
Kirkland Lake District				
Alma Twp	bF			46
Charles Twp - Montreal R.	bF	14	44	53
Chown Twp	bF		3	8
Doon Twp	bF			75
Dufferin Twp - McKee L.	bF			83
Gauthier Twp	bF			13
Gross Twp	bF		7	10
Hearst Twp	bF			4
Hincks Twp	bF			53
James Twp	bF			18
McFadden Twp	bF			16
Milner Twp	bF	4		
Truax Twp	bF		36	46
Van Hise Twp	bF		51	62
Yarrow Twp - Mistimikon L.	bF		75	
Yarrow Twp	bF			70

(cont'd)

Table 4. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on 100 tree ground checks for the past three years (cont'd)

Location	Host	Tree mortality (%) 1975	1976	1977
Sudbury District				
Antrim Twp - Halfway L.	bF	62	86	94
- " "	wS	0	0	8
Beaumont Twp - Graveyard L.	bF	89		87
- Helen L.	bF	81		62
Botha Twp - Rome L. Rd	bF	82		94
- near Morin L.	bF	65		82
Dunbar Twp - Scotia L.	bF	93		88
Ellis Twp - Scarecrow L.	bF			40
Emo Twp - Onaping L.	bF	54		69
Fairbairn Twp - Onaping L.	bF	68		63
Hotte Twp - Mink L.	bF			64
Howey Twp - Laundrie L.	bF			59
Muldrew Twp - Elboga L.	bF	54	71	54
Munster Twp - Rome L. Rd	bF	64		84
Ouellette Twp - Hamanegg L.	bF			60
Rhodes Twp - Richardson L.	bF	30		69
Seagram Twp - Linger L.	bF			16
Sweeny Twp - Ayotte L.	bF	67		80
Ulster Twp - Sideburn L.	bF	38		79
Gogama District				
Asquith Twp	bF		39	86
Hazen Twp	bF			36
Macmurchy Twp	bF			15
Marshay Twp	bF	39		
Miramichi Twp	bF		70	100
Ogilvie Twp	bF			4
Onaping Twp	bF	77		
Valin Twp - Welcome L.	bF			75
Blind River District				
McNie Twp	bF	4		49
Renwick Twp	bF	26	68	77
" "	bF	15	24	55
" "	bF	2	47	56
Sturgeon Twp	bF	1	6	10
Timbrell Twp	bF	16	55	61
Villeneuve Twp	bF	3	10	11

(cont'd)

Table 4. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on 100 tree ground checks for the past three years (cont'd)

Location	Host	Tree mortality (%) 1975	1976	1977
Sault Ste. Marie District				
Bracci Twp - North Chubb L.	bF	13		68
Butcher Twp - Goulais L.	bF	22		70
Hoffman Twp	bF	6		43
Pine Twp	bF	9	27	52
" "	bF	7	22	42
Smilsky Twp	bF	44	93	100
Wlasy Twp - Dyson L.	bF	29		66
Wawa District				
Asselin Twp - Gargantua Rd	bF		15	23
Beaudry Twp - Black Spruce L.	bF	91		74
Beauparlant Twp - McEwen L.	bF	47		70
Brimacombe Twp - Hwy 17	bF		4	16
Broome Twp	bF			82
Copenace Twp - Poon L.	bF	27		46
Esquega Twp - Hwy 101	bF		8	15
Giles Twp - Coldwater R.	bF	31		
Hallett Twp - Hoppy L.	bF	71		98
Labelle Twp - Agawa	bF	8	14	19
Laforme Twp - Hwy 651	bF	31	53	81
LaRonde Twp - Hwy 17	bF		23	56
Larson Twp - Little Agawa L.	bF	48		75
Michano Twp, Miskokomon Twp boundary	bF	63	89	92
Naveau Twp - High Falls Rd	bF	16	21	43
Nebonaionquet Twp - Anjigami Rd	bF	53		
Quill Twp - Budd L. Rd	bF		95	96
Rennie Twp	bF			2
Runnalls Twp - Grey Owl L.	bF	30		89
Tiernan Twp - Peller L.	bF	40	61	
Kapuskasing District				
Cromlech Twp - Brunswick L.	bF		14	
Opasatika Twp - Opasatika L.	bF		2	

(cont'd)

Table 4. Northeastern Ontario - Summary of spruce budworm-associated tree mortality based on 100 tree ground checks for the past three years (concl'd).

Location	Host	Tree mortality (%) 1975	1976	1977
Chapleau District				
Bliss Twp - Esher-Healey Rd	bF	14	30	51
Birch Twp	bF			20
Bonar Twp	bF		25	
Bordeleau Twp - Gale L.	bF	64		70
Borden Twp	bF	55	73	85
" "	wS			12
" " - Westover L.	bF	19	20	
Brackin Twp	bF			61
Brutus Twp	bF		13	
Buckland Twp - Addison L.	bF		74	
Caouette Twp	bF	27	39	
Chewett Twp - Hwy 101	bF	10	15	
- Cedric L. Rd	bF	0		12
Cochrane Twp - Kaniphow Rd	bF	28	32	
- Hwy 101	bF	52		62
Cosens Twp	bF	2	10	
Dalmas Twp	bF	32		72
" "	wS	2		28
Dupuis Twp	bF	56	71	75
Evans Twp	bF			9
Fitzsimmons Twp	bF	25		44
" "	wS			0
" "	bF			16
Foleyet Twp - Hwy 101	bF	0		0
Gilliland Twp	bF	21	33	
Green Twp	bF	8	10	
Halsey Twp - Nemegos Rd	bF	42		58
Hill Twp	bF	8		
Hoey Twp - Lawson L.	bF	55	55	76
- " "	wS			14
Kildare Twp	bF			43
Lipsett Twp - Lafrienier Lumber Rd	bF		30	
- Chapleau Lumber Rd	bF		35	
Marshall Twp	bF	23		
Pattinson Twp	bF	9		34
Reaney Twp	bF	10		22
" "	bF	22		
Sadler Twp	bF	21		42
Windego Twp	bF		66	

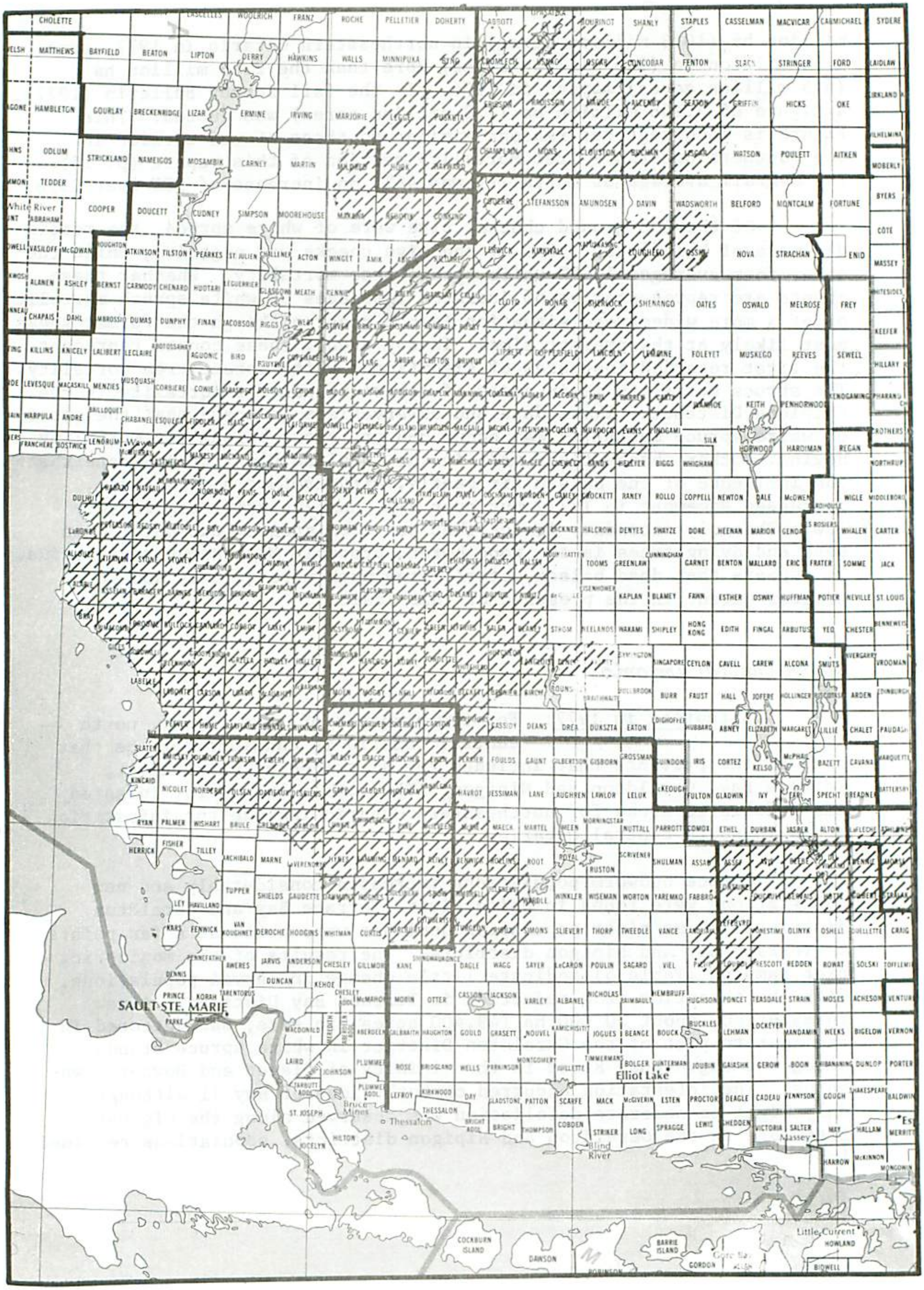
million ha (10.3 million acres) in northeastern Ontario in 1977, some 1.54 million ha (3.8 million acres) more than the 2.63 million ha (6.5 million acres) mapped in 1976. In the fall Survey Bulletin (1977), a figure of 3.156 million ha (7.8 million acres) was quoted. This figure is incorrect for reasons similar to those stated earlier in the Southern Ontario - Tree Mortality section of this report (p. 15). The overall average of mortality was 48%, an increase of 10% over 1976.

