THE 1974 SPRUCE BUDWORM SITUATION IN ONTARIO

PART A: DAMAGE AND FORECASTS

PART B: AERIAL SPRAYING OPERATIONS

G. M. HOWSE, A. A. HARNDEN AND W. L. SIPPELL

GREAT LAKES FOREST RESEARCH CENTRE

SAULT STE. MARIE, ONTARIO

INFORMATION REPORT O-X-228

CANADIAN FORESTRY SERVICE

DEPARTMENT OF THE ENVIRONMENT

APRIL 1975

Copies of this report may be obtained from

Director,
Great Lakes Forest Research Centre,
Canadian Forestry Service,
Department of the Environment,
Box 490, Sault Ste. Marie, Ontario.
P6A 5M7

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 the following Survey Field Technicians who made a major contribution to this report through their observations, aerial mapping and procurement of data:

M. J. Applejohn	E. L. Houser
C. A. Barnes	V. Jansons
W. D. Biggs	H. D. Lawrence
R. L. Bowser	F. Livesey
H. R. Foster	L. S. MacLeod
K. C. Hall	M. J. Thomson
J. Hook	H. J. Weir

L. L. McDowall, Chief Technician

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. H.R. Foster, a Forest Research Technician with the Forest Insect and Disease Survey, is shown using a pole clipper and basket to collect spruce budworm infested foliage from the midcrown of a balsam fir tree. A basket is used to prevent loss of larvae when they are in the later stages of growth.

ABSTRACT

The spruce budworm situation in 1974 eased somewhat in southern Ontario, worsened considerably in northeastern Ontario and remained about the same in northwestern Ontario. Part A of this report describes changes in the infestations in 1974 and forecasts, in cartographic and tabular form, the damage liable to occur in 1975. Part B describes aerial spraying operations covering 19,200 ha (48,000 acres) which were conducted against the spruce budworm in Ontario in 1974 as part of a joint strategy developed by the Canadian Forestry Service and the Ontario Ministry of Natural Resources.

RÉSUMÉ

En 1974, les infestations de la Tordeuse des bourgeons de l'épinette s'est assez apaisée dans le sud de l'Ontario, a empiré considérablement dans le nord-est de l'Ontario et a demeuré à peu près stable dans le nord-ouest de cette province. La partie A de ce rapport décrit les fluctuations des infestations survenues en 1974 et prévoit, en se basant sur des cartes et des tableaux, les dégâts probables en 1975. La partie B décrit les arrosages aériens effectués en 1974 sur une superficie de 19,200 ha (48,000 acres), lors de la réalisation d'un programme conjoint entre le Service canadien des forêts et le Ministère de ressources naturelles de l'Ontario.

TABLE OF CONTENTS

Page

PART A: DAMAGE AND FORECASTS

INTRODUCTION 1

OVERALL SITUATION, 1974 1

Southern Ontario 3

Situation in 1974 3

Infestation Forecasts for 1975 4

Tree Mortality 5

Northeastern Ontario 8

Situation in 1974 8

Infestation Forecasts for 1975 9

Tree Mortality 9

Northwestern Ontario 10

Situation in 1974 10

Infestation Forecasts for 1975 12

Tree Mortality 14

SUMMARY 14

PART B: AERIAL SPRAYING OPERATIONS

INTRODUCTION 43

Southern Ontario 43

1974 Operations 43

Results 44

Proposed Aerial Spraying Operations for 1975 46

Northeastern Ontario 46

1974 Operations 46

Results 46

Proposed Aerial Spraying Operations for 1975 46

(Continued)

TABLE OF CONTENTS (concluded)

Page

PART B: AERIAL SPRAYING OPERATIONS (Cont'd)

Northwestern Ontario 48

1974 Operations 48

Results 48

Proposed Aerial Spraying Operations for 1975 48

SUMMARY 48

REFERENCE 49

The life history of the spruce budworm is depicted on the cover.

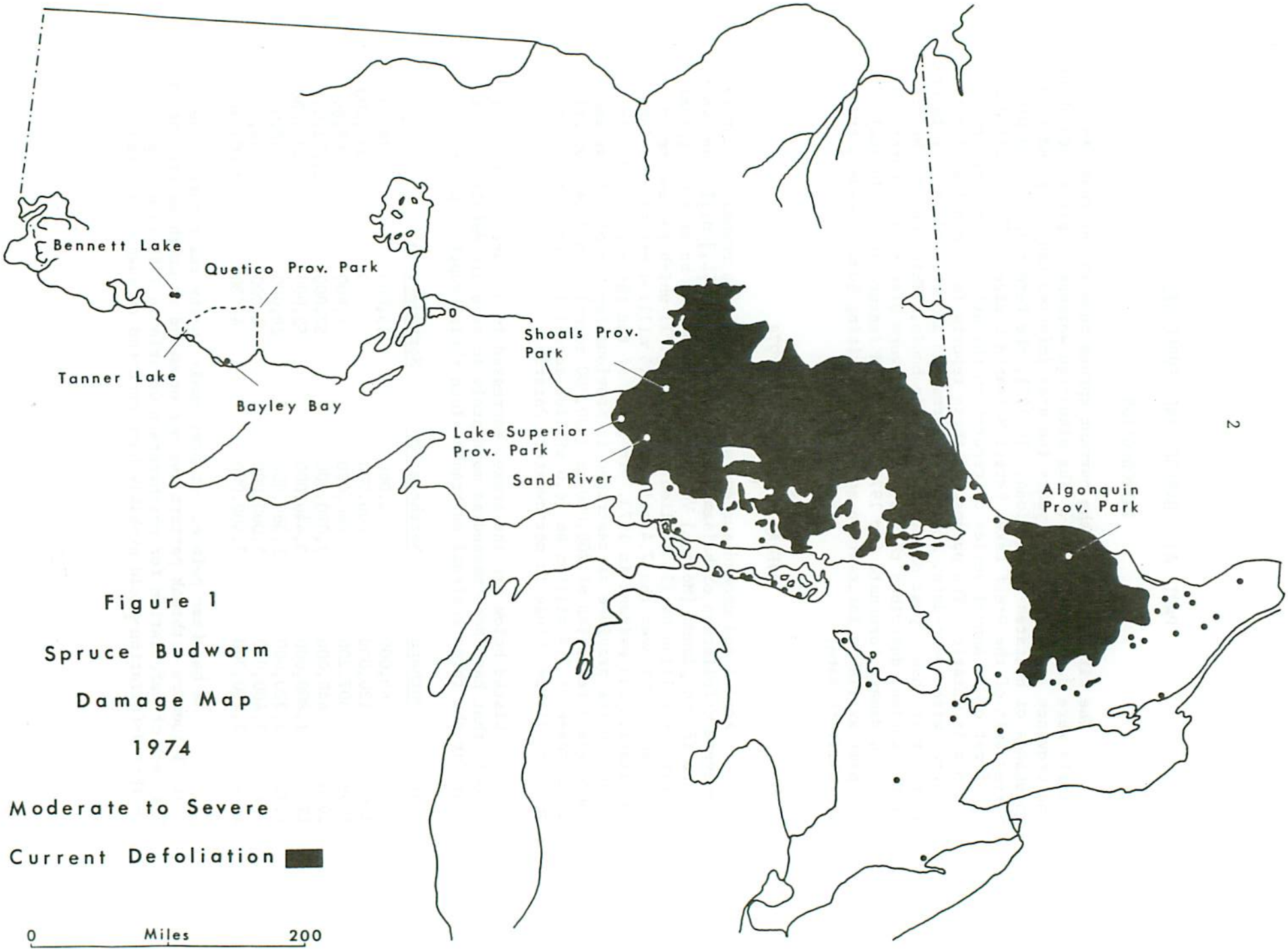


Figure 1

Spruce Budworm

Damage Map

1974

Moderate to Severe

Current Defoliation

PART A: DAMAGE AND FORECASTS

INTRODUCTION

The first signs of the current spruce budworm outbreaks in Ontario were detected in 1967. The situation worsened rapidly throughout the province and within four years the area infested had increased from thousands of hectares to millions. In 1971, the Forest Insect and Disease Survey Unit of the Great Lakes Forest Research Centre (GLFRC) published the first of an annual series of reports on the status of the spruce budworm in Ontario. The purpose of these reports is to provide forest managers with up-to-date, accurate information about Canada's most important forest insect pest on a province-wide basis. This report, the fifth in the series, describes the 1974 spruce budworm situation in Ontario and provides damage forecasts for 1975. An added feature is the inclusion of the best available information and maps describing budworm-caused tree mortality to date.

OVERALL SITUATION, 1974

Aerial and ground surveys of Ontario in 1974 revealed moderate-to-severe defoliation of balsam fir (*Abies balsamea* [L.] Mill.) and white spruce (*Picea glauca* [Moench] Voss) trees throughout an area of approximately 9.6 million ha (24 million acres) (Fig. 1) which represents an increase of 30% over the 7.4 million ha (18.5 million acres) on which defoliation was evident in 1973. In terms of the three regional outbreaks in the province as described in previous reports of this series there was a reduction of 200,000 ha (500,000 acres) in southern Ontario, an increase of 2.4 million ha (6.0 million acres) in northeastern Ontario and very little change in northwestern Ontario.

Listed below are the areas, expressed in hectares (1 ha = 2.5 acres), that have been mapped as moderately to severely defoliated each year for the three regional outbreaks since their eruption in 1967.

Year	Southern	Northeastern	Northwestern	Total
1967	60,000	3,000	16,000	79,000
1968	120,000	200,000	0	320,000
1969	307,200	660,000	1,600	968,800
1970	640,000	2,080,000	52,000	2,772,000
1971	1,800,000	3,440,000	52,000	5,292,000
1972	2,320,000	5,360,000	28,000	7,708,000
1973	2,400,000	5,000,000	4,000	7,404,000
1974	2,200,000	7,400,000	4,680	9,604,680

As has been pointed out previously in several reports, the typical budworm outbreak pattern has not occurred in northwestern Ontario. The lack of defoliation for northwestern Ontario in 1968 is misleading in that defoliation would probably have occurred throughout an area of

at least 100,000 ha (250,000 acres); however, chemical control operations carried out by the Ontario Ministry of Natural Resources (OMNR) totalling 110,000 ha (275,000 acres) in 1968 and 10,400 ha (26,000 acres) in 1969 resulted in the elimination of this infestation. Other infestations detected further west in Quetico Provincial Park since 1969 have been greatly reduced or eliminated by spraying over the past five years. Consequently, the current situation remains quite favorable in northwestern Ontario, particularly when contrasted with the situation in northeastern and southern Ontario.

As a matter of interest, the state of Minnesota, which shares a lengthy international border with northwestern Ontario, reported a total of 120,000 ha (300,000 acres) of moderate-to-severe budworm defoliation in 1974. This represents a considerable decrease from the 800,000 ha (2.0 million acres), 600,000 ha (1.5 million acres) and 200,000 ha (500,000 acres) mapped in 1971, 1972 and 1973, respectively. Thus it is evident that spruce budworm populations have been on a downward trend in adjoining regions of northern Minnesota and northwestern Ontario.

Southern Ontario

Situation in 1974: In southern Ontario, the area infested by budworm diminished slightly from the 2.4 million ha (6.0 million acres) mapped in 1973 to 2.2 million ha (5.5 million acres) in 1974 (Fig. 2). Most of this reduction occurred in the Ottawa River Valley between Pembroke and Arnprior. Although budworm were common in this area, defoliation was generally limited to trace or light with the exception of scattered small pockets of moderate-to-severe defoliation. Only a few minor changes occurred elsewhere within the infestation boundary, with two small extensions in the southern boundary into Tudor Township in the Tweed District and Burleigh Township in the Bancroft District. The western edge of the infestation, which extends from Verulam Township in the Lindsay District to Mattawa in the North Bay District, changed very little except for a westward expansion into Papineau Township in the North Bay District. Six significant pockets of defoliation, ranging from 4000 to 8000 ha (10,000 to 20,000 acres) in size, were located south and east of the main infestation--three in the Tweed District in Marmora, Clarendon and Palmerston townships, two in the Lanark District in Darling and Pakenham townships and one in the Napanee District in Kingston Township. In addition, many small pockets of defoliation, too numerous to list, were detected elsewhere throughout southeastern Ontario.

The infestation in Blair and McConkey townships in the Parry Sound District more than doubled in expanse from about 8000 ha (20,000 acres) in 1973 to about 20,000 ha (50,000 acres) in 1974 (see Fig. 5). Nearby, a small pocket of defoliation in 1973 on the boundary of Blair and Mowat townships developed into a 1300-ha (3250-acre) infestation in 1974. Larval population densities were extraordinarily high

throughout parts of Algonquin Provincial Park. For example, larval densities frequently exceeded 100 living larvae per 45.7-cm (18-in.) branch tip, and in at least one case exceeded 200 per tip for a sample collected at Rock Lake. Elsewhere in southern Ontario budworm populations were low although white spruce and balsam fir were severely defoliated on 60 ha (150 acres) in Amabel Township near Owen Sound, and several other smaller patches of defoliation were noted. Large numbers of budworm moths were prominent in mid-July in parts of southwestern Ontario, especially in the Guelph, London, Chatham, Windsor and Sarnia areas. It is speculated that the moths were swept in by turbulent air currents from infestations in the north.

The population collapse in the Ottawa River Valley occurred in the townships of Westmeath, Bromley, Ross, Horton, the eastern part of Wilberforce and the northern part of Admaston. This occurrence was unusual, to say the least, because high egg-mass populations were present throughout the area in the fall of 1973 and severe defoliation was forecast for 1974. It so happens that the 1967 outbreaks in southern Ontario began in this area. Moderate-to-severe defoliation of host trees has occurred in these townships for seven consecutive years (1967-1973). Tree mortality has been reported from this area since 1971, e.g., from the Bonnechère River and Admaston Township areas. Thus, it is possible that a combination of an increasing number of dead trees, trees with dead tops, and trees still living but with very little green foliage left, could have resulted in very low early-instar larval survival owing to a lack of suitable sites for needle mining or bud mining following emergence in early May, 1974. Of course, other factors such as parasitism, predation or local weather conditions may also have been involved in the collapse.

Aerial and ground spraying operations were carried out in Algonquin Provincial Park in 1974 to protect foliage of host trees in high-value camping and recreational areas. Please refer to Part B of this report for further details.

