THE 1973 SPRUCE BUDWORM SITUATION IN ONTARIO

PART A: DAMAGE AND FORECASTS

PART B: AERIAL SPRAYING OPERATIONS

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INFORMATION REPORT O-X-193

CANADIAN FORESTRY SERVICE

DEPARTMENT OF THE ENVIRONMENT

APRIL 1974

Copies of this report may be obtained from

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ACKNOWLEDGEMENTS

We wish to acknowledge the full cooperation of the Ontario Ministry of Natural Resources in providing aircraft, student help and various facilities to the Forest Insect and Disease Survey Unit.

We are also grateful for the assistance and support of Survey Field Technicians who make a major contribution to this report through their observations, aerial mapping and procurement of data. Included are:

Chief Technician:	L. L. McDowall
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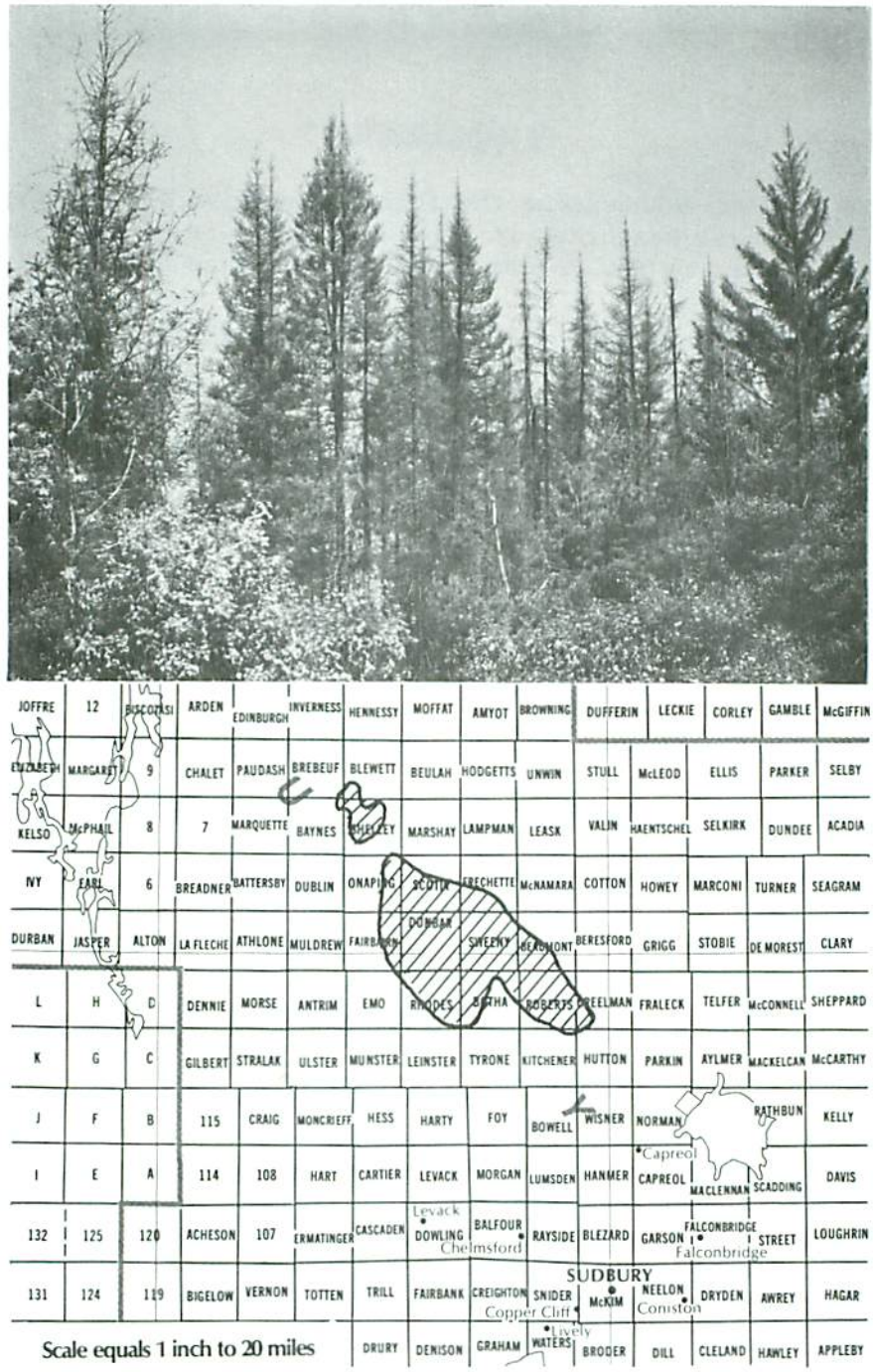
Southeastern Survey Region:	H. J. Weir and W. D. Biggs
Eastern Survey Region:	L. S. MacLeod and H. D. Lawrence
Central Survey Region:	K. C. Hall, F. Livesey and E. L. Houser
Northern Survey Region:	H. R. Foster and J. Hook
Western Survey Region:	M. J. Thomson, C. A. Barnes and M. J. Applejohn

The spruce budworm situation will be critical in the northeastern and southeastern areas of Ontario in 1974 when considerable tree mortality can be expected. 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 Forest Research Technician or write to the Head, Forest Insect and Disease Survey Unit, Great Lakes Forest Research Centre.



Frontispiece. Upper photograph illustrates balsam fir and white spruce trees that are dead or dying because of spruce budworm feeding.

Lower map shows the location of heavy tree mortality caused by spruce budworm in northeastern Ontario.

ABSTRACT

The spruce budworm situation in 1973 changed very little in southeastern Ontario, eased somewhat in northeastern Ontario owing to adverse environmental effects on larval survival in 1972 and continued to improve in northwestern Ontario. Part A of this report describes changes in the infestations in 1973 and forecasts, in cartographic and tabular form, the damage liable to occur in 1974. Part B describes aerial spraying operations covering 88,300 acres which were conducted against the spruce budworm in Ontario in 1973 as part of a joint strategy developed by the Canadian Forestry Service and the Ontario Ministry of Natural Resources.

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On the cover is an outline map of Ontario showing new provincial administrative districts.

PART A: DAMAGE AND FORECASTS

INTRODUCTION

In 1971, because of an obviously worsening spruce budworm picture throughout Ontario, the Forest Insect and Disease Survey Unit of the Great Lakes Forest Research Centre published the first of an annual series of information reports on this forest insect pest. This report is the fourth in the series. It describes the spruce budworm situation in 1973 and provides damage forecasts for 1974 for the Province of Ontario. The reader is directed to the cover of this report for names of provincial administrative districts referred to in figures 2-7.

OVERALL SITUATION - 1973

Aerial and ground surveys of Ontario in 1973 revealed moderate-to-severe defoliation to balsam fir and white spruce throughout an area totalling approximately 18.5 million acres[1] (Fig. 1). In 1973 defoliation represented a slight reduction in heavily infested areas in contrast with 1972 when 19.3 million acres were mapped. In terms of the three regional outbreaks in the Province as described in previous reports of this series (Howse *et al.* 1971, 1972, 1973) there was very little change in southeastern Ontario, a reduction of 900,000 acres in northeastern Ontario and a further marked reduction in budworm infestations in northwestern Ontario.

Listed below are the acreages that have been mapped as moderately to severely defoliated each year for the three regional outbreaks since their eruption in 1967.

Year	Southeastern	Northeastern	Northwestern	Total
1967	150,000	7,500	40,000	197,500
1968	300,000	500,000	0	800,000
1969	768,000	1,650,000	4,000	2,422,000
1970	1,600,000	5,200,000	130,000	6,930,000
1971	4,500,000	8,600,000	130,000	13,230,000
1972	5,800,000	13,400,000	70,000	19,270,000
1973	6,000,000	12,500,000	10,000	18,510,000

It should be evident that the typical budworm outbreak pattern has been altered in northwestern Ontario by the spraying program carried out by the Ontario Ministry of Natural Resources since 1968. Chemical control operations carried out over 275,000 acres in 1968 and

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[1] 1 acre = 0.40 hectares.

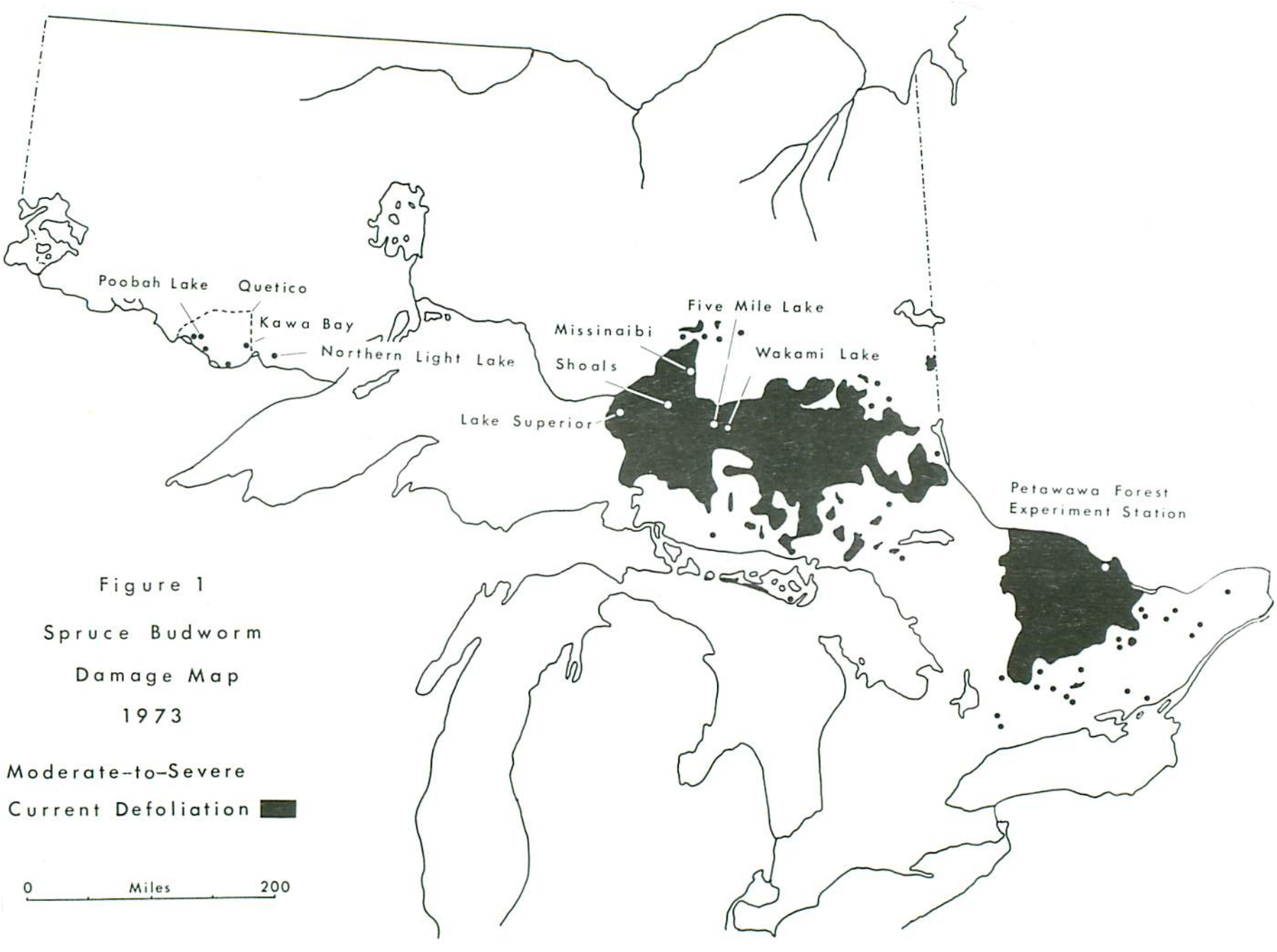

Figure 1

Spruce Budworm

Damage Map

1973

Moderate-to-Severe

Current Defoliation

26,000 acres in 1969 resulted in the elimination of an infestation that was forecast to be upwards of 300,000 acres in 1968 in the vicinity of Burchell Lake, west of Thunder Bay. During the past 4 years other infestations that developed further west in Quetico Provincial Park have been greatly reduced by abatement spraying and the currently favourable situation stands in marked contrast to the explosive developments in northeastern and southeastern Ontario.