Of the 108 ground checks, five were of white spruce, the remainder were of balsam fir. One of the five checks was negative, while the other four averaged 15.5% white spruce tree mortality. Whether these counts are representative of isolated instances of white spruce mortality or of a more widespread situation is not clear although the former seems most likely at the present time. In any event, these counts represent the first recorded instances of significant white spruce tree mortality. The spruce mortality is in areas of severe balsam fir mortality in the Chapleau District. These data and observations indicate that the onset of white spruce mortality may occur 3-4 yrs after balsam fir mortality begins. Other observations made in the Chapleau District indicate that the incidence of the balsam fir beetle, *Pityokteines sparsus* Lec., increased somewhat in 1977, but over all, numbers still remain very low. The only secondary insect that was consistently encountered in dead and dying trees is the wood borer, probably *Monochamus scutellatus*. It appears that dead balsam deteriorates much more quickly and to a greater extent in the presence of this insect.

North Central Ontario

Situation in 1977: For the purposes of this report, north central Ontario is considered to be that part of the province that includes the districts of White River, Terrace Bay, Geraldton and Nipigon. The totals quoted for infested and defoliated areas for northeastern Ontario include the infestation areas in north central Ontario.

Spruce budworm populations increased considerably and new infestations were found in White River, Terrace Bay and Geraldton districts. Some minor population declines were noted at a few points in Terrace Bay and Nipigon districts. The results of the monitoring plot samples (Table 5) indicate little change in larval populations, with the exception of a reduction in Terrace Bay District. A new infestation, about 20 000 ha (49,400 acres) in size, was detected in the eastern part of the Geraldton District in white spruce stands along the Pagwachuan River in the vicinity of Clavet and Downer townships. The infestation occurred on both sides of Hwy 11 although only light-to-moderate defoliation was observed along the highway. Elsewhere in the Geraldton and Nipigon districts, populations remained low.


SAULT STE. MARIE
Elliot Lake
Blind River
Thessalon
Bruce Mines
Massey
Little Current
White River
Wawa
COCKBURN ISLAND
BARRIE ISLAND
CHOLETTE
MATTHEWS
BAYFIELD
BEATON
LIPTON
DERRY
HAWKINS
WALLS
MINNIPUKA
PELLETIER
DOHERTY
ROCHE
FRANZ
ABBOTT
SHANLY
STAPLES
CASSELMAN
MACVICAR
CARMICHAEL
SYDERE
FENTON
STRINGER
FORD
HAMBLETON
GOURLAY
BRECKENRIDGE
LIZAR
ERMINE
IRVING
MARJORIE
GRIFFIN
HICKS
OKE
ODLUM
STRICKLAND
NAMEIGOS
MOSAMBIK
CARNEY
MARTIN
WATSON
POULETT
AITKEN
TEDDER
COOPER
DOUCETT
CUDNEY
SIMPSON
MOOREHOUSE
STEFANSSON
AMUNDSEN
DAVIN
WADSWORTH
BELFORD
MONTCALM
FORTUNE
ATKINSON
TILSTON
PEARKES
ACTON
WINGET
NOVA
STRACHAN
ENID
ALANEN
ASHLEY
CHAPAIS
DAHL
DUMAS
DUNPHY
FINAN
SHENANGO
OATES
OSWALD
MELROSE
FREY
KILLINS
KNICELY
LALIBERT
LECLAIRE
AGUONIE
BIRD
FOLEYET
MUSKEGO
REEVES
SEWELL
LEVESQUE
MENZIES
CORBIERE
COWIE
KEITH
PENHORWOOD
WARPULA
ANDRE
CHABANEL
HORWOOD
HARDIMAN
REGAN
BIGGS
RANEY
ROLLO
COPPELL
NEWTON
DALE
WIGLE
DENYES
SWAYZE
DORE
HEENAN
MARION
WHALEN
CARTER
TOOMS
GARNET
BENTON
MALLARD
FRATER
SOMME
JACK
KAPLAN
BLAMEY
FAWN
ESTHER
OSWAY
POTIER
ST. LOUIS
STROM
SHIPLEY
EDITH
FINGAL
CEYLON
CAVELL
CAREW
ALCONA
SMUTS
BURR
FAUST
HALL
ARDEN
CASSIDY
DEANS
DREA
EATON
ABNEY
CHALET
FOULDS
GAUNT
GISBORN
IRIS
CORTEZ
BAZETT
LANE
LAWLOR
LELUK
FULTON
GLADWIN
IVY
SPECHT
NICOLET
RYAN
PALMER
WISHART
BRULE
MARTEL
NUTTALL
COMOX
ETHEL
DURBAN
ALTON
TILLEY
ARCHIBALD
MARNE
ROOT
SHULMAN
TUPPER
SHIELDS
GAUDETTE
WISEMAN
WORTON
FENWICK
DEROCHE
HODGINS
WHITMAN
SIMONS
THORP
VANCE
OLINYK
CRAIG
AWERES
JARVIS
ANDERSON
CHESLEY
KANE
DAGLE
WAGG
SAYER
POULIN
SAGARD
VIEL
REDDEN
ROWAT
SOLSKI
DUNCAN
KEHOE
PRINCE
KORAH
MORIN
OTTER
JACKSON
VARLEY
NICHOLAS
MOSES
ACHESON
GOULD
GRASETT
NOUVEL
JOGUES
BOUCK
LEHMAN
WEEKS
BIGELOW
VERNON
LAIRD
JOHNSON
ROSE
WELLS
BOLGER
JOUBIN
GEROW
DUNLOP
PORTER
LEFROY
DAY
PATTON
SCARFE
MACK
ESTEN
PROCTOR
DEAGLE
CADEAU
GOUGH
ST. JOSEPH
HILTON
BRIGHT
THOMPSON
COBDEN
STRIKER
LONG
SPRAGGE
LEWIS
SHEDDEN
VICTORIA
SALTER
MAY
HALLAM
HARROW
DAWSON
GORDON
HOWLAND
BIDWELL

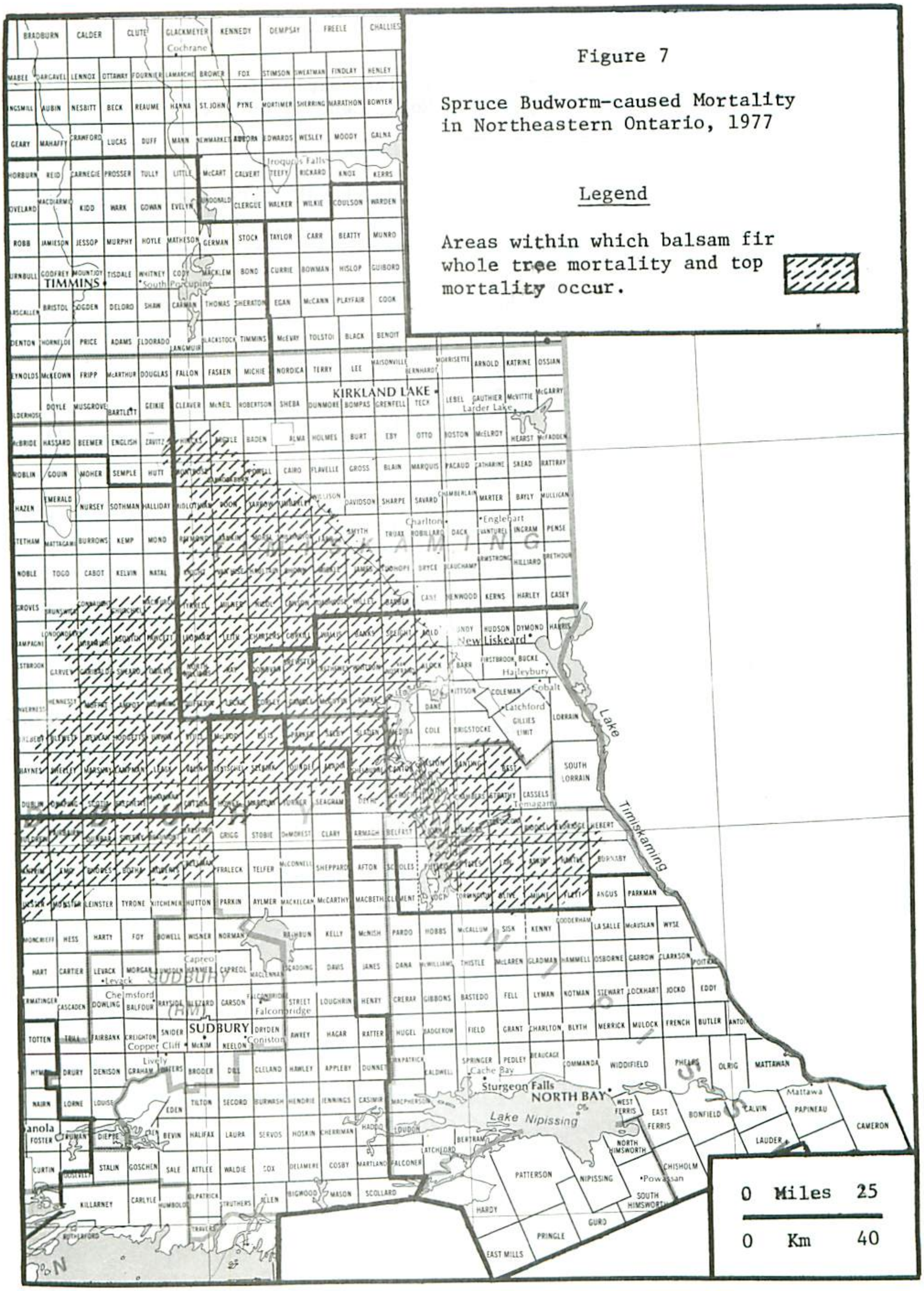


Figure 7

Spruce Budworm-caused Mortality in Northeastern Ontario, 1977

Legend

Areas within which balsam fir whole tree mortality and top mortality occur.

Table 5. Results of monitoring plot samples for a four-year period for plots in North Central Ontario.

