RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE NORTHEASTERN REGION OF ONTARIO, 1984

(FOREST DISTRICTS: WAWA, SAULT STE. MARIE, BLIND RIVER, ESPANOLA, SUDBURY, TEMAGAMI AND NORTH BAY)

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2) those which are capable of causing serious damage but, because of low populations or for other reasons, did not cause serious damage in 1984.

Note: Forest districts affected by specific insects or diseases are listed beneath the names of those insects or diseases in the Table of Contents.

The assistance and cooperation extended to the authors by the Ontario Ministry of Natural Resources, wood-using industries and private individuals during the 1984 field season are acknowledged.

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INSECTS

Major Insects

Eastern Blackheaded Budworm, *Acleris variana* (Fern.)

Although unusually high populations of this insect in 1983 caused severe defoliation to approximately 2,220 ha of eastern hemlock (*Tsuga canadensis* [L.] Carr.) stands in the La Cloche Mountains, Sudbury District, marking the first occurrence of damage by the eastern blackheaded budworm in the area in three decades, populations collapsed in 1984.

In late 1983, egg counts revealed that 56.6% of the eggs were parasitized, which suggested that a marked decrease in populations would occur in 1984. Past records show that severe outbreaks of the insect are sporadic and short-lived and that this sudden collapse in infestation was not unusual.

Elsewhere in Wawa, Sault Ste. Marie, Blind River and Sudbury districts, small numbers of larvae observed in 1983 did not recur in 1984.

Cedar Leafminer, *Argyresthia aureoargentella* Brower

In 1983, severe deterioration of eastern white cedar (*Thuja occidentalis* L.) foliage occurred through an area of about 4,540 ha, stretching from Mills Township east to Hungerford Point on Manitoulin Island, including 570 ha on Fitzwilliam, Rabbit and Wall islands. Ground checks showed that although low numbers of cedar leafminers were present in affected stands, populations were not high enough to account for all the damage observed.

In 1984, however, aerial and ground surveys revealed high populations and severe foliage damage through approximately 3,407 ha of forested land. The aerial surveys revealed damaged cedar stands as far west as Kitchener Island. Damage was also mapped on the south shore of Manitoulin Island, from Burnt Island east to Hungerford Point, Espanola District. Populations collapsed on Rabbit and Wall islands but recurred on Fitzwilliam Island.

Some twig mortality has been recorded and often subsequent branch and whole tree mortality occurs if populations continue to exist unchecked.

Birch Skeletonizer, *Bucculatrix canadensisella* Cham.

The distribution and area defoliated by this pest of white birch (*Betula papyrifera* Marsh.) decreased dramatically across the Region in 1984.

The most significant decrease occurred in the Sudbury District and western portions of the North Bay and Temagami districts where populations collapsed and no defoliation was observed. However, moderate-to-severe defoliation of white and yellow birch (*Betula alleghaniensis* Britton) persisted in the eastern part of Temagami District and continued south into the central portions of the North Bay district, totalling an area of approximately 419,192 ha compared to 1,726,960 ha recorded in 1983 (Fig. 1).

Moderate isolated pockets of skeletonized foliage were found far to the south of the main infestation in Nipissing Township, North Bay District. It is anticipated that a further decline in population level will occur in 1985.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)

This insect caused moderate-to-severe defoliation to trembling aspen (*Populus tremuloides* Michx.) trees in the Espanola District again in 1984.

Approximately 3,200 ha of damage were mapped by aerial surveys in Shakespeare, Gough, Salter, Hallam and May townships, marking a slight increase over the 2,500 ha mapped in 1983. On Manitoulin Island, a new area of infestation was detected by aerial surveys, totalling 1,200 ha of forested land in Allan and Burpee townships, Espanola District. The total area infested by the large aspen tortrix in 1984 increased by approximately 80% over the previous year.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

Results of damage surveys, population sampling and egg-mass counts of this perennial pest will be published with those of other regions at a later date in a report specifically devoted to this insect. That report will provide a complete description and analysis of developments in the spruce budworm situation in Ontario in 1984 and will give infestation forecasts for the province for 1985.

Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Conditions conducive to an increase in jack pine budworm populations existed for the second consecutive year in the Northeastern Region of Ontario.

Heavy flowering of jack pine (*Pinus banksiana* Lamb.) occurred in 1983 and may have influenced jack pine budworm populations, which are usually endemic, to increase, causing moderate-to-severe defoliation through 29,970 ha of forested land in portions of Blind River, Espanola and Sudbury districts. Generally, trees on rocky sites supported particularly

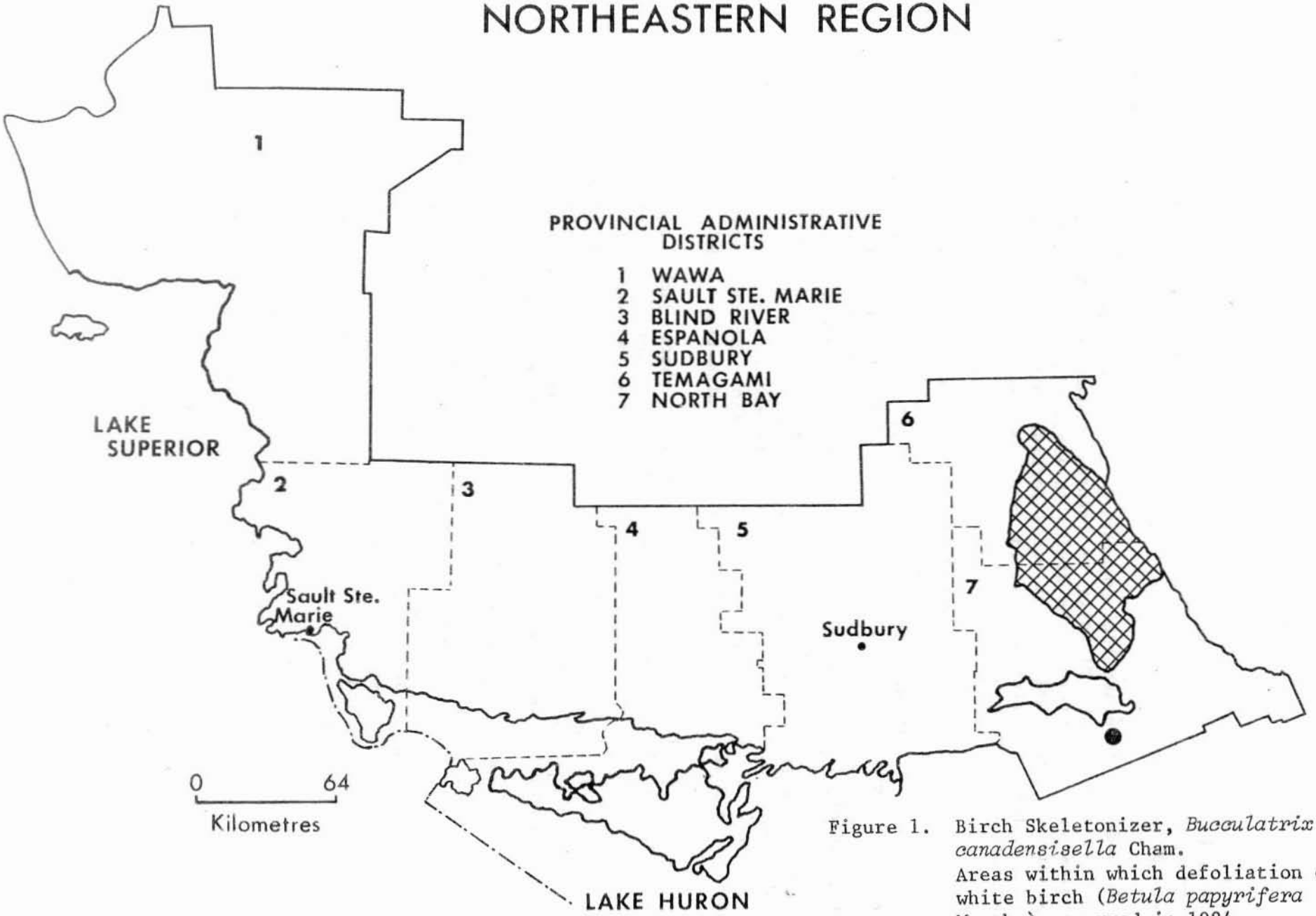


Figure 1. Birch Skeletonizer, *Bucculatrix canadensisella* Cham.
Areas within which defoliation of white birch (*Betula papyrifera* Marsh.) occurred in 1984
Moderate-to-severe . . . ● or ▨

high populations. Drought conditions reported in July and August of 1983 across Ontario may have caused a distress flower crop to occur in the spring of 1984, thus creating a condition favorable to population increases for the second consecutive year.

In order to forecast 1984 population levels in areas of concern as delineated by the Ontario Ministry of Natural Resources (OMNR), 20 egg-mass samples were taken across the Region in 1983. The results indicated that moderate-to-severe defoliation would persist in Cartier and Cascaden townships, Sudbury District and would increase in Monestime Township, Espanola District in 1984.

In 1984, jack pine budworm infestations expanded 14-fold over the previous year. Three sizeable pockets and numerous small scattered infestations spread through approximately 429,220 ha of forested land. The largest of these occurred in the north central part of Espanola District around Lac Aux Sauble totalling 233,027 ha with extensions into adjacent areas of Blind River, Sudbury, Chapleau and Gogama districts. In Blind River District, infestations intensified, especially in the extreme eastern portion of the district as well as in a large pocket west of Rocky Island Lake where severe defoliation of jack pine encompassed approximately 118,021 ha. A small finger of this infestation extended west into Sault Ste. Marie District to damage 746 ha of jack pine trees (Fig. 2).

Infestations recurred in Sudbury District where jack pine surrounding Windy Lake in Cascaden and Cartier townships were again severely damaged and scattered infestations totalling 76,876 ha extended as far east as the north shore of Wanapitei Lake in Aylmer Township. In Temagami District 530 ha of jack pine trees were infested in Brewster Township, extending north into Corkill Township, Kirkland Lake District. In Wawa District and elsewhere, small numbers were recovered from roadside trees.

In areas where two years of moderate-to-severe defoliation have occurred, jack pine trees are in poor condition (see Frontispiece). Surveys west of Richie Falls, Monestime Township, Espanola District, revealed approximately 43% of the trees had the top 2-3 m of the crown seriously damaged. In this area and in Gervais, Olinyk and Redden townships, Espanola District, top mortality is impending. In Cascaden Township, Sudbury District, 5% whole tree mortality has occurred and these trees are supporting large numbers of bark beetles.

Egg surveys were made in infested and adjacent areas to provide information on overwintering populations and to assess the potential for damage in 1985. On the basis of these counts, as expressed in Table 1, infestations are expected to persist and expand slightly in Espanola, Sudbury and Blind River districts.