SOUTHEASTERN ONTARIO

Situation in 1973

In southeastern Ontario, the total area affected in 1973 was 6.0 million acres, almost the same as in 1972 with only slight changes in infestation boundaries (Fig. 2). This outbreak has engulfed virtually all of the Pembroke District, about three-quarters of the Algonquin Park District, the eastern half of the Minden District, most of the Bancroft District and several townships in the northern part of the Tweed District. Three significant pockets of defoliation, each 15,000-20,000 acres in extent, occurred along the southern edge of the main outbreak--two in the Tweed District in Marmora Township and Palmerston Township and one in Lanark District in Darling Township. Many small pockets of infestation, too numerous to list, were detected elsewhere throughout southeastern Ontario.

An infestation of approximately 20,000 acres discovered in 1972 in Blair Township in the Parry Sound District changed very little in intensity or size in 1973. Budworm larval populations were widespread but quite variable in numbers throughout southwestern and south central Ontario. With the exception of Blair Township, populations remained very low in the Parry Sound and Bracebridge districts. Several high counts were recorded on white spruce in the Owen Sound, Cambridge, Huronia and Maple districts but in many cases were lower than 1972 counts.

Numerous pockets of balsam fir tree mortality and top kill have been recorded. The first significant damage was evident in the Bonnechère Valley in Admaston Township in 1971. In 1972, damage was noted in Ross Township, south of Pembroke, in Stratton, Preston, Bower and Bruton townships in Algonquin Park District, and in Galway and Harvey townships in the Minden District. In 1973 the incidence of damage in these locations continued to increase and additional mortality was found in McLaughlin and Canisbay townships in Algonquin Park District, and in Bromley, Brougham and Gratton townships in the Pembroke District. Detailed information on the condition of trees in many of these areas is not yet available but, for example, in one stand in Stratton Township over 90% of the balsam fir trees either were dead or had dead tops.

Infestation Forecasts for 1974

Spruce budworm egg-mass counts and defoliation surveys were carried out during August, 1973 in southern Ontario. Over 100 locations were sampled, egg masses counted, defoliation estimated and infestation forecasts prepared for 1974. The results of this survey show that egg-mass numbers have increased to record highs for the current outbreak in this part of Ontario. For example, five times as many egg masses were recorded from infested areas in Algonquin Provincial Park in 1973 as in 1972 and averaged 1,300 per 100 square feet[2] of foliage. It is expected that all areas showing damage in 1973 will again experience moderate or severe defoliation in 1974 and that many susceptible stands on the periphery of the major infestations will show evidence of defoliation as well (Fig. 3 and Table 1).

There will likely be widespread low populations of budworm between the western boundary of Algonquin Provincial Park and Georgian Bay in the Bracebridge and Parry Sound districts. To date, this area has been free of appreciable damage during the outbreak. Another outbreak of major proportions could occur throughout the Arnprior-Ottawa-Carleton Place area. Elsewhere in southern Ontario budworm damage will occur at no greater than a trace or light level except for the occasional pocket of moderate or severe infestation.

The incidence of tree mortality and top kill will continue to increase, particularly if the unusually high larval populations survive. In the event of good overwintering larval survival and successful establishment of emerging larvae in the spring of 1974, extensive and heavy backfeeding by growing larvae will likely occur, thus hastening the advent and amount of tree mortality.

NORTHEASTERN ONTARIO

Situation in 1973

In northeastern Ontario, 12.5 million acres were moderately to severely defoliated by spruce budworm in 1973 compared with 13.4 million acres in 1972 (Fig. 4). Budworm populations collapsed over an area of 2.5 million acres north and east of Chapleau. This collapse was attributed to the snowstorm and freezing temperatures in this area in late May, 1972 that killed virtually all of the new foliage on balsam fir and many of the new shoots on white spruce, and directly or indirectly affected a large proportion of the budworm population. Small pockets of defoliation were found scattered throughout this area in 1973 and infestation boundaries near Chapleau and Foleyet were vague and difficult to define. However, this large area that escaped

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[2] 1 square foot = 0.0929 square metres.

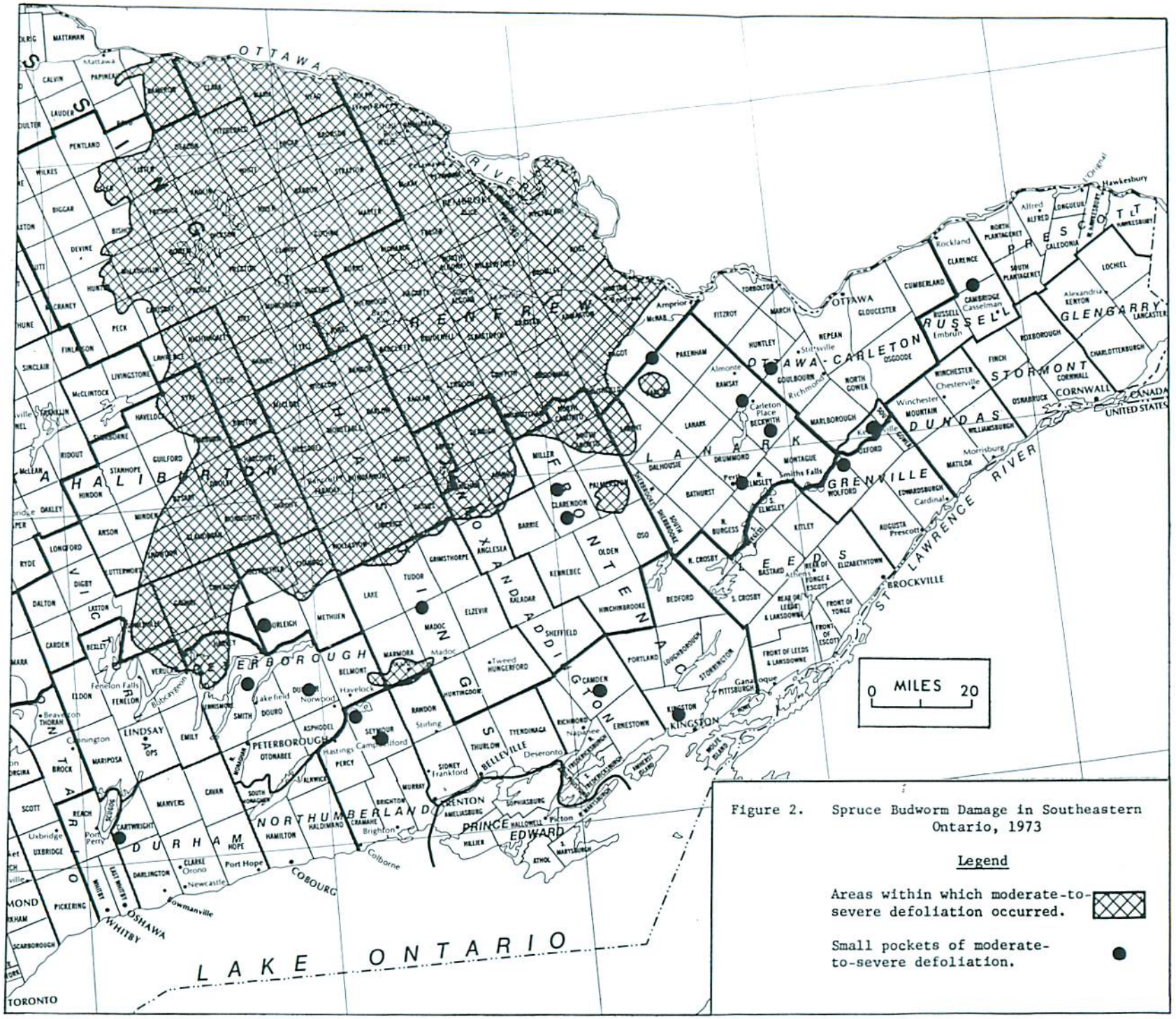


Figure 2. Spruce Budworm Damage in Southeastern Ontario, 1973

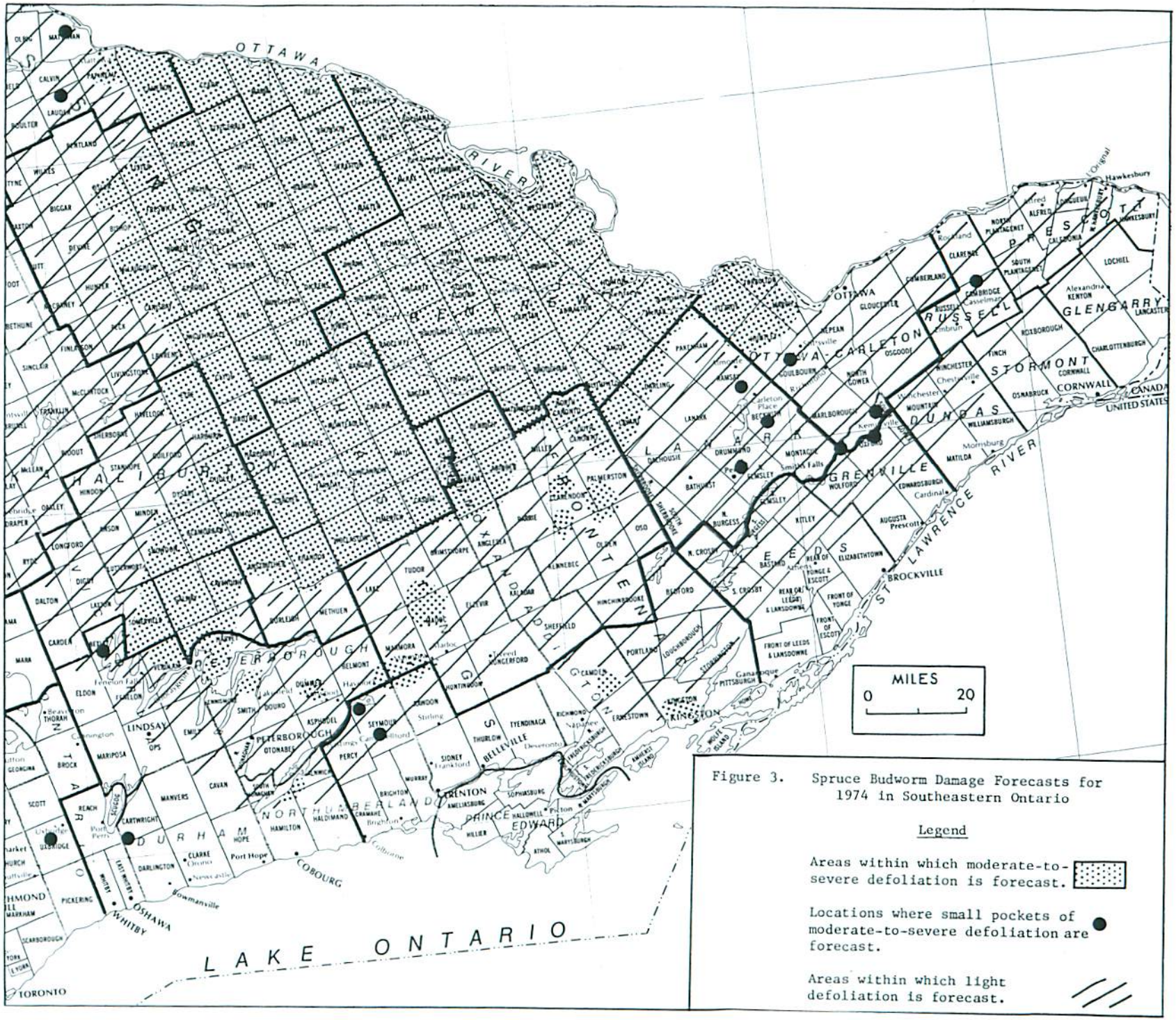
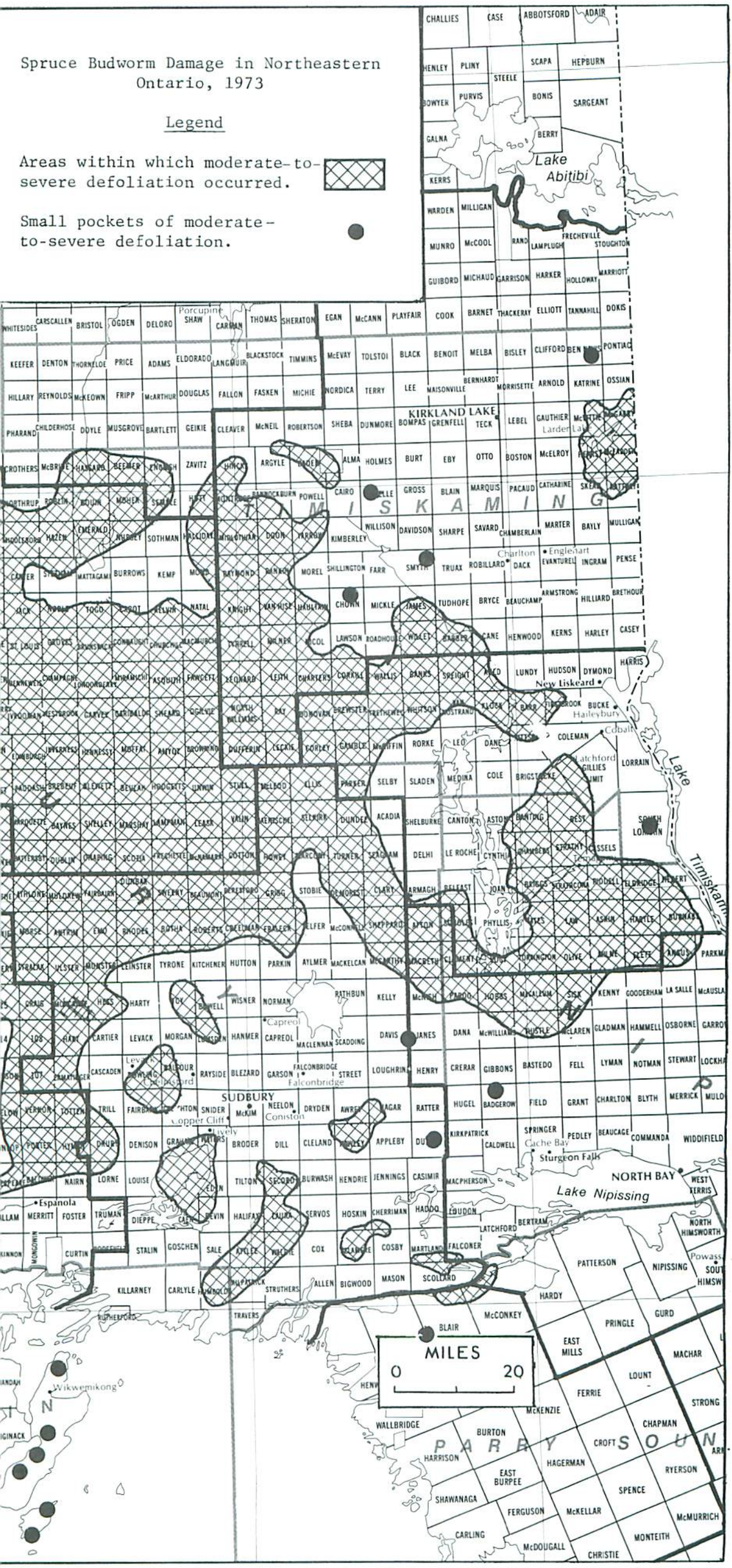