Location	Host	No. of larvae per 20-mat sample			
		1974	1975	1976	1977
Nipigon District					
Black Sturgeon Road	bF	0	7	6	4
Purdom Twp	wS	0	4	23	36
Legault Twp	bF	0	0	0	0
Ledger Twp	bF	1	3	13	3
Summers Twp	bF	0	0	2	4
		1	14	44	47
Geraldton District					
Caramat Road	wS	0	1	0	0
Croll Twp	bF	3	0	2	1
Klotz Lake	bF	0	0	2	4
		3	1	4	5
Terrace Bay District					
Amwri	bF	11	5	5	4
Syine Twp (Twp 82)	wS	1	16	16	0
Lecours Twp (Twp 74)	wS	4	8	6	5
Stevens Tower Hill	bF	3	2	0	3
Catlonite Lake	bF	5	2	2	0
		24	33	29	12
	Totals	28	48	77	64

In the Terrace Bay District, the heavy infestation at Hour Glass Lake showed minor extensions to the north and south but did not move westward into the extensive spruce-fir stands along the Pic River valley to Lake Superior. A new medium-to-heavy infestation, 6 475 ha (16,000 acres) in size, was found northwest of Manitouwadge in Mapledoram Township. Elsewhere in the district, scattered pockets of medium infestation occurred on both sides of Hwy 17 from the south end of the Manitouwadge Road west to the mouth of the Pic River and near the entrance to Neys Park. Populations along the Black River were reduced somewhat in 1977.

In the White River District, two small heavy infestations, which in 1976 occurred west of the town of White River, coalesced in 1977 and spread south of Hwy 17 and west to the Abitibi Road south of Regan infesting approximately 24 280 ha (60,000 acres). Infestations continued near the mouth of the White River and Louie Lake. In Pukaskwa National Park, the main infestation extending along the Lake Superior coast from Oiseau Bay eastward to the Wawa District expanded to form a wider band of defoliation. New infestations were mapped in Nameigos Township (extension from Chapleau infestation) and between Dayohessarah and Wawigami lakes and near Danny and Delink lakes.

Infestation Forecasts for 1978: Egg-mass counts were obtained from 46 locations in north central Ontario in 1977. These data are listed in Table 6. On the basis of 42 locations that are common to both 1976 and 1977, egg-mass densities have more than doubled. However, the increases are due largely to population buildups in known infestations and there is little evidence of a general buildup throughout the four districts (with the exception of the southern half of White River). Despite the increase, average densities are still quite low in the Nipigon, Geraldton (with the exception of the Pagwachuan River infestation) and Terrace Bay (except for Hour Glass Lake and Mapledoram Township) districts. With the exception of the known infestations, defoliation in 1978 is not expected to exceed trace or light levels.

In the 1976 report, it was stated that an outbreak seems imminent in this part of Ontario because populations had continued to build up since 1974. Events of the past year would not cause us to change that statement significantly since it appears that the potential for an outbreak has increased somewhat, according to the 1977 egg-mass counts.

Northwestern Ontario

Situation in 1977: Infestation forecasts for northwestern Ontario predicted that populations and the extent of defoliation in 1977 would probably remain at levels similar to those of 1976 or that some infestations would be somewhat reduced. However, in

Table 6. North Central Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978.

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Geraldton District (9 locations)				
Caramat - 2.8 km (1.8 miles)	bF	3	44	L-M
- 1.76 km (1.1 miles) south	bF	2	0	0
Caramat Road - Mile 15	bF	1	0	0
Catlonite Rd - Mile 72.3	bF	4	0	0
Croll Twp	bF	4	0	0
Klotz Lake	bF	2	39	L-M
Pagwachuan River				
- Mile 2.5	wS	75	752	S
- 8 km (5 miles) west	bF	43	213	M-S
Wintering Lake	bF	3	0	0
Nipigon District (9 locations)				
Black Sturgeon Lake	bF	2	0	0
Jackpine River - Mile 9	bF	3	0	0
Ledger Twp - gas line	bF	3	35	L-M
Legault Twp	bF	1	0	0
Macdiarmid	bF	1	0	0
Parks Lake				
- Mile 30.7 Domtar Rd	bF	2	0	0
Poshkokagan River	bF	6	0	0
Purdom Twp - Cameron Falls	wS	10	26	L-M
Summers Twp	bF	3	0	0
Terrace Bay District (14 locations)				
Amwri Station	bF	0	0	0
Black River - Hwy 17	wS	8	29	L-M
Catlonite Lake	bF	2	0	0
Gertrude Twp	bF	5	0	0

(cont'd)

Table 6. North Central Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Terrace Bay District (cont'd) (14 locations)				
Gravel River - Mile 1 east	bF	2	0	0
Hour Glass Lake	wS	100	1523	S
- .4 km (.25 mile) northwest	bF	73	103	M-S
Jct. of Industrial and Camp 5 Rd	bF	17	96	M-S
Killraine Twp (85) - Rainbow Falls Prov. Pk	bF	2	9	L-M
Manitou Falls	wS	13	18	L-M
Manitouwadge Rd - Mile 1.5 north	bF	98	486	S
Marathon - .8 km (.5 mile) north of Hwy 17	bF	2	9	L-M
Stevens Tower Hill	bF	5	0	0
Syine Twp (82) - Jackfish Lake	bF	2	0	0
White River District (13 locations)				
Abraham Twp (66)	bF	31	169	M-S
Cecile Twp	bF	87	483	S
Cooper Twp	wS	47	181	M-S
Hydro Rd - Mile 2	bF	3	0	0
McCron Twp (70) - Access Rd	bF	14	70	M-S
Obatanga Prov. Pk	bF	4	49	M-S
Pukaskwa National Pk				
- Bonamie Cove	bF	70	112	M-S
- Cascade River	bF	93	480	S
- Oiseau Bay	bF	29	114	M-S
- Oiseau Bay 11.2 km (7 miles) east	bF	63	376	S
- Simons Harbour	bF	51	110	M-S

(cont'd)

Table 6. North Central Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (concl'd).

Location	Host	Estimated percent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
White River District (concl'd) (13 locations)				
Pukaskwa National Pk - Tip Top Mountain 3.2 km (2 miles) southwest	bF	88	258	S
Regan - 14.08 km (8.8 miles) south	bF	85	221	M-S

[a] S = severe, M = moderate, L = light, 0 = nil

fact, the total amount of defoliation between Thunder Bay and Fort Frances increased considerably, from the 61 512 ha (152,000 acres) mapped in 1976 to 211 974 ha (523,799 acres) in 1977 (Figure 8). This may have been due, at least in part, to the exceptionally good weather that prevailed during May and caused very rapid larval growth which, in turn, probably resulted in much higher than normal survival. However, this thesis is not necessarily borne out by the 1977 results of the monitoring plot samples (Table 7) which indicated on an overall basis only a marginal increase in the number of larvae.

In any event, the largest increase occurred in the Fort Frances District where some 27 500 ha (68,000 acres) of defoliation in 1976 increased to 146 600 ha (362,250 acres) in 1977. Last year, defoliation consisted of a number of small pockets scattered between Tanner and Bennett townships in the east and Watten Township in the west, a distance of some 72 km (45 miles). Many balsam fir stands in this area were not infested in 1976, or were infested only lightly. However, virtually all balsam stands in this area showed evidence of defoliation this year. Scattered pockets of defoliation extend northward from the main body of infestation to Lower Manitou Lake. Further to the west, a light infestation (about 1 larvae per 46 cm (18 in.) branch tip) was detected in the Kenora District along the Ontario-Manitoba border between High Lake (just south of the Trans-Canada Highway) and north some 32 km (20 miles) to South Scot Lake. The townships of Ewart, Gundy, Rice and Noyon are involved.

To the east, in Atikokan and Thunder Bay districts, the extent of moderate-to-severe current defoliation doubled from 34 000 ha (84,000 acres) in 1976 to 65 400 ha (161,500 acres) mapped in 1977. Most of this defoliation occurred in pockets stretching from Kawnipi Lake in Quetico Provincial Park northeast to Lower Shebandowan Lake in the Thunder Bay District. For the most part, stands infested last year were reinfested this year, together with neighboring susceptible stands. In addition, several new pockets of defoliation were found including several small scattered pockets south and east of the Seine River on the west side of the Atikokan District and a pocket northwest of Cache Bay, Saganaga Lake in Quetico Provincial Park. Infestations at Prairie Portage in Quetico and along the Pigeon River south of Thunder Bay persisted again this year. Population buildups are reported on white spruce in the vicinity of Cameron Falls in Purdom Township, Nipigon District and in the area between Boulevard Lake in the city of Thunder Bay northward to Stepstone in Gorham Township. Populations elsewhere remained quite low.

Infestation Forecasts for 1978: A total of 214 locations were sampled for egg-mass counts and defoliation estimates in northwestern Ontario in 1977 (Table 8). Some 197 locations were sampled in 1976 and 1977. On the basis of locations common to both years, there was an overall increase of 49% in egg-mass counts. Increases of 61% occurred in the Thunder Bay District and 55% in Fort Frances District while strangely enough a decrease of 4% was recorded in