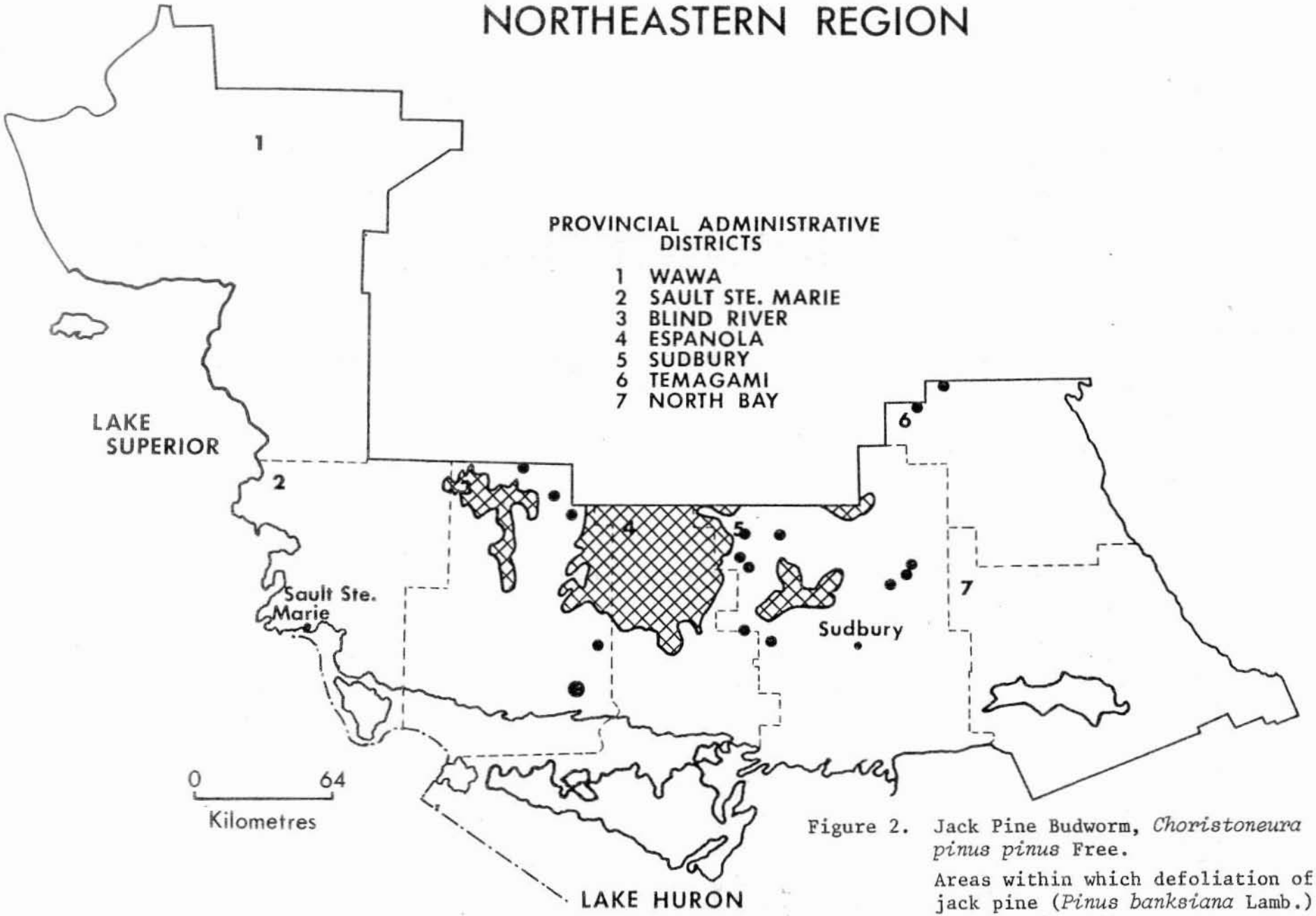


Figure 2. Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Areas within which defoliation of jack pine (*Pinus banksiana* Lamb.) occurred in 1984.

Moderate-to-severe . . . ● or ▨

Table 1. Summary of jack pine budworm defoliation and egg-mass counts in 1983 and 1984 and infestation forecasts for 1985 in the Northeastern Region (counts based on the examination of six 61-cm jack pine branch tips at each location).

Location (Twp)	Avg current defoliation		Total no. of egg masses		Infestation forecasts for 1985
	1983 (%)	1984 (%)	1983	1984	
Blind River District					
Assad	-	1	-	0	nil
Bouck	-	58	-	2	light
Esten	0	2	0	1	light
Fabbro	-	8	-	7	heavy
Gaunt	-	0	-	0	nil
Jessiman	-	7	-	17	heavy
Kirkwood, Area 1	10	0	0	0	nil
Kirkwood, Area 2	0	0	0	1	light
Kirkwood, Area 3[a]	0	0	0	0	nil
Kirkwood, Area 4[a]	0	0	0	0	nil
Martel	-	14	-	2	light
Nicholas	0	0	0	0	nil
Nuttall	-	1	-	4	medium
Rose	-	1	-	5	medium
Ruston	-	2	-	6	heavy
Sagard, Area 1	0	16	2	13	heavy
Sagard, Area 2	0	32	0	18	heavy
Sagard, Area 3	0	4	0	0	nil
Viel	0	0	0	2	light
Wardle	-	0	-	0	nil
Winkler	-	33	-	8	heavy
Espanola District					
Acheson	-	54	-	18	heavy
Alton	-	15	-	5	medium
Assef	-	33	-	10	heavy
Avis	-	30	-	13	heavy
Beebe	-	67	-	48	heavy
Craig	-	2	-	3	medium
Comox	-	3	-	8	heavy
Del Villano	-	14	-	2	light
Dennie	-	34	-	4	medium
Dunlop	-	0	-	0	nil
Durban	-	41	-	8	heavy
Ethel	-	62	-	7	heavy
Fontaine	-	56	-	10	heavy

(continued)

Table 1. Summary of jack pine budworm defoliation and egg-mass counts in 1983 and 1984 and infestation forecasts for 1985 in the Northeastern Region (counts based on the examination of six 61-cm jack pine branch tips at each location) (continued).

Location (Twp)	Avg current defoliation 1983 (%)	Avg current defoliation 1984 (%)	Total no. of egg masses 1983	Total no. of egg masses 1984	Infestation forecasts for 1985
Espanola District (cont'd)					
Foucault	-	72	-	14	heavy
Gerow	-	1	-	0	nil
Gervais	-	52	-	16	heavy
Gilbert	-	2	-	3	medium
Hotte	-	27	-	1	light
Hyman	-	0	-	0	nil
Jasper	-	33	-	11	heavy
Lefebvre	0	82	1	31	heavy
Mandamin, Area 1	-	59	-	17	heavy
Mandamin, Area 2	-	1	-	7	heavy
Monestime	3	57	5	22	heavy
Moses, Area 1	0	4	1	9	heavy
Moses, Area 2	0	14	2	10	heavy
Nairn	-	4	-	0	nil
Olinyk	-	93	-	35	heavy
Oshell	-	51	-	11	heavy
Plourde	-	1	-	6	heavy
Poncet	-	18	-	11	heavy
Prescott	-	46	-	19	heavy
Redden	-	80	-	18	heavy
Rowat	-	4	-	14	heavy
Solski	-	48	-	4	medium
Strain	-	20	-	4	medium
Teasdale	-	62	-	10	heavy
Tennyson	-	0	-	0	nil
Weeks	-	2	-	1	light
Sudbury District					
Athlone	-	4	-	9	heavy
Aylmer	-	62	-	12	heavy
Beaumont	-	16	-	1	light
Beresford	-	58	-	9	heavy
Bowell	-	76	-	9	heavy
Cartier, Area 1	52	61	5	4	medium
Cartier, Area 2	78	82	8	11	heavy
Cascaden, Area 1	94	82	10	23	heavy

(continued)

Table 1. Summary of jack pine budworm defoliation and egg-mass counts in 1983 and 1984 and infestation forecasts for 1985 in the Northeastern Region (counts based on the examination of six 61-cm jack pine branch tips at each location) (concluded).

Location (Twp)	Avg current defoliation		Total no. of egg masses		Infestation forecasts for 1985
	1983 (%)	1984 (%)	1983	1984	
Sudbury District (cont'd)					
Cascaden, Area 2	-	57	-	7	heavy
Ermatinger, Area 1	0	4	1	9	heavy
Ermatinger, Area 2	1	32	1	16	heavy
Foy	-	19	-	9	heavy
Hart	-	38	-	8	heavy
Lafleche	-	15	-	1	light
Leinster	-	43	-	28	heavy
Levack	80	14	1	2	light
Lumsden	-	2	-	7	heavy
Morse	-	27	-	4	medium
Munster	-	28	-	8	heavy
Rhodes	-	5	-	13	heavy
Stralak	-	41	-	1	light
Ulster	-	47	-	5	medium
Temagamai District					
Banks	-	15	-	1	light
Gilles Limit, Area 1	-	12	-	1	light
Gilles Limit, Area 2	-	37	-	0	nil
Klock, Area 1	-	8	-	2	light
Klock, Area 2	-	7	-	3	medium
Strathy	-	48	-	1	light

[a] Host is red pine.

Jack Pine Tip Beetle, *Conophthorus banksianae* McPherson

Surveys in 1984 revealed varying degrees of shoot mortality caused by this insect at scattered points in the Region. Sampling in jack pine plantations in each district revealed that leader damage occurred in sample plots in Wawa, Blind River and Sudbury districts. Leader mortality averaged 5.3%, 1.3% and 0.3%, respectively, in the above districts. In the sample area in Wawa District, it was noted that 72% of the trees examined in a 10-ha plantation had one or more lateral shoots killed by the insect. Elsewhere in the Region, only traces of damage could be found.

Oak Leaf Shredder, *Croesia semipurpurana* (Kft.)

Populations of this serious pest of red oak (*Quercus rubra* L.) recurred in several stands at scattered locations in the southern part of the Sault Ste. Marie and Blind River districts in 1984. Surveys revealed that populations were generally at a lower level than in 1983, except in Tarentorus Township, Sault Ste. Marie District and in Thessalon Township, Blind River District. Surveys revealed 5-ha and 20-ha pockets, respectively, of moderate-to-severe defoliation in the above townships. An increase in the percent defoliation over the previous year was recorded in each of these areas as well (Table 2).

The deployment of sex attractant pheromone traps at four points was continued in 1984, as part of an ongoing survey to evaluate the potential of pheromones as a tool in forecasting the occurrence of future infestations.

Egg samples indicate that in 1985, infestations in Hilton Township, Sault Ste. Marie District will remain low and in Tarentorus Township, Sault Ste. Marie District will decline to light intensity. Infestations in Thessalon and Long townships, Blind River District will remain moderate and light, respectively.

Greenstriped Mapleworm, *Dryocampa rubicunda rubicunda* (Fabr.)

A decrease in the area damaged by mapleworm was evident in the Northeastern Region in 1984. One pocket of heavy damage and a small area of moderate defoliation recurred in Temagami and Blind River districts, respectively. However, only trace populations could be found elsewhere in the above districts and at scattered points in the North Bay District. No insects were found in the Sudbury District in the area where a heavy infestation was reported in parts of three townships in 1983.

In the Temagami District, defoliation reached nearly 100% on red maple (*Acer rubrum* L.) trees and 40% on sugar maple (*A. saccharum* Marsh.) trees through 100 ha of forested land in Selby Township in the area where 180 ha were severely defoliated in 1983. In the Blind River District

moderate defoliation recurred on shoreline sugar maple trees on the northwest side of Basswood Lake in Day and Bright Additional Township. Trace damage was observed at only one point elsewhere in the district.

Table 2. Summary of damage by the oak leaf shredder on red oak trees in the Northeastern Region in 1983 and 1984 (counts based on the examination of the foliage on 10 branch tips, each 35 cm long, randomly selected from five trees at each location) and forecasts for 1985.

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Defoliation (%) 1983	Defoliation (%) 1984	Forecast[a] for 1985
Sault Ste. Marie District						
Hilton	40	500	25	32.3	4.0	light
Tarentorus	25	500	20	17.5	22.5	light
Blind River District						
Thessalon	100	300	25	14.3	41.0	moderate
Long	25	200	15	5.6	4.0	light

[a] Counts based on the examination of two 35-cm branch tips from the midcrowns of each of four red oak trees at each plot location.

Eastern Pine Shoot Borer, *Eusosma gloriola* Heinr.

Low population levels recurred in all areas sampled in the Northeastern Region in 1984. Quantitative sampling at four locations revealed that leader mortality ranged from 1 to 10% (Table 3). Lateral shoot mortality could only be found at one location in Nairn Township, Espanola District where 0.7% of the 1.4-m jack pine trees in a 24-ha plantation sustained light damage.

Birch Leafminer, *Fenusa pusilla* (Lep.)

High populations of this leafminer occurred for the fourth consecutive year on white birch at scattered points in the Region. As in 1983, severe leafmining was observed in various age classes of roadside and shade trees at numerous locations.

In Temagami District, damage to ornamental trees in urban areas resulted in numerous enquiries from concerned property owners. More than 80% defoliation was recorded in scattered white birch clumps through approximately 26 ha in the Latchford, Gillies, Cobalt and Haileybury areas. Severe leafmining was also evident on roadside and shade trees in Hardy Township, North Bay District; in Burwash Township and along the Veuve River in Sudbury District; and in Fenwick and Hodgins townships in the Sault Ste. Marie District, where more than 90% of the foliage was damaged on several trees examined.

