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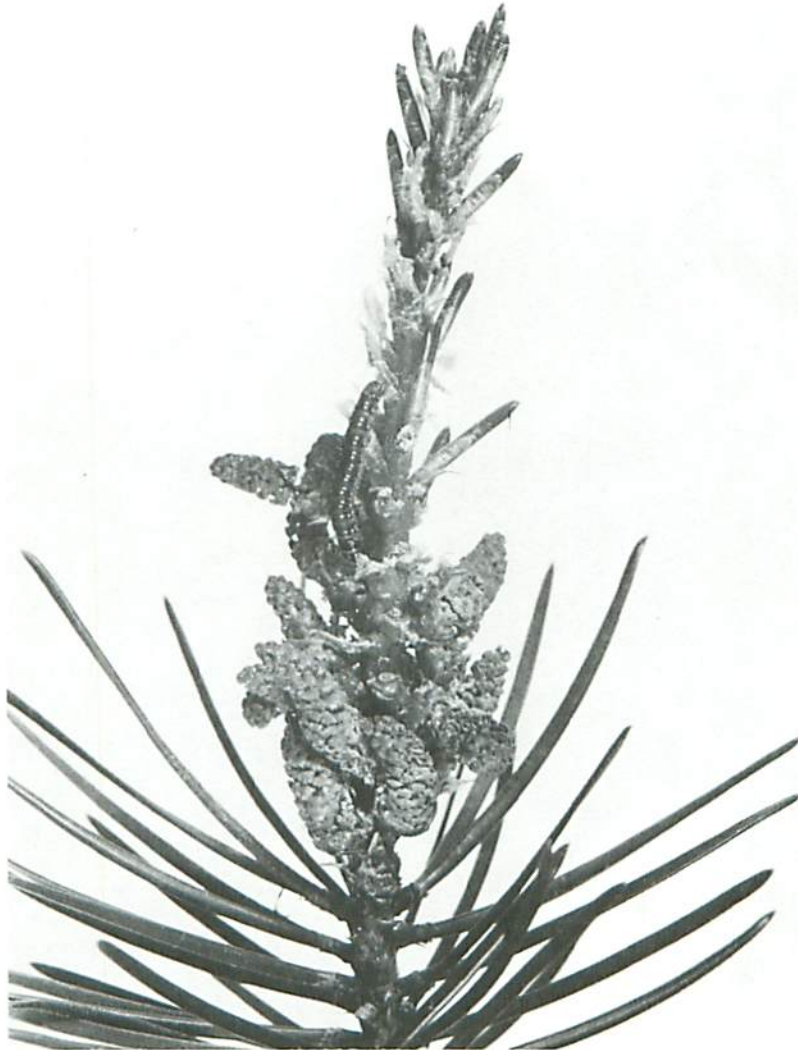
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# SURVEY BULLETIN

33240

Forest Insect and Disease Conditions in Ontario

Summer 1984



Jack pine budworm larva in male flowers of jack pine

# FOREST INSECT AND DISEASE CONDITIONS IN ONTARIO

Summer 1984

This bulletin is the second of three issued annually by the Forest Insect and Disease Survey Unit (FIDS) describing current forest insect and disease conditions in Ontario. The first was issued in May and the third will be issued late in the fall.

## FOREST INSECTS

### Spruce Budworm, *Choristoneura fumiferana* (Clem.)

A number of significant changes were evident in the spruce budworm situation in Ontario in 1984. Combined aerial and ground surveys revealed an overall decline of approximately 292,000 ha in the area of moderate-to-severe defoliation with a total area of 8,747,852 ha affected. Northeastern and southern Ontario experienced considerable decline whereas moderate-to-severe defoliation more than doubled in northwestern Ontario (Table 1, Fig. 1). Areas of moderate-to-severe defoliation are summarized by district in Table 2.

Table 1. Gross area of moderate-to-severe defoliation (current) by spruce budworm (000,000 ha).