Infestation Forecasts for 1975: Spruce budworm egg-mass counts and defoliation surveys were carried out during August, 1974 in southern Ontario. Foliage samples were collected from a total of 124 locations, egg masses were counted, defoliation was estimated and infestation forecasts for 1975 were prepared (Fig. 3; see also Table 1, p. 15). The results of this survey show that the 1974 egg-mass densities have decreased, on the average, by about 35% over those of 1973. Egg-mass counts for the Pembroke—Arnprior area declined by about 40%, but in spite of this reduction, all damage forecasts for this area call for severe infestation levels in 1975. Egg-mass populations which reached record high levels throughout Algonquin Provincial Park in 1973 declined by 60% in 1974. For example, in 1974 the average egg-mass density for 13 locations within

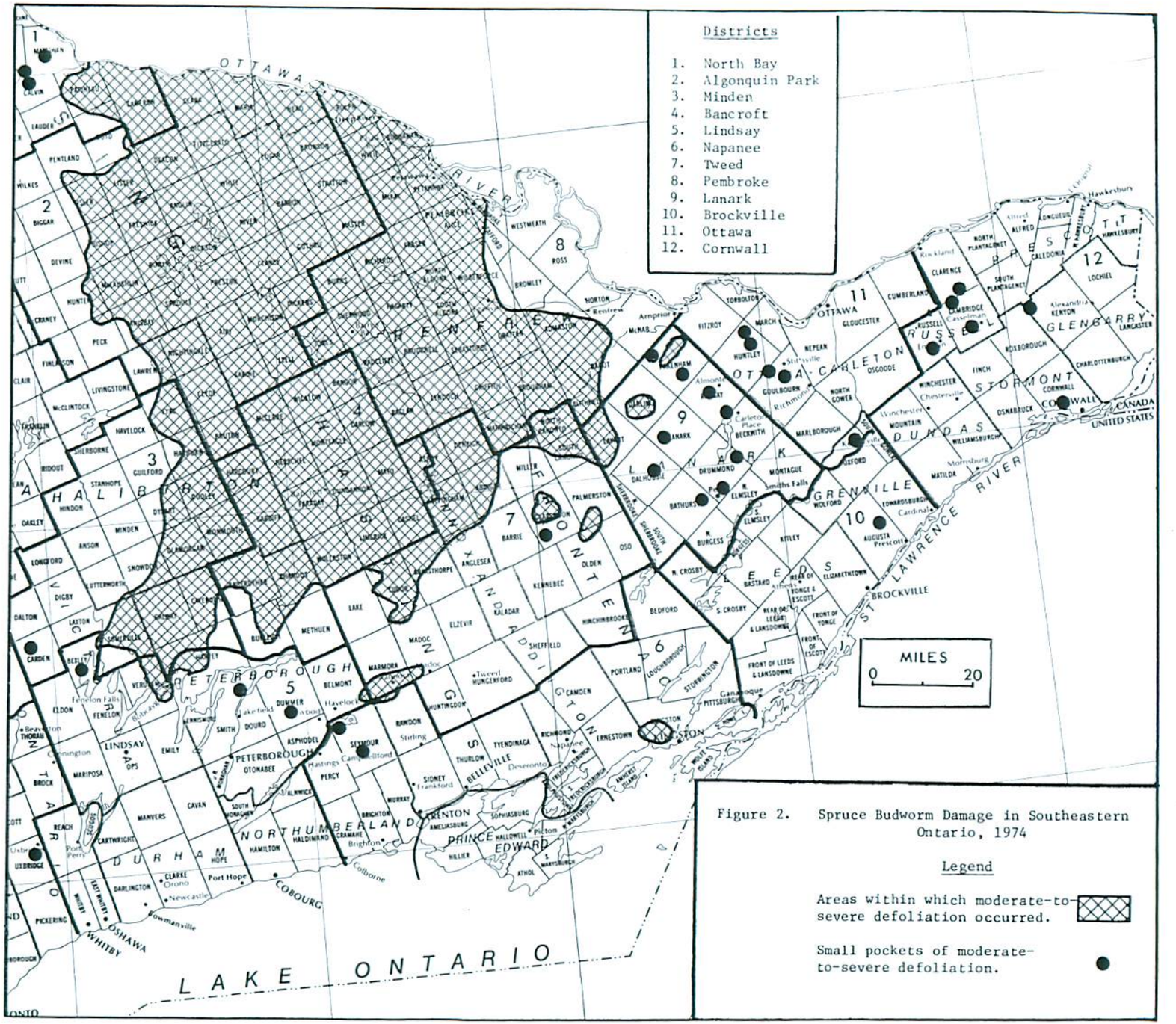


Figure 2. Spruce Budworm Damage in Southeastern Ontario, 1974

Legend

Areas within which moderate-to-severe defoliation occurred.

Small pockets of moderate-to-severe defoliation.

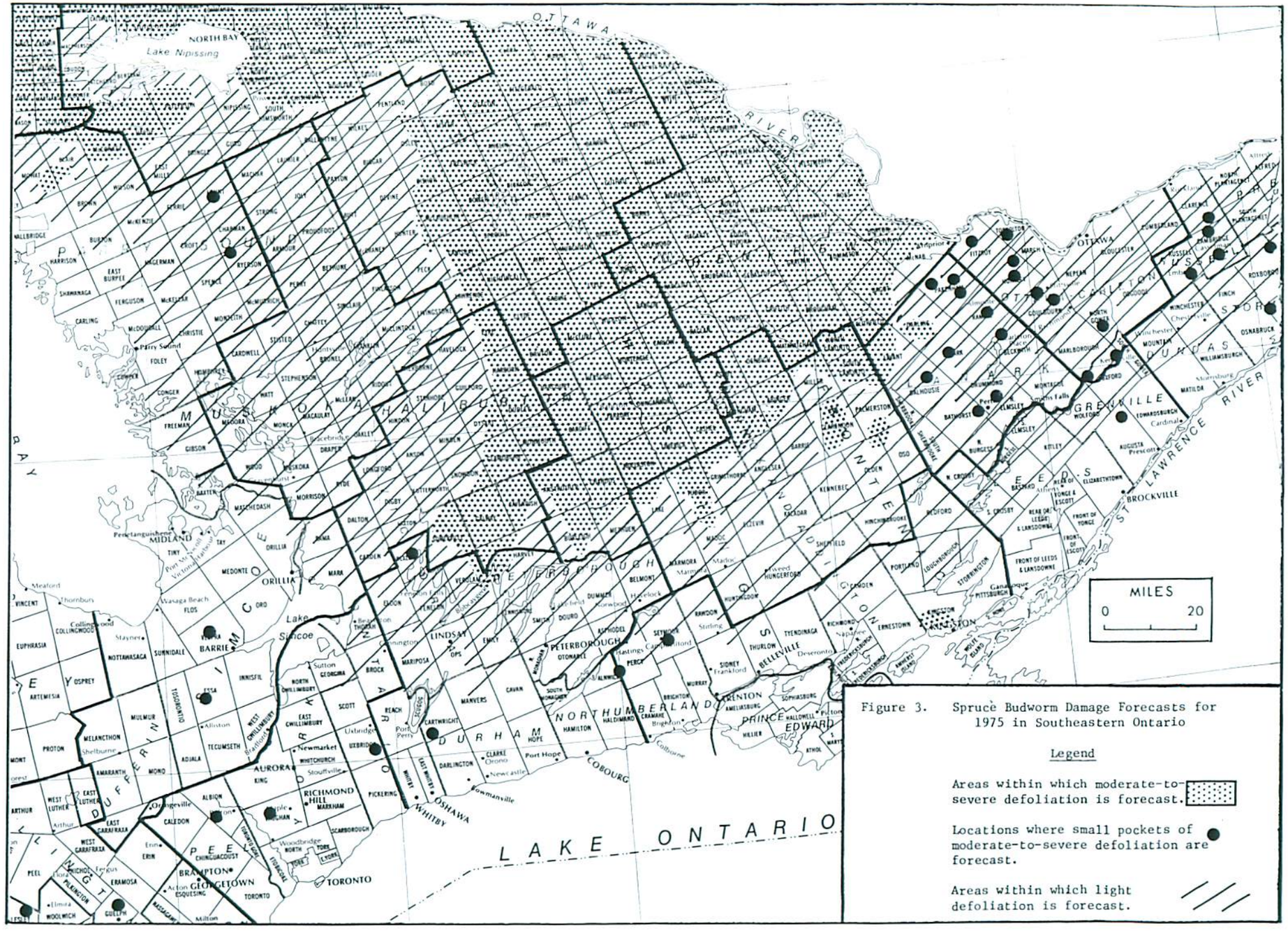


Figure 3. Spruce Budworm Damage Forecasts for 1975 in Southeastern Ontario

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.

the infestation in Algonquin Park was 530 per 9.29 sq. m (100 sq. ft) compared with 1325 per 9.29 sq. m in 1973. The majority of forecasts still call for severe infestation in 1975. The highest egg-mass count recorded in southern Ontario in 1974 was from a white spruce sample taken at St. Williams Nursery in South Walsingham Township in Simcoe District where the count was 3108 egg masses per 9.29 sq. m.

It is tempting to speculate, in view of the decline in area defoliated and egg-mass densities, that these may signal the start of the collapse of the outbreak in southeastern Ontario. Such speculation may be premature because most of the areas damaged in 1974, i.e., 2.0-2.4 million ha (5-6 million acres), will again show moderate or severe defoliation in 1975. Furthermore, although no major expansion is likely to occur, it is quite probable that many susceptible stands on the periphery of the major infestations, particularly in the Ottawa Valley between Pembroke and Ottawa, will show evidence of defoliation in 1975. Populations should remain low throughout the area between Algonquin Provincial Park and Georgian Bay (Bracebridge and Parry Sound districts) with the exception of previously mentioned infestations in the northern part of the Parry Sound District.

In southwestern Ontario, particularly in the Guelph, London, Chatham, Windsor and Sarnia area, where an abundance of budworm moths was noted in mid-July, 1974, white spruce or Norway spruce (*Picea abies* [L.] Karst.) plantations, windbreaks and ornamentals will likely suffer varying levels of defoliation in 1975. Elsewhere throughout southern Ontario, budworm damage should occur at no greater than a trace or light level except for the occasional pocket of moderate or severe infestation.

Tree Mortality: Mortality of balsam fir and to a lesser extent white spruce trees has occurred in many stands hit hardest by the budworm in southeastern Ontario. The locations of areas of [known] significant mortality are shown in Figure 4. Two categories of balsam fir mortality are recognized: (a) areas within which scattered tree mortality and top mortality occur (light or scattered mortality) and (b) areas within which concentrations of tree mortality and top mortality occur (moderate or heavy mortality).

Many of the accessible locations were ground checked by Survey technicians. The percent tree mortality, based on a tally of 100 balsam fir and white spruce trees at the specified location, is tabled below.

Forecasting tree mortality is probably beyond our capabilities at the present time. However, it should be possible to detect mortality, define its extent and follow its progress on a periodic basis, eventually arriving at the overall impact. A combination of aerial

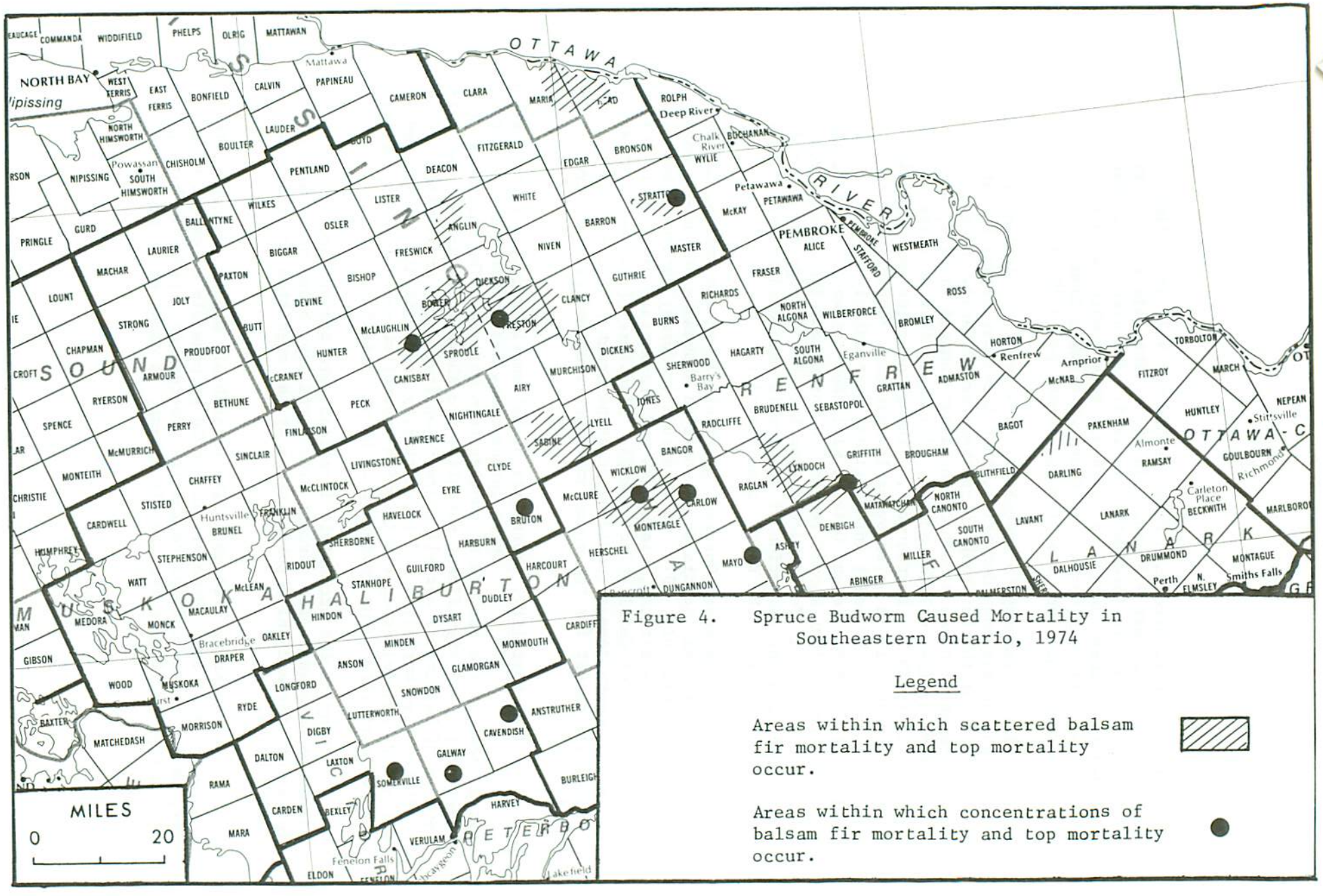


Figure 4. Spruce Budworm Caused Mortality in Southeastern Ontario, 1974

Legend

Areas within which scattered balsam fir mortality and top mortality occur.

Areas within which concentrations of balsam fir mortality and top mortality occur.

Location	Host	Tree mortality in 1974 (%)
Algonquin Park District		
Bruton Twp	bF	75
Canisbay Twp - Wildlife Station	bF	25
" " - Madawaska River	bF	55
Edgar Twp - Lake Traverse	bF	40
Preston Twp - Annie Bay Dam	bF	38
" " - Booth Lake	bF	52 (27)[a]
" " - Kitty Lake	bF	25
" " - Shirley Lake	bF	24
Stratton Twp - Achray (Virus Plot C)	bF	50
" " - " " " "	wS	57
" " - Lone Creek	bF	80 (46)[a]
" " - " "	wS	16 (0)[a]
Bancroft District		
Carlow Twp - New Carlow	bF	36
McClure Twp - Maynooth	bF	15
Monteagle Twp	bF	39
Minden District		
Cavendish Twp - Onion Lake	bF	32
Galway Twp - Bass Lake	bF	47
" " - Crystal Lake	bF	10
Harvey Twp	bF	15
Somerville Twp - Victoria Co. Forest	bF	31
Pembroke District		
Griffith Twp - Strathroy	bF	36

[a] Figures within parentheses are for 1973.

observation, satellite imagery, aerial photography and ground checking will be necessary to carry out this work and it is hoped that techniques currently being developed for this will be in operational use by 1975.

Northeastern Ontario

Situation in 1974: The total area within which moderate-to-severe defoliation occurred on balsam fir and white spruce increased to 7.4 million ha (18.5 million acres) from the 5.0 million ha (12.5 million acres) mapped in 1973 (Fig. 5). Major changes in the northern infestation boundaries resulted from a northward advance of budworm in the Chapleau District into the southeastern part of Hearst District and into the southwestern corner of the Kapuskasing District. Large areas of moderate-to-severe defoliation recurred throughout much of the 1.0 million ha (2.5 million acres) north and east of Chapleau where budworm populations had been adversely affected by a snowstorm and freezing temperatures in late May, 1972. This area had been essentially free of defoliation in 1973 except in small scattered pockets. Infestation boundaries shifted northward into townships south of Timmins in the Timmins District and in a northeastward direction further into the Kirkland Lake District towards the town of Kirkland Lake. In the south, infestations filled gaps left unaffected in 1973 in the Temagami District and expanded southward through the North Bay District to Lake Nipissing. New infestations were also found south of Lake Nipissing in the North Bay District. From North Bay westward through the remainder of the Northeastern Region, defoliation was again severe in areas affected in 1973 and infestations generally expanded somewhat to the south. The only reduction of damage reported was on Cockburn and Great Duck islands (in Lake Huron near Manitoulin Island), on Indian Reserve 26 on Manitoulin Island and in Foy, Bowell and Lumsden townships in the Sudbury District. Modest expansion of infestations occurred, generally in a southward direction, in the Espanola, Blind River and Sault Ste. Marie districts. In the latter district, several pockets of heavy infestation, many of them new in 1974, occurred in MacDonald, Laird and Johnson townships on the North Channel and in the Goulais Bay, Haviland Bay and Wabos areas. High budworm populations were present in several areas within the city of Sault Ste. Marie. There was little change in the northwestern boundary of the infestation in the Wawa District and budworm populations were quite low in the White River and Terrace Bay districts.