Figure 3. Spruce Budworm Damage Forecasts for 1974 in Southeastern Ontario


Spruce Budworm Damage in Northeastern Ontario, 1973
Legend
Areas within which moderate-to-severe defoliation occurred.
Small pockets of moderate-to-severe defoliation.
Lake Abitibi
KIRKLAND LAKE
Larder Lake
T I M I S K A M I N G
New Liskeard
Haileybury
Cobalt
Lake Timiskaming
Latchford
Englehart
Charlton
SUDBURY
Copper Cliff
Coniston
Falconbridge
Capreol
Levack
Onaping
Lively
Espanola
Wikwemikong
Sturgeon Falls
NORTH BAY
Lake Nipissing
Cache Bay
Powassan
MILES
0
20
PARRY SOUND

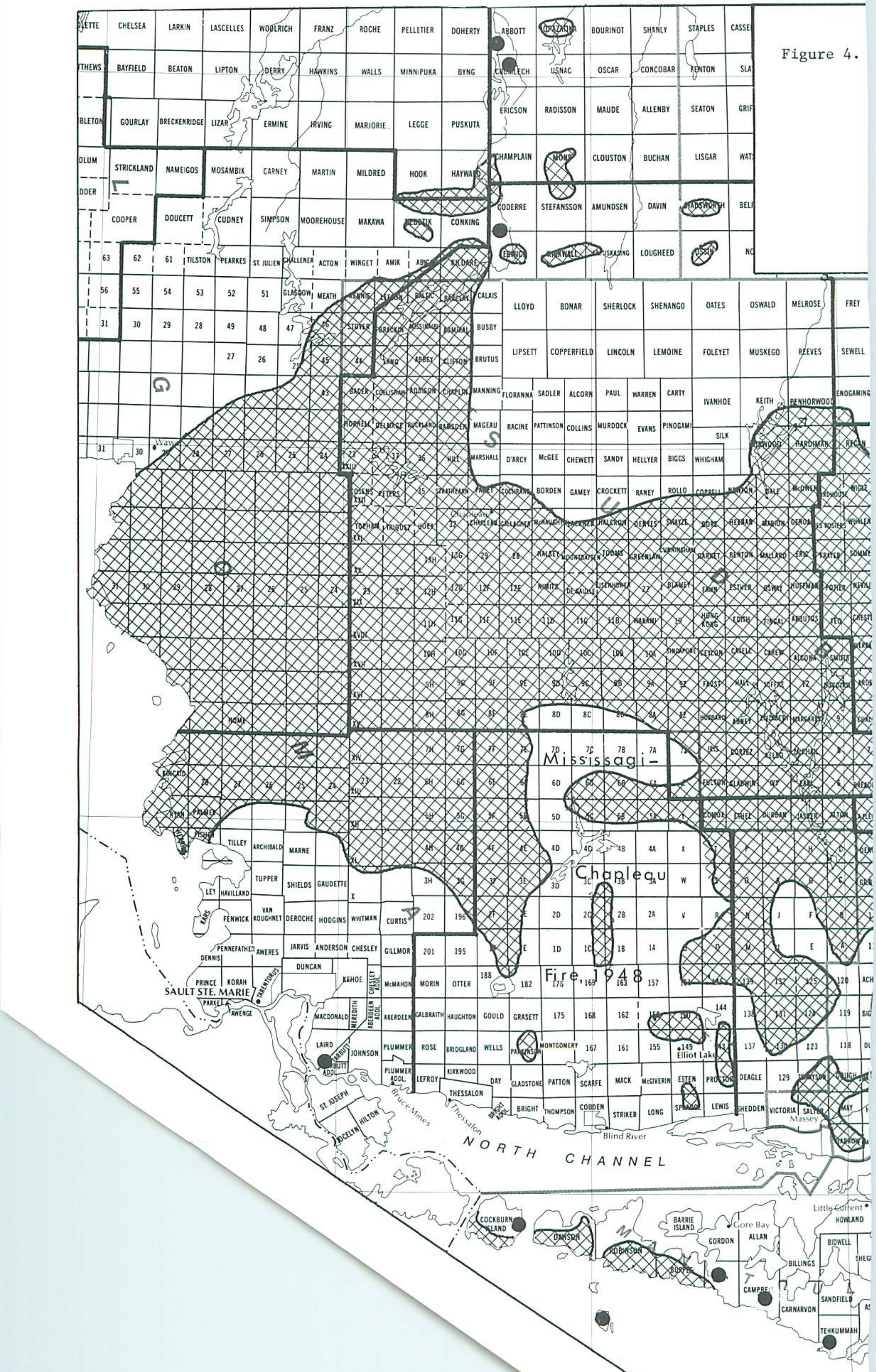

Mississagi-
Chapleau
Fire, 1948
SAULT STE. MARIE
NORTH CHANNEL
Elliot Lake
Blind River
Bruce Mines
Thessalon
Massey
Little Current
Gore Bay
Chapleau
Wawa

Figure 4.

and in Hill and Marshall townships north of Chapleau. In the Wawa District there are small pockets of light mortality in Township 24-Range 20, Township 24-Range 21 and Township 25-Range 22. Light mortality of white spruce occurred in Parkinson Township in the Blind River District where infestations have occurred for many years, and some balsam fir trees have died in Gilbert Township and Township C in the Espanola District. Light mortality was noted in Fairbank Township in the Sudbury District and in Miramichi and Sheard townships in the Gogama District.

Aerial spraying operations were carried out to prevent further damage in five provincial parks in northeastern Ontario in 1973. Please refer to Part B of this report for further details.

Infestation Forecasts for 1974

Egg-mass counts obtained for 240 locations throughout northeastern Ontario have on the average doubled in 1973 over 1972 and consequently have returned to the high record levels reached in 1971. All districts except Kapuskasing and Hearst experienced increases in egg-mass densities. Moderate-to-severe defoliation will likely occur in 1974 throughout all of the area infested in 1973 and in a large part of the area north and east of Chapleau that escaped damage in 1973 (Fig. 5 and Table 2). No major changes are expected to occur along the northwestern edge of the outbreak in the Wawa District but trace or light defoliation will occur at scattered locations throughout the White River and Hearst districts. At present the highest concentration of budworm occurs in the western part of the outbreak in an area bordered by Lake Superior on the west, Highway 101 from Wawa to Chapleau, Highway 129 from Chapleau south to Ranger Lake and then west to Lake Superior. Further spread or new outbreaks will likely occur along the southern edge of the outbreak between Sault Ste. Marie and North Bay and along the eastern front between North Bay and Kirkland Lake.

Thus, in retrospect, it would seem that the outbreak in northeastern Ontario has recovered from the state of decline in 1972 caused by the unusual weather conditions that prevailed. In 1972, unseasonal frosts resulted in poor larval survival causing a 50% decrease in egg-mass numbers and a decrease in total area defoliated in 1973. In last year's report (Howse *et al.* 1973) it was speculated that another year of unusually high larval mortality could bring about a near-general population collapse in northeastern Ontario. Unfortunately, this did not occur; larval survival was good, egg-mass numbers doubled and the outbreak will probably regain its momentum.

defoliation in 1973 was offset to a considerable degree by extensions of the outbreak outward along the southern boundary in the Sault Ste. Marie and Blind River districts and eastward towards Temagami and North Bay. Thus the net decrease in defoliated area from 1972 to 1973 was 900,000 acres.

In the Blind River District, new pockets of defoliation were found in Spragge and Esten townships, 143 and Proctor townships, townships 149, 150, 155 and 156 just north of Elliot Lake, townships 1C, 2C, 1B and 2B, along with a new infestation greater than 100,000 acres extending from the main outbreak through townships 5A, 5B, 5C, 6A, 6B and 6C. Very few changes, with the exception of Manitoulin Island where many new, small, scattered pockets of defoliation were detected, occurred in the Espanola District; however, several new infestations were mapped in the Sudbury District. The largest, 60,000 acres, was south of Lively and covered all of the Whitefish Indian Reservation No. 6. Another infestation, about 30,000 acres in extent, was located west of Capreol in Foy, Morgan, Bowell and Lumsden townships. A previously uninfested area extending from Creelman and Fraleck townships in the northern part of the Sudbury District north to Sheard Township in the Gogama District (about 40 miles)[3] was heavily infested in 1973.

In the Temagami and North Bay districts, a new infestation extended from the main outbreak in the Sudbury District eastward almost to Lake Timiskaming in Burnaby and Hebert townships and north along the east side of Lake Temagami from Thistle Township and Marten River to Brigstocke Township and the town of Latchford. Several small pockets of severe first-year defoliation were mapped northwest of Lake Nipissing and near Mattawa in the North Bay District. Most of the previously uninfested areas in the southwest section of the Kirkland Lake District and the northwest corner of the Temagami District were infested in 1973. The infestation around Larder Lake on the Ontario-Quebec border continued to persist. Virtually all of the Gogama District was covered by the main Chapleau-Sudbury outbreak which also extended into several townships along the southern edge of the Timmins District. The major change in the Chapleau District has been discussed, while there were virtually no changes in the Wawa District. Farther north between Geraldton, Kapuskasing and Cochrane, budworm populations that were formerly quite low declined even further.

