FOREST INSECT AND DISEASE CONDITIONS IN ONTARIO, 1980

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ABSTRACT

This report reviews the status of forest insects and diseases in Ontario in 1980 and gives, for some pests, a forecast of conditions for 1981. Five economically important forest insects (three conifer insects and two hardwood), two tree diseases in addition to stem and root rot, frost damage and maple decline are discussed in detail; many other noteworthy insects and diseases are listed in tabular form. Special surveys conducted by the Forest Insect and Disease Survey Unit (FIDS) and provincial forest insect control programs are described. A list of publications and unpublished results is provided. More detailed information is available on request from the Great Lakes Forest Research Centre.

RESUMÉ

Le présent rapport fait le point sur les insectes forestiers et les maladies des arbres en Ontario en 1980 et donne, pour certains ravageurs, une prévision des conditions qui prévaudront en 1981. Quatre insectes forestiers d'importance économique, dont trois s'attaquant aux résineux et une aux feuillus, deux maladies des arbres en plus de la pourriture des racines et de la tige, les dégâts causés par le gel et le déclin des érables sont traités en détail; plusieurs autres insectes et maladies dignes de mention apparaissent sous forme de tableaux. Des enquêtes spéciales menées par le Relevé des insectes et maladies des arbres (RIMA) ainsi que dans le cadre des programmes provinciaux de lutte contre les insectes forestiers sont décrits dans le rapport. Une liste des publications du RIMA et d'articles connexes du Service canadien des forêts (SCF) est aussi fournie. Des renseignements supplémentaires sont disponibles sur demande au Centre de recherches forestières des Grands Lacs.

ACKNOWLEDGMENTS

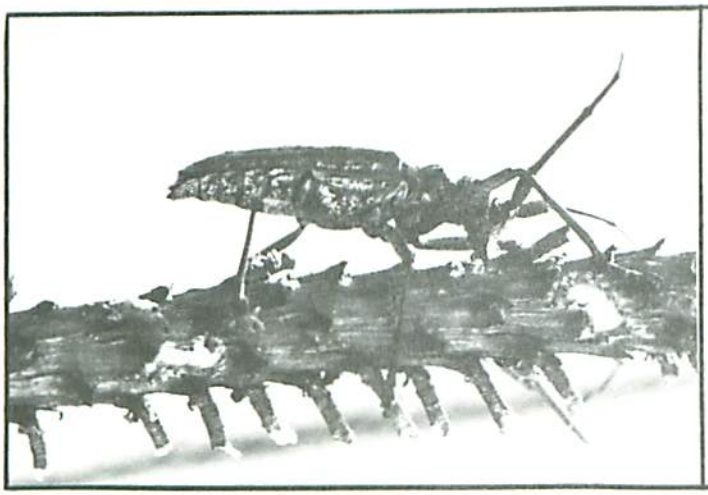
This report is the result of a combined effort of all members of the Forest Insect and Disease Survey Unit at the Great Lakes Forest Research Centre with the support and cooperation of the Ontario Ministry of Natural Resources.

The authors also wish to acknowledge the contribution of D.E. Ketcheson, Senior Economist at the Great Lakes Forest Research Centre, who was instrumental in initiating this annual report. His input, particularly in the form of forest resources data obtained from the Timber Sales Branch of the Ontario Ministry of Natural Resources, is greatly appreciated.

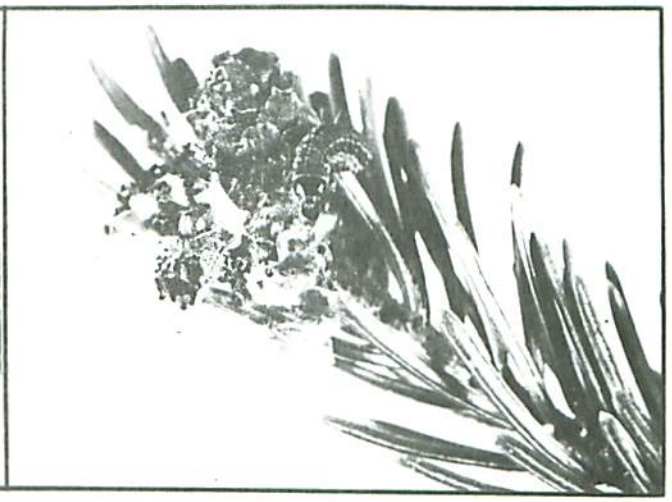
Frontispiece

Snow-covered spray plane at airstrip in Harker Township, Kirkland Lake District, 8-10 June, 1980. This period of cold weather caused considerable damage to aspen foliage in northeastern Ontario.

Elm trees killed by Dutch elm disease (*Ceratocystis ulmi* [Buism.] C. Moreau) in southern Ontario.



Adult white spotted sawyer beetle, *Monochamus scutellatus* (Say).



Spruce coneworm (*Dioryctria reniculloides* Mut. & Mun.) feeding on black spruce flower buds (cones).

TABLE OF CONTENTS

INTRODUCTION

There are approximately 429 000 km^2 of productive forest land within the province of Ontario. About 90% of Ontario's forest area is publicly owned, 9% is privately owned and 1% is administered by the federal government. The forest industry in Ontario generates approximately 1.8 billion dollars annually in value added. Over 75,000 people are employed in nearly 1,300 forest-based establishments and a further 80,000 are employed in activities associated with the forest industry.

The Forest Insect and Disease Survey Unit (FIDS) at the Great Lakes Forest Research Centre (GLFRC) is responsible for the detection, evaluation and prediction of forest pest situations in Ontario. Each year, the Unit conducts a general survey of important forest pest conditions in the province to monitor the occurrence, incidence and fluctuation of important forest insects and diseases and the damage they cause to the forest resource. This survey conducted at the regional level contributes to a national overview of major forest pest problems in Canada. Similar surveys are conducted by five other regionally based units to provide nationwide coverage of Canada's forests. Other responsibilities of the Unit at GLFRC include advising and assisting the province in the conduct of pest control operations, providing pest extension services to the public and to government agencies, carrying out activities related to plant quarantine and conducting special surveys as necessary.

Pest survey technicians are in the field from mid-May to late September, conducting extensive aerial and ground surveys. Numerous reports of damage are received from other forestry agencies including the Ontario Ministry of Natural Resources (OMNR) and forest industry; where there is significant pest damage it is evaluated by the survey field technicians. This report is a summary of the records and reports submitted by survey technicians who were assigned as follows to OMNR forest regions in the 1980 field season.

M.J. Thomson and V. Jansons	Northwestern
H.D. Lawrence and W.D. Biggs	North Central
L.S. MacLeod, W.A. Ingram and D.C. Constable	Northern
K.C. Hall and H. Brodersen	Northeastern
H.J. Weir and H.J. Evans	Algonquin
R.J. Sajan	Eastern
M.J. Applejohn and C.A. Barnes	Central and Southwestern

Other staff of the Forest Insect and Disease Survey Unit for the 1980-1981 fiscal year were as follows:

F.A. Bricault, Curator, Insect Collection and Herbarium

P.E. Buchan, Senior Pathology Technician (retired Dec. 1980)

M.C. Davidson, Stenographer

E.B. Dorworth, Mycology, Culture Technician

H.L. Gross, Pathologist

A.A. Harnden, Senior Entomology Technician (retired Dec. 1980)

G.M. Howse, Entomologist, Head, FIDS

O.H. Lindquist, Insect Taxonomy Technician

R.K. McCron, Mycology, Identification Technician

L.L. McDowall, Chief of the Survey Field Technicians (retired Dec. 1980)

J.H. Meating, Insect Control Officer

D.T. Myren, Mycologist

A.H. Rose, Entomologist (retired Dec. 1980)

P.D. Syme, Entomologist

IMPORTANT FOREST PESTS

Spruce Budworm

The spruce budworm (*Choristoneura fumiferana* Clem.) continued as Ontario's most serious forest pest problem in 1980. The current outbreak started in 1967 and has expanded continually with only minor exceptions. Over all, the area infested by budworm this year within the province totals some 18.85 million ha, an increase of 420 000 ha over last year (Table 1). The area within which budworm-associated tree mortality occurred continued to increase in 1980. A total of 8.356 million ha were mapped, an increase of 841 000 ha over 1979 (Table 2).

Table 1. Comparison of the area of forest in Ontario defoliated by spruce budworm in 1979 and 1980

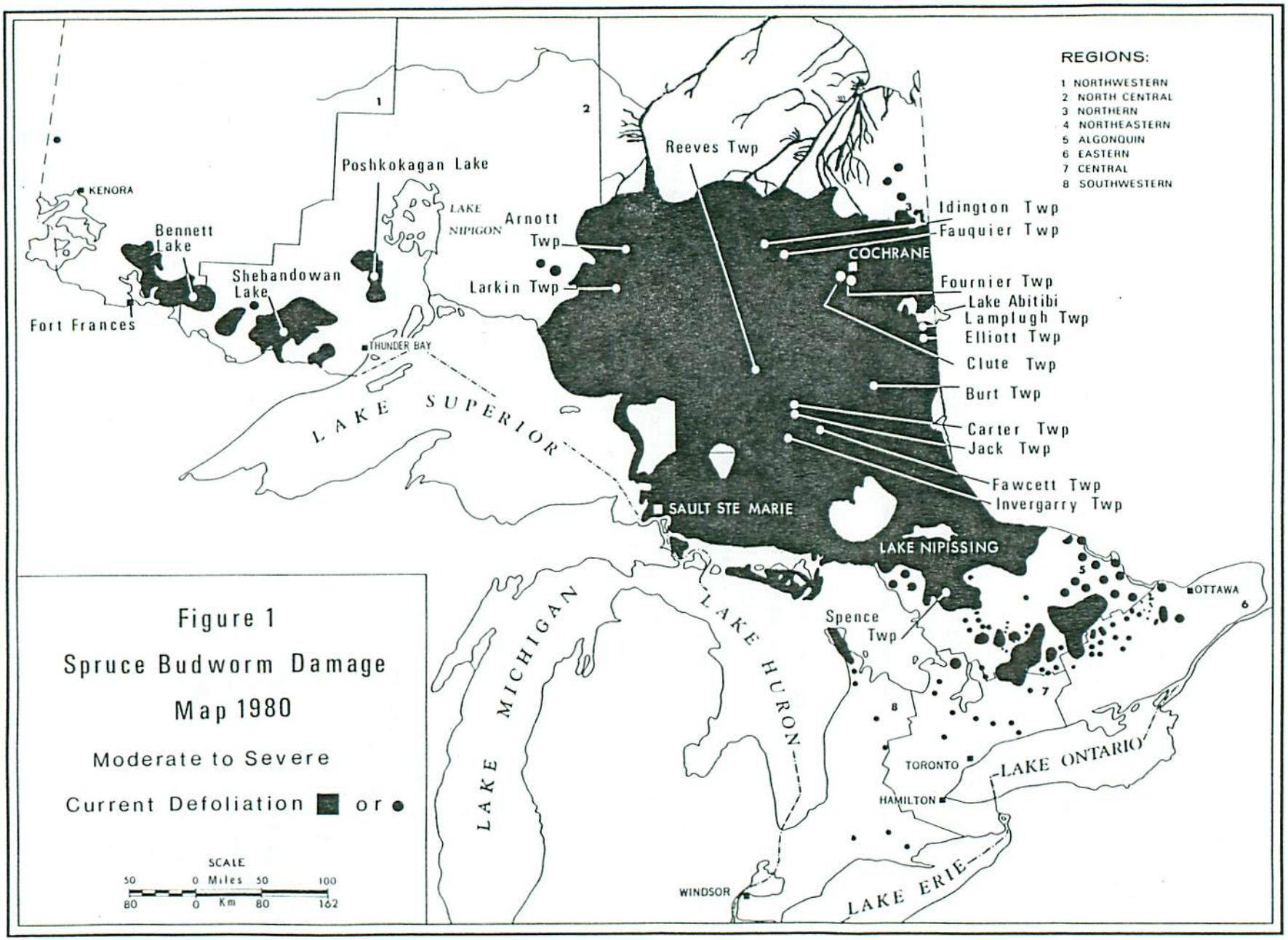
Outbreak Region in Ontario	Gross area of moderate-to-severe defoliation in millions of hectares		
	1979	1980	increase
Northwestern	.488	.724	.236
Northeastern	16.940	17.119	.179
Southern	1.002	1.007	.005
Total	18.430	18.850	.420

Table 2. Comparison of the area of budworm-associated tree mortality in Ontario in 1979 and 1980

Region in Ontario	Gross area of budworm-associated tree mortality in millions of hectares		
	1979	1980	increase
Northwestern	.020	.024	.004
Northeastern	6.111	6.839	.728
Southern	1.384	1.493	.109
Total	7.515	8.356	.841

Figures presented in this report describing areas affected by budworm actually represent gross areas within which stands containing one or more of the major host species show moderate-to-severe current defoliation and/or signs of previous damage. Areas within which moderate-to-severe defoliation is present are delineated and mapped, i.e., defoliation that is detectable from the air is usually considered to be in excess of about 30% of the new growth, and is attributable to spruce budworm. Signs of previous damage may include dead tops and/or dead trees.