Extremely high larval numbers prevailed in parts of the Northeastern and Northern regions, especially between Chapleau and Gogama and between Chapleau and Sault Ste. Marie. For example, an average count of 180 living budworm larvae per 45.7-cm (18-in.) branch tip was obtained from a foliage sample along Hwy 129 near Aubrey Falls about 60 miles (96.56 km) south of Chapleau. When budworm populations are quite high, the larvae are forced to feed on old foliage (backfeeding) or else starve to death after all the new shoots have been destroyed. Backfeeding accompanied by previous defoliation can hasten the death of trees.

gure 5. Spruce Budworm Damage in Northeastern Ontario, 1974

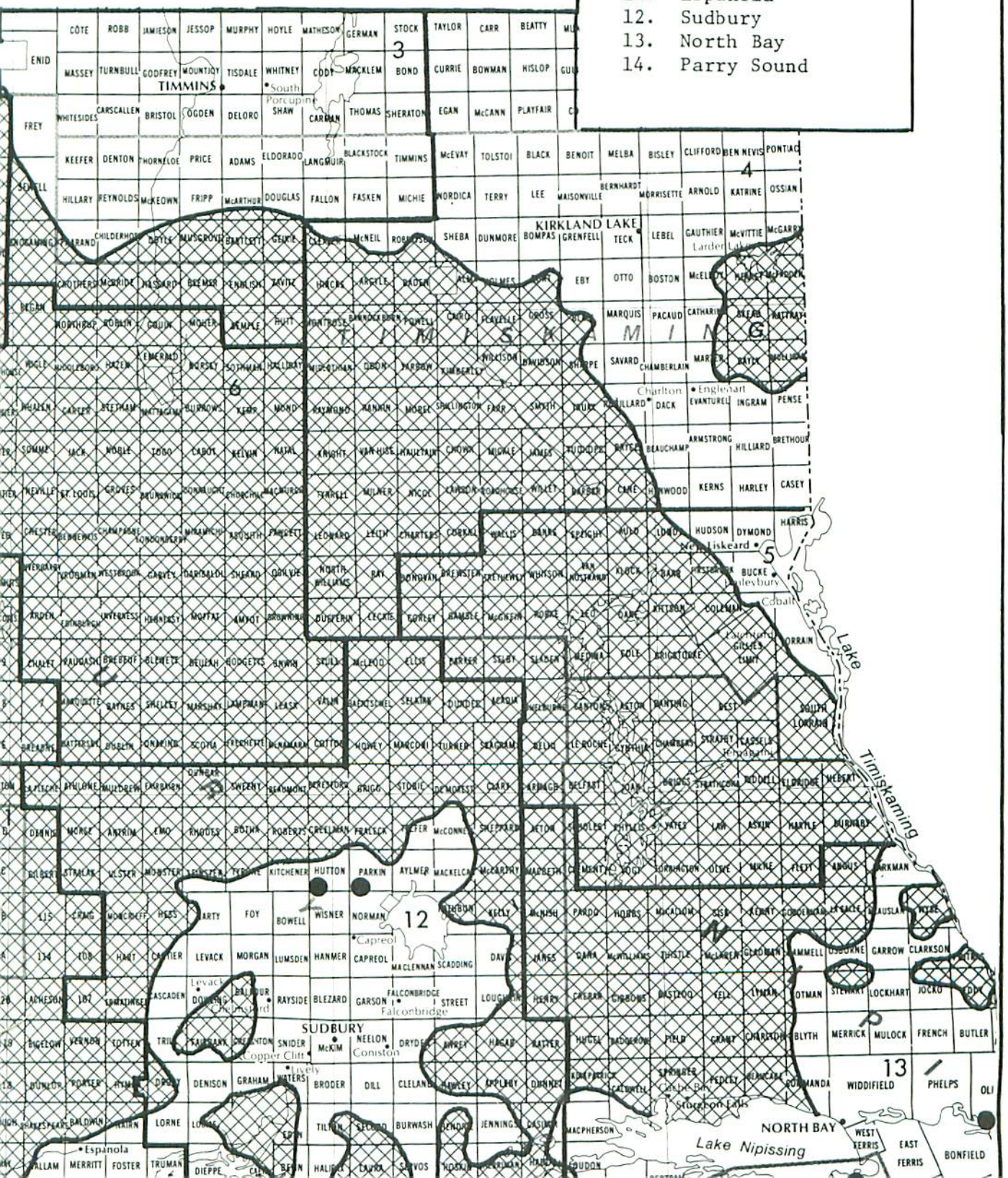
Legend

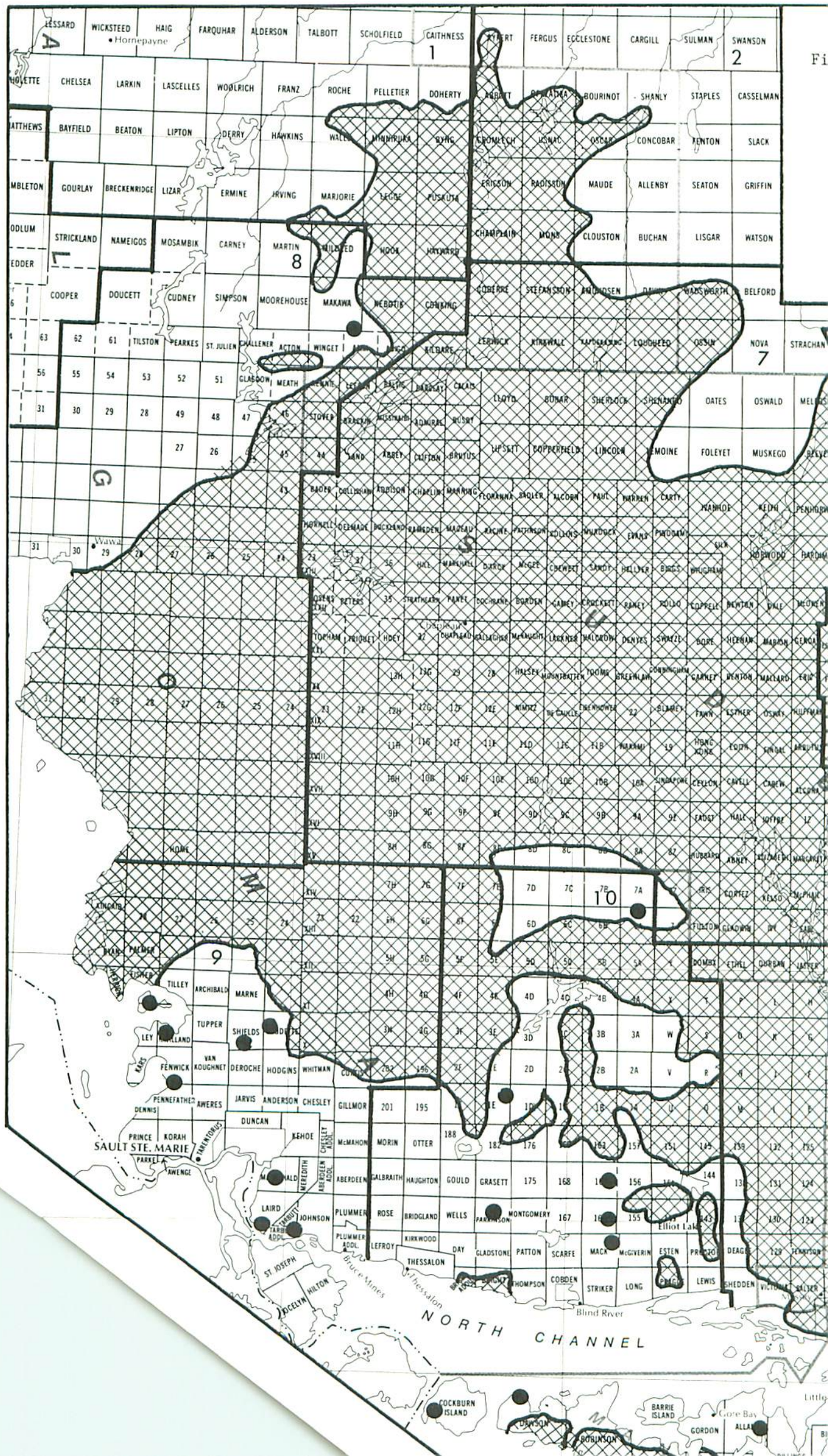
Areas within which moderate-to-severe defoliation occurred.

Small pockets of moderate-to-severe defoliation.

Districts

1. Hearst
2. Kapuskasing
3. Timmins
4. Kirkland Lake
5. Temagami
6. Gogama
7. Chapleau
8. Wawa
9. Sault Ste. Marie
10. Blind River
11. Espanola
12. Sudbury
13. North Bay
14. Parry Sound




LESSARD
WICKSTEED
Hornepayne
HAIG
FARQUHAR
ALDERSON
TALBOTT
SCHOLFIELD
CAITHNESS
1
FERGUS
ECCLESTONE
CARGILL
SULMAN
SWANSON
2
CHELSEA
LARKIN
LASCELLES
WOOLRICH
FRANZ
ROCHE
PELLETIER
DOHERTY
BOURINOT
SHANLY
STAPLES
CASSELMAN
BAYFIELD
BEATON
LIPTON
DERRY
HAWKINS
CONCOBAR
FENTON
SLACK
GOURLAY
BRECKENRIDGE
LIZAR
ERMINE
IRVING
MARJORIE
ERICSSON
RADISSON
MAUDE
ALLENBY
SEATON
GRIFFIN
STRICKLAND
NAMEIGOS
MOSAMBIK
CARNEY
MARTIN
8
HOOK
HAYWARD
CHAMPLAIN
MONS
CLOUSTON
BUCHAN
LISGAR
WATSON
COOPER
DOUCETT
CUDNEY
SIMPSON
MOOREHOUSE
MAKAWA
NEBOTIK
CONKING
BELFORD
TILSTON
PEARKES
ST. JULIEN
CHALLENER
ACTON
WINGET
KILBARE
LERWICK
KIREWALL
LOUDHEED
OSSIN
NOVA
7
STRACHAN
GLASGOW
MEATH
LLOYD
BONAR
SHERLOCK
OATES
OSWALD
STOVER
ADMIRAL
LAND
ABREY
CLIFTON
BRUTUS
LIPSETT
COPPERFIELD
LINCOLN
FOLEYET
MUSKEGO
BADER
COLLINGWOOD
ADDISON
CHARLTON
MANNING
FLORANNA
ENGLER
ALCORN
PAUL
WARREN
CARTY
MANHOE
KEITH
MORNELL
DELMAGE
BUCKLAND
RAMSDEN
MACEAU
RACHE
PATTERSON
COLLINS
MURDOCK
EVANS
PHODAH
ELK
HORWOOD
Wawa
HULL
MARCHMELL
BARCK
McGEE
CHEWETT
SANDY
HELLNER
BIGGS
WHIGHAM
OSBORNE
PETERS
STRATHCARN
PARKE
COCHRANE
BORDEN
GAMEY
CROCKETT
RANEY
FOLIO
COPPELL
NEWTON
DALE
TOPHAM
PRIDHET
HOEY
CHAPLEAU
GALLAGHER
McNAUGHT
LECKNER
HALCROW
DENYES
SWAZIE
BORE
HEEMAN
MARION
GENOA
HALSEY
MOUNTBATTEN
TROOG
GREENLAW
CUNNINGHAM
GARNET
BENTON
MACLARD
ERIE
WINTZ
McCUSKLE
ENGLEHART
BLAREY
FAWN
ESTHER
OSWEY
HUFFMAN
HONG KONG
EDDY
SINDAPORE
CEYLON
CAVELL
CABEN
ALCONA
FADET
HALL
IOFFRE
HOME
HUBBARD
ABREY
ELIZABETH
MARGARET
10
7A
CORTEZ
KELSO
EMPHALE
FULTON
GLADWIN
DOMBI
ETHEL
OSBORN
JASPER
KINGATE
PALMER
9
TILLEY
ARCHIBALD
MARNE
TUPPER
SHIELDS
LEY
FENWICK
VAN KOUGHNET
DEROCHE
HODGINS
WHITMAN
PENNEFATHER
AWERES
JARVIS
ANDERSON
CHESLEY
GILLMOR
201
195
DENNIS
DUNCAN
PRINCE
KORAH
SAULT STE. MARIE
PARKER
AWENGE
KEHOE
McMAHON
MORIN
OTTER
188
182
176
ABERDEEN
GALBRAITH
HAUGHTON
GOULD
GRASETT
175
168
156
144
LAIRD
JOHNSON
PLUMMER
ROSE
BRIDGLAND
WELLS
MONTGOMERY
167
155
143
Elliot Lake
PLUMMER ADDL.
LEFROY
KIRKWOOD
DAY
GLADSTONE
PATTON
SCARFE
MACK
McGIVERIN
ESTEN
DEAGE
129
ST. JOSEPH
THESSALON
Bruce Mines
Thessalon
HILTON
JOCELYN
THOMPSON
COBDEN
STRIKER
LONG
LEWIS
SHEDDEN
Blind River
NORTH CHANNEL
COCKBURN ISLAND
DAWSON
ROBINSON
BARRIE ISLAND
Gore Bay
GORDON
ALLAN

In northeastern Ontario in 1974, OMNR sprayed 8080 ha (20,200 acres) in Lake Superior Provincial Park, Wawa District and 680 ha (1700 acres) in the Shoals Provincial Park, Chapleau District to minimize the intensity of damage caused by budworm within selected areas that have recreational or aesthetic values. Please refer to Part B for further details.

Infestation Forecasts for 1975: Egg masses found in August, 1974 at 282 locations throughout northeastern Ontario were more than double those found in 1973 (Table 2, p. 22). Generally speaking, population levels have now reached record high levels across northeastern Ontario. The average egg-mass density for northeastern Ontario in 1973 was 329 egg masses per 9.29 sq. m (100 sq. ft); in 1974 the average density had increased to 842 egg masses per 9.29 sq. m. The ratio of the 1974 counts to those of 1973 is 2.6, which represents an increase of 260%. Increases occurred in every district with the exception of Kapuskasing where populations remained at approximately the same level as those of 1973. Significant population increases were recorded for the following districts: Temagami (increased by a factor of 5.3), Hearst (increased by 4.7), Kirkland Lake (increased by 3.8), and Chapleau, Espanola and Gogama (each increased by a factor of 3.0). Chapleau District had the highest average egg-mass density (1392 egg masses per 9.29 sq. m) of all the districts and was closely followed by Temagami and Gogama districts with an average of 1378 and 1372 egg masses per 9.29 sq. m, respectively. The highest single egg-mass count in northeastern Ontario was made on a balsam fir sample from Gallagher Township in the Chapleau District, 4274 egg masses per 9.29 sq. m.

Although no new outbreaks or major expansions were detected by the egg-mass survey, it is probable that moderate-to-severe defoliation of host trees will occur next year throughout an area well in excess of 8 million ha (20 million acres). This would include, of course, all of the area infested in 1974 with modestly extended boundaries (Fig. 6). Further spread is likely to occur in the southeastern portion of the outbreak as the eastern part of the North Bay District becomes infested. Indeed, the northeastern Ontario outbreak may become linked with the southeastern Ontario infestation along the Ottawa River in Papineau, Calvin and Mattawan townships.