In addition to the roughly 200,000 acres of heavy balsam fir mortality reported in 1972 and surveyed in detail in 1973 in the Onaping Lake area northwest of Sudbury (see map, Frontispiece), many new pockets of mortality have been detected in the Chapleau, Wawa, Blind River, Espanola, Sudbury and Gogama districts. Light mortality of balsam fir is present throughout Copperfield, Sadler, Pattinson, Collins, McGee, Chewett and Borden townships northeast of Chapleau,

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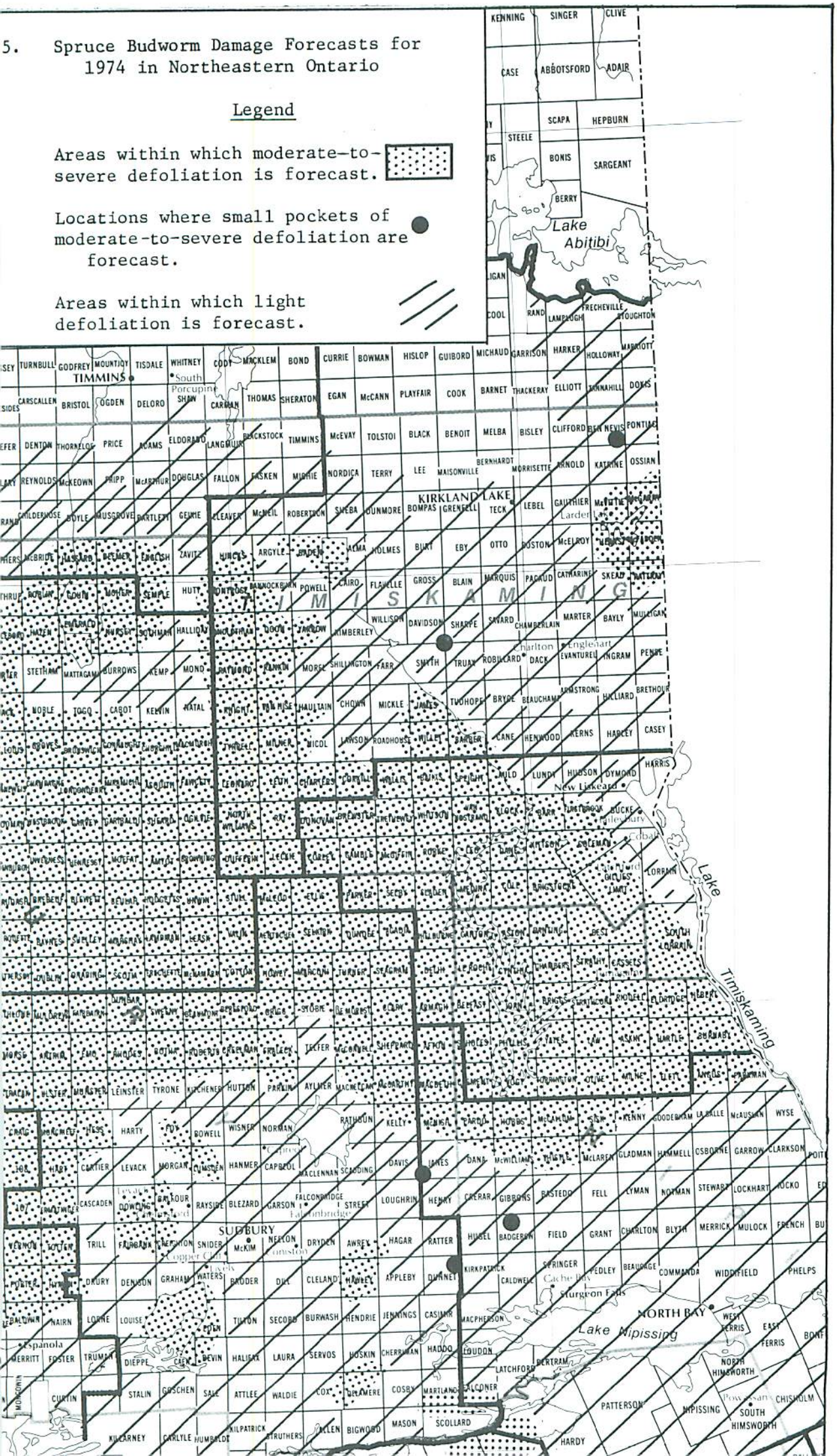
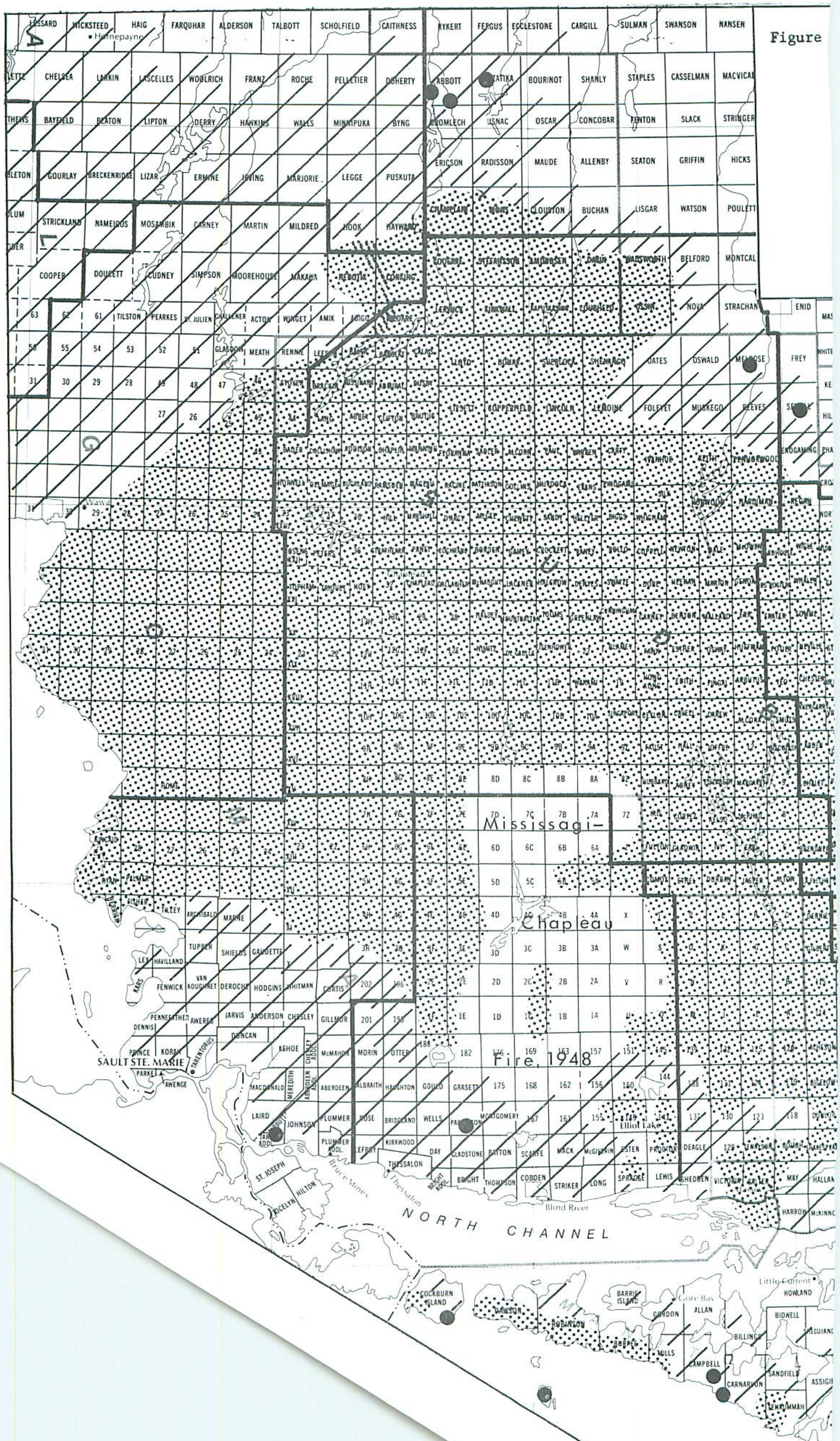
[3] 1 mile = 1.609 kilometres.

5. Spruce Budworm Damage Forecasts for 1974 in Northeastern Ontario





LESSARD
WICKSTEED
HAIG
FARQUHAR
ALDERSON
TALBOTT
SCHOLFIELD
CAITHNESS
RYKERT
FERGUS
ECCLESTONE
CARGILL
SULMAN
SWANSON
NANSEN
Hornepayne
CHELSEA
LARKIN
LASCELLES
WOOLRICH
FRANZ
ROCHE
PELLETIER
DOHERTY
ABBOTT
BOURINOT
SHANLY
STAPLES
CASSELMAN
MACVICAR
BAYFIELD
BEATON
LIPTON
DERRY
HAWKINS
WALLS
MINNIPUKA
BYNG
BROMLECH
USNAC
OSCAR
CONCOBAR
FENTON
SLACK
STRINGER
GOURLAY
BRECKENRIDGE
LIZAR
ERMINE
IRVING
MARJORIE
LEGGE
PUSKUTA
ERICSON
RADISSON
MAUDE
ALLENBY
SEATON
GRIFFIN
HICKS
BUCHAN
LISGAR
WATSON
POULETT
STRICKLAND
NAMEIGOS
MOSAMBIK
CARNEY
MARTIN
MILDRED
HOOK
HAYWARD
CLOUSTON
BELFORD
MONTCALM
COOPER
DOUCETT
CUDNEY
SIMPSON
MOOREHOUSE
MAKAWA
STRACHAN
ENID
TILSTON
PEARKES
ST. JULIEN
ACTON
WINGET
AMIK
NOVA
OATES
OSWALD
MELROSE
FREY
GLASGOW
MEATH
RENNIE
LLOYD
FOLEYET
MUSKEGO
Wawa
Mississagi–
Chapleau
Fire, 1948
SAULT STE. MARIE
PRINCE
KORAH
DENNIS
PENNEFATHER
AWERES
JARVIS
ANDERSON
CHESLEY
GILLMOR
DUNCAN
KEHOE
McMAHON
MORIN
OTTER
TUPPER
SHIELDS
GAUDETTE
HAVILLAND
FENWICK
VAN KOUGHNET
DEROCHE
HODGINS
WHITMAN
CURTIS
ARCHIBALD
MARNE
TILLEY
FISHER
PARKE
AWENGE
TARENTORUS
MACDONALD
MEREDITH
ABERDEEN
GALBRAITH
HAIGHTON
GOULD
GRASETT
LAIRD
JOHNSON
PLUMMER
ROSE
BRIDGLAND
WELLS
PARKINSON
MONTGOMERY
PLUMMER ADDL.
LEFROY
KIRKWOOD
DAY
GLADSTONE
PATTON
SCARFE
MACK
McGIVERIN
ESTEN
PROCTOR
DEAGLE
THESSALON
BRIGHT
BRIGHT ADDL.
THOMPSON
COBDEN
STRIKER
LONG
SPRAGGE
LEWIS
SHEDDEN
VICTORIA
SALTER
MAY
HALLAM
ST. JOSEPH
HILTON
JOCELYN
Bruce Mines
Thessalon
Blind River
Elliot Lake
NORTH CHANNEL
HARROW
McKINNON
Little Current
HOWLAND
COCKBURN ISLAND
DAWSON
ROBINSON
BARRIE ISLAND
Gore Bay
GORDON
ALLAN
BIDWELL
SHEGUIANDAH
BILLINGS
MILLS
CAMPBELL
CARNARVON
SANDFIELD
ASSIGINACK
TEHKUMMAH

Figure

NORTHWESTERN ONTARIO

Situation in 1973

In northwestern Ontario, defoliation totalling about 10,000 acres was limited to the south central part of Quetico Provincial Park in the Atikokan District (Fig. 6). About 5,000 acres of defoliation were mapped within the 75,100 acres sprayed in Quetico in 1973. This pocket extended from Tanner Lake west to Neguaguon Lake Indian Reservation 25D and south from there past Martin Bay on Lac La Croix. Infestations at Allan Lake and Kawa Bay on Kawnipi Lake to the east of Poohbah and Tanner lakes were apparently eliminated by spraying. Several pockets of defoliation totalling about 5,000 acres were detected in unsprayed areas. These included the eastern end of Neguaguon Lake Indian Reservation 25D, which was infested with budworm but was not sprayed because permission could not be obtained early enough; near Prairie Portage on Basswood Lake; and several other pockets of moderate defoliation to the west of Prairie Portage along the international border. The largest of these were south of Robinson and Argo lakes.

Several small but persistent infestations in the southwest part of the Thunder Bay District were finally eliminated in 1973 by aerial spraying. These infestations were located near Northern Light and Granite lakes.

Aerial spraying operations in 1973 in northwestern Ontario and those planned for 1974 are described in Part B of this report.

Infestation Forecasts for 1974

Egg-mass counts from more than 185 locations in northwestern Ontario indicate defoliation throughout an area of 20,000 acres or less in the south central part of Quetico Provincial Park (Fig. 7 and Table 3). Some of this defoliation will result from small localized infestations remaining within the western portion of the large area sprayed in 1973 in the vicinity of Poohbah Lake, Tanner Lake and along the Maligne River west of Tanner Lake. Further south, along the international border, scattered pockets of medium-to-severe infestations are expected at Crooked, Robinson and Basswood (east end) lakes.