Table 3. Summary of damage by the eastern pine shoot borer in the Northeastern Region in 1984 (counts based on the examination of 150 randomly selected jack pine plantations at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Leaders attacked (%)	
				1983	1984
Wawa District					
Recollet	1,000	3,000	2.2	3	1
Sault Ste. Marie District					
Hurlburt[a]	50	5,000	1.5	0	1
Temagami District					
Barr	20	2,500	2.8	13	10
Firstbrook	10	2,500	5.5	12	6

[a] 300-tree sample.

Gypsy Moth, *Lymantria dispar* (L.)

In an effort to detect and monitor spread of the gypsy moth, pheromone traps were again deployed in 1984 in specific locations across the Region (Fig. 3).

These pheromone traps contain a synthetic sex attractant which lures male moths. In 1984, 40 traps, two at each of 20 locations, were set up in provincial and private campgrounds. All pheromone trap results were negative except in Fairbanks Provincial Park, Sudbury District and at Red Lodge, Bidwell Township, Espanola District, where one male moth was

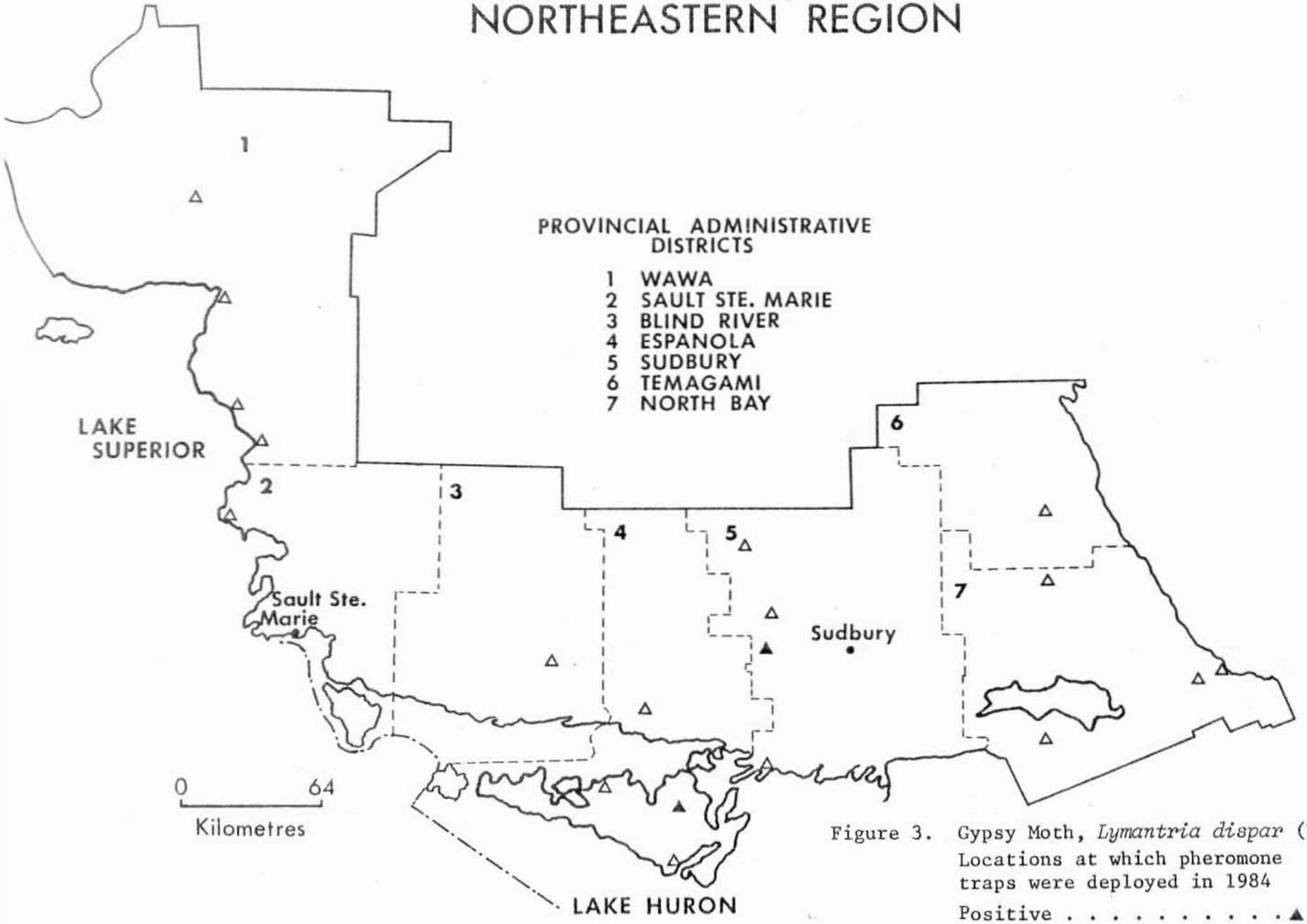


Figure 3. Gypsy Moth, *Lymantria dispar* (L.) Locations at which pheromone traps were deployed in 1984

Positive . . . . . ▲

Negative . . . . . △

Table 4. Summary of the gypsy moth pheromone trap locations and year in which male moths were captured in the Northeastern Region (two traps deployed at each location).

Location	No. of male moths captured	Year in which male moths were captured
Wawa District		
White Lake Provincial Park	1	1982
Obatanga Provincial Park	1	1981
Rabbit Blanket Lake Campground	1	1980
Agawa Bay Campground	-	-
Crescent Lake Campground	-	-
Sault Ste. Marie District		
Pancake Bay Provincial Park	-	-
Blind River District		
Mississagi Provincial Park	-	-
Espanola District		
Chutes Provincial Park	-	-
Gore Bay	-	-
Bidwell, Red Lodge	1	1984
South Baymouth Trailer Park	-	-
Sudbury District		
Halfway Provincial Park	-	-
Windy Lake Provincial Park	1	1981
Fairbanks Provincial Park	1	1984
Killarney Provincial Park	-	-
North Bay District		
Antoine Provincial Park	-	-
Martin River Provincial Park	-	-
Restoule Provincial Park	-	-
Samuel de Champlain Provincial Park	1	1983
Temagami District		
Finlayson Point Provincial Park	-	-

collected at each location (Table 4). These captures do not indicate established populations of gypsy moth in the area; rather, they demonstrate how gypsy moth adults can be brought into an area on camping equipment or vehicles.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

After declining for three consecutive years, the population of this caterpillar showed a marked increase in the Region. New infestations were found in the Temagami, Blind River and Espanola districts in 1984 (Fig. 4).

The principal area of infestation occurred in the northeastern part of the Temagami District. Defoliation of aspen stands extended from the northeastern boundary of the district southward, through approximately 50,500 ha of forests to near the Town of Latchford and the Lorrain Valley, Lorrain Township. Small pockets of infestation were recorded in aspen stands through approximately 860 ha of forest in four townships in the Depot-Elliot lakes area of the Blind River District and through 335 ha in Deagle Township, directly east of the Depot-Elliot lakes infestation, on the western boundary of the Espanola District.

Severe defoliation ranging from 50% to near 100% was evident in most aspen stands in the Temagami District infestation. In the Blind River and Espanola districts, defoliation was generally moderate and ranged from approximately 10% to 50%.

Counts of forest tent capterpillar egg bands made in late summer to forecast populations in 1985 revealed that severe defoliation is likely to recur in the Temagami District infestation and a marked increase in percent defoliation can be expected in infestations in the Blind River and Espanola districts (Table 5).

Redheaded Pine Sawfly, *Neodiprion lecontei* (Fitch)

High populations of this serious pest of pine were recorded causing heavy defoliation at two widely separated locations in the Region in 1984.

The most heavily damaged area was in Campbell Township on Manitoulin Island, Espanola District where recurring populations in several small red pine (*Pinus resinosa* Ait.) plantations, totalling 25 ha, heavily damaged approximately 34% of the trees. In 1983, 6% of the trees in the area were lightly infested. At this location staff of the Forest Pest Management Institute in Sault Ste. Marie applied a nuclear polyhedrosis virus to control populations in the infested plantations. Successful control was achieved about three weeks after application and infested insect colonies were collected for future virus production.

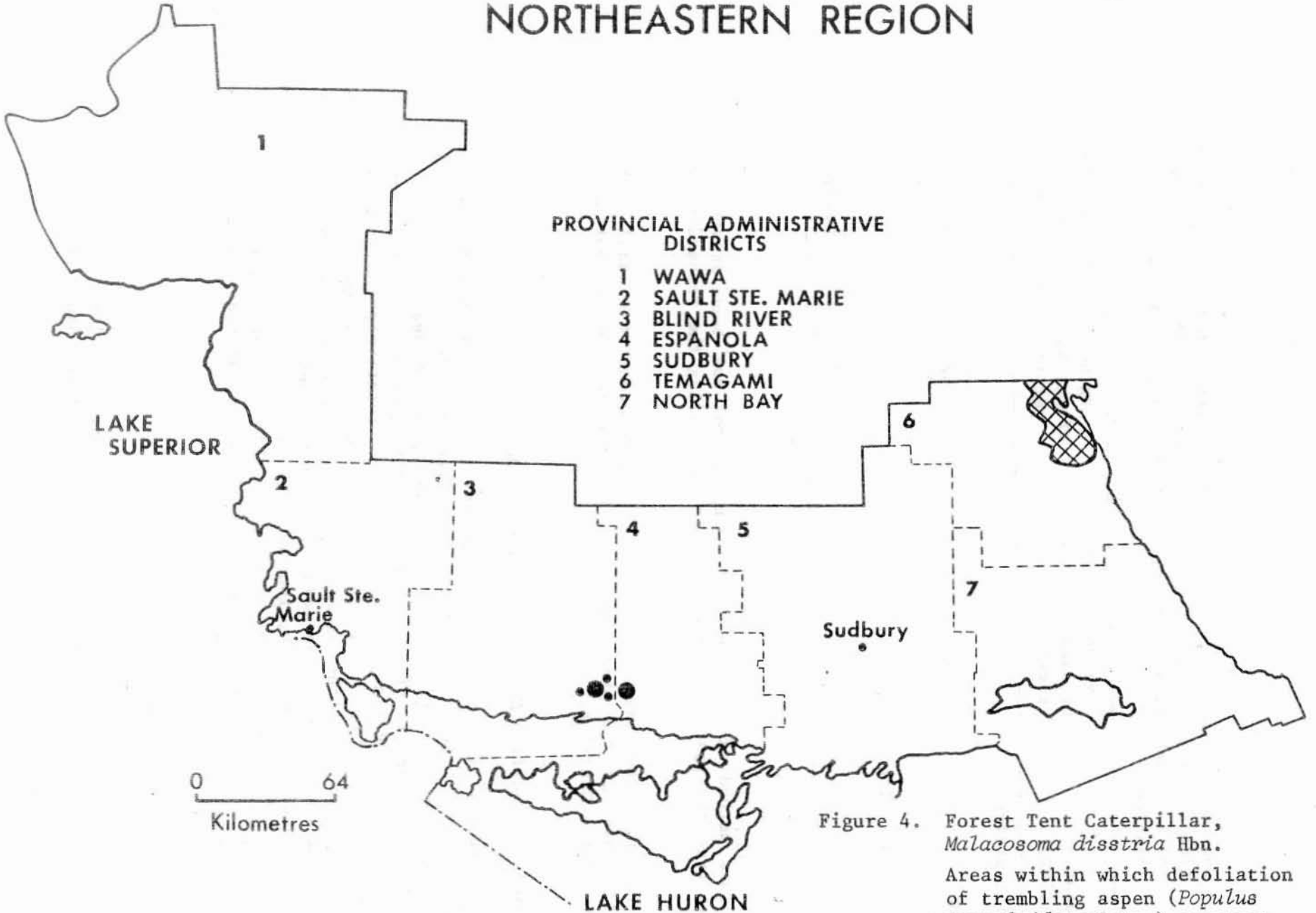


Figure 4. Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Areas within which defoliation of trembling aspen (*Populus tremuloides* Michx.) occurred in 1984

Moderate-to-severe . . . ● or ▨

Table 5. Summary of forest tent caterpillar egg-band counts and infestation forecasts in the Northeastern Region in 1984 (counts based on the examination of one or three trembling aspen trees at each location).