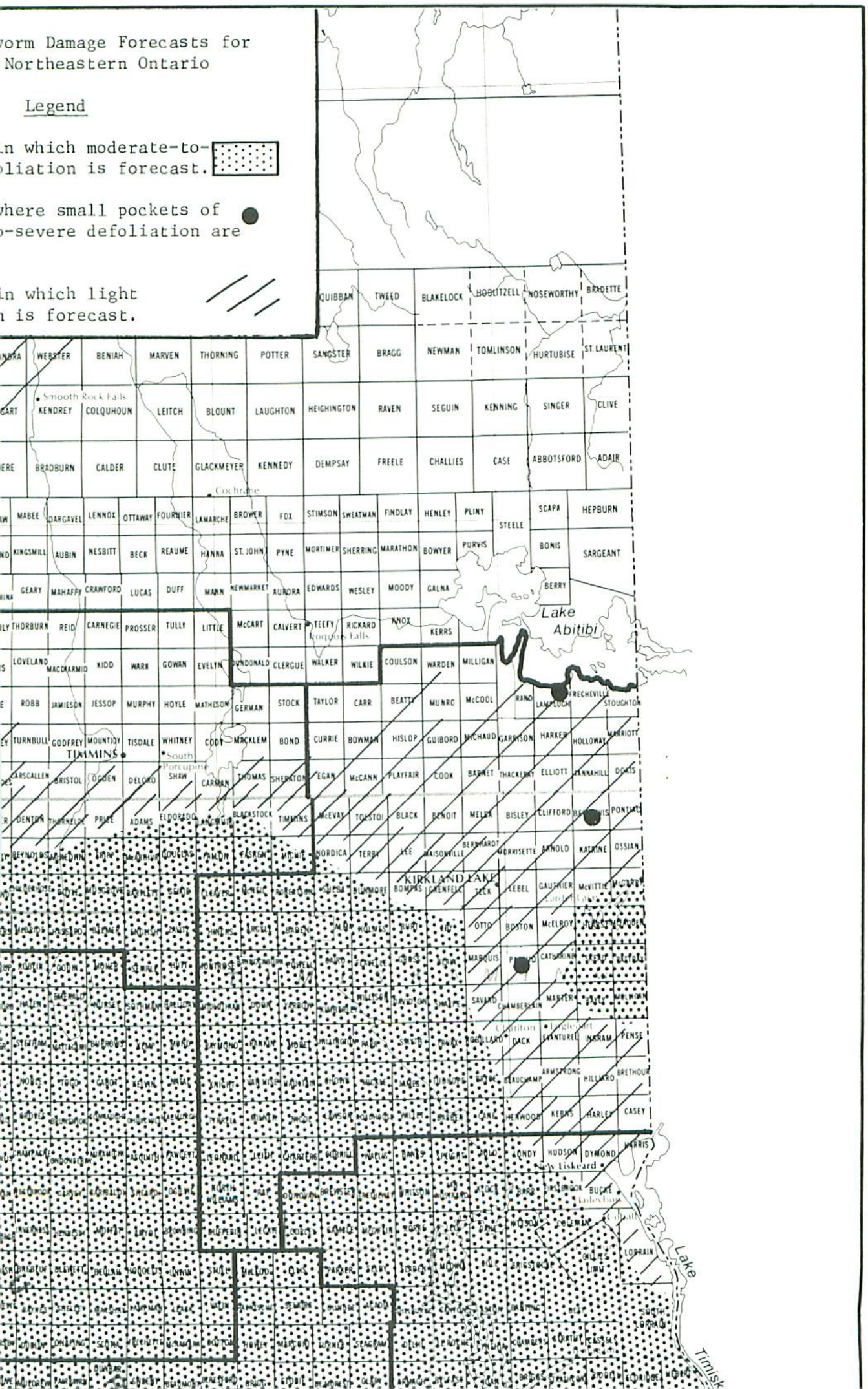
Tree Mortality: Many reports of extensive mortality of balsam fir and white spruce have been received from northeastern Ontario. Many of these reports are based on aerial observations of trees or stands that are grey in color. Whether or not these trees are technically dead is uncertain because, in most cases, ground checks have been impossible owing to inaccessibility. In any event, trees or stands that appear "grey" are undoubtedly in serious condition and if not already dead will probably die in the near future.

Figure 7 shows the location of areas of known or suspected tree mortality in northeastern Ontario in 1974. The 80,000 ha (200,000 acres) of balsam fir mortality found in 1972 in the vicinity of Onaping Lake northwest of Sudbury in the Sudbury and Gogama districts constitute the first significant tree mortality in northeastern Ontario. This area was surveyed in detail in 1973 and some ground checks were done to confirm the presence of mortality. By 1974, the area near Onaping within which mortality was present had expanded to more than 120,000 ha (300,000 acres). Large pockets of heavy mortality are present in Rhodes, Botha, Roberts, Dunbar, Sweeny, Beaumont, Onaping, Scotia and Shelley townships. Scattered mortality occurs throughout the remainder of the area. Light, scattered mortality is present in Fairbank Township in the Sudbury District and in Township C and Gilbert Township in the Espanola District. In the Chapleau District, pockets of dead trees--mainly balsam fir--have appeared over a large area to the north of Chapleau, extending from Chapleau and Gallagher townships in the south to Bonar Township in the north. Several other areas of mortality are reported for this general area: Lougheed and Stefansson townships in the north part of the Chapleau District, Conking Township in the Wawa District and Hook and Hayward townships in the Hearst District.

Scattered mortality is reported in most of the southern half of the Wawa District, including much of Lake Superior Provincial Park. Pockets of mortality exist along the Sand River in Lake Superior Provincial Park, particularly in Township 29, Range 18 and Township 29, Range 19. Very heavy damage due to high larval numbers and considerable backfeeding in 1973 and 1974 has occurred on balsam fir throughout an area east and north of Ranger Lake in Sault Ste. Marie and Blind River districts. Townships affected are 3F, 3G, 4F, 4G, 5F, 5G, 5H, 6F, 6G, 6H and 7H. There are probably relatively few dead trees at the present time but mortality is anticipated in 1975 because of the accumulated heavy damage.

Northwestern Ontario

Situation in 1974: In northwestern Ontario, the total area of defoliation mapped by aerial observers amounted to 4680 ha (11,700 acres) in 1974 compared to 4000 ha (10,000 acres) in 1973 (Fig. 8). A 4000-ha (10,000-acre) infestation was detected near Bennett Lake immediately west of Quetico Provincial Park in the eastern part of Fort Frances District. In the western part of the Atikokan District, an infestation covering slightly more than 400 ha (1000 acres) was found between Little Eva Lake and the Namakan River. Aerial surveys revealed several small pockets of defoliation totalling about 280 ha (700 acres) at Prairie Portage on Basswood Lake along the international border in Quetico Provincial Park (Atikokan District). This infestation was one that had persisted here for several years and


orm Damage Forecasts for
Northeastern Ontario
Legend
n which moderate-to-
liation is forecast.
here small pockets of
-severe defoliation are
n which light
is forecast.
Smooth Rock Falls
Cochrane
Lake Abitibi
TIMMINS
South Porcupine
KIRKLAND LAKE
Timiskaming
Lake

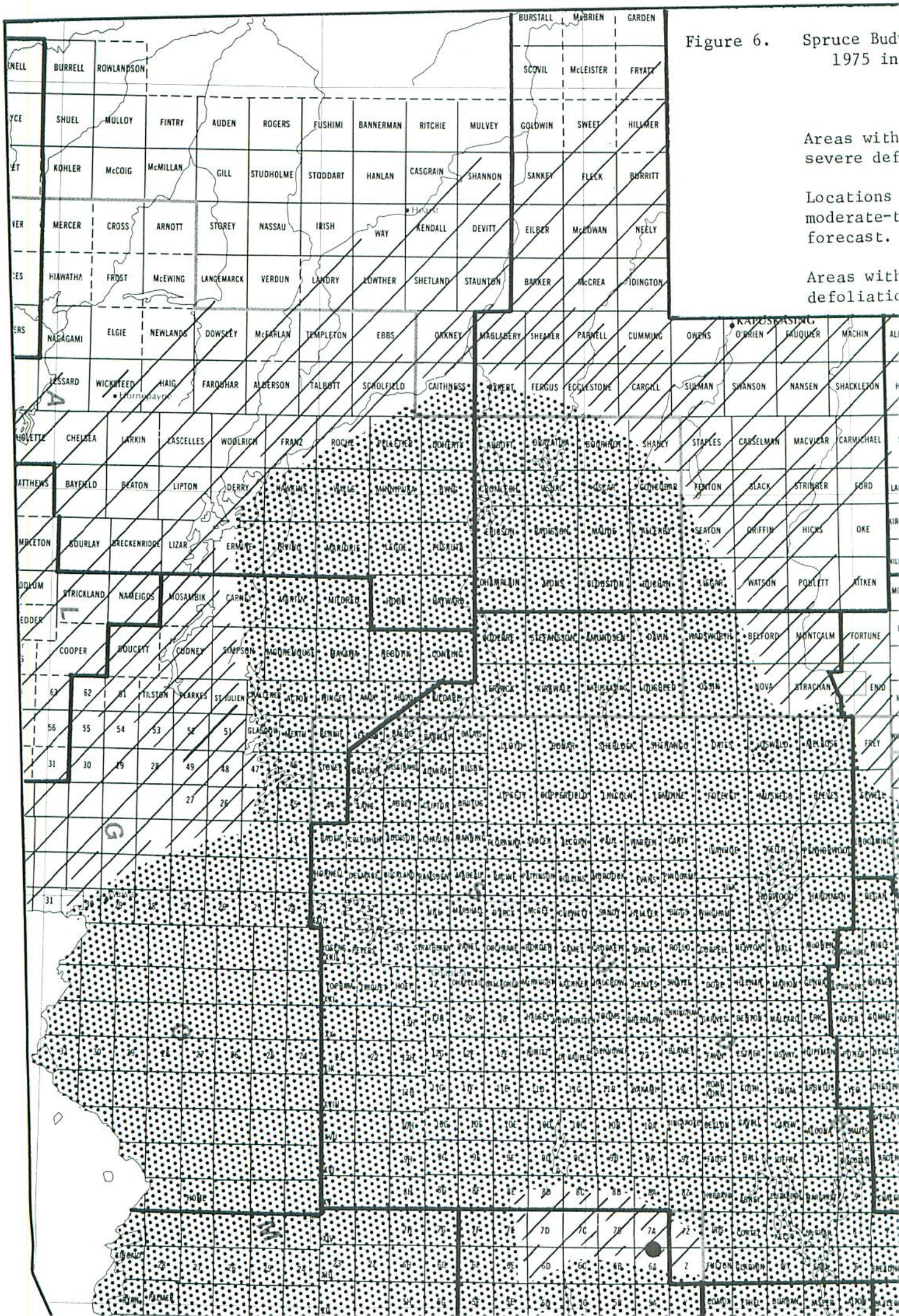


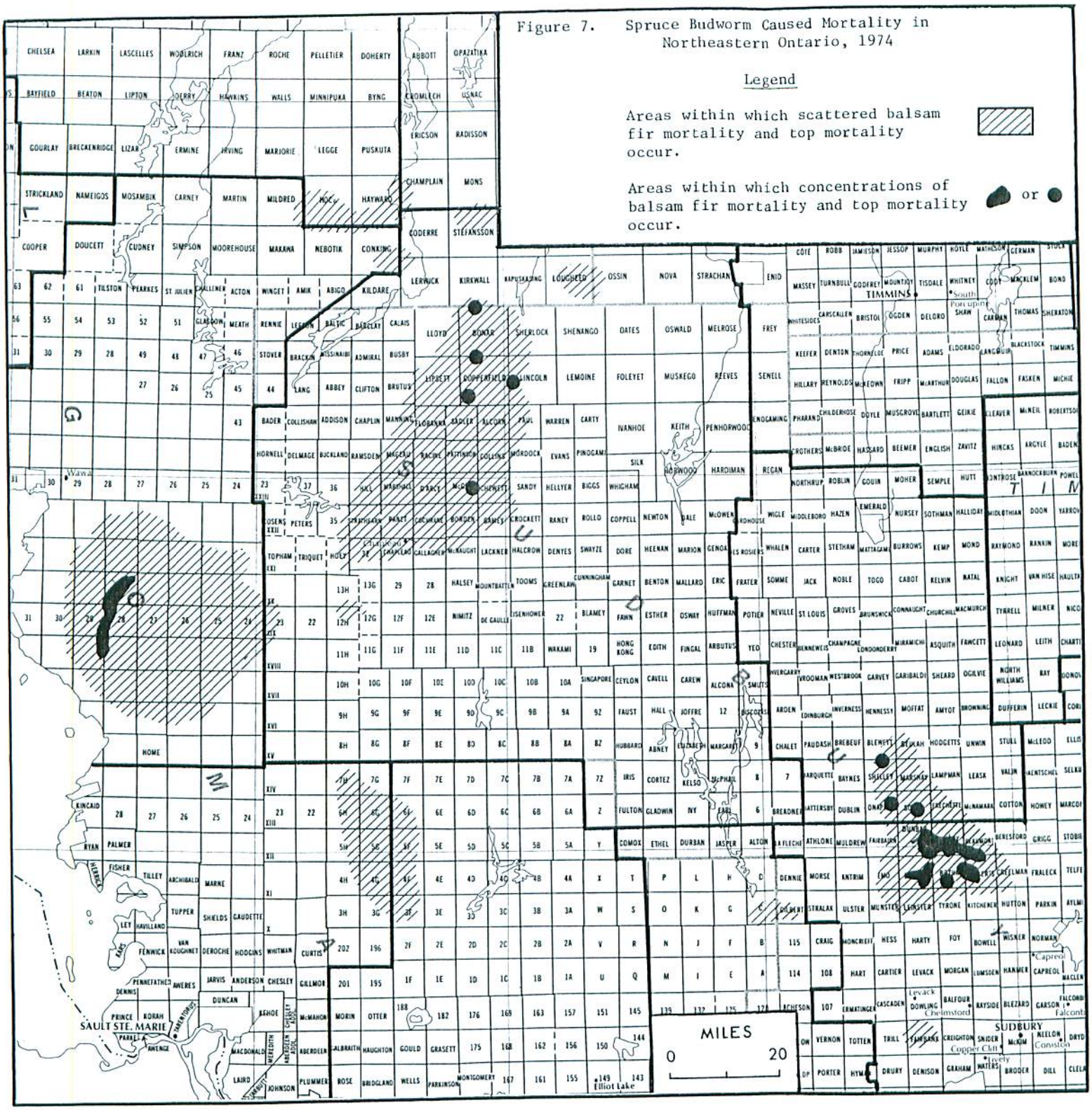
Figure 6. Spruce Bud
1975 in

Areas with
severe def

Locations
moderate-t
forecast.

Areas with
defoliatio

Figure 7. Spruce Budworm Caused Mortality in Northeastern Ontario, 1974



In northeastern Ontario in 1974, OMNR sprayed 8080 ha (20,200 acres) in Lake Superior Provincial Park, Wawa District and 680 ha (1700 acres) in the Shoals Provincial Park, Chapleau District to minimize the intensity of damage caused by budworm within selected areas that have recreational or aesthetic values. Please refer to Part B for further details.

Infestation Forecasts for 1975: Egg masses found in August, 1974 at 282 locations throughout northeastern Ontario were more than double those found in 1973 (Table 2, p. 22). Generally speaking, population levels have now reached record high levels across northeastern Ontario. The average egg-mass density for northeastern Ontario in 1973 was 329 egg masses per 9.29 sq. m (100 sq. ft); in 1974 the average density had increased to 842 egg masses per 9.29 sq. m. The ratio of the 1974 counts to those of 1973 is 2.6, which represents an increase of 260%. Increases occurred in every district with the exception of Kapuskasing where populations remained at approximately the same level as those of 1973. Significant population increases were recorded for the following districts: Temagami (increased by a factor of 5.3), Hearst (increased by 4.7), Kirkland Lake (increased by 3.8), and Chapleau, Espanola and Gogama (each increased by a factor of 3.0). Chapleau District had the highest average egg-mass density (1392 egg masses per 9.29 sq. m) of all the districts and was closely followed by Temagami and Gogama districts with an average of 1378 and 1372 egg masses per 9.29 sq. m, respectively. The highest single egg-mass count in northeastern Ontario was made on a balsam fir sample from Gallagher Township in the Chapleau District, 4274 egg masses per 9.29 sq. m.