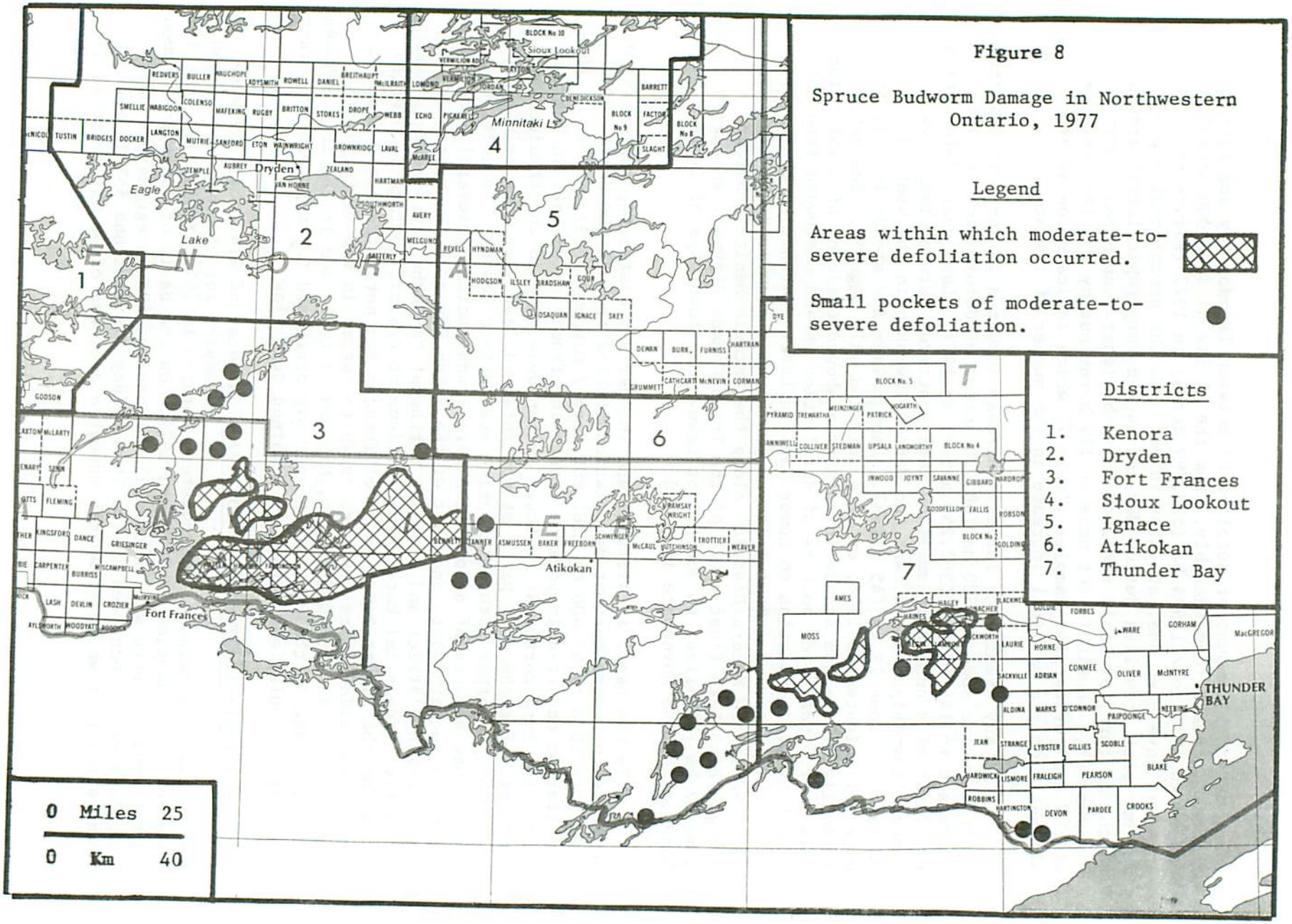


Figure 8
Spruce Budworm Damage in Northwestern Ontario, 1977
Legend
Areas within which moderate-to-severe defoliation occurred.
Small pockets of moderate-to-severe defoliation.
Districts
1. Kenora
2. Dryden
3. Fort Frances
4. Sioux Lookout
5. Ignace
6. Atikokan
7. Thunder Bay
Dryden
Eagle Lake
Minnitaki L.
Sioux Lookout
Atikokan
Fort Frances
THUNDER BAY
0 Miles 25
0 Km 40

Table 7. Results of monitoring plot samples for a six-year period for plots in northwestern Ontario

Location	Host	No. of larvae per 20-mat sample					
		1972	1973	1974	1975	1976	1977
Sioux Lookout District							
McAree Twp	bF	0	0	0	0	0	0
Drayton Twp	wS	0	0	0	0	0	0
Minnitaki Lake	bF	0	0	0	0	0	0
		0	0	0	0	0	0
Red Lake District							
Wenasaga Lake	bF	0	0	0	0	0	1
Dryden District							
Aubrey Twp	bF	0	0	1	3	0	2
Redvers Twp	bF	0	0	1	6	0	0
		0	0	2	9	0	2
Kenora District							
Melick Twp	bF	0	0	0	0	0	0
Redditt Twp	bF	-	0	0	2	1	1
		0	0	0	2	1	1
Fort Frances District							
Sifton Twp	wS	-	0	1	2	0	0
Potts Twp	bF	1	0	1	0	0	0
Mather Twp	bF	3	1	1	2	0	1
		4	1	3	4	0	1
Ignace District							
Norway Lake	bF	0	0	0	0	1	0
Lumberjack Lodge	wS	0	0	0	2	1	0
		0	0	0	2	2	0
Atikokan District							
White Otter Lake	wS	0	0	2	7	2	1
Saganagons Lake	bF	0	2	0	12	2	2
Tanner Lake	bF	-	19	1	8	1	1
		0	21	3	27	5	4
Thunder Bay District							
McTavish Twp	wS	0	6	0	0	33	4
Sibley Peninsula	bF	0	0	0	0	7	5
Little Harry Lake	bF	0	0	0	4	0	2
Hagey Twp	bF	0	1	5	14	5	3
Aldina Twp	bF	1	0	0	1	75	123
Spruce River Road	bF	0	0	1	4	1	1
Holingshead Lake	bF	0	0	0	1	0	0
		1	7	6	24	121	138
	Total	5	29	14	68	129	147

Table 8. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978.

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Atikokan District (74 locations)				
Agnes Lake	bF	0	55	L-M
Airport Road	bF	1	0	0
Allan Lake - west side	bF	0	0	0
Argo Lake - west side	bF	0	0	0
Basswood Lake - Bayley Bay	bF	1	26	L-M
- Canadian Point	bF	1	0	0
- North Bay	bF	0	0	0
- Prairie Portage	bF	2	35	L-M
- Ranger Bay	bF	0	0	0
Beaverhouse Lake	bF	0	0	0
Brent Lake - north central	bF	0	0	0
Buckingham Lake	bF	0	0	0
Cache Bay	bF	0	9	L-M
Cache Lake	bF	0	0	0
Calm Lake	bF	0	0	0
Captain Tom Lake	bF	0	0	0
Clearwater Lake	bF	0	0	0
Crooked Lake - east end	bF	0	0	0
Darky Lake	bF	0	0	0
David Lake	bF	1	13	L-M
Delahey Lake	bF	0	0	0
Dovetail Lake	bF	0	0	0
Duff Lake	bF	1	12	L-M
Emerald Lake	bF	0	0	0
Eye Lake	bF	1	0	0
Factor Lake	bF	0	7	L-M
Ferguson Lake	bF	0	0	0
French Lake	wS	0	0	0
French Lake	bF	3	14	L-M
Gehl Lake	bF	0	0	0
Greer Lake	bF	12	32	L-M
Hydro Line - Hwy 11	bF	0	16	L-M
Joe Lake	bF	0	36	L-M

(cont'd)

Table 8. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Atikokan District (cont'd) (74 locations)				
Joyce Lake	bF	0	0	0
Kawa Bay - #116	bF	1	0	0
Kawa Bay - west end	bF	0	7	L-M
Kawnipi Lake - Devine Creek	bF	1	27	L-M
Lac LaCroix - Campbells	bF	0	0	0
- I.R. 25 D (central)	bF	0	0	0
- I.R. 25 D (east)	bF	0	35	L-M
Lilac Lake	bF	1	0	0
Little Eva Lake	bF	0	37	L-M
Louisa Lake - north end	bF	1	12	L-M
Mack Lake	bF	1	0	0
McAree Lake - Lookout	bF	0	0	0
McCaulay Lake Rd	bF	0	0	0
McEwan Lake	bF	0	0	0
McIntyre Lake	bF	0	17	L-M
McKenzie Lake - (east side)	bF	0	0	0
- southwest end	bF	0	0	0
- Tower	bF	2	32	L-M
Melema Lake	bF	0	21	L-M
Mercutio Lake	bF	0	0	0
Minn Lake	bF	0	0	0
Niven Lake	bF	10	0	0
Olifaunt Lake	bF	0	0	0
Oriana Lake	bF	0	13	L-M
Pipestone River				
- east of Melin Lake	bF	0	0	0
- Whalen Lake Rd	bF	1	9	L-M
Poacher Lake	bF	2	19	L-M
Poohbah Lake	bF	0	0	0
Quetico Lake	bF	0	15	L-M
Saganagons Lake - N. side	bF	0	0	0
Snow Lake	bF	0	0	0
Sturgeon Lake				
- northeast end	bF	0	0	0
- west end	bF	0	12	L-M

(cont'd)

Table 8. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Atikokan District (cont'd) (74 locations)				
Sunday Lake	bF	1	33	L-M
Surprise Lake	bF	0	0	0
Tanner Lake	bF	1	9	L-M
Thompson Lake	bF	0	33	L-M
Tuck Lake	bF	0	7	L-M
Wet Lake	bF	0	0	0
Whalen Lake	bF	0	11	L-M
Wolseley Lake north central	bF	1	0	0
Fort Frances District (61 locations)				
Bear Pass - 2.4 km (1.5 miles) west	bF	86	232	M-S
Bennett Creek - east of Glenorchy	bF	0	15	L-M
Bennett Lake - west end	bF	0	21	L-M
Beynon Lake	bF	0	0	0
Big Sawbill Lake	bF	0	0	0
Boffin Lake - northeast side	bF	0	33	L-M
Crilly Rd	bF	9	86	M-S
Eagle Rock Lake	bF	0	0	0
Eldridge Lake	bF	1	16	L-M
Eltrut Lake	bF	9	223	S
Entwine Lake	bF	1	35	L-M
Eric Lake	bF	0	12	L-M
Floyd Lake	bF	0	11	L-M
Hepburn Lake	bF	7	28	L-M
Heron Lake	bF	2	15	L-M
Hwy 11 - Farrington Twp	bF	0	0	0
- south of Olive	bF	0	7	L-M

(cont'd)