Location (Twp)	Avg DBH of sample trees/cm	No. of trees examined	Avg no. of egg bands per tree	Infestation forecasts for 1985
Temagami District				
Coleman	10	1	42	heavy
Bucke	10	1	26	heavy
Blind River District				
Proctor	14	3	5	heavy

This method of host-specific virus control has been proven very effective over the past several decades in controlling the redheaded pine sawfly.

The only other area of defoliation was recorded on a small number of heavily infested red pine shade trees in the village of Searchmont, Sault Ste. Marie District.

Swaine Jack Pine Sawfly, *Neodiprion swainei* Midd.

The Swaine jack pine sawfly infestation in the Elk Lake Management Unit peaked in 1981 when an area of approximately 5,700 ha of jack pine was moderately to severely defoliated. The following year the area of moderate-to-severe defoliation declined to about 4,650 ha. In 1983, populations continued to decline and defoliation was relatively insignificant over most of the previously infested areas, except for two small pockets of medium infestation in the Banks-Alexander lakes area. In 1984, the downward trend continued to the point where aerial detection of defoliation was not possible. One exception was on Island No. 127, Lake Temagami where severe defoliation of a small stand of jack pine was mapped. Colonies of the sawfly were present at most locations ground checked, but were at the lowest level recorded since 1976.

Bruce Spanworm, *Operophtera bruceata* (Hlst.)

New infestations of this geometrid occurred in 1984 in several deciduous stands, primarily maple, on St. Joseph Island, Sault Ste. Marie District and on Manitoulin Island, Espanola District.

Aerial mapping and ground surveys revealed defoliation at scattered points through approximately 5,700 ha and 126 ha, respectively, in the above areas (Fig. 5). Damage ranged from light, in a 40-ha stand in St. Joseph Township, to moderate-to-severe in Jocelyn and Hilton townships, Sault Ste. Marie District and in Allan Township, Espanola District. More than 50% defoliation of sugar maples of all sizes was common in the moderately to severely damaged areas and in some instances close to 100% of the foliage was destroyed (see photo page).

The light brownish-grey adult moths of this insect emerge in early November, the male winged and the female wingless (see photo page). After emerging from the pupal stage in the duff layer, the females crawl up the trees and lay their eggs in crevices of the bark on the trunk and larger limbs of host trees. The eggs overwinter, hatching in May of the following year.

Surveys of emerging adult populations to determine if infestations are likely to recur in 1985 were carried out at three points on 5 November and again on 9 November 1984. Large numbers of male moths were present at each survey point. Approximately 30 host trees were examined at each point on the above dates to observe the population of crawling females. Although only small numbers could be found on 5 November they were quite common on most trees examined on 9 November indicating that larval populations are likely to cause varying degrees of defoliation in 1985.

White Pine Weevil, *Pissodes strobi* (Peck)

Evaluations of damage caused by white pine weevil attacks showed that in 1984 the incidence of leader mortality declined over that reported in the two previous years in the Northeastern Region. Sampling at 13 points in pine plantations revealed an average of 11.0% leader mortality in 1984, whereas in 1982 and 1983 leader mortality averaged 34.5% and 14.5%, respectively, at points sampled (Table 6). General surveys at numerous points elsewhere in the Region revealed only low populations at scattered locations.

In conjunction with the above survey, it was noted on examination of 25 weevil-infested leaders in a white pine (*Pinus strobus* L.) plantation in Patton Township, Blind River District, that only small numbers of adult weevils emerged in the area.

Mountain-ash Sawfly, *Pristiphora geniculata* (Htg.)

A decrease in the distribution of this defoliator of mountain-ash (*Sorbus americana* Marsh.) was evident in some areas of the Northeastern Region in 1984.

Although high populations persisted and caused moderate-to-severe defoliation, ranging from 50% to 100% on roadside, fringe and lakeshore trees in the northern half and western half of the Sault Ste. Marie and

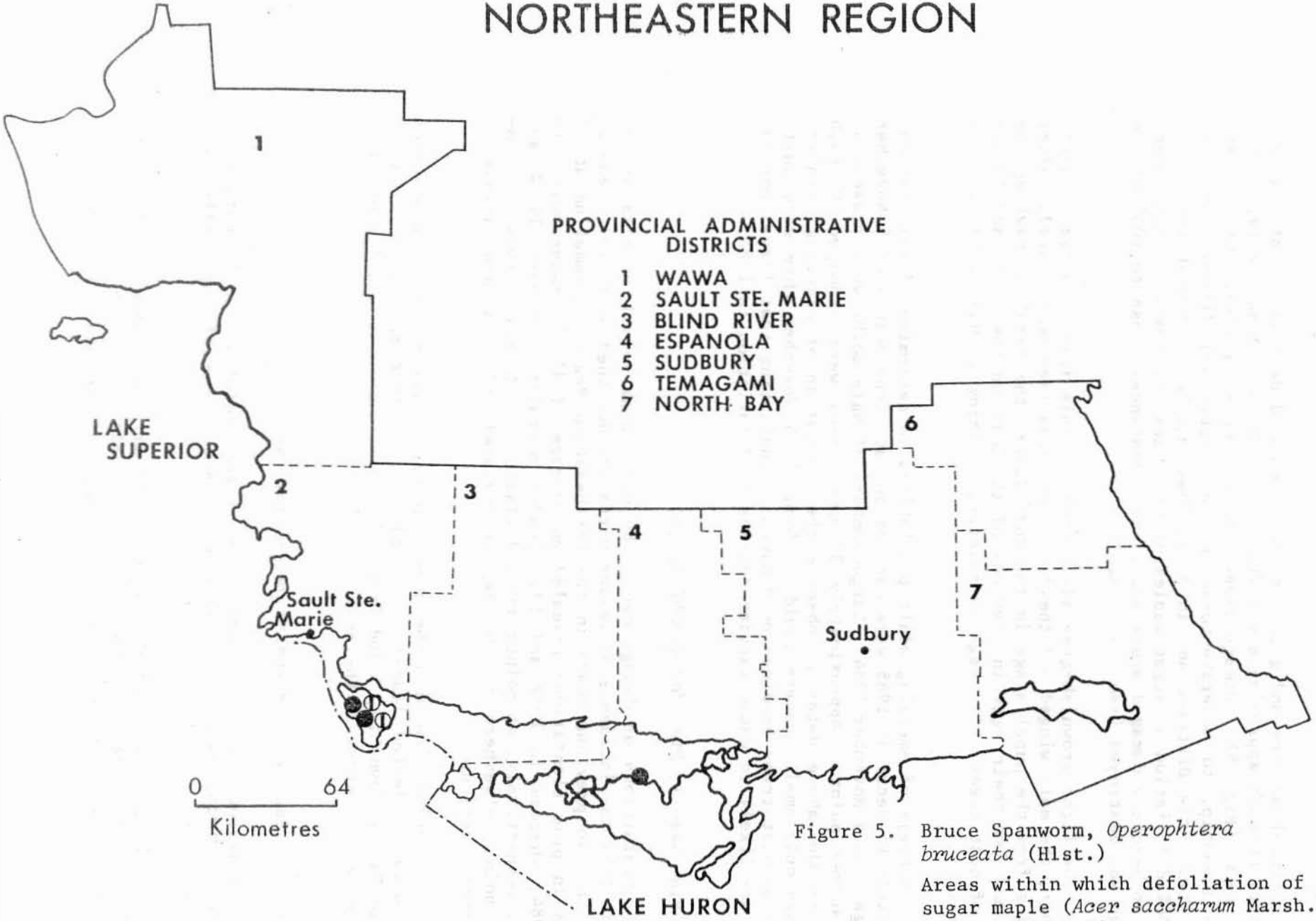


Figure 5. Bruce Spanworm, *Operophtera bruceata* (Hlst.)

Areas within which defoliation of sugar maple (*Acer saccharum* Marsh.) occurred in 1984.

Moderate-to-severe . . . . . ●

Light . . . . . ◐

Table 6. Summary of damage by the white pine weevil in plantations in the Northeastern Region from 1982-1984 (counts based on the examination of 150 randomly selected pine or spruce trees at each location).

Location (Twp)	Host(s)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Leaders attacked (%)		
					1982	1983	1984
Wawa District							
Huotari	jP	10	4,000	3.0	-	1	0
Recollet	jP	1,000	3,000	2.2	-	1	1
Sault Ste. Marie District							
Hurlburt[a]	jP	50	4,000	1.5	-	-	4
Blind River District							
Gladstone	wP	2	2,990	8.3	-	19	3
Haughton	jP	20	2,000	2.0	-	5	3
Patton	wP	20	2,000	5.0	-	-	20
Rose	wP	50	1,500	1.8	-	9	5
Villeneuve[a]							
Espanola District							
Foster	wP	20	2,990	3.3	45	60	55
Nairn[a]	jP	20	5,000	1.4	-	5	6
Sudbury District							
Lorne	jP	10	2,990	1.9	-	-	3
Lumsden	jP	30	3,500	1.6	-	-	20
Hendrie	jP	50	2,990	3.0	-	4	2
Temagami District							
Barr	jP	20	2,500	2.8	7	12	10
Firstbrook	jP	10	2,500	5.5	-	7	9

[a] 300-tree sample.

Wawa districts, respectively, numbers decreased for the second consecutive year in the Temagami District and populations collapsed in North Bay, Sudbury and Espanola districts. Elsewhere only scattered colonies could be found.

Small numbers of dead larvae collected in Herrick Township, Sault Ste. Marie District were infected by a nuclear polyhedrosis virus, the likely cause of death. The presence of this virus in insect populations is not uncommon immediately prior to and during a sudden downward trend or the collapse of an infestation.

Minor Insects

European Pine Needle Midge, *Contarinia baeri* (Prell)

A decline in the distribution and population levels of this insect occurred in 1984. Surveys throughout the Region revealed that the population was confined to the Sault Ste. Marie District and was at generally lower levels than in 1983.

Defoliation was moderate in a 10-ha Scots pine (*Pinus sylvestris* L.) plantation in VanKoughnet Township and light in a 1-ha Scots pine plantation in Jocelyn Township. Moderate-to-severe damage was recorded in both locations the previous year. Elsewhere in the district damage was at a trace level except in Plummer Township, where moderate defoliation was observed on a small number of trees in a roadside shelterbelt.

Maple Trumpet Skeletonizer, *Epinotia aceriella* (Clem.)

Populations of this insect recurred at scattered locations in the southern part of the Northeastern Region in 1984 (Fig. 6). Surveys revealed that a marked increase in area of infestation occurred on St. Joseph Island in the Sault Ste. Marie District where maple trees throughout approximately 6,000 ha of forest suffered varying degrees of defoliation, marking a 100-fold increase over the area infested in 1983. In contrast, a spectacular change in the area of infested forest was evident in the North Bay District where the area of damage decreased from close to 81,000 ha in 1983 to approximately 1,260 ha in 1984. The remaining infestations were situated at scattered points in Patterson, Pringle, Nipissing and Himsworth townships, south of Lake Nipissing. Although defoliation of leaf surfaces was less than 50% in the above areas, up to 90% of the foliage was attacked at scattered points.

Elsewhere in the Region light damage was observed in a 20-ha sugar maple stand in Gough Township, Espanola District and at scattered points along roadsides in the southern portions of Sault Ste. Marie and Blind River districts.