Although no new outbreaks or major expansions were detected by the egg-mass survey, it is probable that moderate-to-severe defoliation of host trees will occur next year throughout an area well in excess of 8 million ha (20 million acres). This would include, of course, all of the area infested in 1974 with modestly extended boundaries (Fig. 6). Further spread is likely to occur in the southeastern portion of the outbreak as the eastern part of the North Bay District becomes infested. Indeed, the northeastern Ontario outbreak may become linked with the southeastern Ontario infestation along the Ottawa River in Papineau, Calvin and Mattawan townships.

Tree Mortality: Many reports of extensive mortality of balsam fir and white spruce have been received from northeastern Ontario. Many of these reports are based on aerial observations of trees or stands that are grey in color. Whether or not these trees are technically dead is uncertain because, in most cases, ground checks have been impossible owing to inaccessibility. In any event, trees or stands that appear "grey" are undoubtedly in serious condition and if not already dead will probably die in the near future.

Figure 7 shows the location of areas of known or suspected tree mortality in northeastern Ontario in 1974. The 80,000 ha (200,000 acres) of balsam fir mortality found in 1972 in the vicinity of Onaping Lake northwest of Sudbury in the Sudbury and Gogama districts constitute the first significant tree mortality in northeastern Ontario. This area was surveyed in detail in 1973 and some ground checks were done to confirm the presence of mortality. By 1974, the area near Onaping within which mortality was present had expanded to more than 120,000 ha (300,000 acres). Large pockets of heavy mortality are present in Rhodes, Botha, Roberts, Dunbar, Sweeny, Beaumont, Onaping, Scotia and Shelley townships. Scattered mortality occurs throughout the remainder of the area. Light, scattered mortality is present in Fairbank Township in the Sudbury District and in Township C and Gilbert Township in the Espanola District. In the Chapleau District, pockets of dead trees--mainly balsam fir--have appeared over a large area to the north of Chapleau, extending from Chapleau and Gallagher townships in the south to Bonar Township in the north. Several other areas of mortality are reported for this general area: Lougheed and Stefansson townships in the north part of the Chapleau District, Conking Township in the Wawa District and Hook and Hayward townships in the Hearst District.

Scattered mortality is reported in most of the southern half of the Wawa District, including much of Lake Superior Provincial Park. Pockets of mortality exist along the Sand River in Lake Superior Provincial Park, particularly in Township 29, Range 18 and Township 29, Range 19. Very heavy damage due to high larval numbers and considerable backfeeding in 1973 and 1974 has occurred on balsam fir throughout an area east and north of Ranger Lake in Sault Ste. Marie and Blind River districts. Townships affected are 3F, 3G, 4F, 4G, 5F, 5G, 5H, 6F, 6G, 6H and 7H. There are probably relatively few dead trees at the present time but mortality is anticipated in 1975 because of the accumulated heavy damage.

Northwestern Ontario

Situation in 1974: In northwestern Ontario, the total area of defoliation mapped by aerial observers amounted to 4680 ha (11,700 acres) in 1974 compared to 4000 ha (10,000 acres) in 1973 (Fig. 8). A 4000-ha (10,000-acre) infestation was detected near Bennett Lake immediately west of Quetico Provincial Park in the eastern part of Fort Frances District. In the western part of the Atikokan District, an infestation covering slightly more than 400 ha (1000 acres) was found between Little Eva Lake and the Namakan River. Aerial surveys revealed several small pockets of defoliation totalling about 280 ha (700 acres) at Prairie Portage on Basswood Lake along the international border in Quetico Provincial Park (Atikokan District). This infestation was one that had persisted here for several years and

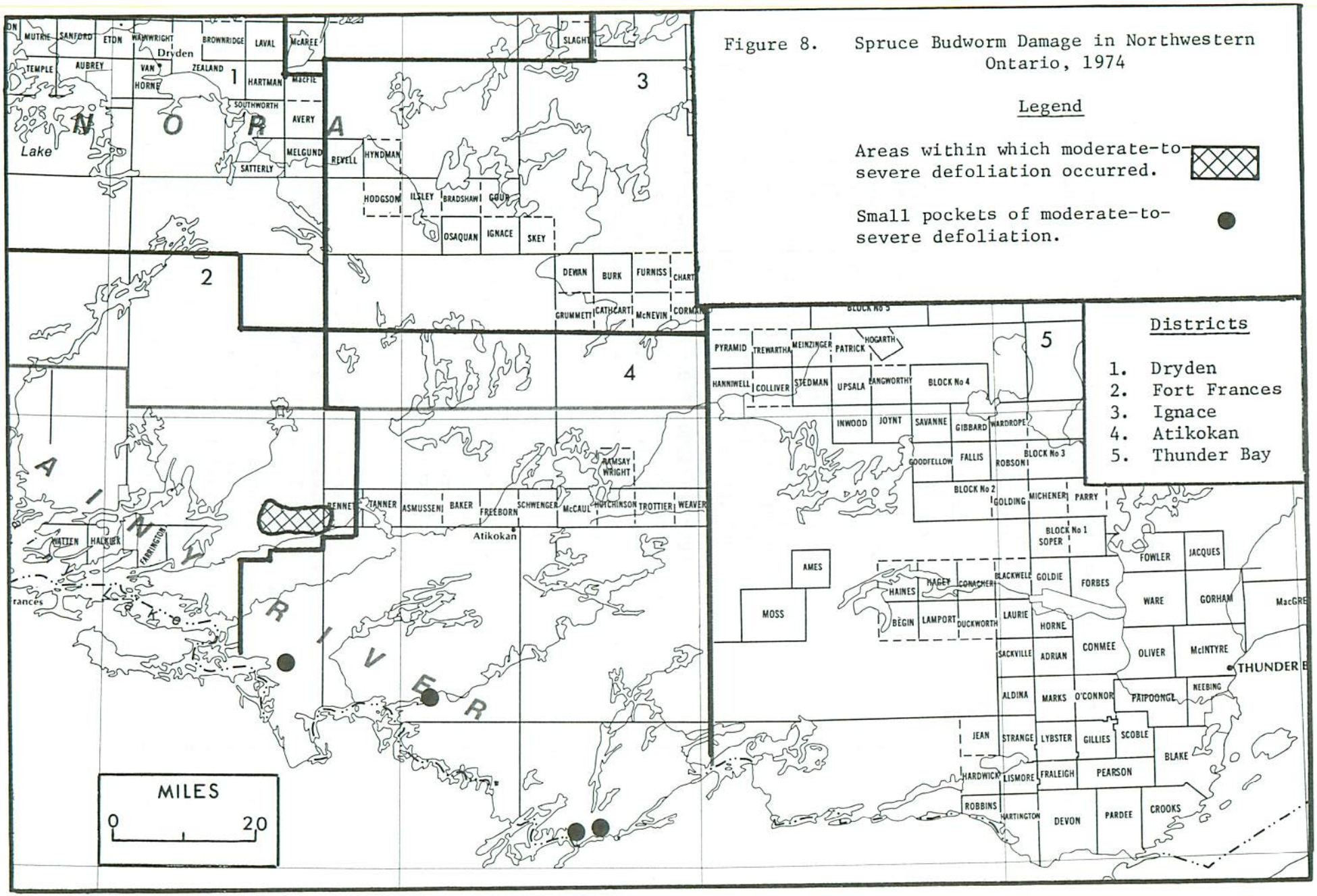


Figure 8. Spruce Budworm Damage in Northwestern Ontario, 1974

Legend

Areas within which moderate-to-severe defoliation occurred.

Small pockets of moderate-to-severe defoliation.

was sprayed in 1974 by OMNR. Elsewhere throughout northwestern Ontario larval populations were generally low. Formerly persistent infestations in the Thunder Bay District at Northern Light Lake and Granite Lake, where spraying was carried out in 1970, 1971, 1972 and 1973, did not recur in 1974 and it appears that they have been eliminated.

Aerial spraying operations carried out in northwestern Ontario in 1974 are described in Part B of this report.

Infestation Forecasts for 1975: An egg-mass survey in August, followed by additional sampling in early November, confirmed that the generally favorable situation in northwestern Ontario should continue for another year (Fig. 9, see also Table 3, p. 34). About 200 locations throughout northwestern Ontario were sampled in August. Another 30 locations, selected to concentrate on two areas of interest, Bennett Lake and Prairie Portage, were sampled in November after results from the earlier survey became available. The 4000-ha (10,000 acre) infestation found in 1974 at Bennett Lake was sampled using a helicopter to try to define the infested area more accurately. In the latter case (i.e., Bennett Lake), about 6000-8000 ha (15,000-20,000 acres), including the 4000 ha (10,000 acres) of defoliation mapped in 1974 and adjacent susceptible stands totalling another 2000-4000 ha (5000-10,000 acres), appeared to be infested. A moderate infestation of 800-1200 ha (2000-3000 acres) still persists, apparently, at Prairie Portage on Basswood Lake despite spraying in 1974. There may be a small pocket of moderate defoliation near Little Eva Lake even though the continuation of this infestation could not be confirmed by egg-mass count. The average egg-mass density for northwestern Ontario with the exception of Bennett Lake was 4.5 egg masses per 9.29 sq. m in 1974 compared with 3.8 in 1973. Slightly more than 70% of the 1974 foliage samples were free of egg masses compared with 74% in 1973. Therefore, the forecast for 1975 is that infestations are likely to occur only at Bennett Lake and Prairie Portage and populations should remain at extremely low levels elsewhere in northwestern Ontario (Fort Frances, Atikokan, Thunder Bay, Nipigon, Geraldton and Terrace Bay districts).

The authors of this report are concerned that the slight increase in average egg-mass density and the decrease in the proportion of negative egg-mass samples could be signs of a ground swell of budworm populations across the Thunder Bay and Atikokan districts. Such data may represent normal fluctuations of endemic levels of budworm populations over a broad area from year to year and variation of this magnitude may not be significant. However, the weather has generally favored budworm survival for the past two years (1973 and 1974) and large areas of susceptible spruce–fir forest exist in Thunder Bay and Atikokan districts. Only time will tell, but it seems likely that the potential has increased for a renewed outbreak in the near future.

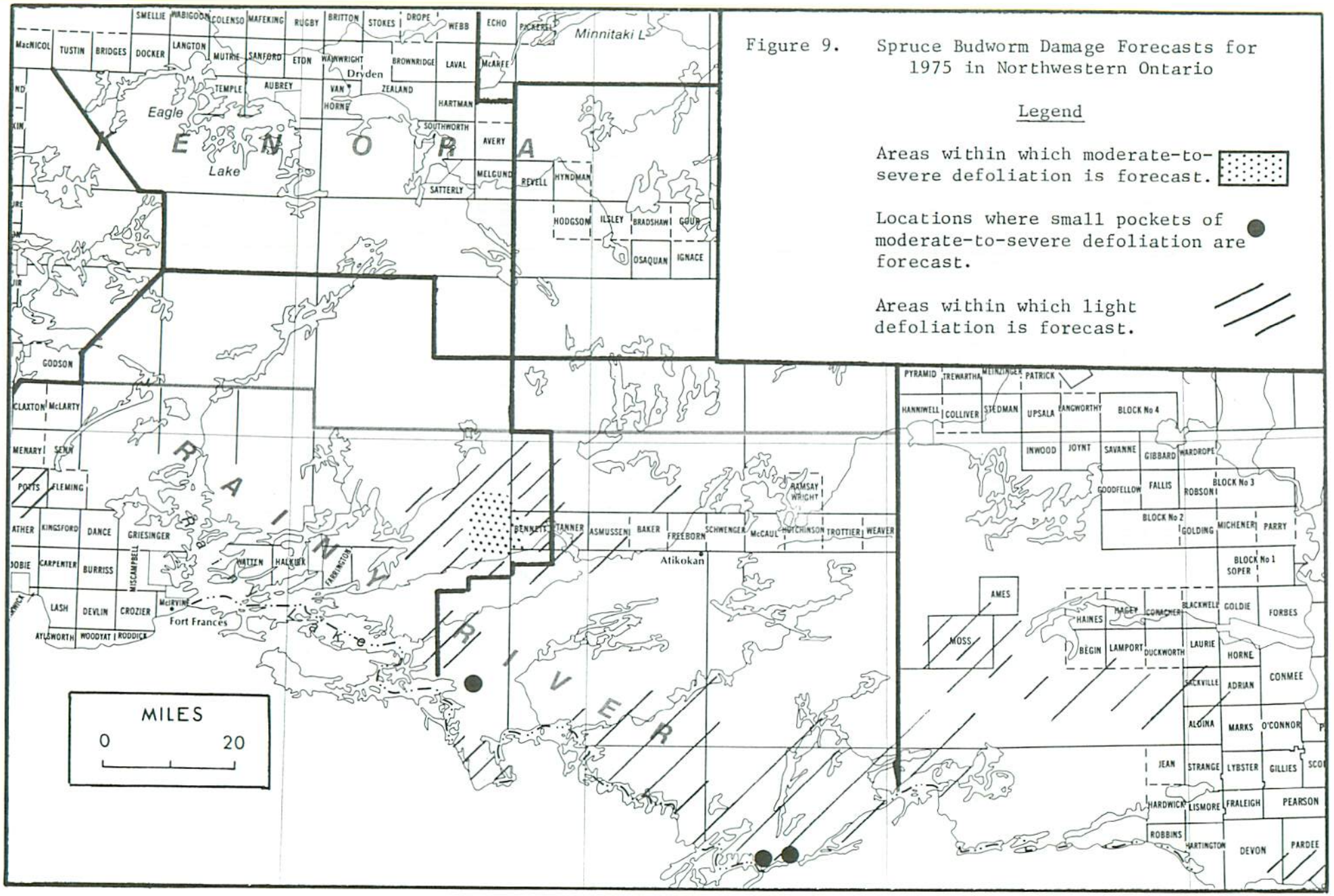


Figure 9. Spruce Budworm Damage Forecasts for 1975 in Northwestern Ontario

Tree Mortality: There are no [known] significant areas or volumes of tree mortality in northwestern Ontario caused by spruce budworm during the 1968-1974 period.

SUMMARY

In 1974, the outbreak in southeastern Ontario affected 2.2 million ha (5.5 million acres), whereas 2.4 million ha (6 million acres) were defoliated in 1973. With the exception of a population collapse in the Pembroke—Arnprior area, there were only slight changes in infestation boundaries. Egg-mass densities have declined on the average by about 35% and a reduction of 60% occurred in Algonquin Park. Despite these favorable trends, forecasts call for moderate-to-severe damage throughout 2.0-2.4 million ha (5.0-6.0 million acres) in 1975. Mortality of balsam fir and, to a lesser extent, white spruce trees has occurred in many stands in the Algonquin, Bancroft, Minden, and Pembroke districts. New locations of mortality will be discovered in 1975, while at the same time, the extent of known locations and the degree of mortality in these known locations will continue to increase.

In northeastern Ontario, 7.4 million ha (18.5 million acres) were defoliated in 1974 compared with 5.0 million ha (12.5 million acres) in 1973. Large parts of the area north and east of Chapleau that was generally free of defoliation in 1973 owing to a population collapse caused by unusual weather in 1972 were defoliated in 1974. Other major boundary changes occurred with extensions into the Hearst, Kapuskasing, Timmins and Kirkland Lake districts and areas unaffected in 1973 in Temagami and North Bay districts were infested in 1974. Egg-mass numbers, on the average, increased by a factor of 2.6 in 1974 over 1973. All areas defoliated in 1974 will be infested in 1975 with modestly extended boundaries. Further spread or new infestations are likely to occur in the southeastern portion of the outbreak in the North Bay District. Tree mortality is reported for extensive areas in Sudbury, Gogama, Chapleau, Wawa, Sault Ste. Marie and Blind River districts. It is anticipated that the tree mortality situation will continue to worsen in northeastern Ontario in 1975.

In northwestern Ontario, the total area of defoliation amounted to 4680 ha (11,700 acres) in 1974. A 4000-ha (10,000-acre) infestation was detected near Bennett Lake in Fort Frances District, 400 ha (1000 acres) near Little Eva Lake and about 280 ha (700 acres) within a sprayed area at Prairie Portage on Basswood Lake in the Atikokan District. On the basis of egg-mass counts, infestations totalling about 6800-9200 ha (17,000-23,000 acres) are forecast for Bennett Lake and Prairie Portage in 1975. Elsewhere in northwestern Ontario, populations are generally very low. Currently, tree mortality caused by spruce budworm is not a serious problem in northwestern Ontario.