Elsewhere in northwestern Ontario (Fort Frances, Atikokan, Thunder Bay, Nipigon, Geraldton and Terrace Bay districts) budworm populations continue to remain at extremely low levels with the exception of a possible incipient infestation near Caramat in the Geraldton District and light defoliation which will probably occur at scattered locations in the Terrace Bay District.

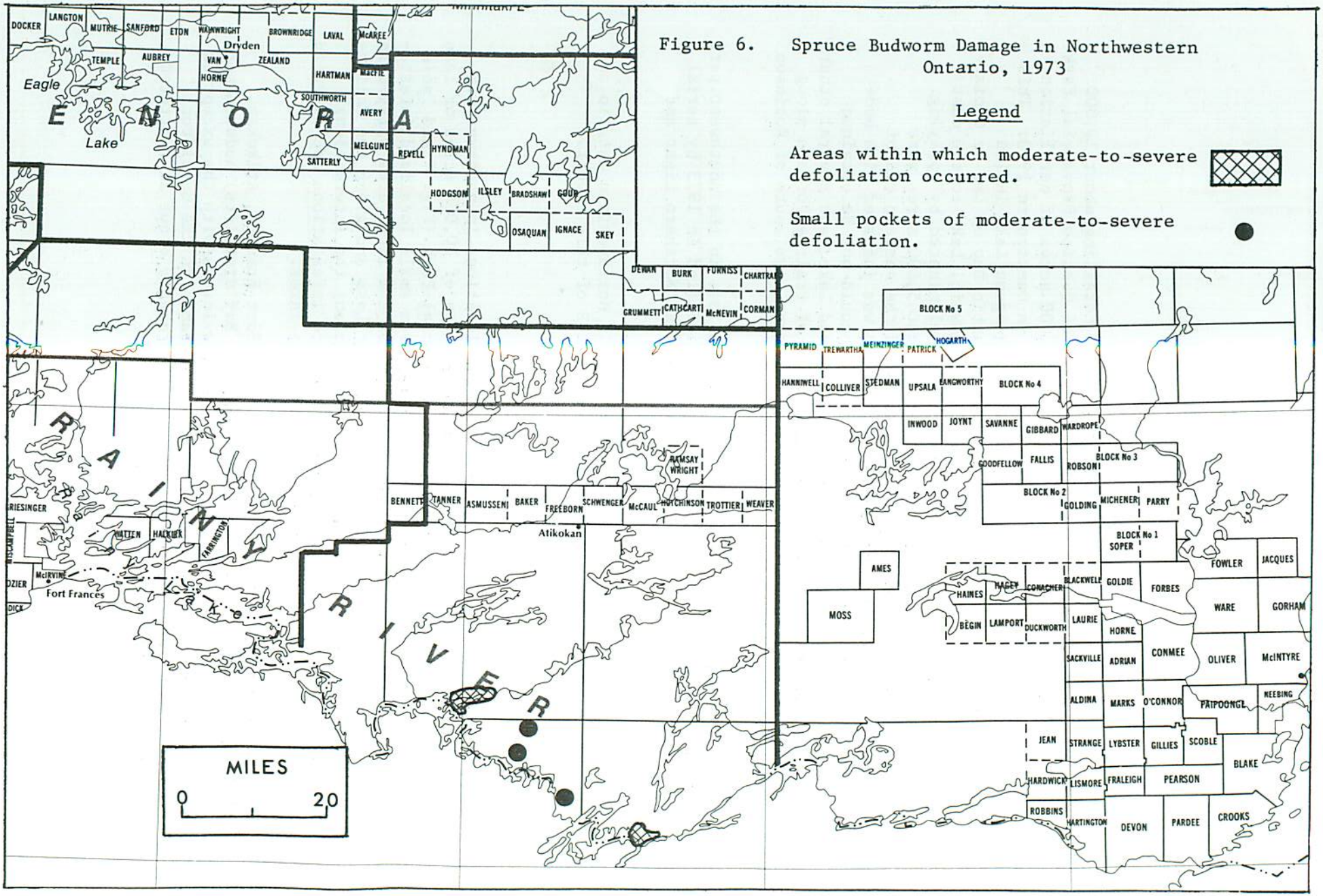


Figure 6. Spruce Budworm Damage in Northwestern Ontario, 1973

Legend

Areas within which moderate-to-severe defoliation occurred.

Small pockets of moderate-to-severe defoliation.

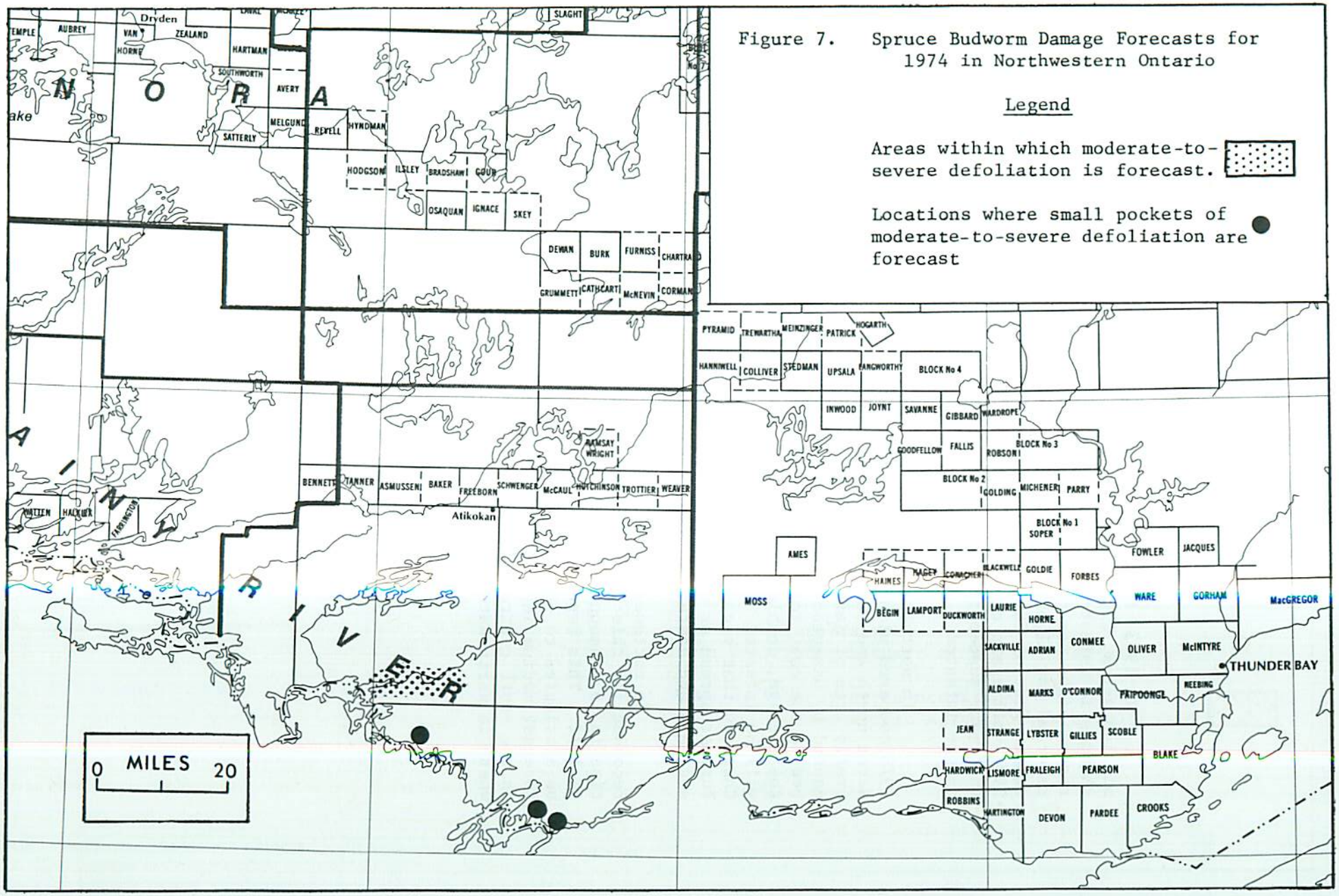


Figure 7. Spruce Budworm Damage Forecasts for 1974 in Northwestern Ontario

Legend

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

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

SUMMARY

In 1973, the outbreak in southeastern Ontario affected 6.0 million acres, almost the same number as in 1972 with only slight changes in infestation boundaries. Egg-mass numbers increased to record highs for the current outbreak. A fivefold increase was recorded for Algonquin Park which averaged 1300 egg masses per 100 square feet of foliage. It is expected that all areas defoliated in 1973 will again experience moderate or severe defoliation in 1974 and that many susceptible stands on the periphery of the outbreak will become infested.

In northeastern Ontario, 12.5 million acres were defoliated in 1973 compared with 13.4 million acres in 1972. An area of 2.5 million acres north and east of Chapleau in the midst of the outbreak was generally free of defoliation in 1973 owing to a population collapse caused by unseasonal weather in 1972. However, major extensions occurred in the east towards Temagami and North Bay. Egg-mass numbers, on the average, doubled in 1973 over 1972. All areas defoliated in 1973 will be infested in 1974 and much of the area north and east of Chapleau that escaped damage in 1973 will be defoliated in 1974. Further spread or new infestations are likely to occur along the southern and eastern fronts of the outbreak.

In northwestern Ontario, the budworm situation is the best yet recorded for this part of the Province for the past 6 years. Defoliation in 1973 amounted to only 10,000 acres compared with 70,000 acres in 1972. This represents an 85% reduction in infested area and should be attributed to the provincial spraying operations. Egg-mass counts forecast medium infestation throughout an area of 20,000 acres or less in the south central part of Quetico Provincial Park in 1974. Elsewhere in northwestern Ontario, populations are generally very low.

Table 1 Southeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Algonquin District (25 locations)				
Airy Twp - East Gate	wS	90	3271	S
Biggar Twp - Sawbill Lake	bF	0	0	0
Bishop Twp - Lake La Muir	bF	2	23	L-M
Bruton Twp	bF	98	521	S
Canisbay Twp				
- Lake of Two Rivers	wS	95	2512	S
- Mew Lake	bF	90	923	S
- Pog Lake	bF	100	287	S
Clara Twp - Deux Rivieres	bF	50	635	S
Clyde Twp	bF	96	549	S
Deacon Twp - North River	bF	50	543	S
Devine Twp - Tim River	bF	5	13	L
Dickens Twp	bF	95	787	S
Dickson Twp - Annie Bay	bF	95	1268	S
Guthrie Twp				
- N. of Basin Depot	wS	75	6116	S
Head Twp - Grant Creek	wS	80	1346	S
Master Twp	bF	5	28	L-M
Peck Twp - Smoke Lake	bF	0	5	L
Preston Twp				
- Annie Bay Dam	bF	95	2622	S
- Tattler Lake	bF	95	286	S
Sabine Twp - McCoy Lake	wS	40	242	S
Sproule Twp - Hiram Lake	wS	70	841	S
Stratton Twp				
- Achray (Plot C)	bF	50	390	S
- Lone Creek	bF	100	209	M-S
White Twp				
- Otterpaw Creek	bF	70	769	S
Wilkes Twp - Wilkes Lake	bF	3	33	L-M

(cont'd)

Table 1 Southeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Bancroft District (5 locations)				
Ashby Twp	bF	90	578	S
Cardiff Twp	bF	85	211	M-S
Chandos Twp	bF	45	326	S
Faraday Twp	bF	95	305	S
Wicklow Twp	bF	80	446	S
Bracebridge District (7 locations)				
Brunel Twp - south of Huntsville	bF	2	5	L
Butt Twp	bF	3	27	L-M
Cardwell Twp	bF	2	0	0
Joly Twp - Paisley Lake	bF	2	37	L-M
Monck Twp - Bardsville	bF	3	42	L-M
Oakley Twp - Clear Lake	bF	4	12	L
Sinclair Twp - Bella Lake	bF	1	34	L-M
Cornwall District (2 locations)				
Cambridge Twp - Larose Forest	wS	10	129	M-S
Clarence Twp - Larose Forest	wS	5	29	L-M
Huronia District (2 locations)				
Essa Twp	wS	10	173	M-S
Vespra Twp	wS	21	140	M-S

(cont'd.)