Outbreak region	1983	1984	Change
Northwestern	2.181	4.631	+2.450
Northeastern	6.451	4.044	-2.407
Southern	.408	.073	-.335
	<u>9.040</u>	<u>8.748</u>	<u>-.292</u>

It should be pointed out that these figures and others presented in this bulletin are preliminary and are subject to change. Aerial surveys are carried out by FIDS technicians early in July when the characteristic red color of budworm-damaged foliage is at its peak, with flying time being provided by the Ontario Ministry of Natural Resources (OMNR). Ground checks are made before and after the aerial surveys to substantiate results.

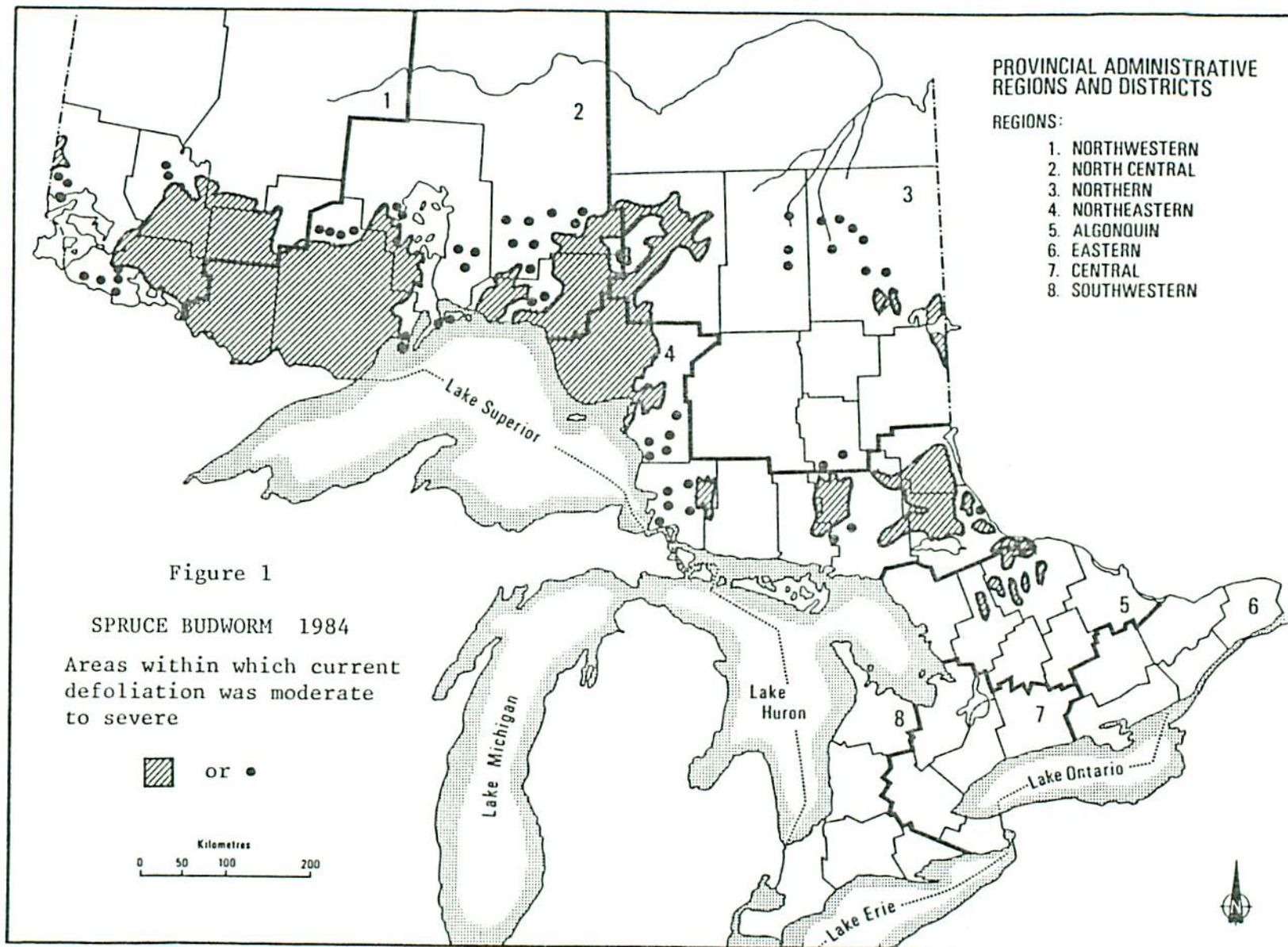


Table 2. Gross area of moderate-to-severe defoliation (current) by spruce budworm (hectares).