The primary hosts of budworm in Ontario are balsam fir (*Abies balsamea* [L.] Mill.) and white spruce (*Picea glauca* [Moench] Voss). Black spruce (*Picea mariana* [Mill.] B.S.P.) growing on upland sites in mixed stands is also affected. The regions in Ontario primarily affected by budworm are the Algonquin, Northeastern, Northern, North Central (Thunder Bay and Atikokan districts) and Northwestern (Fort Frances District) (Fig. 1 and 2). The percentage composition by species (based on volume) of primary growing stock on productive forest land in the four regions of northern Ontario and the Algonquin Region are listed in Table 3. Balsam fir is the fifth most prevalent species, averaging from 3% to 8% in the four northern regions and increases relative to other species from west to east across the north. The percentage composition by species for the forest districts in the Northeastern and Northern regions respectively is given in Tables 4 and 5. Balsam fir constitutes some 17% of the primary growing stock in Kirkland Lake District and nearly 14% in Gogama--in both cases considerably higher than the regional average. The area of balsam fir working group expressed as a percentage of total productive area is contained in Table 6 for the five regions, for the districts of the Northeastern and Northern regions, and for several management units or townships. Volumes of balsam fir in balsam


REGIONS:
1 NORTHWESTERN
2 NORTH CENTRAL
3 NORTHERN
4 NORTHEASTERN
5 ALGONQUIN
6 EASTERN
7 CENTRAL
8 SOUTHWESTERN
KENORA
Bennett Lake
Shebandowan Lake
Fort Frances
Poshkokagan Lake
LAKE NIPIGON
Arnott Twp
Larkin Twp
THUNDER BAY
LAKE SUPERIOR
Reeves Twp
Idington Twp
Fauquier Twp
COCHRANE
Fournier Twp
Lake Abitibi
Lamplugh Twp
Elliott Twp
Clute Twp
Burt Twp
Carter Twp
Jack Twp
Fawcett Twp
Invergarry Twp
SAULT STE MARIE
LAKE NIPISSING
Spence Twp
OTTAWA
LAKE MICHIGAN
LAKE HURON
TORONTO
LAKE ONTARIO
HAMILTON
WINDSOR
LAKE ERIE
Figure 1
Spruce Budworm Damage
Map 1980
Moderate to Severe
Current Defoliation ■ or ●
SCALE
50 0 Miles 50 100
80 0 Km 80 162

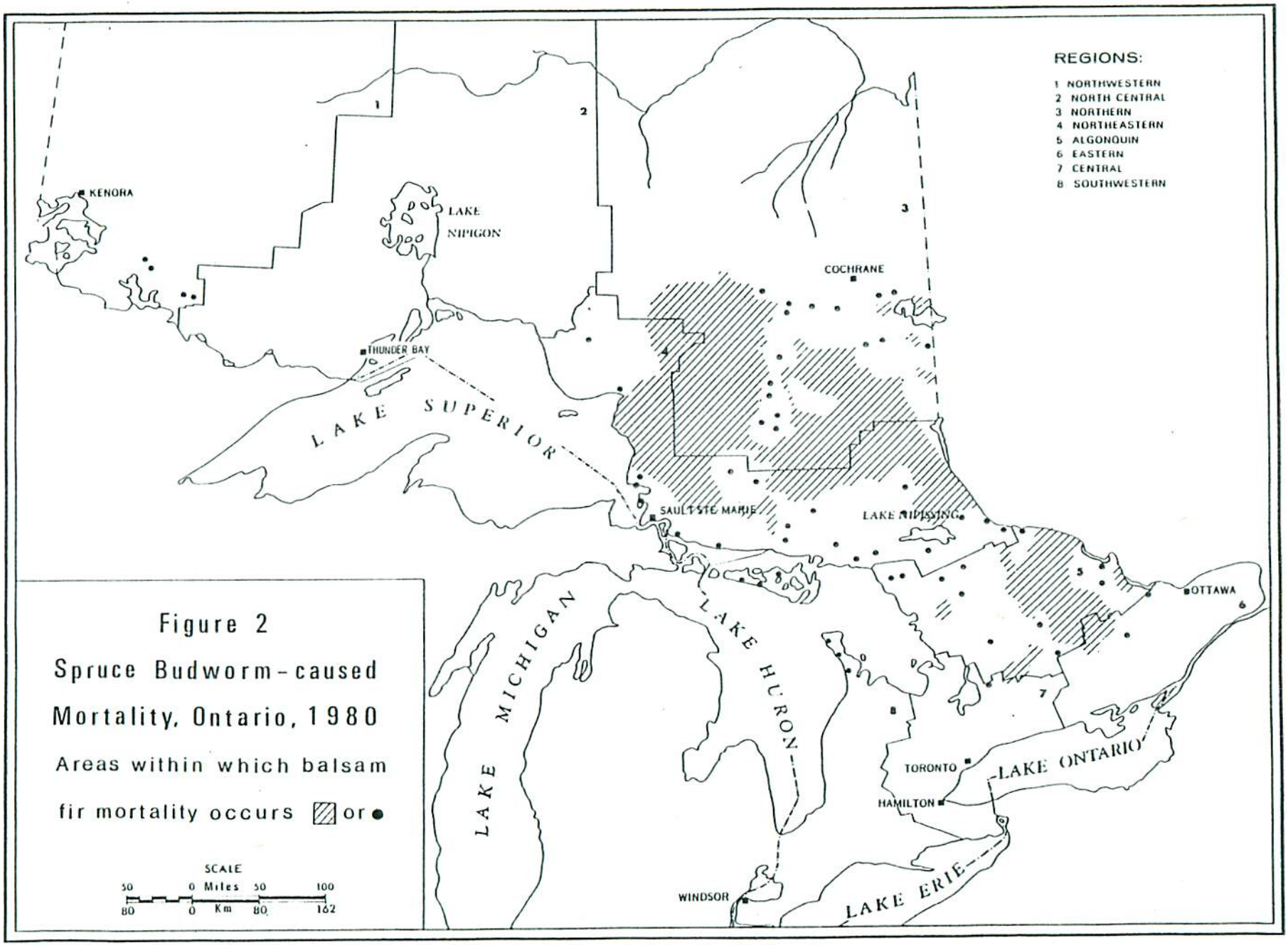


Figure 2

Spruce Budworm-caused Mortality, Ontario, 1980

Areas within which balsam fir mortality occurs ▨ or ●

Table 3. Percent composition by species (based on volume) of primary growing stock on productive forest land in the forest regions affected by spruce budworm. Source of data - Ontario Forest Resources Inventory.

	Region				
	Northwestern	North Central	Northern	Northeastern	Algonquin
Balsam fir	3.3	6.4	6.9	8.1	5.1
White spruce	1.2	1.8	3.1	4.6	2.6
Black spruce	47.3	48.3	48.2	17.4	1.7
Jack pine (*Pinus banksiana* Lamb.)	25.5	14.8	9.6	11.6	.3
White pine (*Pinus strobus* L.)	.4	.1	.4	5.4	7.2
Red pine (*Pinus resinosa* Ait.)	.2	T	T	1.8	1.7
White cedar (*Thuja occidentalis* L.)	.5	.9	2.2	3.1	1.3
Tamarack (*Larix laricina* [Du Roi] K. Koch)	.1	.7	.9	.3	.2
White birch (*Betula papyrifera* Marsh.)	5.6	9.9	8.6	16.9	5.1
Poplar (*Populus* spp.)	15.8	17.1	19.8	17.9	10.3
Red maple (*Acer rubrum* L.)	T	T	.1	1.6	4.2
Ash (*Fraxinus* spp.)	.1	T	T	.4	.6
Elm (*Ulmus* spp.)	T	T	nil	T	.6
Red oak (*Quercus rubra* L.)	T	nil	nil	.3	2.3
Sugar maple (*Acer saccharum* Marsh.)	T	T	.1	6.8	36.3
Yellow birch (*Betula alleghaniensis* Britton)	T	T	.1	3.0	9.6
Hemlock (*Tsuga* spp.)	T	T	T	.7	6.8
Beech (*Fagus* spp.)	T	nil	nil	nil	3.3

Table 4. Percent composition by species (based on volume) of primary growing stock on productive forest land in the forest districts of the Northeastern Region. Source of data - OFRI.

	Wawa	Sault Ste. Marie	Blind River	Espanola	Sudbury	North Bay	Temagami
Balsam fir	7.9	13.7	4.8	6.2	7.0	9.6	10.8
White spruce	3.3	4.6	3.2	6.2	7.3	4.3	4.8
Black spruce	32.7	16.7	12.2	9.0	6.4	7.2	14.0
Jack pine	13.3	7.5	27.1	13.8	12.3	2.4	8.0
White pine	.1	12.0	8.6	5.5	10.7	6.6	8.2
Red pine	T	T	2.2	2.0	4.2	2.2	3.8
White birch	14.3	18.8	17.2	16.7	21.1	16.2	20.8
Poplar	18.2	5.6	13.6	22.9	18.8	17.0	17.8
Sugar maple	4.2	10.3	6.7	5.2	3.0	16.5	3.1
Yellow birch	3.2	5.8	2.6	.8	1.0	6.0	2.0

Table 5. Percent composition by species (based on volume) of primary growing stock on productive forest land in the forest districts of the Northern Region. Source of data - OFRI.

	Hearst	Kapuskasing	Cochrane	Kirkland Lake	Timmins	Gogama	Chapleau
Balsam fir	7.2	4.5	6.1	17.3	8.7	13.8	5.6
White spruce	3.7	1.8	3.2	2.2	6.5	2.0	4.1
Black spruce	47.7	59.6	65.4	25.0	27.5	18.9	29.5
Jack pine	7.6	3.2	3.9	21.7	13.9	25.9	19.1
White birch	5.9	4.4	5.2	12.7	15.6	16.0	16.3
Poplar	24.1	22.3	14.7	18.4	19.9	17.2	19.7

Table 6. Area of balsam fir working group expressed as a percentage of the total productive area. Source of data - OFRI.