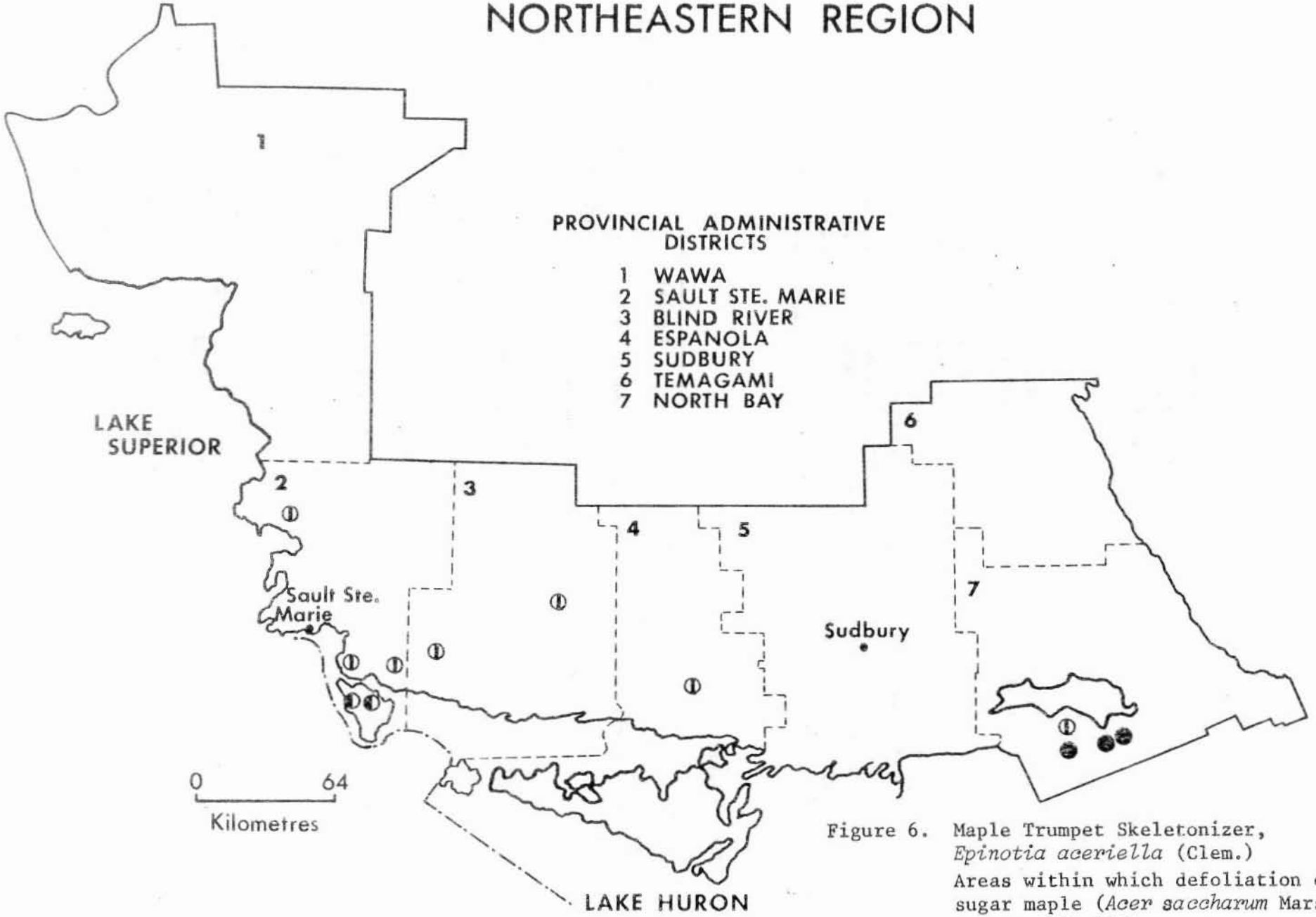


Figure 6. Maple Trumpet Skeletonizer, *Epinotia aceriella* (Clem.)
Areas within which defoliation of sugar maple (*Acer saccharum* Marsh.) occurred in 1984

Severe . . . . . ●
Moderate . . . . . ◐
Light . . . . . ①

This insect appears in the latter part of summer; therefore injury caused by its feeding is not considered serious even when populations are abundant.

Pine Needle Sheathminer, *Zelleria haimbachi* Busck

In 1984, populations recurred at widely scattered locations at varying levels of intensity in the Northeastern Region.

Severe shoot damage recurred in Windy Lake Provincial Park, Sudbury District where 100% of the current year's needles were mined on open-grown, semimature jack pine in a 5-ha area. Heavy infestations caused browning of new jack pine foliage in Gillies Limit, Coleman, Barr and Firstbrook townships in the northern part of Temagami District and in Lorne Township, Sudbury District. Elsewhere, low numbers of this insect were found commonly on jack pine trees under 4 m in height at widely scattered locations in Blind River, Espanola, Sudbury and Temagami districts.

Table 7. Other forest insects.

Insect	Host(s)	Remarks
Acrobasis betulella Hlst. Birch tubemaker	wB	light defoliation evident in birch stands throughout most of Temagami District
Altica populi Brown Poplar flea beetle	bPo	moderate-to-severe defoliation in host stands up to 0.5 ha in area throughout Curtin, Foster, Hallam, Merritt, May and Mongowin twps, Espanola District
Aphrophora cribrata (Wlk.) Pine spittlebug	jP	light populations on open-grown trees in Vasiloff Twp and Obatanga Provincial Park, Wawa District
Archips fervidana (Clem.) Oak webworm	rO	low populations observed in a 5-ha red oak stand in Long Twp, Blind River District and on a single tree in Trill Twp., Sudbury District

(continued)

Table 7. Other forest insects (continued).

Insect	Host(s)	Remarks
Archips negundana (Dyar) Larger boxelder leafroller	mM	severe defoliation to shade trees in a 10-ha area in the Regent St. N. area of Sudbury, Sudbury District
Arge pectoralis (Leach) Birch sawfly	wB	moderate numbers causing conspicuous damage to host trees in a 1.5-ha area on the shore of Ramsay Lake, McKim Twp, Sudbury District
Coleophora laricella (Hbn.) Larch casebearer	tL	recurring heavy damage on a few trees in Carlyle Twp, Sudbury District and increased populations causing severe damage in a 5-ha stand in Tehkummah Twp, Espanola District
Conophthorus resinosae Hopk. Red pine cone beetle	rP	conspicuous damage to shoreline trees along Temagami Lake, Temagami District
Corythucha pallipes Parsh. Birch lace bug	yB	high populations on roadside trees in Whitman and Hodgins twps, Sault Ste. Marie District
Epinotia solandriana L. Birch-aspen leafroller	wB	low numbers observed causing trace defoliation in Mattawan Twp, North Bay District and in McKim Twp, Sudbury District; also numerous in most stands examined in the Temagami District
Hyphantria cunea (Dru.) Fall webworm	W, Al, wB, wE	severe defoliation caused by increased populations in Beaucage Twp, North Bay District; nests found commonly at numerous points through Temagami District

(continued)

Table 7. Other forest insects (continued).

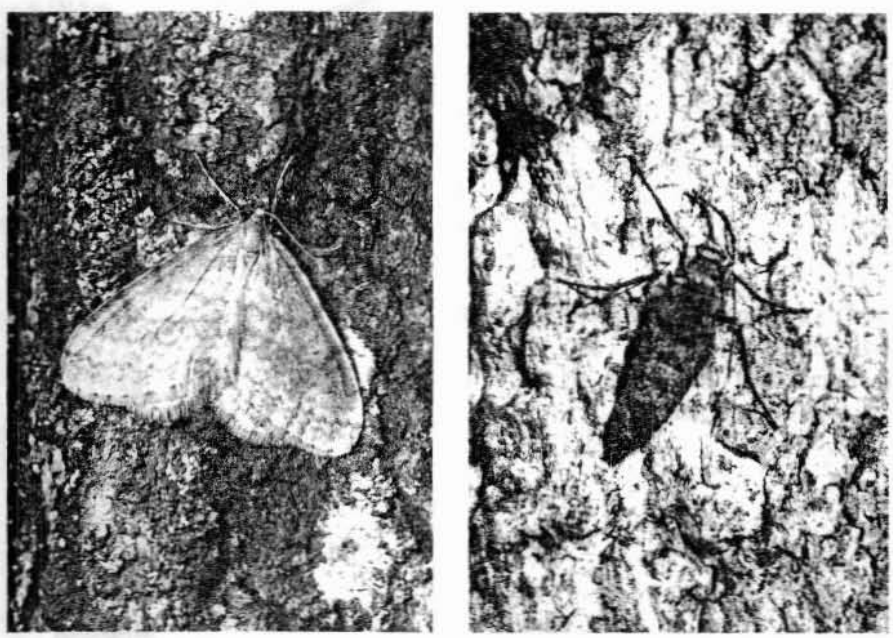
Insect	Host(s)	Remarks
Malacosoma americanum F. Eastern tent caterpillar	cCh	heavy damage to roadside shrubs in a 0.5-ha area in Billings Twp, Espanola District. Low-to-moderate numbers at widely scattered locations elsewhere on Manitoulin Island and in Gurd Twp, North Bay District
Malacosoma californicum pluviale Dyar Northern tent caterpillar	W, pCh	small numbers found on lakeshore shrubs in Charbonneau Twp and Obatanga Provincial Park, Wawa District
Neodiprion nanulus nanulus Schedl. Red pine sawfly	rP, jP	light damage to mature fringe trees along Hwy 144 for a 5-km stretch in Antrim Twp, Sudbury District; scattered colonies observed on shoreline trees on Temagami Lake, Temagami District
Neodiprion pratti banksianae Roh. Jack pine sawfly	jP	low populations observed causing light damage in a 0.5-ha area along Hwy 637 in Attlee Twp, Sudbury District
Neodiprion sertifer (Geoff.) European pine sawfly	scP	moderate numbers causing light damage in Billings Twp, Espanola District
Neodiprion virginianus complex Redheaded jack pine sawfly	jP	several colonies found causing light damage to host trees in a private 2-ha plantation in Campbell Twp, Espanola District
Nymphalis antiopa (L.) Spiny elm caterpillar	W	a few trees stripped by low numbers along a roadside in Gurd Twp, North Bay District

(continued)

Table 7. Other forest insects (concluded).

Insect	Host(s)	Remarks
Paraclemensia acerifoliella (Fitch) Maple leafcutter	sM	small numbers of this insect collected on host trees for the first time in over 30 years in Sault Ste. Marie District, on Campement d'Ours and St. Joseph islands
Petrova albicapitana (Busck.) Northern pitch twig moth	jP	0.3% and 0.7% of trees lightly infested in Hurlburt Twp, Sault Ste. Marie District and Villeneuve Twp, Blind River District, respectively
Phyllobius oblongus (L.) European snout beetle	wE, W	heavy leaf defoliation on individual ornamental trees in Bonfield and Gurd twps, North Bay District
Pikonema alaskensis (Roh.) Yellowheaded spruce sawfly	wS, bS	severe defoliation to ornamentals and roadside trees in McKim Twp, Sudbury District, Manitoulin Island and in Temagami District
Pristiphora erichsonii (Htg.) Larch sawfly	tL	one colony recorded in Wells Twp, Blind River District
Pseudexentera cressoniana Clem. Oak olethreutid leafroller	rO	trace numbers recorded on host trees in a 0.25-ha area in Foster Twp, Espanola District
Pulicalvaria piceaella (Kft.) Orange spruce needleminer	bF, wS	small numbers collected on roadside trees in Herrick Twp, Sault Ste. Marie District and in Casson and Rioux twps, Blind River District
Toumeyella parvicornis (Ckll.) Pine tortoise scale	jP	low numbers on single and small groups of trees recorded at several widely separated points across the Region

Damage caused by the Bruce spanworm, *Operophtera bruceata* (Hlst.) to sugar maple (*Acer saccharum* Marsh.)



Adults of the Bruce spanworm, male (left) and female (right)

Typical Eutypella canker, *Eutypella parasitica* Davidson and Lorenz, on sugar maple (*Acer saccharum* Marsh.)

Scleroderris canker, *Gremmeniella abietina* (Lagerb.) Morelet, showing fruiting on jack pine (*Pinus banksiana* Lamb.)

TREE DISEASES

Major Diseases

Armillaria Root Rot, *Armillaria mellea* (Vahl:Fr.) Kummer

Armillaria root rot often kills trees previously weakened by other diseases or abiotic conditions, although the fungus can attack healthy trees as well. In 1984, low levels were again present across the Region on both coniferous and deciduous hosts.