Region and District		Area of moderate-to-severe defoliation		
		1982	1983	1984
Southern Ontario <sup>a</sup>	Algonquin Park	119,245	211,528	44,234
	Bracebridge	141,822	133,273	28,606
	Minden	3,726	0	0
	Owen Sound	220	0	0
	Parry Sound	158,044	62,693	0
		<u>423,057</u>	<u>407,494</u>	<u>72,840</u>
Northeastern Region	Blind River	655,627	492,104	4,935
	Espanola	788,900	186,101	42,278
	North Bay	895,026	722,704	345,062
	Sault Ste. Marie	299,865	669,875	30,255
	Sudbury	950,670	597,103	250,483
	Temagami	291,755	381,847	241,901
	Wawa	1,421,293	1,483,984	1,288,475
	<u>5,303,136</u>	<u>4,533,718</u>	<u>2,203,389</u>	
Northern Region	Chapleau	438	0	0
	Cochrane	263,922	225,557	85,358
	Gogama	22,578	10,521	11,906
	Hearst	349,100	779,950	784,202
	Kapuskasing	64,794	18,193	6,827
	Timmins	0	0	0
	Kirkland Lake	62,691	250,765	35,633
	<u>763,523</u>	<u>1,284,986</u>	<u>923,926</u>	
North Central Region	Atikokan	124,286	617,267	918,500
	Geraldton	141,699	169,719	189,863
	Nipigon	24,988	101,270	235,372
	Thunder Bay	439,058	688,287	1,809,741
	Terrace Bay	460,711	462,487	726,420
	<u>1,190,742</u>	<u>2,039,030</u>	<u>3,879,896</u>	
Northwestern Region	Dryden	11,618	178,648	454,099
	Fort Frances	300,742	454,841	566,831
	Ignace	0	109,381	456,526
	Kenora	30,469	31,564	63,314
	Red Lake	200	200	200
	Sioux Lookout	0	0	126,831
	<u>343,029</u>	<u>774,634</u>	<u>1,667,801</u>	
TOTAL		8,023,487	9,039,862	8,747,852

<sup>a</sup> Southern Ontario includes Algonquin and Southwestern regions.

As pointed out above, and predicted by egg surveys in the fall of 1983, the area of moderate-to-severe defoliation in northwestern Ontario (Lake Nipigon to Manitoba) more than doubled in 1984 to some 4,631,214 ha (see Fall 1983 Survey Bulletin). The large infestation which occurred in the area between Kakagi Lake, Kenora District and Marks Township, Thunder Bay District merged with the infestation in the Black Sturgeon-Poshkokagan lakes area of Nipigon and Thunder Bay districts. This formed a single huge infestation stretching westward from Lake Nipigon in the east to the Kakagi-Atikwa lakes area of Kenora District, and encompassing parts of Nipigon and Thunder Bay districts in the North Central Region and Atikokan, Ignace, Dryden, Kenora and Sioux Lookout districts in the Northwestern Region. As in 1983, smaller pockets of moderate-to-severe defoliation were mapped around the periphery of the main infestation. These were located as follows: along the Manitoba border between Ryerson and Mantario lakes and in Noyon, Rice, Malachi, Forgie and Glass townships, Kenora District (39,300 ha); in Redvers Township and in the Twilight-Clay lakes area, Dryden District (2,868 ha); in Nelles, Chapple, Emo, Kingsford, Fleming and Sean townships, Fort Frances District (12,850 ha); in the vicinity of South Allely, Weaver, Kearns and Garden lakes and on the Sibley Peninsula of Thunder Bay District (13,242 ha); and east of Havoc Lake, opposite Nazotika Point, on the Black Bay Peninsula, and on St. Ignace, Fluor, Spar and Moss islands in the Nipigon District (25,094 ha). Small pockets of infestation totalling about 200 ha remain on islands in Moar Lake in the Red Lake District.