Table 1 Southeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Lanark District (3 locations)				
Dalhousie Twp - east of Dalhousie Lake	bF	10	21	L-M
Darling Twp - Lot 10, Con. VII	bF	20	88	M-S
Lavant Twp - Robertson Lake	wS	70	211	S
Lindsay District (1 location)				
Cartwright Twp	wS	5	62	M
Maple District (1 location)				
Uxbridge Twp	wS	17	817	S
Minden District (7 locations)				
Carden Twp	wS	5	10	L
Cavendish Twp - Pencil Lake	bF	80	185	M-S
Glamorgan Twp - Koshlong Lake	bF	5	6	L
Guilford Twp	bF	5	22	L-M
Harvey Twp - Nogies Creek	bF	97	124	M-S
Minden Twp	bF	5	17	L-M
Somerville Twp	bF	85	153	M-S

(cont'd.)

Table 1 Southeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Ottawa District (5 locations)				
Fitzroy Twp - Lot 6, Con. IV	wS	40	907	S
Goulbourn Twp. - Hwy. 7	wS	80	925	S
Huntley Twp - Lot 16, Con. IV	wS	30	935	S
Oxford Twp - Kemptville Nursery	wS	60	300	S
Torbolton Twp - Lot 20, Con. I	wS	20	167	M-S
Owen Sound District (2 locations)				
Glenelg Twp	wS	10	115	M-S
St. Edmunds Twp	wS	26	91	M-S
Parry Sound District (5 locations)				
Blair Twp - Blair Camp	wS	5	93	M-S
- Lost Channel	bF	75	518	S
McConkey Twp - Hunt Camp	wS	90	1838	S
McMurrich Twp - Doe L.	bF	2	13	L
Mowat Twp - Pakesley	bF	1	17	L-M
Pembroke District (32 locations)				
Admaston Twp - Bonnechère River	wS	30	992	S
- Mount St. Patrick	bF	75	214	S
Alice Twp	bF	67	235	S

(cont'd.)

Table 1 Southeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Pembroke District (cont'd.)				
Bromley Twp	wS	50	1946	S
Brougham Twp	bF	38	69	M
Brudenell Twp	bF	80	569	S
Gratton Twp	wS	50	641	S
Griffith Twp	wS	73	778	S
Matawatchan Twp	bF	15	75	M-S
McNab Twp	wS	25	541	S
Petawawa Twp				
- Antler Ck.	wS	90	1820	S
Raglan Twp	wS	75	538	S
Richards Twp				
- Round Lake	wS	90	866	S
Rolph Twp	wS	80	4577	S
Ross Twp				
- District Boundary	wS	46	783	S
Ross Twp - Garage	wS	70	1584	S
Sherwood Twp				
- West of Barry's Bay	wS	20	320	M-S
South Algona Twp - Ruby	bF	80	218	S
Stafford Twp - Mixburg	wS	75	1028	S
- Rankin (N.P.V. plot 5)	wS	25	2052	S
- Rankin (N.P.V. plot 5)	bF	20	1990	S
Westmeath Twp				
- east of Westmeath	bF	50	592	S
- Quarry	wS	60	2664	S
Wilberforce Twp				
- NW of Douglas	wS	95	2179	S
- 1 mile north of Rankin	wS	80	954	S
Petawawa Forest Exp. Stn.				
- Wylie and Buchanan twp				

(cont'd.)

Table 1 Southeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (concl'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Pembroke District (cont'd.)				
(Baseline Control)[c]	bF	90	639	S
(By-pass Road Control)[c]	wS	85	822	S
(Deluthier Road - plot G)	wS	62	283	S
(Orange Road Control)[c]	wS	85	842	S
(Spray No. 3)[c]	wS	64	376	S
(Spray No. 4)[c]	wS	62	283	S
(Spray No. 6)[c]	bF	13	251	S
Tweed District (5 locations)				
Clarendon Twp	wS	56	539	S
Denbigh Twp - Slate Falls Rd.	bF	95	185	M-S
Kaladar Twp	bF	8	21	L-M
Marmora Twp	bF	12	39	L-M
Tudor Twp	wS	90	1579	S

[a] 1 square foot = 0.0929 square metres

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

[c] Sprayed fenitrothion 1973 (various treatments)
(Plot names and/or numbers refer to 1970 or 1971 spray operations)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Blind River District (14 locations)				
Bright Twp.	bF	21	13	L
Morin Twp	bF	3	23	L-M
Parkinson Twp	wS	79	457	S
Spragge Twp	bF	5	0	0
Twp 1E	bF	6	55	M
Twp 2C	bF	7	77	M
Twp 3E - Mashagama Virus Plot[c]	bF	70	561	S
Twp 3F - Mashagama Control Plot	bF	77	1258	S
Twp 3F - B.t. Plot 5[d]	bF	82	574	S
Twp 3F	bF	94	2674	S
Twp 5C - Rocky Island L.	wS	14	576	S
Twp 6A	bF	9	120	M-S
Twp 150	bF	22	137	M-S
Twp 169	bF	9	65	M
Chapleau District (54 locations)				
Abney Twp - Spanish Lake	bF	70	1475	S
Amundsen Twp	bF	16	237	S
Amundsen Twp	wS	9	132	M-S
Barclay Twp - Missinaibi Provincial Park[e]	bF	10	111	M-S
- Missinaibi Provincial Park[e]	wS	25	409	S

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Chapleau District (cont'd.)				
Borden Twp	bF	3	153	S
Borden Twp	wS	25	535	S
Brutus Twp	bF	13	100	M-S
Carew Twp	bF	85	696	S
Collins Twp - Alcorn Lake	bF	5	25	L
Denyes Twp - Denyes Lake	bF	50	171	M-S
Fawn Twp	bF	35	319	S
Foleyet Twp	bF	8	20	L
Gallagher Twp	bF	63	565	S
Genoa Twp	bF	40	998	S
Halsey Twp - Nemegos Road	bF	60	615	S
Hardiman Twp	bF	5	47	L-M
Hill Twp	bF	15	264	S
Horwood Twp - Horwood Lake	bF	85	1203	S
Iris Twp. - Mississagi Lake	bF	55	182	M-S
Ivanhoe Twp. - Ivanhoe Provincial Park	bF	51	232	S
Ivanhoe Twp. - Ivanhoe Provincial Park	wS	18	635	S
Ivy Twp - Miniwaski Lake	bF	95	1769	S
Kapuskasing Twp	bF	4	29	L-M
Keith Twp	bF	11	127	M-S
Kirkwall Twp - Dunrankin L.	bF	3	31	M
Leeson Twp	bF	10	184	M-S
Lincoln Twp - Lincoln Lake	bF	5	65	M
Lloyd Twp - Makonie Lake	bF	5	30	L-M
Margaret Twp.	bF	80	2129	S
Melrose Twp.	bF	6	118	M-S
Montcalm Twp - Elf Lake	bF	3	0	0
Ossin Twp - Ossin Lake	bF	5	74	M-S
Oswald Twp - Oswald Lake	bF	3	0	0

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Chapleau District (cont'd.)				
Penhorwood Twp	bF	11	344	S
Peters Twp - Shoals Provincial Park[e]	bF	52	139	M-S
Pinogami Twp	bF	10	131	M-S
Pinogami Twp	wS	26	456	S
Rollo Twp - Rollo Lake	bF	3	0	0
Sadler Twp - Robson Lake	bF	5	64	M
Sandy Twp	bF	15	236	S
Sandy Twp	wS	10	303	S
Shenango Twp - Shenango L.	bF	7	76	M-S
Whigham Twp	bF	13	226	S
Twp 8F - Prairie Grass Lake	bF	95	407	S
Twp 9D	bF	85	295	S
Twp 10F - Vezina Lake	bF	95	2378	S
Twp 11B - Wakami Provincial Park[e]	bF	51	646	S
Twp. 11D - 5 Mile Provincial Park[e]	bF	68	601	S
Twp 12G - Sample Lake	bF	90	1123	S
Twp 12H - Gale Lake	bF	89	1895	S
Twp 23, Rge. 16 - Lineus L.	bF	87	1680	S
Twp 23, Rge. 17 - Power Line R.	bF	80	595	S
Twp 32	bF	58	389	S
Cochrane District (1 location)				
Sydere Twp - Mile 8	bF	0	0	0

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Espanola District (18 locations)				
Baldwin Twp	bF	6	37	L-M
Bidwell Twp	bF	3	0	0
Burpee Twp	bF	70	185	M-S
Campbell Twp	bF	2	33	L-M
Cockburn Island	bF	94	290	S
Comox Twp - Comox Lake	bF	75	553	S
Craig Twp - Bluewater Lake	bF	95	414	S
Dawson Twp	bF	29	63	M-S
Gilbert Twp - Sinaminda Rd.	bF	89	264	S
Gough Twp	bF	2	0	0
Salter Twp - NPV plot[c]	bF	94	281	S
Tehkummah Twp	bF	15	68	M-S
Twp 119	bF	37	89	M-S
Twp 125	bF	67	154	M-S
Twp A - Mile 32, W. Branch Rd.	bF	86	260	S
Twp B	bF	65	173	M-S
Twp J - Russian Lake	bF	5	0	0
Twp M - Plaunt Rd.	bF	76	494	S
Gogama District (15 locations)				
Beulah Twp - Meteor Lake	bF	83	234	S
Edinborough Twp	bF	73	295	S
Hazen Twp	bF	40	264	S
Inverness Twp - Donnegana Lake	bF	97	544	S

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Gogama District (cont'd.)				
MacMurchy Twp	bF	84	677	S
Marquette Twp	bF	70	617	S
Middleboro Twp	bF	23	1154	S
Miramichi Twp	bF	79	944	S
Potier Twp - Schou Lake	bF	34	147	M-S
Scotia Twp	bF	72	47	L-M
Shelley Twp - Onaping Lake	bF	95	415	S
St. Louis Twp	bF	94	399	S
Stull Twp	bF	50	294	S
Togo Twp	bF	0	0	0
Westbrook Twp	bF	61	372	S
Hearst District (7 locations)				
Caithness Twp - Big Pike Lake	bF	20	6	L
Derry Twp - Bullmoose L.	bF	1	15	L
Farquhar Twp	bF	5	14	L
Gourlay Twp - Gourlay L.	bF	3	32	L-M
Minipuka Twp - Goat L.	bF	16	37	L-M
Puskuta Twp	bF	0	0	0
Wicksteed Twp - 1.2 miles south of Hornepayne	bF	0	0	0
Kapuskasing District (15 locations)				
Bourinot Twp - Mile 33	bF	1	12	L
Buchan Twp - Mile 6	bF	3	3	L

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Kapuskasing District (cont'd.)				
Champlain Twp	bF	5	45	L-M
Clouston Twp	bF	5	111	M-S
Cromlech Twp				
- Brunswick Lake	bF	89	803	S
Fauquier Twp - Remi Lake	bF	1	3	L
Fenton Twp				
- Mile 23 Chain of Lakes	bF	0	0	0
Fergus Twp	bF	3	14	L
Griffin Twp - Griffin Lake	bF	0	0	0
Lisgar Twp				
- Chain of Lakes	bF	2	0	0
Mons Twp - Mons Lake	bF	8	57	M
- Mons Lake	wS	25	153	M-S
Opasatika Lake	bF	5	0	0
Shanly Twp				
- Camp 15, Groundhog River	bF	1	15	L
Stringer Twp				
- Groundhog River	bF	0	0	0
Kirkland Lake District (13 locations)				
Alma Twp	bF	38	59	L-M
Ben Nevis Twp	bF	3	0	0
Corkill Twp	bF	88	878	S
James Twp	bF	26	175	M-S
Lamplugh Twp	bF	3	7	L
Marriott Twp	bF	3	9	L-M
Milner Twp	bF	88	118	M-S
Montrose Twp	bF	38	732	S
Mulligan Twp	bF	3	17	L-M

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Kirkland Lake District (cont'd.)				
Rattray Twp	bF	16	99	M-S
Truax Twp	bF	16	94	M-S
Tyrell Twp	bF	88	588	S
Yarrow Twp	bF	5	198	M-S
North Bay District (15 locations)				
Calvin Twp	bF	27	278	S
Cameron Twp	bF	10	131	M-S
Clement Twp	bF	32	182	M-S
Commanda Twp	bF	30	42	L-M
Crerar Twp	bF	52	133	M-S
Jocko Twp	bF	0	0	0
Mattawan Twp	bF	70	154	M-S
Mills Twp	bF	0	25	L-M
Notman Twp	bF	3	0	0
Osborne Twp	bF	1	8	L-M
Papineau Twp	bF	25	43	M
Patterson Twp	bF	2	12	L
Phelps Twp	bF	5	9	L
South Himsworth Twp	bF	2	44	L-M
Thistle Twp	bF	23	210	M-S
Sault Ste. Marie District (12 locations)				
Fisher Twp	bF	5	55	M
Herrick Twp - Pancake Provincial Park	bF	7	111	M-S