Tree mortality ranging from 1 to 2% was caused by this disease in eight pine and spruce plantations averaging 1.6 m in height (Table 8). The only area outside the plantations in which this fungus was recorded was in the Turkey Lake Watershed area, Wishart Township, Sault Ste. Marie District where a single intermediate red maple tree was killed.

Table 8. Summary of damage caused by Armillaria root rot in eight plantations in the Northeastern Region in 1984 (counts based on the examination of 150 trees at each location).

Location (Twp)	Host	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Current mortality (%)
Wawa District					
Cecile	jP	10	2,900	1.2	1
Huotari	jP	15	2,500	2.0	1
Blind River District					
Kirkwood	rP	10	2,990	1.0	2
Espanola District					
Allan	wS	8	2,990	0.5	2
Nairn[a]	jP	24	5,000	2.0	1
Tennyson	rP	10	2,990	1.0	1
Sudbury District					
Lumsden	jP	25	3,050	2.3	1
Hendrie[a]	jP	50	2,990	2.5	1

[a] 300-tree sample.

Ink Spot, *Ciborinia whetzelii* (Seav.) Seav.

This organism was much more prevalent this year than in 1983. Discoloration of foliage was widespread throughout the eastern portions of the Region and negligible in the west.

Pockets of severely damaged foliage, reaching levels of up to 100%, were observed in most aspen stands in Temagami District. Foliage damage in the same areas last year was about 30%. In North Bay District damage was not as extensive and only occasional stands were found with approximately 10% foliar damage. In Sudbury District, damage was variable; in some aspen stands 100% of the leaves suffered infection while in others only trace damage and premature leaf drop were observed.

By late August, stands that were severely infected were left barren of foliage, as infected leaves drop prematurely.

Tar Spot Needle Cast, *Davisomycella ampla* (Davis) Darker

Over the previous two years foliar damage caused by this needle cast has been on the increase across the Region. However, infection levels dropped at numerous locations in 1984.

In 1983, medium and heavy infections occurred in a number of areas, the most severe of which was located in Parkinson Township, Blind River District where 80% of the trees were infected and 75% of the old foliage was damaged. This year the only heavy infection observed was in Michano Township, Wawa District where a small number of trees sustained 80% foliage damage. Moderate infection was recorded in a 1-ha jack pine plantation in Parkinson Township, and on 6% of the trees in a jack pine sample plot in Villeneuve Township, both in the Blind River District. Elsewhere, light damage was confined to roadside regeneration in Parke Township, Sault Ste. Marie District, Sagard and Proctor townships, Blind River District and in Ulster Township, Sudbury District.

Eutypella Canker, *Eutypella parasitica* Davidson & Lorenz

As part of a special survey to determine the incidence of damage in maple stands, red and sugar maple trees were evaluated for the presence of Eutypella cankers at 10 locations across the Northeastern Region in 1984 (Fig. 7). Disease infection levels ranged from 1.0% to 9.3% of the trees at nine locations and negative results were recorded only in Raimbault Township, Blind River District (Table 9). The length of cankers ranged from 55 cm to 130 cm. Defect associated with Eutypella cankers extends only a short distance beyond the canker margin (see photo page). Authorities state that defect caused by cankers extends approximately one-fifth of the length of the canker above and below the cankered area; therefore, the remainder of the stem may be merchantable.

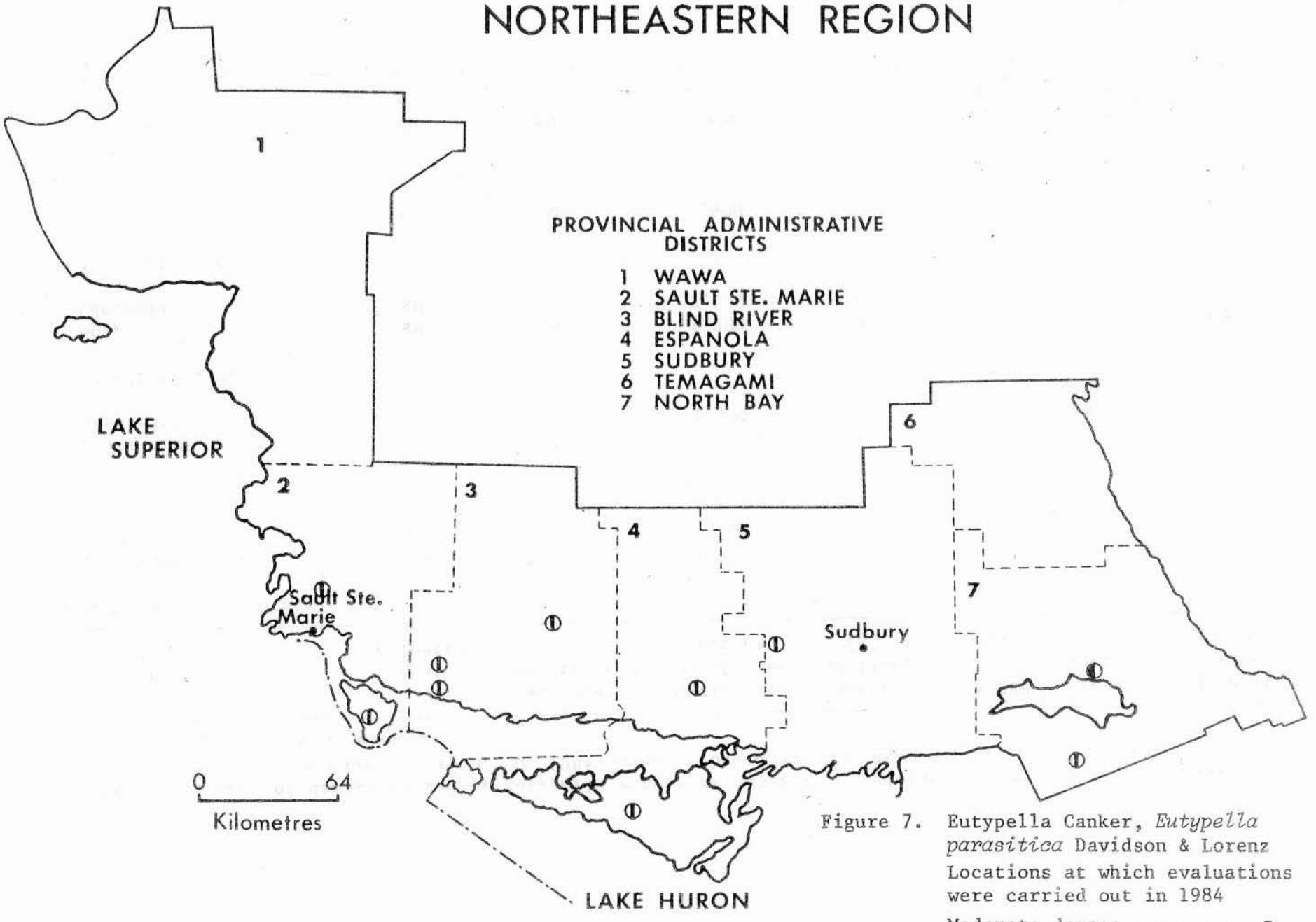


Figure 7. Eutypella Canker, *Eutypella parasitica* Davidson & Lorenz
Locations at which evaluations were carried out in 1984

Moderate damage . . . . . ◐
Light damage . . . . . ◑

Table 9. Summary of damage caused by Eutypella canker of maple in mixed hardwood stands at nine locations in the Northeastern Region in 1984 (counts based on the examination of 150 randomly selected maple trees at each location).

Location (Twp)	Host affected	Estimated area affected (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Avg DBH of trees (cm)	Trees cankered (%)	Avg length of canker (cm)
Sault Ste. Marie District							
Jocelyn[a]	sM	50	1,500	28	25	2.0	55
Aweres[a]	sM	50	1,500	17	18	4.0	63
Blind River District							
Bridgland[a]	sM	25	1,000	21	22	1.0	130
Thessalon[a]	sM, rM	50	1,500	19	19	4.0	63
Espanola District							
Gough	sM	20	1,200	16	27	2.7	63
Campbell	sM	40	2,100	14	31	1.3	75
Sudbury District							
Trill	sM	20	1,600	15	27	2.0	70
North Bay District							
Pringle	sM	50	1,400	15	26	4.7	57
Commanda	sM	10	1,200	15	27	9.3	59

[a] 100-tree samples.

The presence of Eutypella canker, however, can predispose a tree to wind breakage resulting in tree mortality. Whenever possible, cankered portions should be destroyed or placed face down on the ground thus eliminating a source of infection within a stand.

Scleroderris Canker, *Gremmeniella abietina* (Lagerb.) Morelet

A marked increase in the distribution of this pathogen (see photo page) was recorded in the Northeastern Region in 1984, when new infection centres were found at seven points in the Wawa, Sault Ste. Marie and North Bay districts (Fig. 8).

In the Wawa District, infection was evident on the lower branches of roadside jack pine regeneration trees 2 to 3 m in height in Lastheels, Esquega, Miskokomon and Recollet townships. In the Sault Ste. Marie District, a trace of infection was found in a 0.5-ha jack pine plantation in a reclaimed gravel pit in Whitman Township and in a semipermanent sample plot in a 50-ha plantation in Hurlburt Township. Infection was also present on a recently dead jack pine tree in Sisk Township, North Bay District.

The incidence of infection also increased in some areas where the disease had been recorded previously. Quantitative sampling in study plots established in 5- and 20-ha red pine plantations in Haughton and Kirkwood townships in the Blind River District showed increases of 69% and 124%, respectively, in the percentage of trees affected in 1984 compared to 1983 (Table 10).

Shoot Blight, *Venturia macularis* (Fr.) Müller and Arx

Three areas were examined in 1983 and 1984 to evaluate damage to trembling aspen regeneration by this shoot blight. Quantitative data shows that infection levels increased significantly in Dunphy Township, Wawa District but remained comparatively low in the other two areas (Table 11). Leader mortality ranged from 0.7 to 20.6% this year as compared to 0 to 4.6% in 1983. In the past, 100% leader mortality has been recorded in the Region. Continued attack can cause a 'stagheaded' condition or tree mortality in some instances.