Region		District in the Northeastern Region		District in the Northern Region		Management Unit or Township	
Northwestern	- 3.2	Wawa	- 9.4	Hearst	- 6.9	Beemer Twp	- 7.8
North Central	- 8.3	Sault Ste. Marie	- 19.7	Kapuskasing	- 3.5	Elliott Twp	- 39.4
Northern	- 7.8	Blind River	- 4.9	Cochrane	- 4.4	Braithwaite Twp	- 33.4
Northeastern	- 8.2	Espanola	- 4.6	Kirkland Lake	- 23.7	Black Sturgeon	- 29.8
Algonquin	- 5.7	Sudbury	- 6.9	Timmins	- 12.6	Burchell Lake	- 20
		North Bay	- 8.4	Gogama	- 12.1		
		Temagami	- 10.9	Chapleau	- 7.8		

fir working groups average from 42 to 56 cu. m/ha. As one moves from the broader picture (regions) and focuses on local situations (districts, management units or townships), balsam fir becomes a more significant factor in some locations. Another point highlighted by these data is that balsam fir is common, albeit at relatively low levels, across northern Ontario, but concentrations occur frequently in local situations. White spruce has a similar distribution fashion; however, the volume of white spruce is less than half (42%) that of balsam fir. The dominant species in the forests of Ontario's north is black spruce. It is susceptible to budworm attack when growing in mixture with balsam fir and the black spruce can be expected to die concurrently with the balsam fir. In contrast, large stands of pure black spruce on lowland sites rarely show damage, whereas small stands occasionally do, particularly during peak years of attack and when they are surrounded with balsam fir. Rarely is infestation persistent enough in pure stands of black spruce to cause high levels of mortality. If we consider site, upland versus lowland, and other factors, at least half and perhaps closer to two-thirds of the black spruce may be susceptible to spruce budworm.

Infestations and damage caused by budworm are present in three major geographical areas of the province (Fig. 1): southern Ontario (primarily Algonquin Region), northeastern Ontario (Northeastern and Northern regions) and northwestern Ontario (Northwestern and North Central regions). Infestations increased somewhat in extent in all areas in 1980 (Table 1). Over all, in 1980 in southern Ontario, there was only a slight increase in the extent of defoliation. In northeastern Ontario, the net change between 1979 and 1980 was a small increase in the total extent of budworm-infested area. This year the more significant changes occurred in northwestern Ontario. The area of moderate-to-severe defoliation increased by 50% and a number of new infestations were found.

Extremely cool temperatures accompanied by snow occurred in early June, particularly in the eastern half of the Northern Region where mortality of up to 70% of 4th instar larvae on balsam fir and 30% on white spruce was found at one location. Although some frost damage to balsam and spruce was noted, it was not as heavy as expected in view of the high larval mortality.

In southern Ontario, the extent of budworm-associated tree mortality increased by some 109 000 ha with most of the new mortality occurring in the central part of the Algonquin Region. In northeastern Ontario, tree mortality increased by .728 million ha to a total of 6.839 million ha. New mortality was detected in stands in virtually every district. More pockets of white spruce mortality are becoming evident, particularly in the oldest infested areas, although levels of mortality are generally quite low. A few instances of light mortality in black spruce were also recorded. In northwestern Ontario, several pockets of mortality increased somewhat in extent to a total of about 24 282 ha.

It has been estimated that more than 29 million cu. m of balsam fir have been killed in northeastern Ontario (Northeastern and Northern regions) as a result of the current outbreak that has continued for 14 years (Table 7). This represents about 60% of the balsam fir volume within the 6.839 million ha of mortality. The loss figures in Table 7 are for balsam fir mortality only. Mortality of white spruce and black spruce and growth losses of all three species should be included. A conservative estimate of the accumulated total loss to date would likely exceed 56 million cu. m. Even if the outbreak were to cease overnight, tree mortality would continue for several years and the losses would increase.

Egg-mass surveys were carried out during August and September, 1980 at more than 600 locations sampled. Over all, egg-mass densities decreased by some 45% in 1980 in comparison with counts made in similar locations in 1979. The largest regional decline, 68%, occurred in southern Ontario. The decrease was general and, as a consequence, the total area of moderate-to-severe defoliation in southern Ontario will likely diminish in 1981 although a large part of the Algonquin Region will remain heavily infested. In northeastern Ontario, there was a decrease of some 50% on an overall basis. Decreases occurred in 11 of the 15 districts in the Northeastern and Northern regions. In spite of the decline, little change is expected in the extent of defoliation in northeastern Ontario in 1981 since populations are still high enough on the average to cause moderate-to-severe defoliation. Egg-mass densities increased sharply in the eastern part of the North Central Region whereas a decrease of some 14% occurred in northwestern Ontario. Modest expansion of infested areas will likely occur in 1981 in northwestern Ontario.

Oak Leaf Shredder

The oak leaf shredder (*Croesia semipurpurana* Kft.) has been a persistent and widespread pest of red oak (*Quercus rubra* L.) in Ontario in recent years. Defoliation by this insect is probably a major predisposing factor in the condition known as oak decline, oak dieback or oak mortality in a number of areas in Ontario.

The Ontario Ministry of Natural Resources has sprayed several hundred hectares of high-value oak-maple forest annually since 1977 in order to reduce defoliation. Because spraying activities have been confined to the Huronia District, Central Region, intensive surveys have been limited to this district. Elsewhere only the extent of defoliation is mapped each year.

In 1980 approximately 50 000 ha of forest suffered moderate-to-severe defoliation in the Central, Algonquin, Eastern and Northeastern regions. Infestations in the Central Region were located in the northern portion of the Huronia District, in the Uxbridge-Maple area of the Maple District and in the Niagara Falls-Port Colborne area

Table 7. Areas of defoliation and tree mortality, and volumes of balsam fir killed by spruce budworm in northeastern Ontario, 1967-1980.

Year	Area of moderate-to severe defoliation (ha)	Area of mortality (ha)	Balsam fir mortality (cu. m)
1967	25 900[a]		
68	202 347		
69	667 746		
1970	2 104 411		
71	3 480 372		
72	5 422 906	80 939	141 600
73	5 058 681	202 347	198 240
74	7 486 847	667 746	608 880
75	11 007 689	1 214 083	1 146 960
76	14 042 898	2 630 514	2 548 800
77	13 468 231	4 168 353	4 361 280
78	14 789 543	4 734 925	5 664 000
79	16 939 972	6 110 886	7 249 920
1980	17 119 384	6 839 336	7 476 480
			Total = 29 396 160

[a] Light defoliation.

of the Niagara District. Stands affected were usually farm woodlots or county forests of mixed oak and maple. All age classes of trees were attacked but the majority of stands contained mature trees of merchantable sawlog size. Oak content ranged from 20% to 90% and defoliation in many cases was complete. Mortality of all age and size classes is evident at many locations but particularly in the northern Huronia District and in the Uxbridge area. Since oak deteriorates slowly after dying, a number of landowners have been able to complete salvage operations.

Infestations in the Algonquin Region were generally light except in Dungannon and Cashel townships, Bancroft District where medium infestations were reported. These occurred mainly in immature oak-pine forests where the oak content was approximately 50%. No tree mortality was observed.

Heavy defoliation occurred in the Eastern Region at a number of locations in the northern Tweed District, particularly in Abinger and Effingham townships where defoliation reached 100%. The forests affected in this area consist chiefly of mixed, immature or semi-mature hardwoods with oak constituting approximately 10%.

Populations increased substantially in the Northeastern Region where heavy infestations occurred at several locations in the Sault Ste. Marie District and in small pockets in several townships in the Blind River District. All infestations in the Northeastern Region occurred in immature or semimature stands of mixed hardwoods, with sugar maple (*Acer saccharum* Marsh.) the major species and oak accounting for less than 25% of the trees in the stands.

For some years scattered mortality of red oak has occurred at a number of locations throughout southern Ontario. Although not all tree mortality is directly attributable to the oak leaf shredder, the insect is considered one of the major factors involved. In 1977, in an effort to chart the course of oak mortality in the province and to determine some of the factors involved, permanent sample plots were established in all regions of southern Ontario. Initially 100 live trees were examined in each plot and rated with respect to proportion of crown affected. Results are summarized in Table 8.

Table 8. Summary of the condition of red oak in 12 locations in southern Ontario from 1977 to 1980

Location	Avg DBH (cm)	Avg ht (m)	Year	Percentage of crown dead 0-20	21-40	41-60	>60	Tree dead	Oak leaf shredder activity[a]
Eastern Region - Tweed District									
Lavant Twp Joe Lake	12.0	24.0	1977	46	38	12	4	0	M
			1978	21	59	13	7	0	L
			1979	5	51	32	8	4	T
			1980	7	41	36	11	5	T
Lavant Twp Flower Station Road	14.0	19.0	1977	28	60	11	1	0	M
			1978	14	72	11	4	0	L
			1979	5	73	18	2	2	T
			1980	2	53	33	7	5	T
Algonquin Region - Pembroke District									
Alice Twp	15.9	15.5	1977	44	45	11	0	0	L
			1978	43	45	12	0	0	L
			1979	28	58	13	1	0	L
			1980	16	65	17	2	0	T
Wylie Twp	23.8	16.4	1977	26	43	30	1	0	L
			1978	8	54	37	1	0	L
			1979	4	48	44	4	0	L
			1980	2	43	48	6	1	T
- Bracebridge District									
Macaulay Twp	28.9	20.5	1977	17	44	29	10	0	N
			1978	3	43	44	8	2	N
			1979	0	27	60	11	2	N
			1980	0	27	54	15	4	N
Central Region - Lindsay District									
Clarke Twp Durham-Ganoraska Forest	22.9	20.6	1977	38	11	32	19	0	L
			1978	4	36	39	13	8	L
			1979	3	32	41	16	8	L
			1980	2	26	47	13	12	L

(continued)

Table 8. Summary of the condition of red oak in 12 locations in southern Ontario from 1977 to 1980 (concluded)

Location	Avg DBH (cm)	Avg ht (m)	Year	Percentage of crown dead 0-20	21-40	41-60	>60	Tree dead	Oak leaf shredder activity[a]
Central Region - Huronia District									
Tiny Twp	25.9	21.9	1977	54	7	27	12	0	T[b]
Awenda Park			1978	48	5	22	6	4	T
			1979	58	9	3	4	8	T[b]
			1980	61	8	4	4	8	T[b]
Tiny Twp	26.0	22.0	1977			not sampled			S
Farlain Lake			1978			" "			S
			1979			" "			S
			1980	0	4	45	25	26	S
Mulmur Twp	28.2	21.0	1977	64	15	20	1	0	S
Dufferin Co.			1978	64	15	19	1	1	L[b]
Forest			1979	68	15	15	1	1	T
			1980	57	28	13	1	1	L
- Maple District									
Uxbridge Twp	26.1	21.2	1977	42	9	31	18	0	M
Durham			1978	42	9	31	11	7	L
Forest			1979	40	13	26	6	15	M
			1980	38	14	25	7	16	L[b]
Southwestern Region - Simcoe District									
Charlotteville Twp	17.2	31.6	1977	70	8	12	10	0	N
Turkey Point			1978	69	9	12	10	0	N
			1979	58	14	19	8	1	N
			1980	29	37	25	8	1	N
South Walsingham Twp	17.0	21.5	1977	42	35	18	5	0	N
St. Williams			1978	40	33	19	4	4	N
			1979	36	36	16	3	6	N
			1980	29	38	22	5	6	N
- Chatham District									
Bosanquet Twp	11.4	29.0	1977	69	7	17	7	0	N
Pinery Prov.			1978	69	7	17	7	0	N
Park			1979	68	11	16	5	0	N
			1980	53	19	21	7	0	N

[a] N = nil, T = trace, L = light, M = moderate, S = severe

[b] Aerially sprayed for control of oak leaf shredder.

Swaine Jack Pine Sawfly

Two heavy infestations of the Swaine jack pine sawfly (*Neodiprion swainei* Midd.) are causing mortality of jack pine (*Pinus banksiana* Lamb.) in the Elk Lake Management Unit, Temagami District, Northeastern Region. The one infestation in the Banks-Makobe lakes area in Banks and Wallis townships is about 325 ha in size. Some of these infested stands were harvested in the winter of 1979-1980 and further cutting, of about 85 ha, is anticipated during the 1980-1981 winter. However, shoreline reserves of mature timber are to be left uncut on Banks and Makobe lakes and along the Makobe River. These reserves harbor a heavy infestation with a potential for spread into adjacent stands or stands to the north. High populations of the sawfly were present in the reserves in August 1980 and some tree mortality, up to 40% in one stand, is present in the area. The infested stands are almost pure jack pine, about 80%, and range from 50 to 75 years in age and from 19 to 20 m in height. The stands are well stocked and growing on good sites. The Ontario Ministry of Natural Resources is concerned about this infestation spreading northward into extensive stands of immature jack pine in Roadhouse Township.