Table 1. Southern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Algonquin Park District (26 locations)				
Airy Twp - East Gate[c]	wS	47	295	S
Biggar Twp - Sawbill Lake	bF	4	40	L-M
Bishop Twp - Lake La Muir	bF	28	27	L-M
Bruton Twp	bF	99	178	M-S
Canisbay Twp				
- Lake of Two Rivers[c]	wS	6	476	S
- Mew Lake[d]	bF	8	64	M
- Pog Lake[d]	bF	10	210	S
Clara Twp - Dieux Rivières	bF	88	606	S
Clyde Twp	bF	100	947	S
Deacon Twp - North River	bF	100	1153	S
Devine Twp - Tim River	bF	5	21	L-M
Dickens Twp	bF	100	570	S
Dickson Twp - Annie Bay	bF	99	780	S
Guthrie Twp - north of Basin Depot	wS	71	1017	S
Head Twp - Grant Creek	wS	98	606	S
Master Twp	bF	20	22	L-M
Peck Twp - Smoke Lake	bF	0	15	L-M
Preston Twp				
- Annie Bay Dam	bF	98	819	S
- Tattler Lake	bF	85	691	S
Sabine Twp - McCoy Lake	wS	38	360	S
Sproule Twp - Fisheries Res. Stn.[e]	bF	38	246	S
Stratton Twp				
- Achray (Plot C)	bF	23	226	S
- Lone Creek (new)	bF	10	1706	S
- Lone Creek	bF	89	445	S
White Twp - Otterpaw Creek	bF	99	632	S
Wilkes Twp - Wilkes Lake	bF	27	21	L-M

(cont'd.)

Table 1. Southern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Aylmer District (1 location)				
London Twp - City of London	wS	1	631	S
Bancroft District (5 locations)				
Ashby Twp	bF	100	69	M
Cardiff Twp	bF	3	0	0
Chandos Twp	bF	29	84	M-S
Faraday Twp	bF	29	19	L-M
Wicklow Twp	bF	100	693	S
Bracebridge District (8 locations)				
Brunel Twp - south of Huntsville	bF	8	29	L-M
Butt Twp	bF	3	20	L-M
Cardwell Twp	bF	8	16	L-M
Joly Twp - Paisley Lake	bF	2	4	L
Monck Twp - Bardsville	bF	5	0	0
Oakley Twp - Clear Lake	bF	6	14	L
Ridout Twp	bF	2	0	0
Sinclair Twp - Bella Lake	bF	11	8	L
Cambridge District (2 locations)				
Binbrook Twp	wS	2	88	M-S
Guelph Twp	wS	3	254	S

(cont'd.)

Table 1. Southern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Chatham District (2 locations)				
Sarnia Twp - City of Sarnia	wS	0	1280	S
- City of Sarnia	nS	0	919	S
Cornwall District (3 locations)				
Cambridge Twp - Larose Forest, Spruce Road	wS	34	223	S
Clarence Twp - Larose Forest	wS	73	1201	S
Kenyon Twp	wS	47	216	S
Huronia District (3 locations)				
Essa Twp	wS	8	827	S
Vespra Twp	wS	25	56	M
- Midhurst Nursery	nS	2	638	S
Lanark District (4 locations)				
Dalhousie Twp - north of Dalhousie Lake	bF	33	49	L-M
- east of Dalhousie Lake	bF	32	9	L
Darling Twp - Lot 10, Con. VII	bF	28	22	L-M
Lavant Twp - Robertson Lake	bF	33	72	M

(cont'd.)

Table 1. Southern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Lindsay District (2 locations)				
Cartwright Twp	wS	10	34	L-M
Smith Twp	bF	7	0	0
Maple District (3 locations)				
Albion Twp	wS	20	514	S
Uxbridge Twp	wS	59	750	S
Vaughan Twp	wS	24	288	S
Minden District (7 locations)				
Carden Twp	wS	4	22	L-M
Cavendish Twp - Pencil Lake	bF	86	66	M
Glamorgan Twp - Koshlong Lake	bF	8	0	0
Guilford Twp	bF	3	7	L
Harvey Twp - Nogies Creek	bF	99	83	M-S
Minden Twp	bF	8	11	L
Somerville Twp	bF	90	291	S
Ottawa District (6 locations)				
Fitzroy Twp - Lot 6, Con. IV	wS	27	959	S
Goulbourn Twp - Hwy 7	wS	48	336	S
Huntley Twp - Lot 16, Con. IV	wS	28	216	S
North Gower Twp	wS	23	348	S
Oxford Twp - Kemptville Nursery	wS	58	855	S

(cont'd.)

Table 1. Southern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Ottawa District (cont'd.) (6 locations)				
Torbolton Twp - Lot 20, Con. I	wS	48	686	S
Owen Sound District (2 locations)				
Glenelg Twp	wS	11	235	S
St. Edmunds Twp	wS	60	1202	S
Parry Sound District (9 locations)				
Blair Twp - Blair Camp	wS	1	83	M-S
- Lost Channel	bF	93	163	M-S
Christie Twp	bF	5	0	0
Croft Twp	bF	10	17	L-M
Lount Twp	wS	8	95	M-S
McConkey Twp	wS	74	235	S
McKenzie Twp	bF	1	0	0
McMurrich Twp - Doe Lake	bF	3	22	L-M
Mowat Twp - Pakesley	bF	4	9	L
Pembroke District (33 locations)				
Admaston Twp				
- Bonnechère River	wS	28	1076	S
- Mount St. Patrick	bF	26	518	S
Alice Twp	bF	41	242	S
Bromley Twp	wS	13	603	S
Brougham Twp	bF	16	66	M
Brougham Twp - M.N.R. Rd	wS	77	203	M-S
Brudenell Twp	bF	98	326	S

(cont'd.)

Table 1. Southern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Pembroke District (cont'd.) (33 locations)				
Grattan Twp	wS	28	480	S
Griffith Twp	wS	12	542	S
Matawatchan Twp	bF	65	418	S
McNab Twp	wS	57	635	S
Petawawa Twp				
- Antler Creek	wS	38	1090	S
Raglan Twp	wS	45	92	M-S
Richards Twp				
- Round Lake	bF	85	123	M-S
Rolph Twp	wS	88	2367	S
Ross Twp				
- District Boundary	wS	28	785	S
- Garage	wS	14	597	S
Sherwood Twp				
- west of Barry's Bay	wS	71	896	S
South Algona Twp - Ruby	bF	65	191	M-S
Stafford Twp - Mixburg	wS	13	1266	S
- Rankin (N.P.V. plot 5)	wS	5	1125	S
- Rankin (N.P.V. plot 5)	bF	13	698	S
Westmeath Twp				
- east of Westmeath	bF	35	340	S
- Quarry	wS	24	1585	S
Wilberforce Twp				
- northwest of Douglas	wS	45	262	S
- 1 mile north of Rankin	wS	63	1462	S
Petawawa Forest Exp. Stn.				
- Wylie & Buchanan twp				
(Baseline Check)	bF	53	141	M-S
(Bypass Rd - Check)	wS	24	864	S
(Deluthier Rd - plot G)	wS	11	201	S
(Orange Rd - Check)	wS	77	348	S
(Spray No. 3)[f]	wS	37	219	S
(Spray No. 4)[f]	wS	37	253	S
(Spray No. 6)[f]	bF	3	280	S

(cont'd.)

Table 1. Southern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (concl'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Simcoe District (1 location)				
South Walsingham Twp - St. Williams Nursery	wS	36	3108	S
Tweed District (5 locations)				
Clarendon Twp	wS	39	873	S
Denbigh Twp - Slate Falls Rd	bF	99	210	S
Kaladar Twp	bF	4	0	0
Marmora Twp	bF	17	6	L
Tudor Twp	wS	32	422	S
Wingham District (2 locations)				
Colborne Twp - Auburn	wS	21	1783	S
Downie Twp	wS	1	1620	S

[a] 1 square foot = 0.0929 square metres

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

[c] Aerially sprayed, Zectran, 1974

[d] Aerially sprayed, Zectran + ground spray, B.t., 1974

[e] Aerially sprayed, B.t., 1974

[f] Aerially sprayed by CCRI, 1974 (Various treatments of Orthene and B.t.).

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Blind River District (16 locations)				
Bright Twp	bF	60	260	S
Morin Twp	bF	27	50	M
Parkinson Twp	wS	27	1838	S
Spragge Twp	bF	65	370	S
Twp 1F	bF	58	286	S
Twp 2C - Duval Lake	bF	63	590	S
Twp 3E - Mashagama (N.P.V. Plot #6)	bF	98	940	S
Twp 3F - Mashagama (Check Plot)	bF	99	1475	S
Twp 3F - Mashagama (Check Plot #2)	bF	100	779	S
Twp 3F - Mashagama (B.t. Plot #5)	bF	99	1368	S
Twp 3F - Mashagama (N.P.V. Plot #7)	bF	99	1153	S
Twp 3F	bF	100	751	S
Twp 5C - Rocky Island L.	wS	94	489	S
Twp 6A	bF	71	849	S
Twp 150	bF	97	576	S
Twp 169	bF	43	534	S
Chapleau District (55 locations)				
Abney Twp - Spanish L.	bF	98	1811	S
Amundsen Twp	bF	0	152	M-S
Amundsen Twp	wS	6	138	M-S
Barclay Twp				
- Missinaibi Prov. Park	bF	76	1063	S
- Missinaibi Prov. Park	wS	68	2143	S
Borden Twp	bF	89	1322	S
Borden Twp	wS	95	3295	S

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Chapleau District (cont'd.) (55 locations)				
Brutus Twp	bF	99	2424	S
Carew Twp	bF	99	206	S
Chewett Twp	bF	91	758	S
Chewett Twp	wS	68	2461	S
Denyes Twp - Denyes Lake	bF	97	1243	S
Fawn Twp	bF	96	3925	S
Foleyet Twp	bF	8	508	S
Gallagher Twp	bF	97	4274	S
Genoa Twp	bF	96	1598	S
Halsey Twp - Nemegos Rd	bF	99	3219	S
Hardiman Twp	bF	96	1308	S
Hill Twp	bF	74	2347	S
Horwood Twp - Horwood L.	bF	99	575	S
Iris Twp - Mississagi L.	bF	77	386	S
Ivanhoe Twp - Ivanhoe Provincial Park	bF	76	815	S
- Ivanhoe Prov. Park	wS	68	2898	S
Ivy Twp - Miniwaski Lake	bF	99	1857	S
Kapuskasing Twp	bF	27	564	S
Keith Twp	bF	64	1568	S
Kirkwall Twp - Dunrankin Lake	bF	27	947	S
Leeson Twp	bF	97	1256	S
Lincoln Twp - Lincoln L.	bF	2	111	M-S
Lloyd Twp - Makonie L.	bF	8	718	S
Margaret Twp	bF	100	826	S
Melrose Twp	bF	57	600	S
Montcalm Twp - Elf Lake	bF	0	62	M
Ossin Twp - Ossin Lake	bF	2	217	S
Oswald Twp - Oswald Lake	bF	0	468	S
Penhorwood Twp	bF	98	2803	S
Peters Twp - Shoals Provincial Park[c]	bF	96	1017	S

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Chapleau District (cont'd.) (55 locations)				
Pinogami Twp	bF	73	2666	S
Pinogami Twp	wS	66	2070	S
Rollo Twp - Rollo Lake	bF	97	859	S
Sadler Twp - Robson Lake	bF	94	1386	S
Sandy Twp	bF	24	1486	S
Sandy Twp	wS	35	1560	S
Shenango Twp - Shenango L.	bF	7	378	S
Whigham Twp	bF	98	637	S
Twp 8F - Prairie Grass L.	bF	99	1467	S
Twp 9D	bF	95	3039	S
Twp 10F - Vezina Lake	bF	100	1050	S
Twp 11B - Wakami Provincial Park[c]	bF	99	2009	S
Twp 11D - Five Mile Provincial Park[c]	bF	98	2733	S
Twp 12G - Sample Lake	bF	99	1164	S
Twp 12H - Gale Lake	bF	99	1522	S
Twp 23, Rge 16 - Lineus L.	bF	100	385	S
Twp 23, Rge 17 - Power Line Rd	bF	100	480	S
Twp 32	bF	99	395	S
Cochrane District (3 locations)				
Adanac Twp - Mile 23	bF	0	4	L
Harmon Twp - Mile 82	bF	4	8	L
Sydere Twp - Mile 8	bF	3	13	L
Espanola District (37 locations)				
Baldwin Twp	bF	7	57	M
Bidwell Twp	bF	8	195	S
Burpee Twp	bF	23	214	S

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Espanola District (cont'd.) (37 locations)				
Campbell Twp	bF	5	647	S
Cockburn Island	bF	10	29	L-M
Comox Twp - Comox Lake	bF	99	924	S
Craig Twp - Bluewater L.	bF	93	400	S
Dawson Twp	bF	27	322	S
Gilbert Twp - Sinaminda Rd	bF	76	839	S
Gough Twp	bF	8	75	M
Manitoulin Island				
- Dawson and Robinson twp				
(Plot A, Check)	bF	56	650	S
(Plot A, Check)	wS	58	896	S
(Plot B, Check)	bF	22	601	S
(Plot B, Check)	wS	30	1530	S
(Plot C, Check)	bF	57	826	S
(Plot C, Check)	wS	58	1649	S
(Plot E, Check)	bF	92	1000	S
(Plot E, Check)	wS	91	1147	S
(Plot F, plantation)[d]	wS	20	302	S
(Plot G)[d]	bF	71	767	S
(Plot G)[d]	wS	64	418	S
(Plot H, Check plantation)	wS	24	390	S
(Plot I)[e]	bF	22	654	S
(Plot I)[e]	wS	36	675	S
(Plot N)[f]	bF	50	441	S
(Plot N)[f]	wS	38	1472	S
Salter Twp				
- N.P.V. Plot #3	bF	8	436	S
- N.P.V. Plot #3	wS	5	571	S
- South Check plot	bF	7	121	M-S
- South Check plot	wS	11	505	S
Tehkummah Twp	bF	9	802	S
Twp 119	bF	95	293	S
Twp 125	bF	13	444	S

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per[a] 100 sq. ft of foliage	Infestation forecasts for 1975[b]
Espanola District (cont'd.) (37 locations)				
Twp A - West Branch Rd	bF	77	888	S
Twp B	bF	87	898	S
Twp J - Russian Lake	bF	22	157	M-S
Twp M - Plaunt Rd	bF	98	2751	S
Gogama District (16 locations)				
Beulah Twp - Meteor Lake	bF	72	618	S
Edinborough Twp	bF	98	2336	S
Hazen Twp	bF	99	747	S
Inverness Twp - Donnegana Lake	bF	99	745	S
McMurchy Twp	bF	99	2177	S
Marquette Twp	bF	98	2224	S
Middleboro Twp	bF	99	2245	S
Miramichi Twp	bF	99	428	S
Ogilvie Twp	bF	95	1063	S
Pottier Twp - Schou Lake	bF	84	991	S
Scotia Twp	bF	80	393	S
Shelley Twp - Onaping Lake	bF	99	529	S
St. Louis Twp	bF	99	1304	S
Stull Twp	bF	99	3469	S
Togo Twp	bF	4	242	S
Vrooman Twp	bF	99	1306	S
Hearst District (8 locations)				
Caithness Twp - Big Pike Lake	bF	7	153	M-S
Derry Twp - Cameron Lake	bF	8	61	M
Farquhar Twp	bF	2	0	0