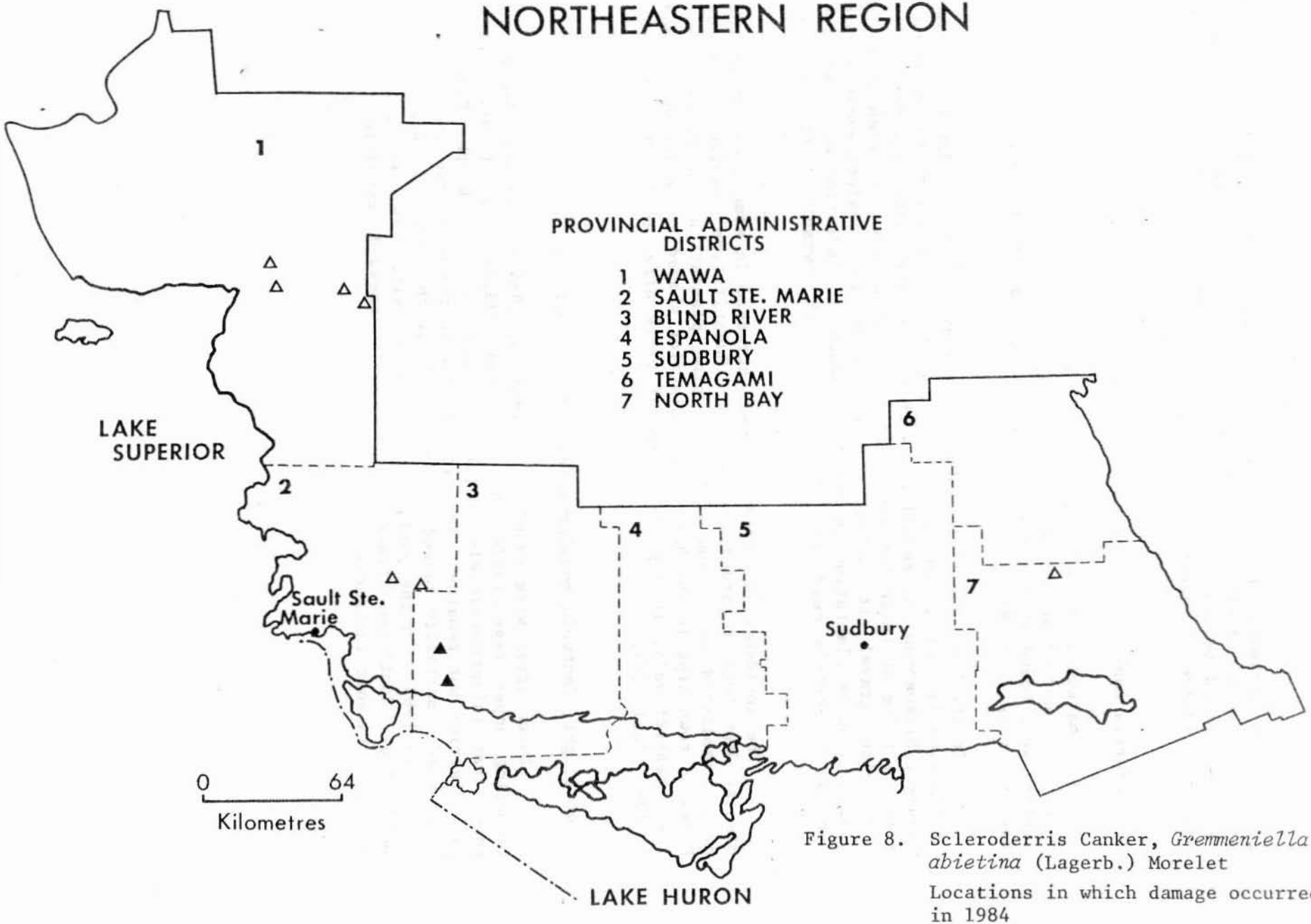


Figure 8. Scleroderris Canker, *Gremmeniella abietina* (Lagerb.) Morelet

Locations in which damage occurred in 1984

Previously established centres . . ▲

New infection centres . . . . . △

Table 10. Summary of damage caused by Scleroderris canker of pine in the Northeastern Region in 1984 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Host(s)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Trees affected (%)		Tree mortality (%)	
					1983	1984	1983	1984
Blind River District								
Haughton	rP	20	2,500	1.0	47.0	79.3	23.6	16.8
Kirkwood	rP	5	250	1.2	15.0	33.6	2.7	2.2
Sault Ste. Marie District								
Hurlburt	jP	50	2,990	1.5	-	0.7	-	0.0
Wawa District								
Esquega	jP	10	1,500	5.0	-	4.0	-	0.0
Lastheels	jP	10	1,500	2.0	-	26.0	-	0.0

Table 11. Summary of damage caused by shoot blight of aspen in natural regeneration at three locations in the Northeastern Region in 1984 (counts based on the examination of 150 randomly selected trembling aspen trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Trees affected (%)		Leader mortality (%)	
				1983	1984	1983	1984
Wawa District							
Dunphy	20	5,000	2.1	4.6	32.6	4.6	20.6
Blind River District							
Parkinson	10	4,000	1.5	1.3	7.3	0.0	2.6
Villeneuve	50	10,000	2.3	0.7	5.3	0.7	0.7

Table 12. Other forest diseases.

Organism	Host(s)	Remarks
Bifusella linearis (Pk.) Höhn.	wP	a high level of infection observed on roadside and scattered trees in a plantation in Rose Twp, Blind River District
Cronartium quercuum (Berk.) Miyabe ex Shirai f.sp. *quercuum* Eastern gall rust	jP	6% incidence found in a 1-ha area of near mature trees in Proctor Twp; small numbers of diseased roadside trees recorded in Sagard, Slievert and Villeneuve twps, Blind River District
Cronartium ribicola J.C. Fisch. ex Rabh. White pine blister rust	wP	less than 5% incidence recorded in a white pine plantation situated under a deciduous overstory in Snow Twp, Sault Ste. Marie District, Alarie Twp, Wawa District and in host tree plantations in Rose and Patton twps, Blind River District

(continued)

Table 12. Other forest diseases (concluded).

Organism	Host(s)	Remarks
Endocronartium harknessii (J.P. Moore) Y. Hirat. Western gall rust	jP	trace infection recorded in a jack pine sample plot in Hendrie Twp, Sudbury District
Lophodermium seditiosum Minter et al. Needle cast	rP	heavy infection of this fungus in a 40-ha red pine stand in Gurd Twp, North Bay District, resulting in 70% needle infection on 95% of the trees
Mycosphaerella populicola G.E. Thomps. Leaf spot	bPo	severe discoloration and early shedding of infected leaves apparent throughout stands in Temagami, Sudbury and North Bay districts; 100% defoliation common in stands up to 5 ha in size
Septoria betulae Pass. Leaf blight	wB, yB	symptoms of this pathogen evident on host trees, often causing 100% defoliation early in August in the northern part of Sault Ste. Marie District and western part of Wawa District; chlorotic leaves observed on 40% of the host trees in a 10-ha area in Clarkson Twp, North Bay District
Taphrina caerulescens (Mont. and Desm.) Tul. Leaf-blister rust	rO	heavy damage to red oak in Killarney Provincial Park and moderate leaf infection to host trees in Fairbanks Provincial Park, Sudbury District

ABIOTIC DAMAGE

Heavy Seed Crop

Throughout the Northeastern Region most tree species except the pines experienced abnormally high flower and fruit production in 1984.

Drought conditions present throughout the Region as reported in the "Results of forest insect and disease surveys in the Northeastern Region of Ontario, 1983" may have contributed to the distress-like seed crop observed on most deciduous and coniferous trees. White spruce *(Picea glauca* [Moench] Voss) trees became most obvious with heavy flowering, and by July the crowns of trees were laden with brown cones. Balsam fir *(Abies balsamea* [L.] Mill.) trees burdened with cones suffered occasional crown breakage as the softer wood could not withstand the excessive weight. Trembling aspen, sugar maple and ironwood *(Ostrya virginiana* [Mill.] K. Koch) all supported heavy seed crops without any abnormal or smaller foliage production, unlike white and yellow birch trees which in some areas were so sparse of foliage that by July they appeared defoliated.

Surveys in 1985 will determine the extent of this heavy seed crop and whether or not branch and twig damage occurs as a result.

Frost

General surveys and a special survey revealed varying degrees of foliage damage caused by late spring frosts through the southern half of the Sault Ste. Marie and Blind River districts.

Significant damage was evident in early foliating clones of trembling aspen at many locations. Examination of affected trees at several points revealed that foliage was sparse, dwarfed and in some instances leaves were severely deformed.

A special survey to determine the incidence of current damage to white spruce was carried out in 12 randomly selected plantations. Mortality of current shoots caused by frost was recorded in five of the plantations. Results showed 55-92% of trees affected, with shoot mortality ranging from 1-6%. Atmospheric Environment Service weather records for the Sault Ste. Marie area show that below-freezing temperatures occurred on eight of the first 15 days in May 1984 with lows ranging from -1.0°C to -5.0°C. During this period recently flushed foliage of trembling aspen and spruces are very susceptible to frost damage.

SPECIAL SURVEYS

Semipermanent Jack Pine Plots

Since the establishment of semipermanent sample plots in four jack pine plantations in the Northeastern Region in 1982, a special survey of insects and diseases occurring in the plots has been carried out annually in early June and again in mid-August. In addition, current tree growth has been measured and mortality rated.

The most important insect pests detected in the survey in 1984 were the white pine weevil and the jack pine budworm. A slight increase in the incidence of damage caused by the white pine weevil was recorded. Leader mortality in 1984 averaged 3.3%, compared to an average of 2.6% in 1983. Small numbers of jack pine budworm were present in three of the plots. Other insects detected are listed in Table 13. The incidence of pine sawflies, *Neodiprion* spp., was negative in sample areas; therefore, these pests are excluded from the table.

The disease pathogens that the survey was designed to evaluate were recorded at low levels in one or more plots (Table 14). The most important of these were Armillaria root rot and Scleroderris canker of pine. Little change in the incidence of Armillaria root rot, a pathogen commonly found in juvenile pine plantations, occurred from that recorded in 1983. The incidence of Scleroderris canker of pine infection recorded in the sample plot in Hurlburt Township represents the presence of a new infection centre in the Sault Ste. Marie District. A general survey elsewhere in the planted area detected a small number of other infected trees.

In conjunction with the above survey, the current leader growth was measured. The analysis revealed that over all, the average terminal growth was 0.47 m, marking an 18.4% increase over the average recorded in 1983 (Table 15).

Table 13. Summary of the incidence of insect damage in a survey conducted in semipermanent sample plots in four jack pine plantations in the Northeastern Region in 1984 (counts based on the examination of 300 trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	White pine weevil	Eastern pine shoot borer		Jack pine tip beetle	Northern pitch twig moth	Jack pine budworm
				Leaders attacked (%)	Leaders attacked (%)	Lateral shoots attacked (%)	Leaders attacked (%)	Trees infested (%)	Trees infested (%)
Sault Ste. Marie District									
Hurlburt	50	5,000	1.5	3.6	0.8	0.0	0.0	0.3	4.0
Blind River District									
Villeneuve	20	2,990	1.5	1.6	0.0	0.0	1.3	0.6	0.3
Espanola District									
Nairn	24	5,000	1.4	6.0	0.0	0.7	0.0	1.0	2.7
Sudbury District									
Hendrie	50	2,990	3.0	2.3	0.0	0.0	0.3	0.3	0.0

Table 14. Summary of the incidence of disease damage in a survey conducted in semipermanent sample plots in four jack pine plantations in the Northeastern Region in 1984 (counts based on the examination of 300 trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Armillaria root rot		Pine needle rust[a]	Tar spot needle cast	Western gall rust	Scleroderris canker
				Trees affected (%)	Tree mortality (%)	Trees affected (%)	Trees affected (%)	Trees affected (%)	Trees affected (%)
Sault Ste. Marie District									
Hurlburt	50	5,000	1.5	0.0	0.0	0.0	0.0	0.0	2.0
Blind River District									
Villeneuve	20	2,990	1.5	0.0	0.0	0.6	6.0	0.0	0.0
Espanola District									
Nairn	24	5,000	1.4	0.3	0.3	0.0	0.0	0.3	0.0
Sudbury District									
Hendrie	50	2,990	3.0	0.3	0.3	5.0	0.0	1.0	0.0

[a] *Coleosporium asterum* (Diet.) Syd.

Table 15. Summary of the current height growth of jack pine trees in four semipermanent sample plots in the Northeastern Region in 1983 and 1984 (measurements based on the examination of 300 trees per sample plot).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)		Avg current growth (m)	
			1983	1984	1984	1983
Sault Ste. Marie District						
Hurlburt	50	5,000	0.7	1.1	0.37	0.47
Blind River District						
Villeneuve	20	2,990	0.7	1.1	0.35	0.46
Espanola District						
Nairn	24	5,000	1.4	1.8	0.36	0.43
Sudbury District						
Hendrie	50	2,990	1.9	2.5	0.55	0.54

White Spruce Plantation Survey

Special surveys have been conducted in plantations and high-value stands of various tree species over the past several years. In 1984, as well as in 1981, white spruce was the species chosen for the survey. Twelve stands were sampled in the Region in three height classes: under 2 m, 2-6 m and over 6 m. Each stand was surveyed twice for specific insects and diseases listed below:

Insects: spruce budworm, spruce coneworm, *Dioryctria reniculelloides* Mut. and Mun.; spruce bud moth, *Zeiraphera* sp.; yellowheaded spruce sawfly and white pine weevil

Diseases: broom rust, *Chrysomyxa arctostaphyli* Diet.; dwarf mistletoe, *Arceuthobium pusillum* Pk.; Armillaria root rot, frost, needle rust and cone rust

All insect species were observed in the survey except the spruce coneworm. Positive results are summarized in Table 16.

No evidence was found of broom rust, mistletoe or Armillaria root rot. Positive results of diseases are presented in Table 17.