Table 8. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Fort Frances District (cont'd) (61 locations)				
Hwy 11				
- Seine River	bF	0	28	L-M
- Mine Centre	bF	0	33	L-M
Jones Lake	bF	1	118	M-S
Law Lake				
3.2 km (2 miles) east	bF	1	16	L-M
Lawrence Lake	bF	0	7	L-M
Little Sawbill Lake				
- south side	bF	0	16	L-M
Little Turtle Lake Rd				
- Mile 9.4	bF	0	0	0
Lower Manitou Lake	bF	0	0	0
Mainville Lake				
- northeast side	bF	0	22	L-M
Makomesut Lake				
- southeast side	bF	1	16	L-M
Manion Lake				
- southeast corner	bF	14	72	M-S
Manion Lake Rd				
- at Hwy 11	bF	32	459	S
- Hillyer Creek	bF	2	88	M-S
- Little Turtle River	bF	7	90	M-S
- Mile 11	bF	13	178	M-S
- Mile 14.5	bF	4	425	S
Manitou Stretch	bF	1	108	M-S
Mather Twp	bF	0	0	0
Melin Lake	bF	7	0	0
Moosetrack Lake				
- west side	bF	62	216	M-S
Mount Lake	bF	5	11	L-M
Otukamamoan Lake				
- southeast side	bF	0	23	L-M
- west side	bF	0	0	0
Pettit Lake	bF	1	28	L-M

(cont'd)

Table 8. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Fort Frances District (cont'd) (61 locations)				
Pipestone Lake - east end	bF	0	0	0
Pickwick Lake	bF	1	42	L-M
Potts Twp	bF	0	0	0
Rainy Lake				
- Ash Bay, west end	bF	0	0	0
- Black Sturgeon Bay	bF	3	11	L-M
- Chamberlain Point	bF	0	24	L-M
- Grassy Portage Bay	bF	68	91	M-S
- Little Grassy Bay	bF	0	0	0
- Moose Bay	bF	0	0	0
- Northeast Bay, south side	bF	0	0	0
- Rat River Bay	bF	0	0	0
- Red Gut Bay	bF	2	0	0
- Reef Point Rd	bF	0	0	0
Roscoe Lake	bF	1	16	L-M
Shoal Lake	bF	0	31	L-M
Sphene Lake	bF	0	0	0
Tupman Lake	bF	0	9	L-M
Turtle River 4 km (2.5 miles) southeast	bF	42	77	M-S
Vista Lake	bF	1	104	M-S
Weller Lake	bF	3	0	0
Thunder Bay District (79 locations)				
Aldina Twp - 101	bF	46	14	L-M
Aldina Twp - 102	bF	45	20	L-M
Armistice Cr. - 3.2 km (2 miles) east of Sunday Lake	bF	3	0	0
Athelstane Lake	bF	3	0	0

(cont'd)

Table 8. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Thunder Bay District (cont'd) (79 locations)				
Batwing Lake	bF	18	0	0
Batwing & Mark lakes Rd Jct	bF	4	13	L-M
Bedivere Lake	bF	3	0	0
Bemar Lake	bF	2	9	L-M
Blackwell Twp	bF	8	31	L-M
Burchell Lake	bF	4	0	0
Clay Lake	bF	78	344	S
Clovenhoof Lake	bF	7	12	L-M
Crayfish Lake	bF	5	24	L-M
Cushing Lake	bF	0	0	0
Devil's Elbow	bF	6	15	L-M
Drift Lake Road	bF	5	0	0
Flatrock Lake	bF	3	0	0
Fountain Lake	bF	9	0	0
Gorham Twp - Current River	bF	12	0	0
Greenwater Lake - east side	bF	68	87	M-S
- Shelter Island	bF	3	0	0
Greenwood Lake	bF	18	29	L-M
Gunflint Lake - west end	bF	20	16	L-M
Hagey Twp - Hwy 586	bF	8	20	L-M
Haines Twp - Postans	bF	8	0	0
Heaven Lake Road	bF	2	0	0
Hood Lake	bF	87	128	M-S
Hoof Lake	bF	64	356	M-S
Huronian Lake	bF	1	0	0
Hwy 11 - west of Burchell Lake Rd	bF	1	0	0
Hwy 800 - Kabitotikwia River	bF	4	15	L-M
Icarus Lake	bF	9	10	L-M
Kashabowie Lake	bF	0	18	L-M
Kekekuab Lake	bF	80	207	M-S

(cont'd)

Table 8. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (cont'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Thunder Bay District (cont'd) (79 locations)				
Lac des Mille Lacs				
- Baril Bay	bF	3	0	0
- Bolton Bay	bF	7	0	0
- Pine Point	bF	4	0	0
- Poplar Point	bF	3	0	0
- Portage Bay	bF	3	0	0
Marks Lake	bF	2	0	0
McGinnis Lake	bF	52	111	M-S
McGrath Lake	bF	3	0	0
McMaster Twp	bF	5	0	0
McTavish Twp				
- Ministry of Transportation Comm. Depot	wS	5	24	L-M
Moss Lake	bF	16	0	0
Mountain Lake	bF	54	11	L-M
Myrt Lake	bF	80	57	L-M
Nelson Lake	bF	24	19	L-M
Northern Light Lake				
- Curran Bay	bF	8	33	L-M
- Gravel Pit	bF	6	0	0
- South Island	bF	3	0	0
- Trafalgar Bay	bF	5	0	0
- Trout Bay Rd	bF	18	77	L-M
North Fowl Lake Rd				
- Mile 2.3 south	bF	27	27	L-M
- Mile 2.5 west	bF	17	15	L-M
Pearson Twp	bF	1	21	L-M
Pigeon River area				
- Hwy 61 at Larsen Rd	bF	2	13	L-M
- Hwy 597	bF	7	28	L-M
- Arrow R. on Hwy 593	bF	1	14	L-M

(cont'd)

Table 8. Northwestern Ontario - Spruce budworm: Summary of defoliation estimates and egg-mass counts in 1977, and infestation forecasts for 1978 (concl'd).

Location	Host	Estimated per cent of defoliation 1977	No. of egg-masses per 9.29 sq. m (100 sq. ft) of foliage	Infestation forecasts for 1978[a]
Thunder Bay District (concl'd) (79 locations)				
Pinecone Lake	bF	28	84	M-S
Plummes Lake	bF	38	61	L-M
Powell Lake	bF	70	109	M-S
Prelate Lake	bF	4	9	L-M
Ross Lake	bF	86	486	S
Sandstone Lake	bF	9	12	L-M
Shebandowan Lake - Sawmill Bay	bF	17	10	L-M
Sibley Peninsula - Joeboy Lake	bF	1	0	0
Sleigh Lake	bF	90	78	M-S
South Fowl Lake	bF	1	0	0
Squeers Lake	bF	13	19	L-M
Squeers River North	bF	18	50	M
Swallow Lake	bF	96	167	M-S
Thunder Bay - O.M.N.R. Tree Nursery	wS	4	14	L-M
- Centennial Pk	wS	54	51	L-M
Tilley Lake	bF	2	0	0
Titmarsh Lake	bF	6	0	0
Upsala Inwood Pk	bF	2	0	0
Weikwabinonaw Lake	bF	7	10	L-M
Whitefish Lake	bF	2	0	0

[a] S = severe, M = moderate, L = light, 0 = nil

Atikokan District. However, this pattern of change emphasizes that populations continue to build up in two major areas of the two districts, i.e., between Bennett Lake and Fort Frances in the Fort Frances District and between Kawnipi Lake in Quetico Provincial Park and Lower Shebandowan Lake in the Thunder Bay District. For the most part, populations remain very low in the area between the two infestations, i.e., the Atikokan District and elsewhere.

As far as forecasts for 1978 are concerned, it seems likely that new infestations will be found and there will be an increase in the extent of defoliation. Generally speaking, those areas infested and defoliated in 1977 will be defoliated in 1978 along with adjacent or nearby susceptible stands. There could be as much as 485 600 ha (1.2 million acres) of defoliation in 1978, i.e., 283 300 ha (700,000 acres) in Fort Frances District and 202 300 ha (500,000 acres) in Thunder Bay District (Figure 9).

In retrospect, it is not clear yet whether 1977 was as crucial a year as we anticipated in determining in which direction and to what extent the balance would be tipped in northwestern Ontario. Certainly, following the 1977 season, the budworm situation had worsened somewhat as was indicated by enlarged areas of defoliation and increased egg-mass counts. However, even though this continued buildup increases the potential for a large scale outbreak, it is still not certain that the situation in northwestern Ontario has reached the point where a full-fledged outbreak is bound to occur simply on the basis of self-generated momentum.

Tree Mortality: In 1976 several pockets of balsam fir mortality, undoubtedly caused by repeated budworm defoliation, as evidenced by the appearance of "grey phase" stands, were detected in the vicinity of Bennett Lake in the eastern part of the Fort Frances District. Because of its inaccessibility, this mortality could not be confirmed until 1977 when ground checks showed about 70% of the merchantable balsam fir was dead in limited areas.