The second infestation, centred around Big Boot Lake in Van Nostrand and Klock townships, is about 450 ha in size. This infestation is established in stands that are primarily immature jack pine, 45-50 years of age and 15-18 m tall. Jack pine accounts for more than 80% of the trees in these stands. Appreciable mortality (not measured because of inaccessibility) has occurred around the lake, and as far south as Red Pine Point on Lady Evelyn Lake. Dead tops and single tree mortality are evident from the air but are scattered throughout the stands. Population levels of the sawfly were probably higher in this area in August 1980 than at any other time since the 1940s. The level of tree mortality will likely increase and OMNR is considering control action among other options for 1981.

Sawyer Beetles

Damage caused by the feeding of adult sawyer beetles (*Monochamus* spp.) occurred in the three northern regions of Ontario in 1980. High numbers of beetles may be due to one or more of the following causes of tree mortality: fire, drought, spruce budworm or timber-harvesting practices. Damage was detected in approximately 200 ha across all three northern regions, with tree mortality occurring in approximately 135 ha. By region, the approximate areas affected were: 20 ha in the Northwestern Region, 80 ha in the North Central Region and 100 ha in the Northern Region. Generally, adult feeding was associated with cutting operations. The presence of slash and cut residue serves as an attraction to flying adults, which first feed on healthy fringe or open residual trees and then breed on recently cut material.

This insect had the greatest economic impact in Hearst and Kapuskasing districts of the Northern Region. In Fushimi Township, Hearst District, a checkerboard harvesting method is under way in 70-year-old black spruce stands. Adults feeding along the fringe of cuts have killed 10-15% of 24 ha of the remaining blocks. In Hopkins Township, Kapuskasing District, the harvesting practice is to leave groups of black spruce for seed trees scattered throughout the cutover. Logs cut during the summer and left to be hauled in the winter, as well as slash and stumps, are a strong attraction to adult sawyer beetles which fly in and feed on the remaining seed tree islands. Heavy damage occurred this summer over approximately 16 ha, and tree mortality, though not yet significant, will undoubtedly become apparent in 1981. In Vrooman and Invergarry townships, Gogama District and in Nimitz, Tooms and Eisenhower townships, Chapleau District, 50- to 60-year-old jack pine stands were the main target. Damage, confined to fringe trees of large cutover areas, averaged 20 ha per district. Tree mortality was 10-20% in these stands. In Midlothian Township in Kirkland Lake District, adult feeding caused considerable branch mortality on white cedar (*Thuja occidentalis* L.) trees in a 20 ha stand from which other conifers had been harvested. Stored logs were sprayed at several locations in the Northern Region to protect them against wood boring larvae.

In the North Central Region significant amounts of adult feeding damage were observed in nine areas within three districts. In the Atikokan District, scattered residual and fringe jack pine and black spruce throughout extensive cutting operations between Fredrickson and Lindgren lakes showed considerable branch and top mortality and scattered tree mortality. Similar damage to jack pine was detected in a smaller cut near Stanton Lake. In the Thunder Bay District, mature jack pine and, to a lesser degree, black spruce near Windigoostigwan Lake and east of McWhinney Lake sustained varying amounts of damage. The above areas constitute about 70 ha of detectable feeding. Dead trees were observed but overall mortality, in relation to future cut, would be less than 5%. Less extensive damage, mainly branch and some top mortality, was observed north of Picklepuss Lake, west of Kerfoot Lake and at Little Harry Lake in Thunder Bay District; and near Springwater Lake and off the Castlebar Road in Geraldton District. The total area of attack in these locations was less than 10 ha.

In the Northwestern Region damage by adult sawyer beetle feeding, detectable since 1977, was less dramatic in 1980. Current feeding damage was observed on near-mature jack pine south and southeast of Sowden Lake and between Queens and Wellington lakes in Ignace District; and on unmerchantable jack pine and black spruce east of Savant Lake village in Sioux Lookout District. Damaged areas were again associated with cutting operations. The total area affected in all three locations was approximately 20 ha. Tree mortality, not apparent by September of this year, will likely be detectable in these areas in 1981.

Adults observed from the ground, from the third week of June to mid-August, were predominantly the white spotted sawyer beetle (*Monochamus scutellatus* [Say]). However, a few northeastern sawyer beetles (*M. notatus* [Drury]) were also seen.

Scleroderris Canker (*Gremmeniella abietina* [Lagerb.] Morelet)

There are two races of the fungus *Gremmeniella abietina* (Lagerb.) Morelet. The North American race has probably been present in Ontario for over 30 years. The pathogen was first identified in 1965; however, damage typical of Scleroderris canker has been present since the early 1950s. Since the early 1970s a European race has been associated with extensive mortality of pines in the northeastern United States. It has now been detected in Quebec, Newfoundland and New Brunswick. In Canada, the occurrences of the European races appear to be of recent origin, and sanitation measures have been implemented to control and possibly eradicate the pathogen.

Both races cause a shoot blight disease. Infection by the North American race commonly stops after the current year's growth has been killed. Shoots more than 2 m tall are rarely affected, but cankers, typically associated with green stained wood, form on the branches and main stem. Damage associated with the European race usually is more extensive. Entire branches at any crown height can be killed in a single year. Cankers are not common, probably because tree parts die at a faster rate.

European race: Although the European race of Scleroderris canker is still not known to be present in Ontario, concern for the potential of this disease in the vast pine forests of Ontario stimulated extensive detection surveys again in 1980. Selected plantations are examined thoroughly for the presence of the disease at least every two years. In 1980, 70 of these plantations were checked, with at least 500 pines being examined along diagonal transects. In addition, each survey technician in southern Ontario conducted an aerial reconnaissance for evidence of Scleroderris damage. Ground checks of suspicious damage, and stands examined while other survey duties were being performed, resulted in 200 additional disease checks.

In 1980, approximately 100 collections of Scleroderris were made throughout the known range of the disease in Ontario. About half of these yielded cultures that were serologically tested for race determination.

The disease has had a devastating effect on pine plantations in parts of the northeastern United States. The potential of the disease in Ontario is unknown but pine species of all ages are susceptible; hence, the pine resource of Ontario may be threatened by this European race. Pine is present in Ontario in over 5 million ha, an area that supports an annual harvest of 2 500 cu. m (red pine: 5%, white pine: 17%, and jack pine: 78%. Many of the red pine plantations in southern Ontario are just approaching merchantable size, and this species will likely increase in proportion to other pines in amounts harvested. Also threatened are about 50 000 ha of Scots pine (*P. sylvestris* L.) plantations, half of which service the valuable Christmas tree industry.

North American race: Although the North American race of *G. abietina* appears to be less virulent than the European race, considerable Scleroderris damage has occurred in Ontario. Initially red pine was considered to be the principal host, but eventually widespread damage to jack pine became evident. White pine, Scots pine, black spruce and white spruce are hosts to this race, but damage to these species has been minimal.

The management of red pine has been affected throughout most of the range of this species in northern Ontario. This impact is difficult to assess as jack pine culture is reasonably successful on most sites that were satisfactory for red pine. Records indicate that about 1 000 ha were planted repeatedly to red pine before the involvement of Scleroderris in the mortality was recognized. Some of the failures occurred on poor sites that were commonly affected by frost. Also, infected nursery stock caused many of the early failures. Currently sanitation control measures are necessary in the management of red pine where Scleroderris canker is known to occur. The FIDS Unit conducted a workshop on disease identification and control procedures in May 1980 in conjunction with OMNR. This workshop seemed to stimulate control efforts in the Algonquin Region where red pine is a much more desirable species than jack pine.

This year Scleroderris was collected in the Dufferin Forest, Mulmur Township about 120 km north of Toronto. Morphological characters of the collection indicate that it is the North American race of the disease. Previously this race seemed to be confined to parts of the province north of 45° latitude.

Damage to jack pine is confined mostly to stands on site class III and low site class II lands. About 40% of the total jack pine type falls in this category, and in view of the fact that jack pine requires about 10 years to attain sufficient height (2 m) to be assured of survival, about 100 000 ha fall within the susceptible size and site class. Data indicate that about 2 500 ha of this are severely (>25%)

infected and another 1 500 ha are moderately (6-25%) infected. While this constitutes only about 4% of the susceptible host type, the proportion of area affected can be expected to increase. The disease seems to have been present in northwestern Ontario for only about 10 years. Disease levels seem to be intensifying and that part of the province has proportionately more susceptible host type, probably because of the drier climate.

Maple Decline

The status of sugar maples affected by maple decline in the Owen Sound and Parry Sound districts improved considerably in 1980. Conditions were most severe in 1978 following several years of heavy forest tent caterpillar (*Malacosoma disstria* Hbn.) defoliation. Defoliation was minimal in 1978, and maple vigor has since improved (Tables 9 and 10). Recovery in 1979 was most apparent in the Parry Sound District, possibly because the 1978 growing season was more favorable than in the Owen Sound District, which experienced a drier season. Decline status for the Owen Sound District in 1979 can best be described as static. Both areas showed good recovery in 1980 on the basis of vigorous branch growth and crown recovery. While dieback symptoms remain common in these areas, the percentage of trees affected is similar to that found throughout the range of maple in Ontario. Surveys conducted in 1977 indicate that it is common to find over 20% of the sugar maple showing some dieback symptoms throughout Ontario. In total, 28 700 ha of sugar maple forest were affected and about half of the area experienced greater than 25% sugar maple mortality. This represents about 14% of the 202 400 ha of susceptible maple forest in the two districts. The total loss of timber is estimated at just over 2 million cu. m (current value $19.5 million).

Stem and Root Rot

Significant losses caused by wood decay occur annually in Ontario. A number of organisms, mostly fungi, consistently cause cull losses estimated in excess of 6 million cu. m annually. Decay occurring in the stump and root portions causes less direct losses estimated at 2 million cu. m of lost growth and .5 million cu. m of tree mortality. This represents a drain of some 20% of the allowable annual cut for Ontario. Moreover, it costs money to handle this cull material as it is physically present, and in many cases, must be harvested and moved through processing plants.

Armillaria mellea (Vahl ex Fr.) Kummer, *Coniophora puteana* (Schum. ex Fr.) Karst, *Fomes annosus* (Fr.) Karst, *Polyporus schweinitzii* Fr., and *Polyporus tomentosus* Fr. appear to be the principal causes of root rot in conifers. Very little data are available on the influence or presence of hardwood root disease. We do know that *A. mellea* is

Table 9. Condition of sugar maples affected by maple decline: percentage of crown dead compared with previous condition

Forest District	Year	Relative Crown Condition			
		Dead (%)	Static (%)	Improved (%)	Declined (%)
Owen Sound	1978	2			
	1979	1	74	11	15
	1980	1	80	19	1
Parry Sound	1978	16			
	1979	5	53	42	5
	1980	1	53	43	4

Table 10. Annual status of maple decline of sugar maples based on percentage of crown dead

Year	Branches Dead (%) 0-5	6-20	21-40	41-60	>60	Trees dead
Owen Sound						
1978	59	19	3	3	3	12
1979	63	12	3	3	4	15
1980	76	1	1	1	2	19
Parry Sound						
1978	16	31	18	8	11	16
1979	32	24	14	8	2	20
1980	65	6	6	2	0	21

frequently associated with hardwood decline complexes such as maple decline. Also, hardwood cull surveys have detected the presence of fungi that are known to cause root decay as well. Hence, the above estimates are conservative as they do not include the impact of hardwood root rots.