Populations of the spruce budworm have declined considerably since 1981 in those white spruce plantations where comparisons can be made. In 1981, 11 out of 12 plantations were infested and populations caused an average of 13.6% defoliation of 71.1% of the trees sampled. This year, however, only nine areas supported populations, causing an average of 5.6% defoliation on 41.4% of the trees examined.

The spruce bud moth was recorded in six areas in 1981 and in only two in 1984, lightly infesting 23.5% and 1% of the trees, respectively.

In 1981, the yellowheaded spruce sawfly infested 7.9% of the trees and caused an average 2.4% defoliation in three plantations compared to four areas infested, averaging 7.7% of the trees and damaging 2.5% of the foliage in 1984.

White pine weevil populations have remained consistently low over the past few years in white spruce plantations. This year, one area had 1% of the leaders attacked, compared to 1.3% of the leaders damaged in 1981.

Frost damage varies considerably from year to year and no effective comparison can be made. However, frost can cause serious damage in one year, and repeated attacks on a single tree may cause serious deformation. In 1981, only two areas reported frost damage. An average of 92% of the trees were affected, but only 3% of the foliage was damaged. In 1984 the scene changed little, with 62.8% of the trees experiencing 2.4% foliar damage in 5 areas. More information on frost damage can be found previously in this report.

In 1981, needle rust affected foliage on 100% of the trees in two sample areas, damaging 7.5% of the foliage. However, in 1984, foliar damage in three plantations averaged 1.3% on 25.3% of the trees sampled.

Cones from several areas were sampled in 1981 and although a variety of insects were found damaging them, no cone rust disease was observed. In 1984, 100 cones were collected from each of five plantations and rust damage ranged from 0 to 37%. Further information on cones, seed and flower pests can be found under the White Spruce Flower, Cone and Seed Survey, elsewhere in this report.

Table 16. Summary of the incidence of insect damage in a survey conducted in white spruce plantations in the Northeastern Region in 1984 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Spruce budworm		*Zeiraphera* sp.	Yellowheaded spruce sawfly		White pine weevil
				Trees infested (%)	Foliage affected (%)	Trees infested (%)	Trees infested (%)	Foliage affected (%)	Leaders attacked (%)
Blind River District									
Rose	15	1,200	1.1	2	1	1	1	1	0
Haughton	20	1,800	1.3	5	1	0	1	1	0
Kirkwood	15	2,500	2.6	0	0	0	0	0	0
Patton	3	2,000	4.6	90	9	1	0	0	0
Rose	15	2,500	7.7	10	1	0	1	1	0
Kirkwood	10	1,500	14.7	100	8	0	0	0	0
Espanola District									
Allan	8	2,990	0.5	0	0	0	28	7	0
Foster	10	2,990	4.5	3	1	0	0	0	0
Dawson	25	2,990	11.8	0	0	0	0	0	0
Sudbury District									
Burwash	25	2,990	1.2	56	12	0	0	0	1
Burwash	5	2,990	6.9	100	16	0	0	0	0
North Bay District									
Gurd	7	3,200	3.8	7	1	0	0	0	0

Table 17. Summary of the incidence of disease damage in a survey conducted in white spruce plantations in the Northeastern Region in 1984 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Frost		Needle rust		Cone rust	
				Trees affected (%)	Foliage affected (%)	Trees affected (%)	Foliage affected (%)	No. of cones sampled	Cones affected (%)
Blind River District									
Rose	15	1,200	1.1	75	6	0	0	0	0
Haughton	20	1,800	1.3	55	1	0	0	0	0
Kirkwood	15	2,500	2.6	92	2	0	0	100	37
Patton	3	2,000	4.6	90	2	0	0	100	2
Rose	15	2,500	7.7	2	1	3	1	100	0
Kirkwood	10	1,500	14.7	0	0	0	0	100	16
Espanola District									
Allan	8	2,990	0.5	0	0	0	0	0	0
Foster	10	2,990	4.5	0	0	0	0	0	0
Dawson	25	2,990	11.8	0	0	0	0	0	0
Sudbury District									
Burwash	25	2,990	1.2	0	0	55	2	0	0
Burwash	5	2,990	6.9	0	0	18	1	100	0
North Bay District									
Gurd	7	3,200	3.8	0	0	0	0	0	0

White Spruce Flower, Cone and Seed Survey

A special survey was carried out to determine the influence of insects and diseases on flowers and cones of white spruce. Collections of approximately 200 late female flowers were made in late May in Blind River and North Bay districts. A second collection was made of approximately 100 cones in North Bay and Sudbury districts in early July. The samples were assessed for the proportion of damaged flowers and cones, and the identity of insects and diseases destroying seed (Table 18).

The proportion of damaged female flowers varied considerably between areas, from 5% in Blind River District to 47% in North Bay District. Of the species that could be identified, spruce budworm and spruce coneworm were the most damaging, although an unknown insect damaged 40 of the flowers in the North Bay District sample. Damage to the cones was more severe with 43 and 37 cones being affected in North Bay and Sudbury districts, respectively. The largest proportion of seed loss was caused by the Lepidopterous pests, spruce budworm and spruce seed moth, *Laspeyresia youngana* (Kft.), followed by dipterous pests, spruce cone maggot, *Hylemya anthracina* (Czerny) and spruce cone axis midge, *Dasineura rachiphaga* Tripp. The only evidence of disease damage was recorded in the Sudbury District collection where one cone was affected by spruce cone rust, *Chrysomyxa pirolata* Wint.

Maple Dieback

In 1984, a special survey to determine the incidence of crown dieback of sugar maple and red maple trees was conducted at 10 locations in the Northeastern Region. The cumulative percent of crown mortality was assessed on 100 trees, examined in 10 randomly selected subplots in each stand.

The survey revealed varying degrees of crown deterioration in each stand examined, with 63% to 100% of the trees sustaining 0% to 20% of the crown dead (Table 19). The occurrence of tree mortality was recorded in each sample area, as well, and it was determined that mortality was confined to understory or suppressed trees in diameters ranging from 1 cm to approximately 8 cm.

Pinewood Nematode, *Bursaphelenchus xylophilus* (Steiner and Buhrer) Nickle

As part of special surveys over the past five years, distressed pine trees have been sampled in an effort to find this nematode. To date all samples submitted have been negative.

The nematodes are transferred from infested to healthy trees by sawyer beetles, where they multiply rapidly in the sapwood of branches and stems, thereby disrupting the water flow within the tree. Foliage discoloration, changing from green to yellow, and finally brown, is the first

Table 18. Summary of the incidence of insect damage of white spruce female flowers and white spruce cones collected in the Northeastern Region in 1984.

Location (Twp)	Flowers		Cones		Seed loss in damaged cones (%)	Cones affected by insects		
	Examined (no.)	Damaged (no.)	Examined (no.)	Damaged (no.)		Lepidopterous (%)	Spruce cone maggot (%)	Unknown (%)
Blind River District								
Thessalon	197	5	0	0	0	0	0	0
North Bay District								
Widdifield	200	47	95	43	23	39	1	0
Sudbury District								
Burwash	0	0	100	37	14	33	0	3

Table 19. Summary of maple dieback at 10 locations in the Northeastern Region in 1984 (expressed as a percent of the total number of trees examined).

Location (Twp)	Avg DBH of trees (cm)	Estimated area of stand (ha)	Cumulative % of crown dead				Tree mortality
			0-20	21-40	41-60	>60	
Sault Ste. Marie District							
Jocelyn	25	50	80	6	2	2	10
Aweres	18	50	72	5	3	5	15
Blind River District							
Bridgland	22	25	76	18	0	0	6
Raimbault	33	10	84	7	5	3	1
Thessalon	19	50	63	30	3	0	4
Espanola District							
Gough	27	20	100	0	0	0	0
Campbell	31	40	98	1	0	0	1
Sudbury District							
Trill	27	20	99	0	0	1	0
North Bay District							
Pringle	26	50	97	0	0	0	3
Commanda	27	10	92	1	1	0	6

visible symptom of infestation. Trees invaded by nematodes ultimately wilt, and death usually occurs by late summer.

Acid Rain National Early Warning System

As part of a national early warning system to detect and monitor the effect of acid rain on the forest, the Ontario Forest Insect and Disease Survey Unit established study plots at various locations in the province in 1984. Each plot was established on land currently reserved for various study purposes over extended periods to ensure minimum outside disturbance.

In the Northeastern Region, monitor plots were established in mixed hardwood stands in Wishart and Drury townships in Sault Ste. Marie and Sudbury districts, respectively. Trees within a 10-m x 40-m rectangle were numbered, and measurements of the vertical and radial growth, crown structure and density, branch or stem mortality, incidence of insect and disease attack and specific acid rain symptoms were recorded.

The plots will be monitored and various measurements will be recorded at specific intervals each subsequent year.

Climatic Data

Weather plays an important role in the development of insects, diseases and tree growth. Certain weather conditions can create favorable conditions for our forests or predispose them to damage, and can be the cause of serious fluctuations of insect populations or disease incidence. Adverse weather conditions cause abiotic damage such as frost, winter drying or scorch, wind breakage, snow or hail damage and drought. Weather data pertaining to three locations across the Region are expressed in Table 20 which includes the monthly mean temperature, total precipitation and deviation for 1984 from the 30-year normals.

More detailed weather information is obtainable from local Atmospheric Environment Weather Offices.

Table 20. Summary of mean temperature and total precipitation for the year 1984 from three locations across the Northeastern Region.

Location	Month	Mean temperature (°C)		Deviation from normal (°C)	Total precipitation (mm)		Deviation from normal (%)
		Normal	Actual		Normal	Actual	
Sault Ste. Marie	January	-10.1	-13.2	-3.1	74.0	39.4	-46.8
	February	-10.0	-4.3	+5.7	68.6	38.7	-43.6
	March	-5.1	-6.3	-1.2	60.4	45.1	-25.3
	April	3.1	6.3	+3.2	64.4	37.0	-42.5
	May	9.1	7.9	-1.2	84.2	29.0	-65.6
	June	14.6	14.5	-0.1	74.3	107.3	+44.4
	July	17.3	17.0	-0.3	55.6	67.8	+21.9
	August	16.9	18.3	+1.4	82.7	65.4	-20.9
	September	12.8	11.7	-1.1	95.3	131.4	+37.9
	October	7.6	8.9	+1.3	74.2	94.1	+26.8
	November	0.7	0.8	+0.1	93.3	93.3	0.0
	December	-6.7	-5.1	+1.6	79.6	154.4	+93.9
Sudbury	January	-13.7	-16.2	-2.5	57.5	36.8	-36.0
	February	-12.5	-6.2	+6.3	47.0	56.0	+19.1
	March	-6.0	-7.9	-1.9	55.2	23.6	-57.2
	April	2.7	6.3	+3.6	61.1	49.4	-19.1
	May	10.5	8.3	-2.2	67.1	101.1	+50.7
	June	16.0	16.1	+0.1	82.8	178.0	+114.9
	July	18.7	18.8	+0.1	83.1	61.1	-26.5
	August	17.3	18.5	+1.2	82.9	143.2	+72.7
	September	12.2	10.9	-1.3	106.5	96.8	-9.1
	October	6.3	7.8	+1.5	74.6	73.7	-1.2
	November	-1.2	-0.6	+0.6	77.8	89.3	+14.8
	December	-10.2	-8.2	+2.0	65.0	80.1	+23.2
North Bay	January	-13.0	-15.7	-2.7	63.5	40.5	-36.2
	February	-11.3	-5.2	+6.1	56.2	70.9	+26.2
	March	-5.3	-8.1	-2.8	61.1	37.5	-38.6
	April	3.2	6.6	+3.4	62.3	60.1	-3.5
	May	10.6	8.4	-2.2	69.3	114.6	+65.4
	June	15.7	15.8	+0.1	85.1	127.8	+50.2
	July	18.3	18.0	-0.3	102.4	137.2	+33.9
	August	17.0	17.9	+0.9	98.7	102.6	+3.9
	September	12.2	10.8	-1.4	115.9	125.6	+8.4
	October	6.4	8.2	+1.8	87.7	91.0	+3.8
	November	-1.0	-0.7	+0.3	86.6	120.9	+39.6
	December	-9.7	-7.2	+2.5	75.4	95.8	+27.1