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Hearst District (8 locations)				
Gourlay Twp - Gourlay L.	bF	2	0	0
Minipuka Twp - Goat Lake	bF	11	599	S
Puskuta Twp	bF	11	89	M-S
Scholfield Twp	bF	0	0	0
Wicksteed Twp - 1.2 miles south of Hornpayne	bF	1	4	L
Kapuskasing District (17 locations)				
Bourinot Twp - Mile 33	bF	7	108	M-S
Buchan Twp - Mile 6	bF	6	16	L
Champlain Twp	bF	32	237	S
Clouston Twp	bF	2	0	0
Cromlech Twp - Brunswick L.	bF	20	152	M-S
Fauquier Twp - Remi Lake Provincial Park	bF	2	17	L-M
Fenton Twp - Mile 23 Chain of Lakes Road	bF	7	0	0
Fergus Twp	bF	6	32	L-M
Griffin Twp - Griffin L.	bF	6	7	L
Howells Twp - Mile 66 Kipling Dam Road	wS	6	12	L
Lisgar Twp - Chain of Lakes	bF	11	92	M-S
Mons Twp - Mons Lake	bF	2	7	L
Opasatika Twp - Opasatika Lake	bF	5	73	M
- Rufus Lake	bF	4	66	M
Seaton Twp	bF	8	391	S
Shanly Twp - Camp 15 Groundhog River	bF	9	142	M-S
Stringer Twp - Groundhog River	bF	6	16	L-M

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Kirkland Lake District (20 locations)				
Alma Twp	bF	80	540	S
Ben Nevis Twp	bF	0	101	M-S
Blain Twp	bF	90	1107	S
Corkill Twp	bF	100	1440	S
Dack Twp	bF	15	28	L-M
Eby Twp	bF	0	157	M-S
Hearst Twp	bF	55	901	S
James Twp	bF	90	2880	S
Katrine Twp	bF	0	54	L-M
Lamplugh Twp	bF	10	76	M
Marriott Twp	bF	2	20	L-M
Milner Twp	bF	90	1960	S
Montrose Twp	bF	50	630	S
Mulligan Twp	bF	70	520	S
Pacaud Twp	bF	0	102	M-S
Parker Twp	bF	0	226	S
Rattray Twp	bF	75	267	S
Truax Twp	bF	60	665	S
Tyrell Twp	bF	97	360	S
Yarrow Twp	bF	87	1707	S
North Bay District (15 locations)				
Calvin Twp	bF	2	103	M-S
Cameron Twp	bF	53	405	S
Clement Twp	bF	80	649	S
Commanda Twp	bF	15	86	M
Crerar Twp	bF	40	155	M-S
East Mills Twp	bF	2	86	M-S
Jocko Twp	bF	5	71	M
Mattawan Twp	bF	52	171	M-S
Notman Twp	bF	3	57	M

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
North Bay District (cont'd.)				
Osborne Twp	bF	2	63	M
Papineau Twp	bF	22	96	M-S
Patterson Twp - Restoule Provincial Park	bF	15	13	L
Phelps Twp	bF	5	57	M
South Himsworth Twp	bF	22	30	L-M
Thistle Twp	bF	83	488	S
Sault Ste. Marie District (15 locations)				
Aberdeen Additional Twp	bF	4	6	L
Fenwick Twp	bF	54	445	S
Fisher Twp	bF	5	126	M-S
Herrick Twp - Pancake Bay Provincial Park	bF	48	268	S
Haviland Twp	bF	79	608	S
Palmer Twp	bF	10	292	S
Shields Twp	bF	25	392	S
Tarbutt Additional Twp	bF	50	166	M-S
Whitman Twp	bF	28	292	S
Twp 3H - Mile 20	bF	99	1377	S
Twp 5H - Tujak Lake	bF	100	1336	S
Twp 7H	bF	94	924	S
Twp 23, Rge 13 - Hanes L.	bF	100	1593	S
Twp 25, Rge 14 - Wart L.	bF	99	1049	S
Twp 26, Rge 12	bF	48	169	M-S
Sudbury District (20 locations)				
Antrim Twp - Halfway Lake Provincial Park	bF	98	644	S
Beaumont Twp - Helen Lake	bF	55	725	S

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Sudbury District (20 locations)				
Botha Twp	bF	95	371	S
Creelman Twp	bF	7	53	M
Davis Twp	bF	29	583	S
Delamere Twp	wS	76	1348	S
DeMorest Twp	bF	21	100	M-S
Dunnett Twp	bF	31	16	L
Fairbank Twp	bF	60	532	S
Hawley Twp	bF	82	863	S
Hess Twp	bF	77	395	S
Howey Twp	bF	60	370	S
Hyman Twp	bF	55	104	M-S
Killarney Twp - Killarney Provincial Park	bF	1	28	L-M
Muldrew Twp	bF	95	575	S
Selkirk Twp - Solace Lake	bF	59	516	S
Tyrone Twp - Michaud Lake	bF	24	48	M
Waldie Twp	bF	75	961	S
Twp 107	bF	95	548	S
Indian Reserve #6 - LaVase Lake	wS	34	1464	S
Temagami District (16 locations)				
Askin Twp	bF	90	1667	S
Aston Twp	bF	30	1132	S
Banting Twp	bF	75	1282	S
Barr Twp	bF	95	1277	S
Belfast Twp	bF	65	600	S
Briggs Twp	bF	95	1063	S
Dane Twp	bF	75	1413	S
Flett Twp	bF	90	672	S
Gamble Twp	bF	99	2345	S
Gillies Limit Twp	bF	68	1058	S

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Temagami District (cont'd.) (16 locations)				
Olive Twp	bF	95	1215	S
Rorke Twp	bF	85	1543	S
Shelburne Twp	bF	90	3067	S
South Lorrain Twp	bF	75	1198	S
Strathy Twp	bF	95	1257	S
Torrington Twp	bF	90	1314	S
Timmins District (7 locations)				
Bartlett Twp - Texmont Rd	bF	80	968	S
English Twp - English L.	bF	81	588	S
Hassard Twp	bF	80	592	S
Langmuir Twp	bF	0	103	M-S
McKeown Twp	bF	15	606	S
Pharand Twp	bF	5	223	S
Sewell Twp - Lapierre Rd	bF	0	25	L-M
Wawa District (37 locations)				
Abigo Twp - Apisabigo L.	bF	95	588	S
Challener Twp	bF	2	49	M
Conking Twp	bF	48	396	S
Home Twp	bF	68	641	S
Simpson Twp - Oba Lake	bF	8	194	S
Twp 25, Rge 18 - Tikamaganda Lake	bF	99	1975	S
Twp 25, Rge 23	bF	99	593	S
Twp 26, Rge 25 - Manitowik Lake	bF	99	1644	S
Twp 27, Rge 13	bF	26	246	S
Twp 27, Rge 23	bF	79	2698	S
Twp 28, Rge 15 - Crescent Lake	bF	23	129	M-S

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Wawa District (cont'd.) (37 locations)				
Twp 28, Rge 18	bF	99	714	S
Twp 28, Rge 19 - Sand River #3[c]	bF	99	363	S
Twp 28, Rge 20 - Sand River #4[c]	bF	99	450	S
Twp 28, Rge 24 - Hawk Junction	bF	98	2042	S
Twp 29, Rge 16 - Agawa Bay	bF	20	212	S
Twp 29, Rge 16 - Pictographs	bF	64	372	S
Twp 29, Rge 17 - Mouth of Sand River	bF	73	607	S
Twp 29, Rge 17 - Sand River #1[c]	bF	99	229	S
Twp 29, Rge 19 - Sand River #2[c]	bF	97	101	M-S
Twp 29, Rge 20 - Mijin Rd. at Mijin Lake[c]	bF	60	220	S
Twp 30, Rge 17 - Mouth of Coldwater River	bF	70	580	S
Twp 30, Rge 18 - Camp 101	bF	30	96	M-S
Twp 30, Rge 19 - Baldhead River (spray Plot, 1972)[c]	bF	10	576	S
Twp 30, Rge 20 - Red Rock Ranger Stn. (Zectran, 1973)[c]	bF	5	137	M-S
Twp 30, Rge 20 - Mijin Rd 2 miles east of Hwy 17 (Check, 1973)[c]	bF	95	265	S
Twp 30, Rge 20 - - Red Rock River[g]	bF	38	775	S

(cont'd.)

Table 2. Northeastern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (concl'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg-masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Wawa District (cont'd.) (37 locations)				
Twp 30, Rge 20 - Red Rock River[g]	wS	55	1171	S
Twp 30, Rge 20 - Check plot #1, 1974	bF	83	615	S
Twp 30, Rge 20 - Red Rock River, Check plot #1, 1974	wS	60	897	S
Twp 30, Rge 21 - Rabbit Blanket Lake (Campground)[c]	bF	21	176	M-S
Twp 30, Rge 24 - Black Trout Lake	bF	27	369	S
Twp 30, Rge 26	bF	2	25	L-M
Twp 43 - Ogasiwi River	bF	98	993	S
Twp 46 - Renabie Road	bF	99	1245	S
Twp 31, Rge 21 - Old Woman Bay (Campground)[c]	bF	9	326	S
Twp 31, Rge 22 - Lake Superior Provincial Park, north boundary	bF	15	303	S

[a] 1 square foot = 0.0929 square metre

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

[c] Aerially sprayed, Zectran, 1974

[d] Aerially sprayed, N.P.V., 1974

[e] Aerially sprayed, B.t., 1974

[f] Aerially sprayed, insect growth regulator, 1974

[g] Aerially sprayed, Zectran - N.P.V. (Mixed), 1974

Table 3. Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975

Location	Host	Estimated per cent of defoliation 1974	No. of egg masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Atikokan District (93 locations)				
Agnes Lake	bF	0	15	L
Airport Road	bF	0	0	0
Allan Lake - east side	bF	3	0	0
- west side	bF	0	23	L-M
Argo Lake - west side	bF	0	7	L
Basswood Lake - Bayley Bay	bF	8	34	L-M
- Canadian Point	bF	1	0	0
- North Bay	bF	2	0	0
- Prairie Portage[c]	bF	5	43	L-M
- Ranger Bay	bF	2	12	L
Beaverhouse Lake	bF	0	7	L
Bentpine Lake	bF	2	0	0
Bold Creek	bF	0	0	0
Brent Lake - north central	bF	2	7	L
Buckingham Lake	bF	1	0	0
Cache Bay	bF	0	14	L
Cache Lake	bF	1	0	0
Cairn Lake	bF	0	5	L
Camel Lake	bF	0	0	0
Captain Tom Lake	bF	0	0	0
Carp Lake	bF	5	60	M
Conmee Lake - northeast side	bF	2	0	0
Crooked Lake - east end	bF	1	15	L-M
- Gardiner Bay	bF	6	0	0
- northeast of Sunday Bay	bF	4	14	L
Darky Lake	bF	0	21	L-M
David Lake	bF	0	0	0
Delahey Lake	bF	2	0	0
Duff Lake	bF	0	0	0
Emerald Lake	bF	0	0	0
Eye Lake	bF	0	4	L

(cont'd.)

Table 3. Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Atikokan District (cont'd.) (93 locations)				
Factor Lake	bF	3	0	0
Ferguson Lake	bF	0	0	0
Fred Lake	bF	0	0	0
French Lake	bF	0	0	0
French Lake	wS	0	0	0
Gehl Lake	bF	3	0	0
Greer Lake	bF	1	6	L
Hydro line - Hwy 11	bF	1	0	0
Kawa Bay - #115	bF	0	0	0
- #116	bF	0	0	0
- #117	bF	0	0	0
Lac La Croix - Campbell's	bF	2	0	0
- I.R. 25 D central	bF	0	0	0
- I.R. 25 D east end[c]	bF	5	0	0
Martin Bay - central	bF	5	0	0
- west	bF	8	8	L
Lilac Lake	bF	4	31	L-M
Little Eva Lake	bF	0	0	0
Loon Lake	bF	0	6	L
Louisa Lake - north end	bF	0	6	L
- south end	bF	0	0	0
MacKenzie Lake - southwest end	bF	0	0	0
- tower	bF	5	0	0
Mahon Lake	bF	0	0	0
Maligne River - west of Tanner Lake[c]	bF	2	0	0
McAree Lake - lookout	bF	2	21	L-M
- portage	bF	1	0	0
McCaulay Lake Road	bF	3	11	L
McEwan Lake	bF	0	5	L
McIntyre Lake	bF	13	9	L
Melema Lake	bF	0	0	0
Mercutio Lake	bF	0	0	0

(cont'd.)

Table 3. Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Atikokan District (cont'd.) (93 locations)				
Minn Lake	bF	0	0	0
Northland Gateway	bF	0	0	0
Nydia Lake	bF	1	0	0
Olifaunt Lake	bF	1	0	0
Oriana Lake	bF	2	0	0
Orion Lake	bF	0	14	L
Partridge Crop Lake (south of)	bF	0	0	0
Pipestone Creek	bF	2	6	L
Poacher Lake	bF	0	0	0
Poohbah Lake - central	bF	0	0	0
- east end	bF	0	0	0
- west end[c]	bF	2	0	0
Price Lake	bF	3	11	L
Quetico Lake	bF	0	0	0
Robinson Lake	bF	1	0	0
Shade Lake	bF	0	13	L
Snow Lake	bF	0	6	L
Sturgeon Lake				
- northeast end	bF	0	9	L
- southwest side	bF	1	0	0
- west end	bF	1	0	0
Sunday Lake	bF	0	27	L-M
That Man Lake	bF	0	9	L
Thompson Lake	bF	0	0	0
Tuck Lake	bF	0	0	0
Whalen Lake	bF	0	0	0
Wicksteed Lake	bF	2	25	L-M
Wild Potato Lake (south of)	bF	0	0	0
William Lake - east end	bF	5	26	L-M
- west end	bF	1	0	0
Wolseley Lake				
- north central	bF	3	0	0

(cont'd.)

Table 3. Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Fort Frances District (40 locations)				
Bear Pass	bF	2	30	L-M
Bennett Creek				
- east of Glenorchy	bF	62	326	S
Bennett Lake - west end	bF	98	277	S
Beynon Lake	bF	0	0	0
Manion Lake Road				
- at Hwy 11	bF	2	0	0
- Hillyer Creek	bF	8	82	M
- Little Turtle River	bF	7	9	L
- Manion Creek	bF	0	5	L
- Mile 6.5	bF	0	19	L
- Mile 9	bF	1	109	M-S
- Mile 11	bF	2	49	M
- Mile 13	bF	0	0	0
Crilly River	bF	4	34	L-M
Duff Creek	bF	0	7	L
Eltrut Lake - (2 miles southeast of)	bF	0	6	L
Hepburn Lake	bF	0	0	0
Hwy 11 - Farrington Twp	bF	1	0	0
- south of Olive	bF	0	0	0
- south of Turtle	bF	0	0	0
- Seine River	bF	2	0	0
- Mine Centre	bF	4	10	L
Hillyer Creek - #10	bF	2	29	L-M
Law Lake (2 miles east of)	bF	0	0	0
- (2 miles north of)	bF	0	0	0
Little Turtle River - #7	bF	0	7	L
Little Turtle River - #9	bF	51	225	S
- #11	bF	54	666	S
- #12	bF	2	166	M-S
- #15 (1 mile north of)	bF	0	23	L-M
Mather Twp	bF	2	0	0

(cont'd.)

Table 3. Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Fort Frances District (cont'd.) (40 locations)				
McPherson Twp	bF	3	0	0
Melin Lake	bF	0	0	0
Moosetrack Lake - west side	bF	0	53	M
Pipestone River	bF	0	21	L-M
Potts Twp	bF	0	18	L-M
Shoal Lake	bF	0	0	0
Sturgeon Falls Indian Reserve - west side	bF	1	0	0
Tessup Creek	bF	0	0	0
Tessup Lake - (2 miles south of)	bF	0	9	L
Turtle River - #16 (2.5 miles southeast of)	bF	0	5	L
Geraldton District (6 locations)				
Caramat (4 miles south of)	bF	6	0	0
Caramat Road - Mile 15	bF	5	0	0
Catlonite Road - Mile 72.3	bF	6	0	0
Croll Twp.	bF	3	0	0
Pagwa River Road - Mile 2.6	wS	4	0	0
Wintering Lake area	bF	3	0	0
Nipigon District (9 locations)				
Black Sturgeon Lake	bF	1	0	0
Jackpine River area - Mile 9	bF	0	0	0
Ledger Twp - gas line	bF	5	0	0
Legault Twp	bF	0	0	0

(cont'd.)