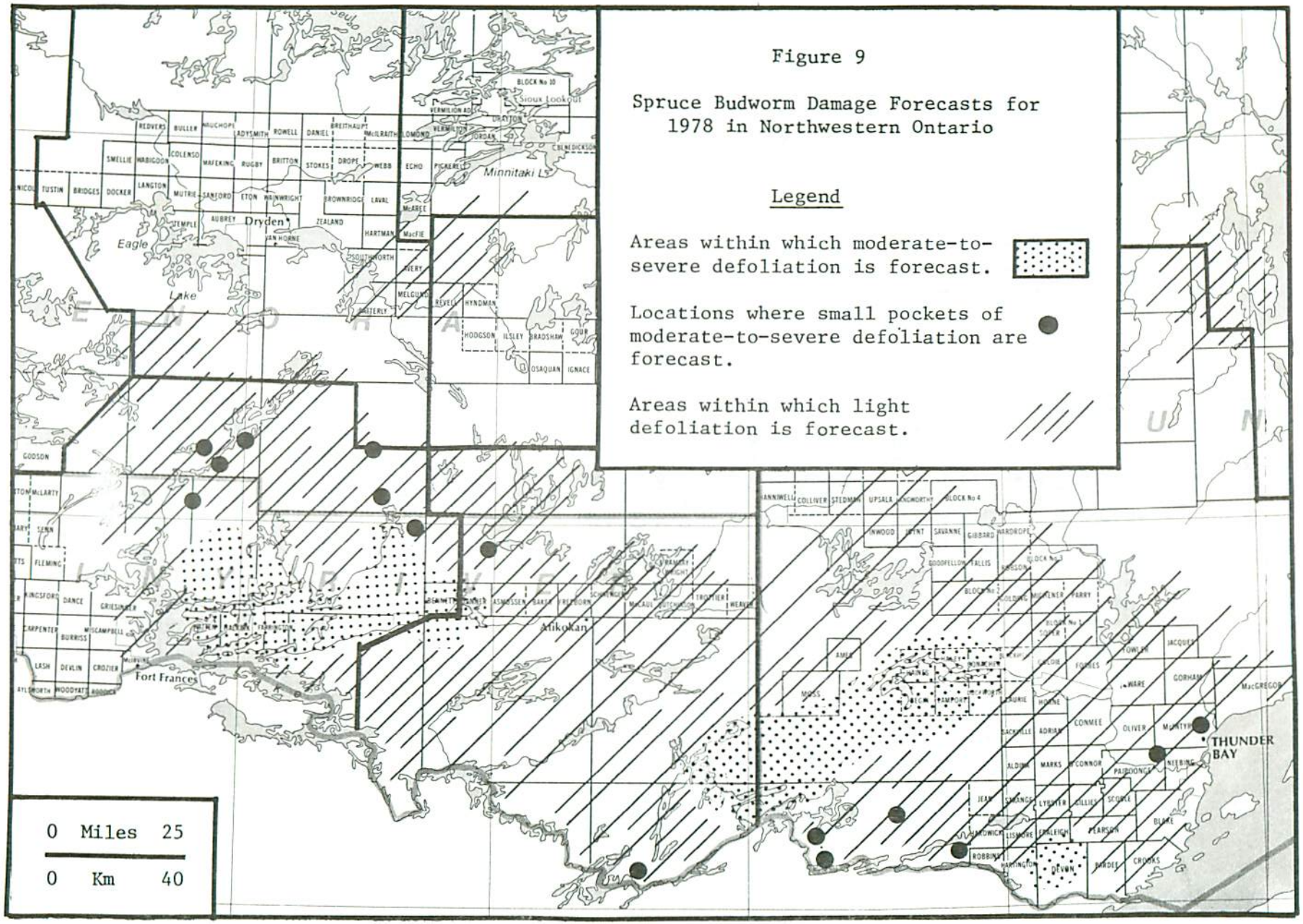


Figure 9
Spruce Budworm Damage Forecasts for 1978 in Northwestern Ontario
Legend
Areas within which moderate-to-severe defoliation is forecast.
Locations where small pockets of moderate-to-severe defoliation are forecast.
Areas within which light defoliation is forecast.
Dryden
Eagle Lake
Minnitaki L.
Sioux Lookout
Fort Frances
Atikokan
THUNDER BAY
0 Miles 25
0 Km 40

PART B: AERIAL SPRAYING OPERATIONS

INTRODUCTION

The Ontario Ministry of Natural Resources conducted aerial spraying operations totalling some 4 260 ha (10,527 acres) against spruce budworm in 1977. Operations this year were confined to northeastern Ontario. Included in the overall area sprayed are field trials of Orthene totalling 405 ha (1,000 acres). The Great Lakes Forest Research Centre provided the biological information necessary for the planning, timing and evaluation of these operations. In addition, GLFRC (FIDS) carried out province-wide surveys for spruce budworm defoliation and egg-mass counts in order to determine the overall situation and provide forecasts for 1978. OMNR was responsible for the spraying logistics and provided aid to GLFRC in the form of aircraft time for surveys and casual help for foliage mills.

The spray contractor was General Airspray Ltd., St. Thomas, Ontario with a portion of the work subcontracted to Zimmer Air Service of Charing Cross, Ontario. Aircraft used were an Agcat and a Cessna Agtruck, both equipped with four Micronair AU3000 dispersal units. Matacil (aminocarb, Chemagro Ltd.) mixed with fuel oil was applied to 3 856 ha (9,527 acres) in single (664 ha or 1,640 acres) or double (3 192 ha or 7,887 acres) applications of 28.3 g in .59 L per .4 ha (1 oz (a.i.) in 20 fluid oz of spray mixture per acre) (Table 9(a)). Orthene (Chevron Chemical Ltd.) mixed with water was applied to 664 ha (1,000 acres) at 113.4 and 226.8 g in .59 L or 1.89 L per .4 ha (4 and 8 oz (a.i.) in 20 fluid oz or .5 gal (U.S.) per acre) (Table 9(a)). Thuricide 16B (Sandoz, Inc.) was sprayed by mistblower on some 77 ha (190 acres) at various rates (Table 9(b)).

Southern Ontario

1977 Operations: Aerial spraying operations totalling some 809 ha (2,000 acres) each year had been carried out in Algonquin Provincial Park from 1974 to 1976. Populations declined to very low levels in the fall of 1976 and protection spraying was not required in 1977.

Proposed Aerial Spraying Operations for 1978: No spraying is required because of low population levels.

Northeastern Ontario

1977 Operations: In all, 4 260 ha (10,527 acres) were aerially sprayed and 77 ha (190 acres) were ground sprayed by mistblower in northeastern Ontario in 1977. The locations, areas and treatments are listed in Tables 9(a) and 9(b). Fuel oil was the diluent

Table 9(a). Summary of aerial spraying operations in northeastern Ontario against spruce budworm by the Ministry of Natural Resources, 1977.

Location	Hectares	Treatment
Chapleau District		
Five Mile Prov. Park	177	Matacil 28.3 g (a.i.)/.59 L/.4 ha, sprayed twice
Missinaibi Prov. Park	411	" " " " " " " " " "
Shoals Prov. Park	368	" " " " " " " " " "
Wakami Prov. Park	87	" " " " " " " " " "
Chapleau Nursery	4	" " " " " " " " " "
Triquet Twp S.P.A.[a]	176	" " " " " " " " " "
Reeves Twp S.P.A.	12	" " " " " " " " " "
	1 235	
Kirkland Lake District		
Swastika Nursery	81	" " " " " " " " " "
Burt Twp S.P.A.	79	" " " " " " " " " "
	160	
Wawa District		
Hwy 17 corridor	1 756	" " " " " " " " " "
Rabbit Blanket	40	" " " " " " " " " "
Mijin Lake Shore	664	" " " " " " " " , sprayed once
Mijin Road	81	Orthene 113.4 g (a.i.)/.59 L/.4 ha, sprayed once
	148	Orthene 226.8 g (a.i.)/.59 L/.4 ha, sprayed once
	81	Orthene 113.4 g (a.i.)/1.89 L/.4 ha, sprayed once
	95	Orthene 226.8 g (a.i.)/1.89 L/.4 ha, sprayed once
	2 865	
Total =	4 260	

Table 9(b). Summary of ground spraying of *B.t.* by mistblower in Chapleau District against spruce budworm by the Ministry of Natural Resources, 1977.

Park	Hectares	Treatment
Shoals	18	11.24 L/min, Thuricide 16B mixed 1:7 with water
Shoals	12	19.98 L/min, " " " " " "
Five Mile	41	19.98 L/min, " " " " " "
Wakami	6	35.96 L/min, " " " " " "

[a] S.P.A. - Seed Production Area.

Conversion factors

1 ha = 2.471 acres
28.35 g = 1 oz
29.57 mL = 1 fl oz (U.S.)
3.785 L = 1 gal. (U.S.)

for Matacil at a ratio of 2.75:1. Approximately 5-7 days were allowed between applications for those areas that were sprayed twice. Orthene was mixed with appropriate amounts of water depending on dosage and application rate. Rhodamine B was added to each Orthene treatment to a concentration of 1-2%.

The purpose of the spraying was to minimize damage caused by budworm feeding within selected high-value areas, such as provincial parks, forest nurseries or seed production areas. The Orthene treatments were a continuation of operational field trials started last year with this material in order to develop alternative means of controlling spruce budworm larvae and protecting foliage in high-value areas. In the provincial parks in Chapleau District the intent was to spray Matacil throughout the parks except for a buffer strip of approximately 100 m along lake edges and around campgrounds. *Bacillus thuringiensis* was applied from a mistblower along lakeshores or campgrounds.

Spraying was carried out from May 26 to June 9 in the Chapleau District using a Cessna Agtruck and from May 31 to June 8 in Lake Superior Provincial Park using a Grumman Agcat. The spraying in Kirkland Lake District was carried out from Chapleau with the Agtruck on May 30 and June 9. Approximately equal proportions of third and fourth instar budworm were present at the start of spraying. As in 1976, the operations were prolonged beyond optimum limits by poor spraying weather.

Results: The various treatments in Chapleau and Wawa districts were assessed by intensive sampling for effectiveness. Table 10 presents pre- and postspray population data for Chapleau District on a plot basis and larval mortality and foliage protection due to treatment. Table 12 summarizes larval mortality and foliage protection for each treatment. Results of two applications of 28.3 g/.4 ha (1 oz/acre) each of Matacil are not consistent. They range from fairly good in some cases to very poor in others. Inconsistent results are probably related to variation in spray deposit. However, no deposit measurements were made. Generally, results are much better on balsam fir than on white spruce. Mistblower applications of *B.t.* produced generally good results, probably because of better coverage (mistblower vs aircraft) rather than because of the materials used (*B.t.* vs Matacil).

In Lake Superior Provincial Park in Wawa District, operational trials comparing various dosages and application rates of Orthene were carried out as well as operational protection spraying of Matacil along Hwy 17. Detailed results on a plot to plot basis are presented in Table 11. A summary of results for each treatment is contained in Table 13. Two applications of Matacil, each 28.3 g/.4 ha (1 oz/acre) generally provided good results in terms of larval mortality and foliage protection. The results with Matacil in the Wawa District were more consistent and had fewer differences between balsam fir and white spruce than the Matacil results in the Chapleau District.

Table 10. Population reduction and foliage protection attributable to various spray treatments in individual plots on balsam fir and white spruce in four provincial parks, a forest nursery and a seed production area in the Chapleau District, 1977. Plots consisted of 5 or 10 pairs of balsam fir and white spruce trees (one 46 cm (18 in.) branch tip per tree for prespray samples and two 46 cm (18 in.) tips per tree for postspray). Budworm development at time of spraying was primarily L4 and L5 with some L6 present.