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Sault Ste. Marie District (cont'd.)				
Palmer Twp	bF	20	9	L
Tarbutt Additional Twp	bF	75	139	M-S
Whitman Twp	bF	3	9	L
Twp 3H - Mile 20	bF	61	418	S
Twp 5H - Tujak Lake	bF	61	647	S
Twp 7H	bF	86	460	S
Twp 23, Rge 13				
- Hanes Lake	bF	97	1129	S
- Hanes Lake	wS	68	1279	S
Twp 25, Rge 14				
- Wart Lake	bF	55	326	S
Twp 26, Rge 12	bF	5	53	M
Sudbury District (20 locations)				
Antrim Twp - Halfway Lake	bF	40	66	M-S
Beaumont Twp - Helen Lake	bF	23	50	L-M
Botha Twp	bF	53	327	S
Creelman Twp	bF	2	0	0
Davis Twp	bF	7	373	S
Delamere Twp	wS	69	938	S
DeMorest Twp	bF	20	160	M-S
Dunnett Twp	bF	76	213	M-S
Fairbank Twp	bF	30	114	M-S
Hawley Twp	bF	75	542	S
Hess Twp	bF	85	222	S
Howey Twp	bF	26	287	S
Hyman Twp	bF	21	31	L-M

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Sudbury District (cont'd.)				
Killarney Twp - Killarney Provincial Park	bF	5	30	L-M
Muldrew Twp	bF	84	558	S
Selkirk Twp - Solace Lake	bF	80	185	M-S
Tyrone Twp - Michaud Lake	bF	15	14	L-M
Waldie Twp	bF	74	836	S
Twp 107	bF	96	206	S
Indian Reserve #6 - LaVase Lake	wS	67	394	S
Temagami District (17 locations)				
Askin Twp	bF	82	322	S
Aston Twp	bF	4	23	L
Banting Twp	bF	39	148	M-S
Barr Twp	bF	81	474	S
Belfast Twp	bF	3	0	0
Briggs Twp	bF	76	477	S
Dane Twp	bF	2	102	M-S
Flett Twp	bF	3	166	M-S
Gamble Twp	bF	88	857	S
Gillies Limit Twp	bF	75	840	S
Olive Twp	bF	25	70	M-S
Parker Twp	bF	4	0	0
Rorke Twp	bF	3	194	M-S
Shelburne Twp	bF	0	0	0
South Lorrain Twp	bF	88	185	S
Strathy Twp	bF	75	277	S
Torrington Twp	bF	7	59	M-S

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Timmins District (7 locations)				
Bartlett Twp - Texmont Road	bF	75	313	S
English Twp - English Lake	bF	65	726	S
Hassard Twp	bF	20	192	S
Langmuir Twp	bF	5	18	L-M
McKeown Twp	bF	6	29	L-M
Pharand Twp	bF	10	33	L-M
Sewell Twp - Lapierre Rd.	bF	10	63	M-S
Wawa District (38 locations)				
Abigo Twp - Apisabigo Lake	bF	5	12	L
Challener Twp	bF	5	14	L-M
Conking Twp	bF	12	12	L
Home Twp	bF	64	235	M-S
Simpson Twp - Oba Lake	bF	3	34	L-M
Twp. 25, Rge. 18 - Tikamaganda L.	bF	98	621	S
Twp 25, Rge. 23	bF	95	567	S
Twp 26, Rge. 25 - Manitowik Lake	bF	56	329	S
Twp 27, Rge. 23	bF	58	1233	S
Twp 27, Rge. 23	bF	93	1038	S
Twp 28, Rge. 15 - Crescent Lake	bF	6	8	L
Twp 28, Rge. 18	bF	82	324	S
Twp 28, Rge. 19 - Sand R. #3	bF	95	1252	S

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per[a] 100 sq. ft of foliage	Infestation forecasts for 1974[b]
Wawa District (cont'd.)				
Twp 28, Rge. 20 - Sand R. #4	bF	100	1414	S
Twp 28, Rge. 24	bF	70	283	S
Twp 28, Rge. 24 - Hawk Junction	bF	72	732	S
Twp 29, Rge. 16 - Agawa Bay	bF	12	26	L-M
Twp 29, Rge. 17 - Sand R. #1	bF	75	357	S
Twp 29, Rge. 19 - Sand R. #2	bF	98	288	S
- Sand R. #2	wS	90	1009	S
- Sand R. #2	bS	27	206	S
Twp 30, Rge. 19 - Baldhead River (Spray Plot, 1972)[e]	bF	11	88	M
- Baldhead River (Spray Plot 1972)[e]	wS	19	771	S
Twp 30, Rge. 20 - Red Rock Creek B.t. plot (1973)[d]	bF	30	82	M
- Red Rock Creek B.t. Plot (1973)[d]	wS	35	537	S
- Red Rock Control Plot (1973)	bF	81	427	S
- Red Rock Control Plot (1973)	wS	77	646	S
- Mijin B.t. Plot (1973)[d]	bF	30	358	S
- Mijin B.t. Plot (1973)[d]	wS	64	1091	S

(cont'd.)

Table 2 Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (concl'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Wawa District (cont'd.)				
- Mijin Control Plot (1973)	bF	83	278	S
- Mijin Control Plot (1973)	wS	65	1170	S
- Red Rock Zectran Spray Plot (1973)[e]	bF	10	101	M-S
- Red Rock Zectran Spray Plot (1973)[e]	wS	20	311	S
Twp 30, Rge. 21 - Rabbit Blanket Lake[e]	bF	35	106	M-S
Twp 30, Rge. 24 - Black Trout Lake	bF	10	34	L-M
Twp 30, Rge. 26	bF	2	19	L
Twp 43 - Ogasiwi River	bF	93	1377	S
Twp 46 - Renabie Road	bF	35	370	S

[a] 1 square foot = 0.0929 square metres

[b] S = severe, M = moderate, L = light, O = nil

[c] Aerial sprayed, NPV, 1973

[d] Aerial sprayed, B.t., 1973

[e] Aerial sprayed, Zectran, 1973

Table 3 Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Atikokan District (81 locations)				
Agnes Lake	bF	0	0	0
Airport Road	bF	4	4	L
Allen Lake[c]	bF	0	0	0
Argo Lake - west side[c]	bF	1	5	L
Basswood Lake				
- Bayley Bay	bF	12	0	0
- Canadian Point	bF	13	6	L
- North Bay	bF	4	0	0
- Prairie Portage	bF	49	98	M-S
- Ranger Bay	bF	0	0	0
Beaverhouse Lake	bF	0	0	0
Bentpine Lake	bF	0	0	0
Brent Lake - north central	bF	0	0	0
Buckingham Lake	bF	0	0	0
Cache Lake	bF	0	0	0
Cairn Lake	bF	0	0	0
Camel Lake	bF	0	0	0
Captain Tom Lake	bF	0	0	0
Carp Lake	bF	0	0	0
Conmee Lake				
- northeast side	bF	40	22	L-M
Crooked Lake - east end	bF	16	3	L
- Gardner Bay	bF	3	13	L
- N.E. of Sunday Bay	bF	50	66	M
Darky Lake	bF	0	0	0
David Lake	bF	0	0	0
Delahey Lake	bF	0	0	0
Devine Creek - #114 (1973)[c]	bF	3	7	L

(cont'd.)

Table 3 Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Atikokan District (cont'd.)				
Devine Creek				
- #181 (1973)[c]	bF	0	15	L
- #182 (1973)[c]	bF	2	8	L
Emerald Lake	bF	0	0	0
Eye Lake	bF	3	10	L
Ferguson Lake	bF	0	0	0
Fred Lake	bF	2	0	0
French Lake	wS	1	18	L
French Lake	bF	0	0	0
Hydro Line - Hwy. 11	bF	0	0	0
Joyce Lake	bF	0	0	0
Kawa Bay - #115[c]	bF	0	5	L
- #116[c]	bF	2	2	L
- #117[c]	bF	0	0	0
Lac La Croix				
- Campbells	bF	8	0	0
- I.R. 25 D (central)	bF	0	0	0
- I.R. 25 D (east)	bF	17	5	L
- Martin Bay (central)[c]	bF	8	0	0
- Martin Bay (west)[c]	bF	20	0	0
Lilac Lake	bF	13	10	L
Little Eva Lake	bF	2	0	0
Loon Lake	bF	5	7	L
Louisa Lake - north end	bF	4	0	0
Maligne River				
- west of Tanner Lake[c]	bF	36	48	M
McAree Lake - Lookout	bF	9	7	L
- Portage	bF	20	6	L
McEwan Lake	bF	8	0	0
McIntyre Lake	bF	0	0	0

(cont'd.)

Table 3 Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Atikokan District (cont'd.)				
Melema Lake	bF	0	0	0
Mercutio Lake	bF	4	0	0
Minn Lake[c]	bF	4	0	0
Northland Gateway	bF	0	0	0
Nydia Lake	bF	0	0	0
Olifaunt Lake	bF	0	10	L-M
Oriana Lake	bF	0	0	0
Orion Lake	bF	5	0	0
Pipestone Creek	bF	0	5	L
Poohbah Lake - Central[c]	bF	2	0	0
- east end	bF	0	0	0
- west end	bF	8	108	M-S
Quetico Lake	bF	0	0	0
Robinson Lake	bF	38	20	L
Shade Lake	bF	0	0	0
Snow Lake[c]	bF	21	0	0
Sturgeon Lake				
- northeast end	bF	0	0	0
- southwest side	bF	5	0	0
- west end[c]	bF	0	3	L
Tanner Lake - Dam[c]	bF	17	86	M
- Poohbah Creek[c]	bF	60	7	L
Thomson Lake	bF	3	11	L
Trail Lake[c]	bF	0	0	0
Tuck Lake	bF	5	0	0
Wicksteed Lake[c]	bF	14	0	0
William Lake - east end	bF	0	0	0
- west end	bF	0	0	0
Wolseley Lake				
- north central	bF	0	0	0

(cont'd.)

Table 3 Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Fort Frances District (4 locations)				
Bear Pass	bF	0	0	0
Hillyer Creek	bF	2	26	L-M
Mather Twp	bF	0	0	0
Potts Twp	bF	0	0	0
Geraldton District (5 locations)				
Caramat - 4 miles south	bF	20	5	L
Caramat Road - Mile 15	bF	2	0	0
Catlonite Road - Mile 72.3	bF	5	0	0
Croll Twp	bF	0	0	0
Wintering Lake Area	bF	0	0	0
Nipigon District (9 locations)				
Black Sturgeon Lake	bF	0	0	0
Jackpine River Area - 9 miles W. of Gravel River	bF	0	0	0
Ledger Twp - Gas line	bF	3	3	L
Legault Twp	bF	3	0	0
MacDiarmid - Mi. 30.7 Domtar Road	bF	3	0	0
Parks Lake	bF	0	0	0
Poshkokagon River	bF	0	0	0
Purdom Twp - Cameron Falls	wS	0	0	0
Summers Twp	bF	2	0	0

(cont'd.)

Table 3 Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Terrace Bay District (9 locations)				
Amwri Station	bF	0	0	0
Catlonite Lake	bF	5	3	L
Gertrude Twp	bF	0	0	0
Jct. of Industrial and Camp 5 Road	bF	0	0	0
Manitouwadge Road - Mile 1.5	bF	10	0	0
Marathon - 1/2 mile north of Highway 17	bF	0	10	L
Stevens C.N.R. - Monitoring and pheromone plots	bF	1	4	L
Twp 82 - Jackfish Lake	bF	0	8	L
Twp 85 - Rainbow Falls Park	bF	0	5	L
Thunder Bay District (77 locations)				
Aldina Twp	bF	0	0	0
Arrow Lake	bF	0	0	0
Athelstane Lake	bF	0	0	0
Batwing Lake	bF	0	0	0
Batwing & Mark lakes Rd. Jct.	bF	0	0	0
Bedivere Lake	bF	0	0	0
Bemar Lake	bF	0	0	0
Blackwell Twp	bF	0	0	0
Burchell Lake	bF	0	0	0

(cont'd.)