Stem decay is caused by a large variety of fungi. The presence of these rots is often indicated by fruiting bodies, called conks, growing at branch stubs and wound surfaces. A typical example is rot caused by *Fomes igniarius* (L. ex Fr.) Kickx. which is common on many hardwoods, especially aspens.

Frost

Cold temperatures in late spring are a perennial problem in Ontario but the severity varies from year to year. The most damaging frost ever recorded by the FIDS Unit occurred in 1972 when one killing frost, accompanied by snow, occurred on May 30 and 31 and was followed by a second frost which lasted from June 10 to 12. Balsam fir, spruces, ashes, oaks, and poplars seem to suffer the most damage but pines can also be damaged. Frost kills succulent tissues, usually new shoots and opening buds. Most trees can recover from occasional frosts but in areas where frost is an annual occurrence the trees become stunted and quite bushy, and may even be killed.

Frost damage occurred throughout Ontario in 1980 with the most severe damage occurring in the Northern and Northeastern regions (Fig. 3) where cold temperatures were accompanied by snow. Temperatures dropped to a low of -2 C on June 16 in the Central Region and -2 C from June 8 to 10 in the Northern Region. Temperatures in adjacent areas were similar. Table 11 presents a summary of the data collected by the FIDS Unit for the Northern Region.

Dutch Elm Disease

The fungus which causes Dutch elm disease (*Ceratocystis ulmi* [Buism.] C. Moreau) was first found in North America in the state of Ohio in 1930. The disease, hereinafter referred to as DED, was reported from Canada in 1944 from the province of Quebec. By 1946 the fungus had spread into eastern Ontario and is now found in most parts of the province where elm trees grow. Movement of the fungus into Ontario from points in the United States has contributed to the rapid spread. The fungus is also well established in Manitoba and some eastward spread from that province may have contributed to the presence of the disease in the Kenora area. The majority of the elm in Ontario is found in the southern part of the province where *C. ulmi* has been active for a number of years. This area is comprised of the Algonquin, Central, Southeastern and Southwestern regions and in 1953 had a total of 304 429 600 cu. m of elm primary growing stock,

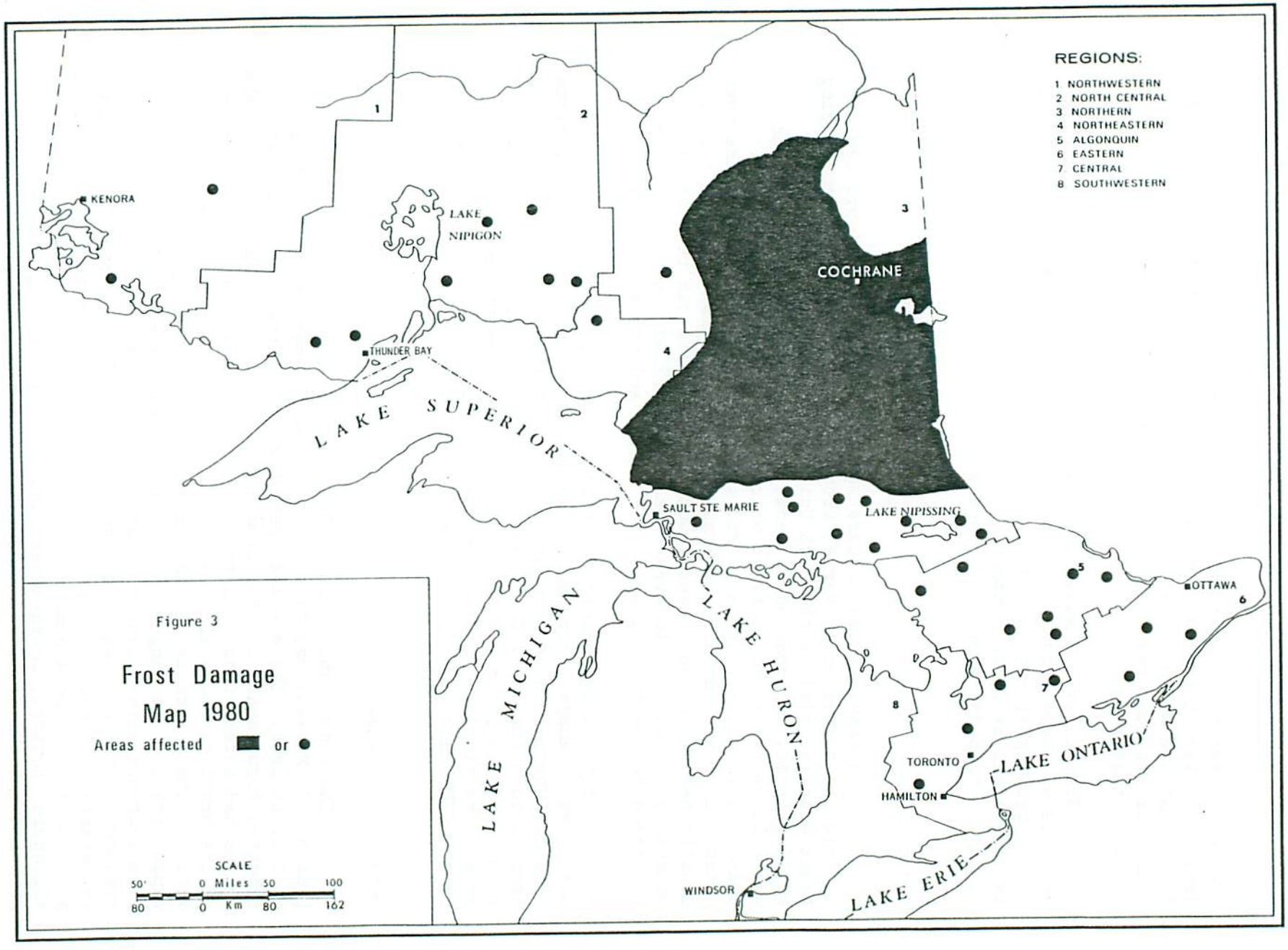

REGIONS:
1 NORTHWESTERN
2 NORTH CENTRAL
3 NORTHERN
4 NORTHEASTERN
5 ALGONQUIN
6 EASTERN
7 CENTRAL
8 SOUTHWESTERN
KENORA
LAKE NIPIGON
COCHRANE
THUNDER BAY
LAKE SUPERIOR
SAULT STE MARIE
LAKE NIPISSING
OTTAWA
LAKE MICHIGAN
LAKE HURON
TORONTO
LAKE ONTARIO
HAMILTON
WINDSOR
LAKE ERIE
Figure 3
Frost Damage
Map 1980
Areas affected or
SCALE
50 0 Miles 50 100
80 0 Km 80 162

Table 11. Summary of frost damage evaluations for current foliage in six districts of the Northern Region in 1980.

Location (Twp)	Tree species	Tree ht (m)	Trees affected (%)	Foliar damage (%)
Chapleau District				
Gallagher	bS	0.9	100	50
Topham	bS	0.6	100	61
Cosens	bS	0.8	100	50
Edith	bS	1.2	100	25
Edith	tA	14.0	100	100
Caverley	bF	0.7	100	100
Caverley	wS	0.9	80	90
Manning	wS	1.7	100	67
Chapleau Nursery	wS	Seedlings	75	30
Chapleau Nursery	jP	Seedlings	2	Trace
Mallard	tA	14.0	100	100
Gogama District				
Garibaldi	bS	0.7	60	15
Jack	tA	14.0	100	97
Macmurchy	tA	15.0	100	80
Miramichi	tA	14.0	100	100
Cochrane District				
Sargeant	wS	6.0	98	80
Sargeant	bF	10.0	100	30
Stinson	wS	15.0	100	95
Stinson	bF	15.0	100	95
Kapuskasing District				
Slack	bF	10.0	100	35
Slack	tA	15.0	40	28
Slack	bPo	6.0	100	58
Harmon	bF	12.0	100	40

(cont'd)

Table 11. Summary of frost damage evaluations for current foliage in six districts of the Northern Region in 1980 (concl'd).

Location (Twp)	Tree species	Tree ht (m)	Trees affected (%)	Foliar damage (%)
Kirkland Lake District				
Taylor	bF	4.5	100	100
Taylor	wS	6.1	100	80
Catharine	tA	1.8	62	40
McGarry	tA	9.2	50	50
Stock	bS	1.8	100	80
Beauchamp	tA	3.7	100	100
Timmins District				
Hillary	tA	10.7	100	90
Hassard	tA	15.3	100	90
Shaw	tA	15.3	100	90
Godfrey	bF	12.2	100	100

83.6% of which was on patented land. It is estimated that 70% of this amount, 213 100 720 cu. m, has since been lost to DED. It is difficult to put a monetary value on this loss as it represents trees in urban areas, fence rows, unmanaged woodlots and so forth, much of which would not have been cut for commercial purposes, as well as trees in areas which could be harvested.

The major economic impact of DED has probably been in urban areas where considerable expense has been incurred by individuals and municipalities for tree removal, sanitation, chemical control and replanting operations. The magnitude of the problem can be understood when one recognizes that elm may constitute as much as 50%-80% of the shade trees of many cities in Ontario. Toronto, for example, has approximately 500,000 elms, Sault Ste. Marie 8,000, Kitchener 7,000 and Windsor 10,000.

Sault Ste. Marie has maintained a DED control program since 1968 and a more comprehensive program since 1976. From 1968 to 1976 the city spent $185,200 on tree removal, sanitation and chemical injection in its DED control program. This cost included the removal of 3,415 trees, sanitation operations and chemical injection of 102 trees. Annual sanitation costs are not available for all years but in 1976 this operation totalled $45,000. In 1977, $58,051 was spent on chemical injection of 101 trees, sanitation and the removal of 740 dead or dying infected elms. The 10-year cost of the DED control program was $243,251. By 1979 the sanitation and removal costs had been reduced to $24,501 but the fact that no chemical injections were made helped to reduce the cost. It is expected that the cost of the control program will decrease as the elm population decreases. Many other cities conduct DED control programs similar to that of Sault Ste. Marie and even in cities where no control is attempted the cost of tree removal cannot be avoided. It appears that DED will intensify in areas of northwestern Ontario, where it has been found only recently, and will continue to cause mortality in the areas where it is long been well established.

Forest Tent Caterpillar (*Malacosoma disstria* Hbn.)

In general, forest tent caterpillar infestations in northern Ontario continued to decline in 1980 (Fig. 4). Aerial observers mapped moderate-to-severe defoliation of aspen stands within approximately 325 500 ha of forest land compared to 2 650 936 ha in 1979. The decline in 1980 was attributed largely to frosts that occurred after larvae emerged in late April and early May as well as natural mortality factors such as parasitism and disease.