	Prespray larvae/ 46 cm (18 in.) branch tip		Surviving pupae/ 46 cm (18 in.) branch tip		% Population reduction due to treatment		Defoliation	
	bF	wS	bF	wS	bF	wS	bF	wS
Missinaibi Provincial Park - Matacil, 2 applications, 28.3 g/.4 ha (1.0 oz/acre) each								
Plot 1 (n = 10)	42.1	54.7	.8	4.3	93	0	41	68
Check (n = 5)	26.8	62.6	7.1	1.9			62	97
Chapleau Nursery - Matacil, 2 applications, 28.3 g/.4 ha (1.0 oz/acre) each								
Plot 1 (n = 5)	11.2	5.0	.1	1.3	98	13	10	12
Check (n = 5)	13.7	16.7	5.0	5.0			64	57
Reeves Twp, Seed Production Area - Matacil, 2 applications, 28.3 g/.4 ha (1.0 oz/acre) each								
Plot 1 (n = 10)		73.1		2.1		5		93
Check (n = 5)		62.6		1.9				97
Shoals Provincial Park - mistblower application of *B.t.*, 11.24 L/min (3.0 gal (US)/min)								
Plot 5 (n = 5)	12.4	19.1	.4	.9	89	71	15	32
Check (n = 5)	9.5	18.2	2.7	3.0			61	47
Plot 6 (n = 5)	6.1	7.2	.7	1.5	60	30	7	9
Check (n = 5)	7.4	16.7	2.1	5.0			44	57
- mistblower application of *B.t.*, 19.98 L/min (5.3 gal/min)								
Plot 2 (n = 5)	11.2	20.3	2.0	1.3	37	61	57	60
Check (n = 5)	9.5	18.2	2.7	3.0			61	47
Plot 3 (n = 5)	21.2	14.0	2.4	1.0	62	57	55	74
Check (n = 5)	23.9	18.2	7.1	3.0			62	47
Plot 4 (n = 5)	16.6	12.6	.5	1.5	83	28	23	32
Check (n = 5)	17.8	18.2	3.2	3.0			84	47

(cont'd)

Table 10. Population reduction and foliage protection attributable to various spray treatments in individual plots on balsam fir and white spruce in four provincial parks, a forest nursery and a seed production area in the Chapleau District, 1977. Plots consisted of 5 or 10 pairs of balsam fir and white spruce trees (one 46 cm (18 in.) branch tip per tree for prespray samples and two 46 cm (18 in.) tips per tree for postspray). Budworm development at time of spraying was primarily L4 and L5 with some L6 present (concl'd).

	Prespray larvae/ 46 cm (18 in.) branch tip		Surviving pupae/ 46 cm (18 in.) branch tip		% Population reduction due to treatment		Defoliation	
	bF	wS	bF	wS	bF	wS	bF	wS
5 Mile Provincial Park - Matacil, 2 applications, 28.3 g/.4 ha (1 oz/acre) each								
Plot 7 (n = 5)	9.0	14.0	.4	.2	84	95	23	33
Check (n = 5)	9.5	16.7	2.7	5.0			61	57
- mistblower application of *B.t.*, 19.98 L/min (5.3 gal/min)								
Plot 1 (n = 5)	2.5	7.4	1.8	1.1	0	10	15	21
Check (n = 5)	7.4	18.2	2.1	3.0			44	47
Plot 2 (n = 5)	6.7	3.4	1.1	.6	42	0	21	11
Check (n = 5)	7.4	18.2	2.1	3.0			44	47
Plot 3 (n = 5)	11.4	12.8	2.4	1.0	26	53	25	19
Check (n = 5)	9.5	18.2	2.7	3.0			61	47
Plot 4 (n = 5)	6.3	17.1	0	.1	100	96	6	22
Check (n = 5)	7.4	18.2	2.1	3.0			44	47
Plot 5 (n = 5)	8.8	13.0	.5	1.1	80	49	24	24
Check (n = 5)	9.5	18.2	2.7	3.0			61	47
Plot 6 (n = 5)	6.1	14.9	.3	.7	83	84	11	23
Check (n = 5)	7.4	16.7	2.1	5.0			44	57
Wakami Provincial Park - Matacil, 2 applications, 28.3 g/.4 ha (1 oz/acre) each + mistblower application of *B.t.*, 35.96 L/min (9.5 gal/min)								
Plot 1 (n = 5)	8.1	10.1	.1	.2	96	88	10	25
Check (n = 5)	7.4	18.2	2.1	3.0			44	47
- Matacil, 2 applications, 28.3 g/.4 ha (1 oz/acre) each								
Plot 2 (n = 5)	17.5	23.9	.5	.3	90	93	32	38
Check (n = 5)	23.9	26.5	7.1	5.0			62	57
Plot 3 (n = 5)	12.8	16.9	.7	.4	81	86	13	37
Check (n = 5)	9.5	18.2	2.7	3.0			61	47
Plot 4 (n = 5)	30.6	26.5	.1	.2	99	88	12	51
Check (n = 5)	26.8	23.4	7.1	1.5			62	34
Plot 6 (n = 5)	35.8	68.8	.2	.7	98	66	77	88
Check (n = 5)	26.8	62.6	7.1	1.9			62	97
Plot 7 (n = 10)	15.7		.1		96		36	
Check (n = 5)	16.0		2.7				61	

Table 11. Population reduction and foliage protection attributable to various spray treatments in individual plots on balsam fir and white spruce in Lake Superior Provincial Park, Wawa District, 1977. Budworm development at time of spraying was L4-L5.

	Prespray larvae/ 46 cm (18 in.) branch tip		Surviving pupae/ 46 cm (18 in.) branch tip		% Population reduction due to treatment		% 1977 Defoliation		% 1977 Frost damage	
	bF	wS	bF	wS	bF	wS	bF	wS	bF	wS
Matacil, 2 applications, 28.3 g/.59 L/.4 ha (1.0 oz/20 fl oz/acre) each										
Plot 1	19.4	49.0	.1	2.5	95	75	15	38	0	0
Check	17.2	46.2	1.7	9.5			75	25	30	20
Plot 2	32.2	84.0	.2	1.6	96	88	90	85	30	5
Check	35.4	59.8	6.3	9.3			95	60	5	5
Plot 3	32.8	70.2	.3	.7	95	94	35	95	25	10
Check	35.4	59.8	6.3	9.3			95	60	5	5
Plot 4	41.6	84.6	1.2	2.2	81	83	75	90	50	5
Check	36.8	59.8	5.7	9.3			75	60	30	5
Plot 5	18.8	44.8	1.5	2.0	19	78	25	30	25	5
Check	17.2	46.2	1.7	9.5			75	25	30	20
Plot 6	31.4	55.0	.1	1.6	98	81	20	25	20	5
Check	35.4	59.8	6.3	9.3			95	60	5	5
Plot 7	39.4	71.0	0	0	100	100	65	29	5	5
Check	36.8	59.8	5.7	9.3			75	60	30	5
Plot 8	22.4	123.6	.3	.7	93	96	40	75	5	0
Check	24.8	59.8	4.8	9.3			40	60	35	5
Plot 9	29.0	51.6	0	2.5	100	76	60	60	20	5
Check	24.8	46.2	4.8	9.5			40	25	35	20
Plot 10	21.7	25.7	1.0	2.8	76	6	50	25	2	0
Check	24.8	27.6	4.8	3.2			40	20	35	0
Plot 11	3.4	6.0	.5	1.6	0	0	10	5	0	0
Check	6.6	13.4	.5	1.5			5	10	0	0
Orthene, 1 application, 113.4 g/.59 L/.4 ha (4 oz/20 fl oz/acre)										
Plot 1	41.6	51.2	.1	.2	98	98	80	80	0	0
Check	36.8	46.2	5.7	9.5			15	25	30	20
Plot 2	33.2	31.6	.5	1.5	92	59	80	60	15	0
Check	35.4	27.6	6.3	3.2			95	20	5	0
Plot 3	10.6	38.4	0	.9	100	80	60	80	2	0
Check	15.4	39.8	2.4	4.6			25	75	0	20
Plot 4	18.4	24.8	0	.2	100	93	65	45	20	0
Check	17.2	27.6	1.7	3.2			75	20	30	0
Plot 5	27.6	45.8	0	.3	100	97	55	70	2	0
Check	24.8	46.2	4.8	9.5			40	25	35	20

(continued)

Table 11. Population reduction and foliage protection attributable to various spray treatments in individual plots on balsam fir and white spruce in Lake Superior Provincial Park, Wawa District, 1977. Budworm development at time of spraying was L4-L5 (concl'd).

	Prespray larvae/ 46 cm (18 in.) branch tip		Surviving pupae/ 46 cm (18 in.) branch tip		% Population reduction due to treatment		% 1977 Defoliation		% 1977 Frost damage	
	bF	wS	bF	wS	bF	wS	bF	wS	bF	wS
Orthene, 1 application, 226.8 g/.59 L/.4 ha (8 oz/20 fl oz/acre)										
Plot 1	26.2	44.8	.1	.7	98	92	65	30	45	5
Check	24.8	46.2	4.8	9.5			40	25	35	20
Plot 2	3.6	54.0	.4	.3	0	96	25	30	50	20
Check	6.6	59.8	.5	9.3			5	60	0	5
Plot 3	9.2	52.8	0	.4	100	96	95	60	20	5
Check	6.6	46.2	.5	9.5			5	25	0	20
Plot 4	9.2	24.0	.1	.7	86	75	90	95	30	0
Check	6.6	27.6	.5	3.2			5	20	0	0
Plot 5	19.2	24.0	.6	1.7	68	39	99	99	5	0
Check	17.2	27.6	1.7	3.2			75	20	30	0
Orthene, 1 application, 113.4 g/1.89 L/.4 ha (4 oz/.5 gal/acre)										
Plot 1	19.2	40.8	0	0	100	100	90	85	45	10
Check	17.2	39.8	1.7	4.6			75	75	30	20
Plot 2	33.0	66.0	0	1.4	100	86	60	50	40	5
Check	35.4	59.8	6.3	9.3			95	60	5	5
Plot 3	21.8	24.0	1.6	6.2	62	0	75	75	35	0
Check	24.8	27.6	4.8	3.2			40	20	35	0
Plot 4	59.4	39.0	1.2	1.2	87	73	65	60	30	2
Check	36.8	39.8	5.7	4.6			75	75	30	20
Plot 5	20.8	50.8	.7	1.3	66	88	95	95	35	2
Check	17.2	46.2	1.7	9.5			75	25	30	20
Orthene, 1 application, 226.8 g/1.89 L/.4 ha (8 oz/.5 gal/acre)										
Plot 1	18.2	27.6	.1	.5	94	84	30	35	15	5
Check	17.2	27.6	1.7	3.2			75	20	30	0
Plot 2	18.2	40.2	0	.6	100	87	25	40	25	5
Check	17.2	39.8	1.7	4.6			75	75	30	20
Plot 3	16.8	37.4	0	.1	100	98	25	20	5	0
Check	17.2	39.8	1.7	4.6			75	75	30	20
Plot 4	4.6	17.0	.2	.4	43	79	90	85	0	0
Check	6.6	13.4	.5	1.5			5	10	0	0
Plot 5	12.2	42.4	.1	1.3	92	74	70	50	2	0
Check	17.2	42.4	1.7	4.9			75	75	30	0

Table 12. Summary of population reduction and foliage protection attributable to various spray treatments on balsam fir and white spruce at various locations in Chapleau District, 1977.