Table 3. Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Nipigon District (cont'd.) (9 locations)				
Macdiarmid	bF	2	9	L
Parks Lake	bF	13	0	0
Poshkokogan River	bF	1	0	0
Purdom Twp - Cameron Falls	wS	1	0	0
Summers Twp	bF	3	0	0
Terrace Bay District (9 locations)				
Amwri Station	bF	2	0	0
Catlonite Lake	bF	12	0	0
Gertrude Twp	bF	1	0	0
Junction of Industrial and Camp 5 Road	bF	2	6	L
Manitouwadge Road - Mile 1.5	bF	6	20	L-M
Marathon - .5 mile north of Hwy 17	bF	2	0	0
Stevens - monitoring plot	bF	5	0	0
Twp 82 - Jackfish Lake	bF	6	5	L
Twp 85 - Rainbow Falls Provincial Park	bF	2	8	L
Thunder Bay District (72 locations)				
Aldina Twp	bF	1	8	L
Arrow Lake	bF	0	0	0
Athelstane Lake	bF	0	7	L
Batwing Lake	bF	0	5	L
Batwing and Marks Lake Rd	bF	1	0	0
Bedivere Lake	bF	0	0	0
Bemar Lake	bF	0	9	L

(cont'd.)

Table 3. Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Thunder Bay District (cont'd.) (72 locations)				
Blackwell Twp	bF	0	0	0
Burchell Lake	bF	0	0	0
Clovenhoof Lake	bF	1	6	L
Crayfish Lake	bF	0	0	0
Cushing Lake	bF	0	0	0
Devil's Elbow	bF	5	10	L
Drift Lake	bF	0	0	0
Fountain Lake	bF	0	14	L
Granite Lake	bF	5	0	0
Granite River (south of)	bF	2	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	4	0	0
- west end	bF	16	21	L-M
- central	bF	1	0	0
Hagey Twp - Hwy 586	bF	0	0	0
Haines Twp - Postans	bF	0	0	0
Heaven Lake Road	bF	1	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	1	0	0
Kashabowie Lake	bF	2	0	0
Kekekuab Lake	bF	0	0	0
Lac des Mille Lacs				
- Baril Bay	bF	0	8	L
- Bolton Bay	bF	0	0	0
- Pine Point	bF	0	0	0
- Poplar Point	bF	1	0	0
- Portage Bay	bF	0	0	0

(cont'd.)

Table 3. Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (cont'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg masses per[a] 100 sq. ft of foliage	Infestation forecasts for 1975[b]
Thunder Bay District (cont'd.) (72 locations)				
Marks Lake	bF	0	0	0
McGinnis Lake	bF	2	17	L-M
McMaster Twp	bF	0	0	0
Melvin Lake	bF	1	0	0
Moss Lake	bF	0	8	L
Mountain Lake - Point	bF	3	0	0
Mountain Lake	wS	6	0	0
Nelson Lake	bF	0	0	0
Northern Light Lake				
- Curran Bay	bF	0	0	0
- Gravel pit	bF	7	5	L
- Savage Bay	bF	1	0	0
- South Island	bF	1	0	0
- Trafalgar Bay	bF	1	0	0
- Trout Bay	bF	0	0	0
- Trout Bay Road (pupal sample point)	bF	12	0	0
Pearson Twp	bF	2	0	0
Pigeon River	bF	0	12	L
Plummes Lake	bF	0	0	0
Powell Lake	bF	0	0	0
Prelate Lake	bF	1	0	0
Ross Lake	bF	0	0	0
Sandstone Lake	bF	1	0	0
Shebandowan Lake - Upper	bF	1	0	0
Sibley Peninsula				
- Joe Lake	bF	0	0	0
- M.T.C. Depot	bF	1	0	0
Sleigh Lake	bF	1	0	0
South Fowl Lake	bF	5	0	0
Squeers Lake	bF	0	0	0
Sunbow Lake	bF	0	0	0
Swallow Lake	bF	0	5	L

(cont'd.)

Table 3. Northwestern Ontario - Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1974, and infestation forecasts for 1975 (concl'd.)

Location	Host	Estimated per cent of defoliation 1974	No. of egg masses per 100 sq. ft[a] of foliage	Infestation forecasts for 1975[b]
Thunder Bay District (cont'd.) (72 locations)				
Tilley Lake	bF	0	0	0
Titmarsh Lake	bF	1	0	0
Upsala - Inwood Park	bF	0	0	0
- Inwood Park	wS	0	0	0
Whitefish Lake	bF	0	0	0
White River District (3 locations)				
Twp 32, Rge 27 - Obatanga	bF	5	5	L
Twp 66	bF	5	0	0
Twp 70 - Access Road	bF	5	0	0

[a] 1 square foot = 0.0929 square metres

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

[c] Aerially sprayed with Zectran, 1974

PART B: AERIAL SPRAYING OPERATIONS

INTRODUCTION

Approximately 19,200 ha (48,000 acres) of spruce budworm infested forest were sprayed by the Ontario Ministry of Natural Resources (OMNR) in Ontario in 1974. The location of the operations is shown in Figure 1 (see p. 2). Staff of the Great Lakes Forest Research Centre (GLFRC) cooperated with OMNR by obtaining the biological information required for the planning, execution, timing and assessment of these operations. In addition, GLFRC staff conducted province-wide surveys for spruce budworm defoliation and egg-mass counts to determine the overall current situation and to provide forecasts for 1975.

Insecticides used were Zectran FS 15 and *Bacillus thuringiensis* (Thuricide 16 B). Aerial spraying was done by General Airspray Ltd., St. Thomas, Ontario using one Agcat and two Stearman spray planes equipped with Micronair AU 3000 dispersal units. Zectran was applied at a rate of 34 g in 0.57 liters of spray mixture per 0.4 ha (1.2 oz in 0.15 U.S. gal per acre). The spray mixture consisted of 1 part Zectran:2 parts Arotex.

The following description of the operations and results is taken from a report by Howse, Sippell and Turner (1974).

Southern Ontario

1974 Operations: A total of 744 ha (1860 acres) were sprayed in Algonquin Provincial Park in 1974. The purpose of spraying was to protect foliage on host trees in high-value areas along Hwy 60. Many major camping or recreational areas such as those located at Mew Lake, Lake of Two Rivers, Killarney Lodge, Pog Lake, Whitefish Lake and Opeongo Lake were sprayed.

Zectran and *B. thuringiensis* were applied by Stearman aircraft. *Bacillus thuringiensis* was also sprayed from the ground using a John Bean Roto-Mist blower. Following are the treatments and areas over which they were applied.

1. Zectran - 1 application of 34 g (1.2 oz) over 540 ha (1350 acres)

2. Zectran - 1 application of 34 g (1.2 oz) + 1 mistblower application of *B. thuringiensis* over 8 ha (20 acres)

3. Zectran - 2 applications of 34 g (1.2 oz) each over 80 ha (200 acres)

4. Zectran - 2 applications of 34 g (1.2 oz) each + 1 mistblower application of *B. thuringiensis* over 50 ha (125 acres)

5. *B. thuringiensis* - 2 applications by aircraft of 4 billion International Units (B.I.U.) each, both applications at 1.89 liter per 0.4 ha (0.5 U.S. gal per acre) over 40 ha (100 acres)

6. *B. thuringiensis* - 1 mistblower application over 26 ha (65 acres)

The basic approach was to spray one application of Zectran at 34 g per 0.4 ha (1.2 oz per acre). Some areas, such as campgrounds that had been heavily damaged previously and in which a high level of protection was currently required received a second application of Zectran and, in addition, *B. thuringiensis* was applied to accessible trees from a mistblower. Thuricide (*B. thuringiensis*) applied from the mistblower was diluted 7:1 with water. The 40 ha (100 acres) sprayed with *B. thuringiensis* from the air were located at the south end of Opeongo Lake where the Harkness Fisheries Laboratory and a campground are located.

Budworm emergence occurred during the third week of May. Zectran spraying was carried out on June 6 and 7 and the aerial applications of *B. thuringiensis* were made on the morning of June 8. Mistblower spraying with *B. thuringiensis* started June 5 and finished June 10. The aerial applications of Zectran were carried out under generally ideal weather conditions with little or no air movement. The aerial applications of *B. thuringiensis* were done in the presence of an 8-10 km per hour (5-6 mph) wind.

Results: All treatments with the exception of the third (i.e., two applications of Zectran) were assessed. Results are presented in Table 4 (see p. 45). It is evident that any treatment involving Zectran provides good or excellent foliage protection and that the level of protection is enhanced when followed by *B. thuringiensis* from a mistblower. Differences in results obtained from aerial applications, aerial and mistblower, and mistblower only on the two host species indicate that the better results on white spruce are probably due to improved coverage by the mistblower.

Table 4. Population reduction and foliage protection attributable to spraying on balsam fir and white spruce in Algonquin Provincial Park, 1974. Budworm development (instar) at time of spraying was L4. Data from 14 plots (10 spray, 4 check)

	Prespray larvae/45.7-cm (18-in.) branch tip		Surviving pupae/45.7-cm (18-in.) branch tip		Population reduction due to treatment (%)		1974 defoliation (%)	
	bF	wS	bF	wS	bF	wS	bF	wS
Zectran 1 application of 34 g (1.2 oz) - L4 - 540 ha (1350 acres)								
Spray	57.6	122.6	.8	4.4	92	36	28	38
Check	50.3	113.3	8.9	6.3	--	--	95	88
Zectran 1 application of 34 g (1.2 oz) + 1 mistblower application of *B. thuringiensis* - L4 - 8 ha (20 acres)								
Spray	144.9	137.1	.2	1.3	99	83	13	16
Check	82.5	113.3	6.9	6.3	--	--	100	88
Zectran 2 applications of 34 g (1.2 oz) each + 1 mistblower application of *B. thuringiensis* - L4 - 50 ha (125 acres)								
Spray	67.4	108.1	0	1.3	100	79	11	18
Check	50.3	113.3	8.9	6.3	--	--	95	88
B. thuringiensis 2 applications of 4 B.I.U. each, both 1.89 liters per 0.4 ha (.5 U.S. gal per acre) - L4-5 - 40 ha (100 acres)								
Spray	29.1	136.9	3.2	15.0	64	0	44	42
Check	34.5	113.3	10.4	6.3	--	--	99	88
B. thuringiensis 1 mistblower application - L4-5 - 26 ha (65 acres)								
Spray	--	--	1.3	.1	78	86	44	57
Check	--	--	5.8	.7	--	--	98	94

The aerial application of *B. thuringiensis* provided moderate foliage protection although the data did not show a population reduction on white spruce. The sixth treatment (i.e., mistblower application of *B. thuringiensis*) would probably have been more effective, in terms of foliage protection, if applied a few days earlier.

Proposed Aerial Spraying Operations for 1975: Protection is planned for a total of 800 ha (2000 acres) in Algonquin Park in 1975.

Northeastern Ontario

1974 Operations: A total of 8760 ha (21,900 acres) were sprayed in two provincial parks in northeastern Ontario, 8080 ha (20,200 acres) in Lake Superior Provincial Park in the Wawa District and 680 ha (1700 acres) in the Shoals Park, Chapleau District. All applications consisted of Zectran at 34 g in 0.57 liters per 0.4 ha (1.2 oz per 0.15 U.S. gal per acre). The primary purpose of this spraying, as in previous years, was to minimize the intensity of damage caused by budworm within selected areas that have recreational or aesthetic values.

Budworm emergence occurred during late May. Spraying was carried out from June 15 to June 24 in Lake Superior Provincial Park in corridors along Hwy 17, Mijin Lake Road and the Sand River and from June 21 to 23 for the Shoals. Two aircraft, a Stearman (LSPP) and an Agcat (Shoals) carried out the spraying but owing to other commitments the Agcat arrived in Chapleau well past the optimum time to achieve maximum or even satisfactory protection. In Lake Superior Provincial Park the spray plane operated from a gravel road in the middle of the park instead of from the Wawa airport. This considerably reduced ferry time and, over all, significantly improved the efficiency of the operation.

Results: Assessments of the spraying along Hwy 17 and Mijin Lake Road in Lake Superior Provincial Park showed excellent results (see Table 5, p. 47). However, a helicopter survey of the Sand River in August revealed that the sprayed corridor was virtually completed defoliated. Reasons for the failure of spraying along the Sand River are unknown. The area is inaccessible and consequently it was not possible to determine population reduction or to monitor spray deposit. Similarly, results from the Shoals Park were not good, with defoliation reaching 75%-80% in various pockets throughout the sprayed area. This is probably due to the late arrival of the aircraft combined with high budworm populations.

Proposed Aerial Spraying Operations for 1975: It is expected that approximately 8000 ha (20,000 acres) will be sprayed in Lake Superior Provincial Park and 2000 ha (5000 acres) in various parks in the Chapleau District.

Table 5. Population reduction and foliage protection attributable to Zectran on balsam fir and white spruce in Lake Superior Provincial Park, 1974. Budworm development (instar) at time of spraying was L4-L5. Data from 20 plots (14 spray, 6 check) established along Hwy 17 and Mijin Lake Road

	Prespray larvae/45.7-cm (18-in.) branch tip	Surviving pupae/45.7-cm (18-in.) branch tip	Population reduction due to treatment (%)	1974 defoliation (%)
		balsam fir - 1 application of 34 g (1.2 oz)		
Spray	28.1	.6	94	26
Check	19.7	7.0	--	66
		white spruce - 1 application of 34 g (1.2 oz)		
Spray	51.7	2.8	87	24
Check	41.3	17.1	--	55

Northwestern Ontario

1974 Operations: In 1974, some 9840 ha (24,600 acres) were sprayed in Quetico Provincial Park in the Atikokan District. Applications were Zectran at 34 g in 0.57 liters per 0.4 ha (1.2 oz per 0.15 U.S. gal per acre). The purpose of this operation was the same as it has been over the past three years, i.e., to prevent the spread of budworm into susceptible forests to the east of Quetico. Cool weather delayed budworm emergence till the latter part of May. A single Stearman, working from Atikokan, started spraying June 13 and finished July 2.

Two areas were sprayed in Quetico. One block of 8640 ha (21,600 acres) extended from the west end of Poohbah Lake westward to the international boundary at Martin Bay. The second block consisted of 1200 ha (3000 acres) at Prairie Portage on Basswood Lake, which is also located on the international boundary.

Results: On the basis of aerial defoliation surveys, pupal counts and egg-mass counts, the results appear to be good. Several small pockets of defoliation totalling about 280 ha (700 acres) were mapped in the Prairie Portage spray block. No defoliation was evident in the larger Poohbah Lake—Tanner Lake spray block. Pupal counts and egg-mass counts from the sprayed areas show that budworm populations have been reduced by more than 95% since 1973.

Proposed Aerial Spraying Operations for 1975: It is expected that the province will continue its policy of abatement in this part of Ontario and will likely spray the infestation found in 1974 at Bennett Lake in the Fort Frances District and the remnants of the Prairie Portage infestation in Quetico Provincial Park in the Atikokan District. The total area of infestation is not likely to exceed 6000 ha (15,000 acres).

SUMMARY

Aerial spraying operations covering 19,200 ha (48,000 acres) were conducted against the spruce budworm in Ontario by the Ontario Ministry of Natural Resources in 1974. In northwestern Ontario, 9840 ha (24,600 acres) were sprayed in Quetico Provincial Park, 8760 ha (21,900 acres) in Lake Superior and Shoals provincial parks in northeastern Ontario and 744 ha (1860 acres) in Algonquin Provincial Park in southeastern Ontario. Zectran was applied at a rate of 34 g in 0.57 liters of spray mixture (Arotex) per 0.4 ha (1.2 oz in 0.15 U.S. gal per acre) by Stearman and Agcat spray planes equipped with Micronair dispersal units. Generally, this year's results were good in terms of budworm kill and foliage protection. It is expected that a spraying program similar in type and magnitude to that of 1974 will be conducted in 1975.

REFERENCE

Howse, G.M., W.L. Sippell and K.B. Turner. 1974. Spruce budworm in Ontario (aerial spraying operations, outbreak status and forecasts, plans for next year). Report to the Canadian Forest Pest Control Forum, Ottawa, November 19, 1974. 6 p. (mimeogr.).