Regionally, the biggest change occurred in the Northwestern Region, where heavy infestations totalling some 2 120 000 ha in 1979 virtually collapsed in 1980. Only light-to-moderate defoliation of trembling aspen (*Populus tremuloides* Michx.) remained within an area

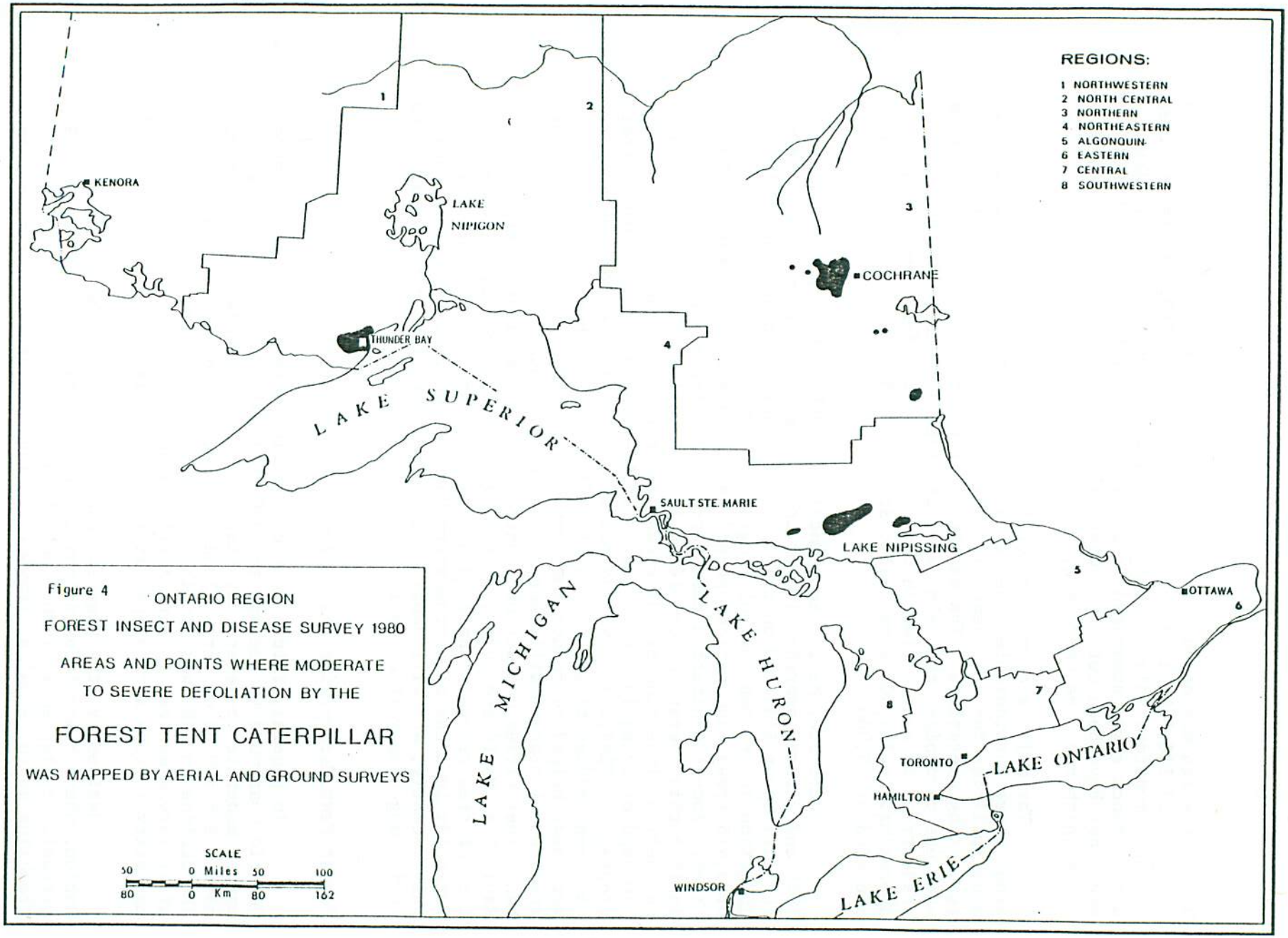


Figure 4 ONTARIO REGION

FOREST INSECT AND DISEASE SURVEY 1980

AREAS AND POINTS WHERE MODERATE TO SEVERE DEFOLIATION BY THE

FOREST TENT CATERPILLAR

WAS MAPPED BY AERIAL AND GROUND SURVEYS

of approximately 64 700 ha in Fort Frances District near Lake of the Woods. Elsewhere a few small patches of light defoliation occurred in the Sioux Lookout and Ignace districts. In the North Central Region, a total of 54 000 ha of moderate-to-severe defoliation was mapped compared to 259 000 ha in 1979. The infestation in the Atikokan District collapsed, presumably as a result of frost killing young larvae, whereas the infestation in Thunder Bay District, which experienced more favorable weather, expanded somewhat. In the Northern Region, infestations in the Hearst, Moosonee and Kapuskasing districts collapsed with the exception of a few small pockets of light defoliation. An infestation covering approximately 13 000 ha occurred in the Cochrane District in and around Greenwater Provincial Park and another sizeable infestation occurred near Englehart in the Kirkland Lake District. Three pockets of moderate-to-severe defoliation were mapped in the Northeastern Region, one each in the districts of Espanola, Sudbury and North Bay. The total area of defoliation mapped in the Region in 1980 amounted to 121 500 ha compared to 45 140 ha in 1979.

Forecasts for 1981 based on egg-band counts indicate that infestations have collapsed in the western part of the province with the exception that light defoliation is expected in the western part of Fort Frances District and the infestation in Thunder Bay District is expected to recur with little increase in extent of affected area. In the Kirkland Lake District, the Englehart infestation will expand somewhat and several pockets of severe defoliation will occur in the Cochrane District. The three infestations in the Northeastern Region may double in size in 1981.

SPECIAL SURVEYS

White Pine Plantations

White pine plantations were randomly selected and sampled throughout the Algonquin, Central, Eastern, Southwestern and Northeastern regions. Each survey technician attempted to sample two plantations in each of the following height strata: <2 m, 2-6 m, and >6 m. A total of 40 stands were sampled, and in each, 10 plots containing 15 white pine apiece were rated for the pests listed below.

Insects: The most abundant insect was the pine bark adelgid (*Pineus strobi* [Hartig]). It was present in 58% of the stands and 12% of the trees sampled. In all cases, however, the intensity of infestation on individual trees was rated as light.

White pine weevil (*Pissodes strobi* Peck) was present in 53% of the stands sampled, and the percentage of trees with weeviled leaders averaged 8% (range 0%-22%). White pine weevil was not encountered in the stands sampled in the Eastern Region and this is probably a reflection of control programs in that region. Also, trees more than 2 m tall were most affected, probably as a result of population buildup as stands age.

Pine spittlebug (*Aphrophora cribrata* [Say]) was commonly present in all but the Eastern Region on all height classes. Intensity of infestation was always low to trace, and over all the insect was present on 7% of the trees sampled.

Pine false webworm (*Acantholyda erythrocephala* [L.]) has caused serious defoliation of pine in recent years. This year population levels were low on white pine in plantations. Webworm was present in 10% of the stands sampled, usually with less than 3% of the trees infested.

European pine shoot borer (*Eucosma gloriola* Heinrich) was unimportant. It was detected in only two stands with only one or two trees affected in each.

Diseases: White pine blister rust (*Cronartium ribicola* J.C. Fischer) was the most damaging disease detected by the survey. The damage level in most plantations was low (avg 3.3%, range 0%-15%) and about half of the affected trees (avg 1.6%, range 0%-11%) had stem cankers.

The most common form of foliar damage to white pine over the years has been semimature tissue needle burn caused by air pollutants. Two stands in the Algonquin Region suffered moderate foliar damage from needle burn. Elsewhere, most stands were unaffected, but occasional trace or low damage was present. Disease-caused foliar damage was negligible.

Basal stem cankers were present in 10% of the stands sampled. Over all, fewer than 1% of the trees were affected; however, in two stands in the Algonquin Region 7% of the trees were affected. In view of the fact that basal cankers from most causes are fatal, these represent serious situations. This aspect of the survey was also designed to detect the presence of Verticicladiella root disease (*Verticicladiella procera* W.B. Kendr.), and this problem was not identified.

Armillaria root rot (*Armillaria mellea* [Vahl. ex Fr.] Kummer) does not appear to be a serious problem of white pine management in Ontario. The disease was detected in only 10% of the stands sampled but the percentage of trees affected was never greater than 2%.

Most of the mortality encountered was the result of white pine blister rust or Armillaria root rot infection. One stand had 15% mortality, but in that instance the trees were small and drought was considered a contributing factor. Mortality in all other stands did not exceed 3% and usually was less than 1%.

Black Spruce Plantations

Black spruce plantations were sampled in the Northern, Northwestern and North Central regions. Each survey field technician attempted to sample two plantations in each of the following height strata: <2 m, 2-6 m, and >6 m. A total of 34 plantations was sampled. In each, 10 plots containing 15 black spruce apiece were rated for the pests listed below.

Insects: The most important pest of black spruce was spruce budworm. Most black spruce plantations sampled for this survey within the current infestation suffered defoliation. Spruce coneworm (*Dioryctria reniculelloides* Mut. & Mun.) is a common associate of budworm, and defoliation by both insects was necessarily grouped. Budworm, however, seemed to be the principal defoliating agent. Within the infested area, 47% of the black spruce trees had budworm. Coneworm was detected only in the stands sampled in the North Central Region. Then, only plantations with trees more than 2 m tall were attacked, and in all cases fewer than 10% of the black spruce were affected. In comparison with damage to balsam fir and white spruce, defoliation of black spruce was low. Only 4% of the trees had detectable defoliation. Average defoliation was about 5% and ranged up to 35% of the current foliage.

Considerable flower and cone damage, however, can be present at this relatively low level of foliar damage. For example, stands with trees of cone-bearing size in the Northern and North Central regions had 55% and 18% of the cones damaged, respectively. The principal insects causing this damage were budworm and spruce coneworm, with some fir coneworm (*Dioryctria abietivorella* [Grote]) also present.

In the Northwestern Region, Lepdioptera played a minor role in cone damage. The spruce cone maggot (*Lasiomma* [= *Hylemya*] *anthracina* Czerny) and the spruce cone axis midge (*Dasineura rachiphaga* Tripp), both dipterous pests, caused most of the damage to cones (19% were affected).

Defoliators other than budworm and coneworm were unimportant on black spruce in 1980. Yellowheaded spruce sawfly (*Pikonema alaskensis* [Roh.]) was detected in only one stand where it caused

10% foliar damage. White pine weevil was present in 22% of the stands, but only one stand (9%) had over 2% of the leaders attacked. Damage by adult sawyer beetles was negligible.

Diseases: Diseases were unimportant in black spruce plantations. Spruce needle rust was present at low levels of foliar damage in three stands. This status has been typical for Ontario in recent years. Cone rust was not detected in this survey, but a few collections of this rust were made as part of other cone-related observations. Armillaria root rot was present in four stands, but associated mortality was never above 1%.

Frost and cold damage were important causes of foliar damage in 1980. In the North Central and Northwestern regions 27% of the trees sampled were affected by frost and caused up to 13% foliar damage. Frequently the terminal shoot was killed, and this seems to be the major influence on affected trees. Damage occurred on 23% of the black spruce foliage in the Northern Region. The percentage of trees affected averaged 84% but in this instance the cold weather in mid-June accompanied by several snows was the destructive agent.

Seed and Cone Insects of Black Spruce

Because of the concern expressed by foresters over seed production and regeneration of black spruce, and associated problems, a special effort was made to determine the extent of damage, its impact on seed production, and the causative agents (insect or disease) on black spruce cones in Ontario.

Cones were collected (the collections being timed so that the presence of expected pests could be detected) and examined at the laboratory. Collections were made both inside and outside the spruce budworm infestation, on upland and lowland sites, and where possible, on budworm-infested and budworm-free trees.

The major insect causing injury was the spruce budworm. This species fed on both the flowers (male and female) and the developing cones. Associated with budworm in the North Central and Northern regions was the spruce coneworm. This species also feeds on flowers and developing cones.

A dipterous pest, the spruce cone maggot (*L. anthracina*), was prevalent in some samples. This insect feeds as a maggot in the seed zone, utterly destroying the seeds, and drops to the ground in mid-summer. Another dipterous pest, the spruce cone axis midge (*D. rachiphaga*) bores as a maggot into the central axis of the developing cone. It does not directly destroy the seeds but at least partially interrupts the nutrient supply to the cone, thereby reducing seed development.

In the Northwestern Region, little budworm and virtually no coneworm were detected, and flower damage was minimal. However, the resulting cones were moderately damaged by lepidoptera (including budworm) (up to 41%) and the two dipterous pests, *L. anthracina* (up to 17%) and *D. rachiphaga* (up to 23%). Upland sites suffered the severest damage by lepidoptera.

In the North Central Region budworm (and in places, coneworm) was very abundant. Damaged flowers (conelets) made up 92% of the samples. The resulting damaged cones were more abundant (88%) on budworm-infested trees than on relatively budworm-free trees (11%) and damage to cones by lepidoptera and the two dipterous species was greater in the lowland sites.