	Prespray larvae/ 46 cm (18 in.) branch tip		Surviving pupae/ 46 cm (18 in.) branch tip		% Population reduction due to treatment		% 1977 Defoliation	
	bF	wS	bF	wS	bF	wS	bF	wS
Matacil, 2 applications, 28.3 g + 28.3 g/.4 ha (1 + 1 oz/acre)								
Missinaibi Prov. Park	42.1	54.7	.8	4.3	93	0	41	68
Check	26.8	62.6	7.1	1.9			62	97
Chapleau Nursery	11.2	5.0	.1	1.3	98	13	10	12
Check	13.7	16.7	5.0	5.0			64	57
Reeves Twp S.P.A.		73.1		2.1		5		93
Check		62.6		1.9				97
5 Mile Prov. Park	9.0	14.0	.4	.2	84	95	23	33
Check	9.5	16.7	2.7	5.0			61	57
Wakami Prov. Park	22.5	34.0	.3	.4	94	86	34	54
Check	20.6	32.7	5.3	2.8			62	59
Matacil, 2 applications, 28.3 + 28.3 g/.4 ha (1 + 1 oz/ acre) and a mistblower application of *B.t.* , 35.96 L/min (9.5 gal/min)								
Wakami Prov. Park	8.1	10.1	.1	.2	96	88	10	25
Check	7.4	18.2	2.1	3.0			44	47
B.t. - mistblower application, 1124 L/min (3 gal/min)								
Shoals Prov. Park	9.2	13.2	.6	1.2	77	60	11	20
Check	8.4	17.4	2.4	4.0			52	52
B.t. - mistblower application, 19.98 L/min (5.3 gal/min)								
Shoals Prov. Park	16.3	15.6	1.6	1.3	60	50	45	55
Check	17.1	18.2	4.3	3.0			69	47
5 Mile Prov. Park	7.0	11.4	1.0	.8	50	62	17	20
Check	8.1	18.0	2.3	3.3			50	49

Table 13. Summary of population reduction and foliage protection attributable to various spray treatments on balsam fir and white spruce in Lake Superior Provincial Park, Wawa District, 1977. Budworm development at time of spraying was L4-L5.

	Prespray larvae/ 46 cm (18 in.) branch tip		Surviving pupae/ 46 cm (18 in.) branch tip		% Population reduction due to treatment		% 1977 Defoliation		% 1977 Frost damage	
	bF	wS	bF	wS	bF	wS	bF	wS	bF	wS
Matacil, 2 applications, 28.3 g/.59 L/.4 ha (1.0 oz/20 fl oz/acre) each										
Spray	26.6	60.5	.5	1.6	88	84	44	51	16	4
Check	26.8	48.9	4.4	8.1			65	42	22	8
Orthene, 1 application, 113.4 g/.59 L/.4 ha (4 oz/20 fl oz/acre)										
Spray	26.3	38.4	.1	.6	98	90	68	67	8	0
Check	25.9	37.5	4.2	6.0			62	33	20	12
Orthene, 1 application, 226.8 g/.59 L/.4 ha (8 oz/20 fl oz/acre)										
Spray	13.5	39.9	.2	.8	88	88	75	63	30	6
Check	12.4	41.5	1.6	6.9			26	30	13	9
Orthene, 1 application, 113.4 g/1.89 L/.4 ha (4 oz/.5 gal/acre)										
Spray	30.8	44.1	.7	2.0	85	69	77	73	37	4
Check	26.3	42.6	4.0	6.2			72	51	26	13
Orthene, 1 application, 226.8 g/1.89 L/.4 ha (8 oz/.5 gal/acre)										
Spray	14.0	32.9	.1	.1	93	97	48	46	9	2
Check	15.1	32.6	1.5	3.8			61	51	18	8

Unfortunately the operational trials involving Orthene in the Wawa District may have been compromised somewhat by the occurrence of frost during the period 3-10 June. Foliage damage caused by frost was recorded in most of the treatment and check plots. There may also have been an adverse effect on larval populations exposed to the low temperatures. However, if it is assumed that frost affected all treatment and check plots more or less equally, then the results in Tables 11 and 13 indicate that there are apparently no significant differences among the four treatments. The recommended operational dosage and application rate of Orthene, 226.8 g in 1.89 L per .4 ha (8 oz (a.i.)/.5 gpa), produced the highest larval mortality and the best foliage protection, although admittedly the level of foliage protection was marginal, at best. The other three Orthene treatments produced similar results, i.e., high larval mortalities, relatively consistent results from plot to plot within treatments, only minor differences between fir and spruce and generally poor foliage protection. The lack of foliage protection in view of the high larval mortalities and timing of the applications is somewhat surprising. All four Orthene treatments were carried out the same morning, 1 June, with ideal weather conditions from start to finish. Deposit was good for all treatments averaging 101 droplets per cm^2 for the 113.4 g in .59 L per .4 ha (4 oz in 20 fl oz/acre) sprayed between 6:00-6:30 a.m.; 88 droplets per cm^2 for the 226.8 g in .59 L per .4 ha (8 oz in 20 fl oz/acre) sprayed between 7:00-7:30 a.m.; 86 droplets per cm^2 for the 226.8 g in 1.89 L per .4 ha (8 oz/.5 gpa) sprayed between 8:00-8:30 a.m. and finally, 55 droplets per cm^2 for the 113.4 g in 1.89 L per .4 ha (4 oz/.5 gpa) sprayed between 9:00 and 9:30 a.m. It would seem that the deposit recorded for the Orthene treatments is correlated with time of application rather than application rate. Light rain fell later in the day starting about 1:00 p.m. and continued intermittently until the next morning. A total of 1.9 mm of rain fell in the 24 hour period following the treatments. There is no evidence to indicate adverse effects due to the rain; in fact, the rain may have enhanced the treatments by spreading the insecticide more evenly over the foliage surface and penetrating sheltered budworm feeding sites.

Proposed Aerial Spraying Operations for 1978: It is likely that an operational spraying program similar in nature to that of 1977 but much reduced in scope will be carried out in 1978. For example, it appears that about 607 ha (1,500 acres) will be aerially treated and 200 ha (500 acres) or so will be sprayed from the ground at various locations in Wawa, Chapleau, Kirkland Lake and Kapuskasing districts.

Northwestern Ontario

1977 Operations: In northwestern Ontario, starting in 1968, OMNR adopted a policy of attempting to eliminate incipient infestations or to suppress outbreaks. Such an approach required early detection and relatively precise definition of infested areas. Annual spraying operations ranging from 4 452 to 111 291 ha

(11,000 to 275,000 acres) in size were conducted from 1968 to 1976. The results of this policy and the execution thereof appeared quite successful, particularly when one compares the course of events in northwestern Ontario with those that occurred in northeastern Ontario during this time period. However, the situation changed in 1975 and budworm populations increased over extensive areas. By 1976, it was clear that two major areas of infestation existed in this part of Ontario and an operation of approximately 400 000 ha (1.0 million acres) in extent would be necessary if the policy of suppression was to be continued. OMNR decided against an operation of this magnitude for environmental and economic reasons and no spraying occurred in northwestern Ontario in 1977.

Proposed Aerial Spraying Operations for 1978: There are no plans for any aerial spraying operations in northwestern Ontario next year. It is expected that if the outbreak continues to develop and enlarge, OMNR will protect high-value stands.

SUMMARY

Aerial spraying operations totalling 4 260 ha (10,527 acres) were conducted against the spruce budworm in Ontario by the Ministry of Natural Resources in 1977. Spraying operations were confined to Wawa, Chapleau and Kirkland Lake districts in northeastern Ontario. Matacil was applied to 3 856 ha (9,527 acres) at a rate of 28.3 g (a.i.) in .59 L of spray mixture per .4 ha (1 oz (a.i.) in 20 fl oz per acre). Most of this area, 3 192 ha (7,887 acres), received two applications while the remaining 664 ha (1,640 acres) were sprayed once. Orthene was tested at two dosages, 113.4 and 226.8 g (a.i.) per ha (4 and 8 oz (a.i.) per acre and at two application rates, .59 L and 1.89 L per .4 ha (20 fl oz and .5 gal (U.S.) per acre) on a total of 664 ha (1,000 acres). About 77 ha (190 acres) were ground sprayed with Thuricide 16B at various rates. An AgCat and an Agtruck, both equipped with Micronairs, were used to apply the aerial sprays. Matacil provided somewhat inconsistent results in the Chapleau District, although they were fairly good in most cases. Results with Matacil in Wawa District were generally good and more consistent than results in Chapleau. All treatments with Orthene effected high larval mortalities and poor foliage protection. Frost affected host trees in the Orthene plots, and that further complicated interpretation of results. Mistblower applications of *B.t.* produced good results.

REFERENCE

Howse, G.M. and J.R. Carrow. 1977. Spruce Budworm in Ontario, 1977 -- Aerial spraying operations, outbreak status and forecasts and plans for 1978. Report to the Annual Forest Pest Control Forum, Ottawa, December 6-7, 1977.