Table 3 Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Thunder Bay District (cont'd.)				
Clovenhoof Lake	bF	0	0	0
Crayfish Lake	bF	0	0	0
Cushing Lake	bF	0	0	0
Devil's Elbow	bF	0	8	L
Drift Lake Road	bF	0	0	0
Fountain Lake	bF	0	0	0
Granite Lake - north side[c]	bF	15	15	L
- south side[c]	bF	1	0	0
- 1972 pocket of infestation	bF	4	0	0
Greenwater Lake				
- east side	bF	0	0	0
- Shelter Island	bF	0	0	0
Greenwood Lake	bF	3	0	0
Gunflint Lake - east end	bF	0	5	L
- west end	bF	15	0	0
- central	bF	1	0	0
Hagey Twp - Hwy. 586	bF	0	0	0
Haines Twp - Postans	bF	0	6	L
Heaven Lake Road	bF	1	3	L
Hood Lake	bF	0	0	0
Hoof Lake	bF	0	0	0
Huronian Lake	bF	0	0	0
Hwy. 11				
- west of Burchell Lake Rd.	bF	0	0	0
Icarus Lake	bF	0	0	0
Kashabowie Lake	bF	0	0	0
Kekekaub Lake	bF	1	4	L
Lac des Mille Lacs				
- Baril Bay	bF	0	0	0
- Bolton Bay	bF	0	0	0
- Pine Point	bF	0	0	0

(cont'd.)

Table 3 Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (cont'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Thunder Bay District (cont'd.)				
Lac des Mille Lacs				
- Poplar Point	bF	0	0	0
- Portage Bay	bF	0	0	0
Lily Lake	bF	0	0	0
Marks Lake	bF	2	0	0
McGinnis Lake	bF	0	10	L
McMaster Twp	bF	0	0	0
Melvin Lake	bF	6	0	0
Moss Lake	bF	0	0	0
Mountain Lake	bF	1	0	0
Mountain Lake	wS	2	5	L
Nelson Lake	bF	0	0	0
Northern Light Lake				
- Curran Bay	bF	0	0	0
- Gravel Pit[c]	bF	0	0	0
- Savage Bay	bF	5	4	L
- South Island[c]	bF	11	17	L
- Trafalgar Bay	bF	0	0	0
- Trout Bay	bF	1	0	0
- Weather Station (1970)[c]	bF	2	9	L
Pearson Twp	bF	0	5	L
Pigeon River	bF	0	0	0
Plummes Lake	bF	0	0	0
Powell Lake	bF	0	0	0
Prelate Lake	bF	0	0	0
Ross Lake	bF	0	0	0
Sandstone Lake	bF	0	0	0
Shebandowan Lake	bF	0	0	0
- Sawmill Bay	bF	1	0	0
Shekak Lake	bF	0	0	0
Sibley Peninsula				
- Joe Lake	bF	0	0	0
- M.T.C. Depot	bF	0	2	L

(cont'd.)

Table 3 Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1973, and infestation forecasts for 1974 (concl'd.)

Location	Host	Estimated per cent of defoliation 1973	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1974[b]
Thunder Bay District (cont'd)				
Sleigh Lake	bF	0	0	0
Squeers Lake	bF	0	0	0
Sunbow Lake	bF	0	0	0
Swallow Lake	bF	0	0	0
Tilley Lake	bF	0	0	0
Titmarsh Lake	bF	0	0	0
Upsala Inwood Park	bF	0	0	0
Whitefish Lake	bF	0	0	0
White River District (3 locations)				
Twp 32, Rge. 27 - Obatanga	bF	4	16	L
Twp 66	bF	1	0	0
Twp 70 - Access Road	bF	0	0	0

[a] 1 square foot = 0.0929 square metres

[b] S = Severe, M = moderate, L = light, 0 = nil

[c] Aerial sprayed, Zectran, 1973

PART B: AERIAL SPRAYING OPERATIONS

INTRODUCTION

In 1973, the Ontario Ministry of Natural Resources sprayed 88,300 acres against spruce budworm in northeastern and northwestern Ontario. Figure 1 shows the location of the operations. Four Stearman aircraft and one Agcat were contracted from General Airspray Ltd., St. Thomas, Ontario to apply the sprays. Each aircraft was equipped with four Micronair AU 3000 units for spray dispersal. Zectran was sprayed at a rate of 1.2 ounces[4] in .15 gallons (U.S.)[5] of spray mixture (Arotex) per acre.

The Canadian Forestry Service (Great Lakes Forest Research Centre) participated in the planning of operations and was responsible for timing the spray applications and assessing the results. The following description of the operations and results is taken from a report by Howse, Sippell and Turner (1973).

SOUTHEASTERN ONTARIO OPERATIONS

1973 Operations

There were no provincial spraying operations in southeastern Ontario. Spraying to protect plantations and natural stands on the Petawawa Forest Experiment Station was carried out by the Canadian Forestry Service (Chemical Control Research Institute and Petawawa Forest Experiment Station). About 5,300 acres were sprayed up to three times with various concentrations and application rates of fenitrothion-Arotex mixture in an effort to determine the best method of protecting white spruce. The problem of protecting white spruce in Ontario, particularly in plantations, was described by Howse *et al.* (1972).

Results

The results of this operation were described by Armstrong (1973) and the following information is abstracted from that report. Three applications (using a Cessna Agtruck and a Piper Pawnee, both fitted with AU 2000 Micronair units) of fenitrothion at 3 ounces per acre applied in a minimum volume of 0.5 gallons (U.S.) per acre caused 90-98% population reduction on balsam fir and at best only about 50% population reduction on white spruce. A single application of 4 ounces per acre did not provide effective control.

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[4] 1 ounce = 31.103 grams
[5] 1 U.S. gallon = 3.78 litres

An aerial survey conducted by personnel from the Forest Insect and Disease Survey Unit of the Great Lakes Forest Research Centre in late June, 1973 showed that several of the sprayed white spruce plantations were either moderately or severely defoliated, either in part or throughout most of the plantation. Heavy defoliation was evident in sprayed natural stands in three separate locations totalling about 300 acres. Otherwise, in the sprayed area, natural stands and white spruce plantations appeared to be in reasonably good condition. Stands with a high balsam fir content were green and appeared to have received good protection. Dominant white spruce trees throughout the sprayed area commonly exhibited a tinge of colour due to budworm feeding but damage in most cases was not heavy enough to be classified as moderate.

Proposed Aerial Spraying Operations for 1974

Egg-mass counts throughout most of southeastern Ontario, but particularly in Algonquin Provincial Park and the Petawawa Forest Experiment Station, indicate very high levels of spruce budworm larval populations in 1974.

Plans for protecting Petawawa Forest Experiment Station and perhaps parts of the Canadian Forces Base, Petawawa are being formulated by the Chemical Control Research Institute and the Great Lakes Forest Research Centre, in consultation with personnel at the Petawawa Forest Experiment Station.

The Ontario Ministry of Natural Resources has delineated areas of susceptible forest in Algonquin Provincial Park where protection against budworm damage would be desirable. However, the extent of the area to be sprayed in 1974 remains to be determined.

NORTHEASTERN ONTARIO OPERATIONS

1973 Operations

A total of 11,000 acres, as outlined below, were sprayed in parts of five provincial parks in northeastern Ontario. The primary purpose of this spraying was to minimize the intensity of damage caused by budworm within selected high-value recreational areas.

District	Park	Acreage Sprayed
Wawa	Lake Superior	3,350
Chapleau	Shoals	1,600
	Missinaibi	5,250
	Five Mile	500
	Wakami	300
		11,000

Budworm emergence occurred about mid-May. Spraying was carried out on June 9, 10 and 13 in Lake Superior Provincial Park and from June 14 to June 21 in the parks in the Chapleau District. Two aircraft, a Stearman and an Agcat, were available to expedite the operation but the weather was generally unsettled and the sprayers could not operate on several days.

Results

As in 1972, an assessment was made in 1973 in a 550-acre block of Lake Superior Provincial Park to obtain detailed information on the effectiveness of Zectran when applied at the operational rate of 1.2 ounces in .15 gallon (U.S.) of Arotex per acre. The results showed population reductions of 90% on balsam fir and 74% on white spruce (corrected for natural mortality). Damage to current foliage showed defoliation to balsam fir of 16% in the Zectran plot compared with 85% in the untreated check. The corresponding figures for white spruce were 19% defoliation in the Zectran plot and 58% in the untreated check. Pupal counts and defoliation estimates for the areas sprayed in Chapleau District confirmed that fair protection was achieved.

The Ontario Ministry of Natural Resources also tested *Bacillus thuringiensis* (Thuricide formulation) at a semi-operational level in 1973 in Lake Superior Provincial Park. The Canadian Forestry Service (the Insect Pathology Research Institute and the Great Lakes Forest Research Centre) provided technical advice and evaluated the effectiveness of the B.t. sprays. The Ontario Ministry of Natural Resources provided financial support for entomological evaluation work.

A Stearman spray plane (General Airspray) equipped with Micronair AU 3000 dispersal units was used to spray a 160-acre area with Thuricide at a rate of 4 billion International Units per .5 gallon (U.S.) of water per acre on the evening of June 11. A second 160-acre area was sprayed on the evening of June 12 at a rate of 2 billion International Units per .5 gallon (U.S.) of water per acre. Larvae were in the third and fourth instar. The second area was sprayed a second time at a rate of 2 billion International Units per .5 gallon (U.S.) of water per acre on the evening of June 20 when larvae were primarily in the fifth and sixth instar. All spray applications were made under satisfactory weather conditions and spray deposit was generally good, though somewhat variable. Droplet counts in excess of 100 per square centimetre[6] were recorded in some cases. Pertinent population reduction attributable to the B.t. sprays and defoliation determinations is summarized below. The results of the Zectran spray are included to allow ready comparison with the B.t. sprays.

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[6] 1 square centimetre = 0.155 square inches

Treatment	Host	% Population Reduction Spray + 8 days	% Population Reduction Spray + 24 days	% Current Defoliation Plots	% Current Defoliation Checks
B.t. - 4 billion IU	bF	61	61	36	85
	wS	34	42	41	64
B.t. - 2 billion IU x 2	bF	57	59	40	85
	wS	3	18	59	64
Zectran	bF	-	90	16	85
	wS	-	74	19	58

These B.t. results were in general supported by diagnostic studies carried out by H.A. Tripp of the Insect Pathology Research Institute. He determined the proportion of larvae infected with B.t. in the different sprayed areas, and showed that budworm in the sprayed plots were infected with B.t. in proportions ranging from 22% to 46% one to two weeks after sprays were applied. Higher proportions of budworm were infected on balsam fir than on white spruce.

In summary, these results demonstrate that B.t. is a viable alternative to chemical insecticides under certain circumstances. It is likely that B.t. spraying will continue to cost more than chemical spraying for the foreseeable future ($4.00 per acre for B.t. compared to $1.00-$1.50 per acre for Zectran in 1973) and probably will not provide as good a degree of protection although the degree of protection is dependent to a large extent upon population density of early-instar larvae. In any event, the results obtained in Lake Superior Provincial Park in 1973 with B.t. should be acceptable to the forest manager in terms of protecting trees. Thus B.t. can be considered in those situations where cost is not an inhibiting factor, where budworm populations are not unusually high or where the use of chemical insecticides would cause environmental problems or arouse public concern.

Proposed Aerial Spraying Operations for 1974

The Province is considering protecting some 24,000 acres in various provincial parks in the Wawa and Chapleau districts in 1974.

NORTHWESTERN ONTARIO OPERATIONS

1973 Operations

As in previous years, the largest operation in the Province took place in northwestern Ontario with headquarters at Atikokan. From 29 May to 29 June 77,300 acres were treated using three Stearman spray planes. Budworm emergence occurred about mid-May. The sprayers were unable to operate for the first week of June because of poor weather.

Most of the spraying was done in Quetico Provincial Park where 69,000 acres lying between Poohbah Lake, Neguaguon Lake Indian Reservation 25D and Martin Bay, 1,500 acres around Allan Lake and 4,600 acres between Kawa Bay and Devine Creek were treated. Another 1,500 acres at Northern Light Lake and 700 acres at Granite Lake, east of Quetico in the Thunder Bay District, were also treated.

Results

On the basis of aerial defoliation surveys, pupal counts and egg-mass counts, the results generally appear to be good. Several pockets of defoliation, totalling only about 5,000 acres, were mapped in the largest spray block. Pupal counts and egg-mass counts from the sprayed areas show that budworm populations are reduced by an average of 70% from 1972. Infestations at Allan Lake, Kawa Bay, Northern Light Lake and Granite Lake appear to have been eliminated.

Proposed Aerial Spraying Operations for 1974

The Province is expected to continue its policy of abatement and will likely spray the remnants of the main infestation in Quetico Provincial Park in the Poohbah and Tanner lakes area and possibly some of the small infestations remaining along the border. The total area is not likely to exceed 20,000 acres.

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