In the Northern Region, budworm and coneworm were moderately abundant; damage to female flowers was high (up to 92%) in all upland samples, and moderate (up to 53%) on lowland sites. Resulting cone damage was somewhat higher in upland samples, with lepidoptera being the major contributor (up to 44%) on the upland sites and the lowland sites (up to 27%). *L. anthracina* damaged only up to 18%, whereas *D. rachiphaga* damaged only up to 5% on the lowland sites, and less than that on the upland sites.

In addition, nine samples in this region produced few or no cones and virtually all the female flowers were damaged either by budworm or by frost, or both. Regardless, there was virtually a complete loss of the cone crop in these cases.

Measurements and counts of developing seeds in sound and damaged cones showed that the mean cone size for sound cones was significantly greater than that for damaged cones from the same sample and that the number of potentially viable seeds was generally at least twice as great in the sound cones.

In summary, therefore, the destruction of potential cones by the feeding of budworm and coneworm during the flowering stage, accompanied by damage at later stages by budworm, coneworm and the two dipterous pests undoubtedly has a considerable impact on the potential seed production of black spruce, particularly in the Northern Region. Insect-caused losses can only aggravate the seed shortages that have occurred in recent years in some parts of northern Ontario.

Gypsy Moth in Northern Ontario

In 1979, the FIDS Unit was asked to assist in the detection program for gypsy moth (*Lymantria dispar* [L.]) conducted by the Plant Quarantine Division of Agriculture Canada, by deploying pheromone traps to capture gypsy moth males in provincial parks and other major parks with campgrounds across northern Ontario. FIDS technicians placed

two traps, one near the park or campground entrance and one within the camping area, at each designated park in the Northern, North Central and Northeastern regions. Traps were set out at chest level by July 15 and were picked up at the end of August. Trap catches, if any, were examined at the laboratory. The exercise was repeated in 1980.

In 1979 returns from 37 parks were negative, but in 1980 one trap within the Rabbit Blanket Lake Campground of Lake Superior Provincial Park about 50 km south of Wawa caught two male gypsy moths. The moths were identified at the Sault Ste. Marie laboratory and the identification was confirmed at the Biosystematics Research Institute in Ottawa. The results have been forwarded to the Plant Quarantine Division of Agriculture Canada.

This capture in the Wawa District, Northeastern Region, marks a significant westward extension of gypsy moth captures in Ontario.

CONTROL PROGRAMS

Spruce Budworm

The Ontario Ministry of Natural Resources aerially sprayed about 8 700 ha of commercial forest and about 1 770 ha of high-value forest in 1980. There were three parts to the program:

(i) 8 700 ha of commercially operable balsam-spruce forest in Elliott and Lamplugh townships in the Kirkland Lake District, Northern Region were sprayed by three AgCats (spray aircraft). About half of the area was treated with Matacil, using a double application of 86 g/1.4 L/ha. About 3 800 ha were treated with a double application of *Bacillus thuringiensis*; i.e., either Thuricide or Novabac; the first application was 25 BIU/4.7 L/ha and the second was 15 BIU/4.7 L/ha. An additional 400 ha were treated with a sequential application of Matacil, followed by *B.t.* Experimental applications were conducted to test a single high volume application of Matacil and a single and double application of Permethrin. The operational costs of spraying (materials + aircraft) were $8.00/ha for a double application of Matacil and $23.50/ha for a double application of *B.t.* Results in terms of foliage protection were good for all treatments.

(ii) 920 ha of high-value forest areas in Hearst, Kapuskasing, Cochrane, Gogama, Chapleau and Kirkland Lake districts in the Northern Region were treated by two helicopters, a Hughes 300 and a Bell 47. There were 21 separate areas or

stands sprayed, including white spruce and black spruce seed production areas, white spruce regeneration and nurseries. About 740 ha were treated with a single or double application of Orthene at 560 g/9.4 L/ha and 180 ha were treated with a single application of Cygon at 560 g/9.4 L/ha. The average cost of these treatment was $53.90/ha. In general, results were not satisfactory, particularly in view of the high cost.

(iii) 850 ha of wildlife management area, considered part of the high-value forest program, were sprayed in Spence Township, Parry Sound District, Algonquin Region. The deer yard was treated with a single application of Thuricide 16B or Dipel 88 at a rate of 20 BIU/4.7 L/ha using an Agcat and a Pawnee aircraft. Cost of the Thuricide treatment was $23.45/ha. Fair-to-moderate levels of balsam fir foliage protection were achieved.

Oak Leaf Shredder

In May 1980, OMNR aerially sprayed a total of 767 ha of high-value oak-maple forest in the Huronia District, Central Region for the purpose of minimizing defoliation. An AgCat sprayed a single application of Orthene 97 SP at 840 g/9.4 L/ha. Cost of the spraying was $19.37/ha and the results were satisfactory.

PUBLICATIONS AND UNPUBLISHED RESULTS

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12. Lawrence, H.D. and Biggs, W.D. 1980. Results of forest insect and disease surveys in the North Central Region of Ontario, 1979. Dep. Environ., Can. For. Serv., Sault Ste. Marie, Ont. 25 p. (unpubl.).

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OTHER NOTEWORTHY INSECTS AND DISEASES

Forest pests of lesser importance in 1980 are included in the following tables to provide information on the history and fluctuation in populations of these pests. For example, although the forest tent caterpillar was written up as a major pest this year, populations declined to low levels in 1980 after several years of severe, widespread outbreaks. This pest will likely be mentioned only in the tables in the 1981 report. Undoubtedly populations of this insect will start increasing in a few years, probably in the mid-1980s, and the forest tent caterpillar will again become a major pest throughout Ontario. Many other organisms may never become problems at the provincial or even forest region level but they can cause significant damage in local situations.

Forest insect pests and diseases are listed alphabetically by their common name. Each organism listed is rated according to its importance as follows:

A - of major importance, capable of killing or severely damaging trees or shrubs;

B - of moderate importance, capable of sporadic or localized injury to trees or shrubs;

C - of minor importance, not known to present a threat to living trees or shrubs;

F - insects of forest products or insects associated with the forest environment but not attacking forest trees or shrubs.

OTHER NOTEWORTHY INSECTS AND DISEASES

Insects or diseases	Host(s)	Location	Remarks	Rating
Ambermarked birch leafminer *Profenusa thomsoni* (Konow)	Birch, white	Geraldton District	Severe browning.	B
American aspen beetle *Goniotena americana* (Schaef.)	Aspen, trembling	Northern Ontario and Algonquin Provincial Park	Moderate-to-severe defoliation in scattered areas.	B
Annosus root rot *Fomes annosus* (Fr.) Karst.	Pine, red	Central Region	Newly detected infection centres in a merchantable plantation in Blenheim Twp. Scattered mortality with heavy damage on 1.6 of the 8 ha.	A
Aspen leafblotch miner *Lithocolletis ontario* Free.	Aspen, trembling	Northern Ontario and Algonquin Region	Population levels fluctuated. Light-to-heavy foliar damage.	B
Aspen leafroller *Pseudexentera oregonana* Wlshm.	Aspen, trembling	Province-wide	Declining population in northern Ontario. Light-to-moderate populations throughout southern Ontario.	A
Aspen twinleaf tier *Enargia decolor* Wlk.	Aspen, trembling	Temagami District and from French River to Bracebridge in the Parry Sound and Bracebridge districts	Moderate-to-severe defoliation.	B
Balsam fir sawfly *Neodiprion abietis* complex	Balsam fir	Northern Ontario and Eastern and Algonquin regions	Low-to-moderate defoliation.	A

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Balsam poplar leafblotch miner *Lithocolletis nipigon* Free.	Poplar, balsam	Thunder Bay District	High numbers recurred.	B
Basswood looper *Erannis tiliaria* Harr.	Basswood	Tavistock, Aylmer District	Low populations, but buildup expected in 1981.	B
Birch leafminer *Fenusa pusilla* (Lep.)	Birch, white	Northwestern Ontario, Thunder Bay, Thunder Bay District	Generally low numbers. Heavy infestation in and around city.	A
Birch skeletonizer *Bucculatrix canadensisella* Cham.	Birch, white	Fort Frances, Fort Frances District and Iron Bridge, Blind River District to Chapleau, Chapleau District	Increased populations with moderate defoliation.	A
Blackheaded budworm *Acleris variana* Fern.	Spruce, white, black, blue Hemlock	Fort Frances, Fort Frances District Huronia District and Woodstock, Aylmer District	Light infestation on ornamentals. Common, light-to-heavy infestations.	B
Black knot of cherry and plum *Apiosporina morbosa* (Schw.) Arx	Cherry, pin, choke, black Plum	Common throughout the range of the host	Causing significant damage to some plum trees in Sault Ste. Marie and other scattered locations in the province.	B
Bronze birch borer *Agrilus anxius* Gory	Birch, white	Red Lake District	Serious damage and moderate mortality throughout 195 km^2 of forest.	B

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)			Rating
Brown spot needle blight *Scirrhia acicola* (Dearn.) Siggers	Pine, Mugho	Sauble Falls Provincial Park, Owen Sound District	Defoliation found on three Mugho pine. This is the first record of this fungus in Ontario and the first record on Mugho pine.	A
Cedar leafminers *Argyresthia aureoargentella* Brower, with *A. canadensis* Free., *A. thuiella* Pack. and *Pulicalvaria thujaella* (Kft.)	Cedar, white	Southern Ontario	Populations increasing except in Algonquin Region. Twig and top mortality common, with tree mortality showing up near Owen Sound.	A
Comandra blister rust *Cronartium comandrae* Pk.	Pine, jack	Throughout the range of its host	Common at trace levels.	B
Conifer-Aspen rust *Melampsora medusae* Thuem.	Aspen, trembling Larch, eastern Poplar, hybrid	Northeastern and Southwestern regions	Trace levels with occasional high foliar damage on certain hybrid poplar clones.	B
Dieback of pine *Cenangium ferruginosum* Fr. ex Fr.	Pine, jack	Central Region	Occurrence at low levels.	B
Eastern dwarf mistletoe *Arceuthobium pusillum* Pk.	Spruce, black	Province-wide	Common cause of witches' brooms throughout the range of its host.	A
Eastern larch beetle *Dendroctonus simplex* Lec.	Tamarack	South Gower Township, Brockville District	High populations in dying trees.	C

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Eastern pine shoot borer *Eucosma gloriola* Heinr.	Pine, jack, red, white	Province-wide	Low numbers persist in the northwest, but northeastern, central and southern Ontario suffered heavy damage with southwestern Ontario experiencing low levels.	B
Elm lace bug *Corythuca ulmi* O. & D.	Elm, white	Wilberforce Township, Pembroke District	Heavy damage.	B
Elm spanworm *Ennomos subsignarius* Hbn.	Oak, red Maple, sugar	East of Thessalon, Blind River District	High populations for second consecutive year.	C
European pine sawfly *Neodiprion sertifer* (Geoff.)	Pine, red, Scots, Mugho	Sault Ste. Marie, Cornwall, Napanee, Tweed, Pembroke, Lindsay and Chatham districts	Increased populations at these locations. Elsewhere populations remain at low levels.	A
European pine shoot moth *Rhyacionia buoliana* (Schiff.)	Pine, red, Scots	Southwestern and Central regions	After a period of low populations several scattered areas suffered heavy infestation.	A
Fall cankerworm *Alsophila pometaria* (Harr.)	Maple, Manitoba	Petawawa, Pembroke District, and Cambridge District	Heavy damage to shade trees.	A

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Fall webworm *Hyphantria cunea* Dru.	Hardwoods	Fort Frances and North Bay districts, Algonquin Provincial Park, Eastern Region Central and Southwestern regions	Single scattered colonies. Moderate infestation expanding. Low-to-moderate numbers. Increasing numbers and severe defoliation throughout most of area.	B
Fir needle rust *Pucciniastrum epilobii* Otth.	Fir, balsam	North Central Region	Occurrence at trace levels.	B
Greenstriped mapleworm *Dryocampa rubicunda rubicunda* Fabr.	Maple, red, sugar	Blind River and Elliott Lake, Blind River District	Marked increase in population levels and pockets of heavy defoliation.	A
Hemlock looper *Lambdina fiscellaria fiscellaria* Gn.	Hemlock	Minden and Bancroft districts	Low levels of larvae in previously severely infested trees.	A
Horse-chestnut leaf blotch *Phyllosticta sphaeropsoidea* Ellis & Everh.	Horse-chestnut	Central and Southwestern regions	Foliar damage from trace to severe on scattered ornamentals.	B
Hypoxylon canker *Hypoxylon mammatum* (Wahl.) J.H. Miller	Aspen, trembling	Province-wide	Common in mature stands.	A
Ink spot of poplar *Ciborinia whetzelii* (Seaver) Seaver	Aspen, trembling	Province-wide	Common at low levels of foliar damage. Severity of damage considerably reduced from levels present in 1979.	A

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Jack pine budworm *Choristoneura pinus pinus* Free.	Pine, Scots, jack	Northwestern Ontario and southern Ontario	Population increase in Kenora District failed to materialize. Light infestations only. Light infestations in Maple and Huronia districts and Pelee Island.	A
Jack pine sawfly *Neodiprion pratti paradoxicus* Ross	Pine, jack	Moneymore, Tweed District and North Algona Twp, Pembroke District	Increasing and heavy populations caused major defoliation. Light-to-severe defoliation throughout region.	A
Jack pine tip beetle *Conophthorus banksianae* McPh.	Pine, jack	Northern Ontario	Common, low to high populations in many plantations with conspicuous damage.	C
Larch casebearer *Coleophora laricella* Hbn.	Tamarack Larch, European	Province-wide	Pockets of low populations throughout north. Widespread with pockets of heavy-to-severe defoliation throughout southern Ontario.	B
Larch sawfly *Pristiphora erichsonii* (Htg.)	Tamarack Larch, European	Province-wide	Generally low-to-moderate populations in northern Ontario with pockets of increasing damage. New distribution record at Otoskwin River. In southern Ontario populations were light with increases in the Central and Southwestern regions.	A

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Large aspen tortrix *Choristoneura conflictana* Wlk.	Aspen, trembling	Espanola, Parry Sound, Bracebridge and Minden districts	Moderate-to-severe defoliation, 2 500 ha severely defoliated for third year at Parry Sound.	B
Leaf and twig blight *Venturia macularis* (Fr.) Muller & Arx	Aspen, trembling	Province-wide	Common at low levels of terminal kill. Disease incidence low relative to 1978 and 1979.	A
Leaf anthracnose *Kabatiella apocrypta* (Ell. & Everh.) Arx	Maple	Southwestern Region	Levels of foliar damage relatively low compared to levels in recent years. Still occasionally present at the moderate level of foliar damage.	B
Leaf spot of aspen *Marssonina brunnea* (Ell. & Ev.) Magn.	Aspen	Algonquin Region	Low level of occurrence.	B
Leaf spot of aspen *Marssonina populi* (Lib.) Magn.	Aspen, trembling	Central Region	Low level of occurrence.	B
Maple canker *Eutypella parasitica* Davidson & Lorenz	Maple, sugar	Wingham and Owen Sound districts	Special survey of maple decline plots indicates 7 percent of the sugar maple in this District has maple canker.	B
Maple leafcutter *Paraclemensia acerifoliella* Fitch	Maple, sugar	Robertson Tract, Cambridge and Elmira, Cambridge District; Uxbridge, Maple District; Napanee and Bancroft districts	Light-to-heavy damage by this usually rare insect. Up to 100% defoliation.	B

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Mountain ash sawfly *Pristiphora geniculata* Htg.	Mountain-ash	Province-wide	High populations throughout much of northern Ontario. New record at French Lake, 65 km west of previous boundary. Defoliation in southern Ontario varied from light to heavy.	A
Native elm bark beetle *Hylurgopinus rufipes* Eich.	Elm, white	Fort Frances, Fort Frances District	Galleries of this main vector of Dutch elm disease were common in infested trees.	A
Needle cast of jack pine *Davisomycella ampla* (J.J. Davis) Darker	Pine, jack	Northeastern Region	Common at the trace damage level.	B
Northern pine weevil *Pissodes approximatus* Hopk.	Pine, white	Turkey Point Provincial Park, Simcoe District	Drought-damaged trees infested.	A
Orangestriped oakworm *Anisota finlaysoni* Riotte	Oak, bur	Napanee and Cambridge districts; Toronto, Maple District	Populations up markedly.	A
Orangestriped oakworm *Anisota senatoria* J.E. Smith	Oak, white	Southwestern Region	Light-to-moderate infestations.	A
Pine bark aphid *Pineus strobi* Htg.	Pine, white	Greenwater Provincial Park, Cochrane District	Trees heavily infested, common elsewhere throughout range of white pine.	B
Pine engraver beetle *Ips pini* Say	Pine, red	Midhurst nursery, Huronia District	Associated with patches of mortality near nursery.	B

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Pine false webworm *Acantholyda erythrocephala*	Pine, red, jack, Scots, white	Southern Ontario	Population levels generally increasing; older infestations declining.	A
Pine needle midge *Contarinia baeri* (Prell.)	Pine, Scots	Southern Ontario	First record in Huronia District. Low populations in Southwestern Region with pockets of higher levels in the Central and Algonquin regions.	B
Pine needle rust *Coleosporium asterum* (Diet.) Syd.	Pine, jack, red	Algonquin, North Central and Northeastern regions	Common at low levels of foliar damage on small trees; however, damage levels reduced compared to 1979.	B
Pine spittlebug *Aphrophora cribrata* (Say)	Pine, Scots, white	Southern Ontario north to Blind River District	Light-to-severe damage scattered throughout; populations declined at Espanola.	A
Pine tortoise scale *Toumeyella parvicornis* (Ckll.)	Pine, jack, Scots	Parry Sound, Algonquin Park and Tweed districts	Heavy infestations with some tree mortality of jack pine. Moderate infestations on Scots pine.	A
A poplar blister mite *Phyllocoptes didelphis* Keifer	Aspen, trembling	Asquith Twp, Gogama District	Severe damage.	C
Poplar gall mite *Aceria* near *dispar* (Nalepa)	Aspen, trembling	Atikokan and Thunder Bay districts	Heavy, widespread damage.	C

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Poplar gall mite *Eriophyes* sp.	Aspen, trembling	Northern Region	Small pockets of heavy infestation.	C
Poplar leaf beetle *Chrysomela walshi* Brown	Poplar, balsam	Northern Region	Populations remain high with severe discoloration and damage to trees.	C
Poplar and willow leafroller *Archips mortuanus* Kft.	Sweet gale	Burnaby Township, Temagami District	Heavy infestations along lakeshores.	C
Redheaded jack pine sawfly *Neodiprion virginianus* complex	Pine, jack	Northwestern and North Central regions Northern and Northeastern regions	Low populations. Pockets of severe defoliation.	B
Redheaded pine sawfly *Neodiprion leconteï* (Fitch)	Pine, red, jack	Southern Ontario east of HW 400 Sault Ste. Marie District	Generally low populations with pockets of severe defoliation. Heavy damage and population increase.	A
Rhizina root rot *Rhizina undulata* Fr.	Conifers	Province-wide	Fruiting common following fire on upland sites previously occupied by coniferous forests.	A
Root rot *Armillaria mellea* (Vahl ex Fr.) Kumm.	Pine, jack, red, Scots	Province-wide	Common at light damage levels in young plantations.	A
Root rot *Polyporus tomentosus* Fr.	Pine, red	St. Williams, Simcoe District	Found causing root rot on one semimature red pine.	A

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Saddled Prominent *Heterocampa guttivitta* (Wlk.)	Maple, sugar	Huronia and Maple districts	Light infestations. Occasional larvae found.	A
Satin Moth *Leucoma salicis* L.	Poplar, lombardy, silver	Eastern Region	Populations and distribution continue to increase.	A
Seedling root rot *Cylindrocladium floridanum* Sob. & Seymour	Spruce, black	Midhurst Nursery, Huronia District	Mortality at 80% level in one compartment of black spruce.	A
Spruce broom rust *Chrysomyxa arctostaphyli* Diet.	Spruce, black	Province-wide	Occasionally present at trace levels throughout the range of its host.	B
Spruce canker *Leucostoma kunzei* (Fr.) Munk	Spruce	Province-wide	Continues to cause damage to spruce planted as ornamentals; most severe on blue spruce.	B
Spruce coneworm *Dioryctria reniculelloides* Mut. & Mun.	Spruce, white black	Eastern half of North Central Region, Northern and Northeastern regions; Cambridge District	Low-to-moderate numbers.	C
Spruce needle rusts *Chrysomyxa ledi-* (Alb. & Schw.) d By. and *Chrysomyxa ledicola* Lagh.	Spruce, black, white	Throughout host range	Occasionally present at trace level of foliar damage on understory trees. This level of damage has been typical for several years.	B
Spruce spider mite *Oligonychus ununguis* Jac.	Tamarack	French Lake, Atikokan District; Thunder Bay and Nipigon districts	Yellowing of small trees.	B

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (continued)

Insects or diseases	Host(s)	Location	Remarks	Rating
Stalactiform rust *Cronartium coleosporioides* Arth.	Pine, jack	Throughout the range of its host	Common at trace levels.	B
Sweetfern rust *Cronartium comptoniae* Arth.	Pine, jack	Throughout the range of its host	Common in scattered plantations, causing moderate damage on younger trees.	B
Sycamore anthracnose *Discula platani* (Pk.) Sacc.	Sycamore	Southwestern Region	Continues to be a common foliar problem of ornamental trees.	B
Tar spot *Rhytisma acerinum* (Pers. ex Sainte Amans) Fr.	Maple, red	Algonquin Region	Common, trace foliar damage.	C
Tar spot of willow *Rhytisma salicinum* (Pers.) Fr.	Salix	Province-wide	Trace levels throughout the range of the host.	C
Uglynest caterpillar *Archips cerasivoranus* (Fitch)	Cherry, choke, pin	Province-wide	Generally low-to-moderate levels, but high populations in northern and southwestern Ontario.	B
Walnut caterpillar *Datana integerrima* G. & R.	Walnut, black Hickory Butternut	Central and Southwestern regions	Population increases with heavy damage over most of area.	C
White pine blister rust *Cronartium ribicola* J.C. Fischer	Pine, white	Throughout the range of its host	Common at the trace damage levels, occasionally causing severe mortality.	A

(continued)

OTHER NOTEWORTHY INSECTS AND DISEASES (concluded)

Insects or diseases	Host(s)	Location	Remarks	Rating
White pine weevil *Pissodes strobi* (Peck)	Pine, white, jack	Province-wide	Populations were lower in northern Ontario, but increased towards the east. Similarly southeastern Ontario showed higher levels.	A
Woolly larch aphid *Adelges strobilobius* Kalt.	Spruce, black	Ignace District and Shoals Provincial Park, Chapleau District	Light infestation. Heavy damage on understory trees.	C
Yellowheaded spruce sawfly *Pikonema alaskensis* Roh.	Spruce, white, black, blue	Northern Ontario	Pockets of severe defoliation with tree mortality in northwestern Ontario.	A
		Southern Ontario	Pockets of moderate-to-severe damage with low numbers in the southwestern portion.	
Yellow spruce budworm *Zeiraphera canadensis* Mut. & Free.	Spruce, white, Norway, Chinese	North Central and Northwestern regions (Terrace Bay to Kenora)	Scattered pockets of heavy defoliation of natural stands of white spruce and open growing trees and ornamentals.	B
		Simcoe, Aylmer and Cambridge districts	Medium infestations.	