In northeastern Ontario, budworm populations have declined steadily since 1980. Defoliation in 1984 totalled 4,043,598 ha in comparison with 6,450,910 ha in 1983. The eastern section of the outbreak, which extended from the Espanola District through Sudbury, Temagami and North Bay districts, broke up into several large pockets and a number of smaller ones. The largest was located in the North Bay and Temagami districts, with small areas extending into the Sudbury District and totalling approximately 580,400 ha in area. The second was approximately 238,136 ha in area and was located in the western Sudbury District, with some extension into the adjacent Espanola District. Approximately 20 smaller pockets persist, mainly in the eastern part of North Bay District and the northern part of Sudbury District, affecting an area of about 59,618 ha. Some 21 small pockets of moderate-to-severe defoliation totalling 11,906 ha were found in the southeastern Gogama District. Moderate-to-severe defoliation totalling 127,818 ha was mapped in 23 pockets of varying size in the Kapuskasing, Cochrane and Kirkland Lake districts. The largest of these were located on the north and south sides of Lake Abitibi adjacent to the Quebec border and totalled approximately 88,100 ha.

The western section of the outbreak also changed considerably. Large declines in the Blind River, Sault Ste. Marie and southern Wawa districts were matched by sizeable increases in the Terrace Bay, Nipigon and Geraldton districts. The main infestation in the Hearst District (784,200 ha) remained virtually unchanged from last year. The main

infestation also encompassed approximately 2,012,250 ha in the Geraldton, Terrace Bay and Wawa Districts. Some 46 scattered pockets remain in the Sault Ste. Marie, Blind River and southern Wawa districts, affecting a total area of 39,237 ha. The largest, approximately 25,000 ha in area, was located between Ranger and Carpenter lakes in the Sault Ste. Marie District and the adjacent Blind River District. In the Terrace Bay and Geraldton districts a number of scattered pockets of moderate-to-severe defoliation in the Caramat-Stevens area merged and joined with the main body of infestation to the east. Numerous other pockets of moderate-to-severe defoliation were also mapped west of the main body of infestation in the Terrace Bay and southern Geraldton districts, and totalled approximately 32,700 ha. A large new infestation was found extending from the Rossport-Terrace Bay area on the north shore of Lake Superior, north through the Terrace Bay District to the Kamuck Lake area in the southern Geraldton District, and affecting a total area of approximately 153,100 ha. Five small pockets of new infestation totalling 4,227 ha were located in the Lake Jean-Barbara Lake area of the eastern Nipigon District.

In southern Ontario, the large area of moderate-to-severe defoliation in the northwest Algonquin Park District and adjacent areas in the northeast Bracebridge District was reduced to 13 separate pockets totalling approximately 72,840 ha--a reduction of some 271,961 ha. Small pockets which persisted in the southern Bracebridge and Minden districts and the St. Edmunds Township area of Owen Sound District subsided this year.

OMNR again conducted aerial spraying operations over approximately 4,300 ha in the Hearst District. Areas protected included a moose yard, two provincial parks, high-value plantations and commercial forest. Most of the area was treated with the biological insecticide *Bacillus thuringiensis* (B.t.) and several small areas were treated with the chemical insecticides Matacil and Sevin-4-oil.

The annual spruce budworm egg and mortality surveys are now in progress and results of these will be included in the fall Survey Bulletin.

#### Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Jack pine budworm infestations expanded dramatically in 1984. On a provincewide basis the area within which moderate-to-severe defoliation was mapped totals some 1,150,158 ha in the Northwestern, North Central, Northern, Northeastern and Algonquin regions (Fig. 2 and Table 3), an increase of some 1,083,000 ha over 1983.

In the Northeastern Region there were three sizeable pockets and a number of widely scattered small infestations for a total of 429,220 ha. The largest of these, totalling 314,882 ha, occurred around Lac aux

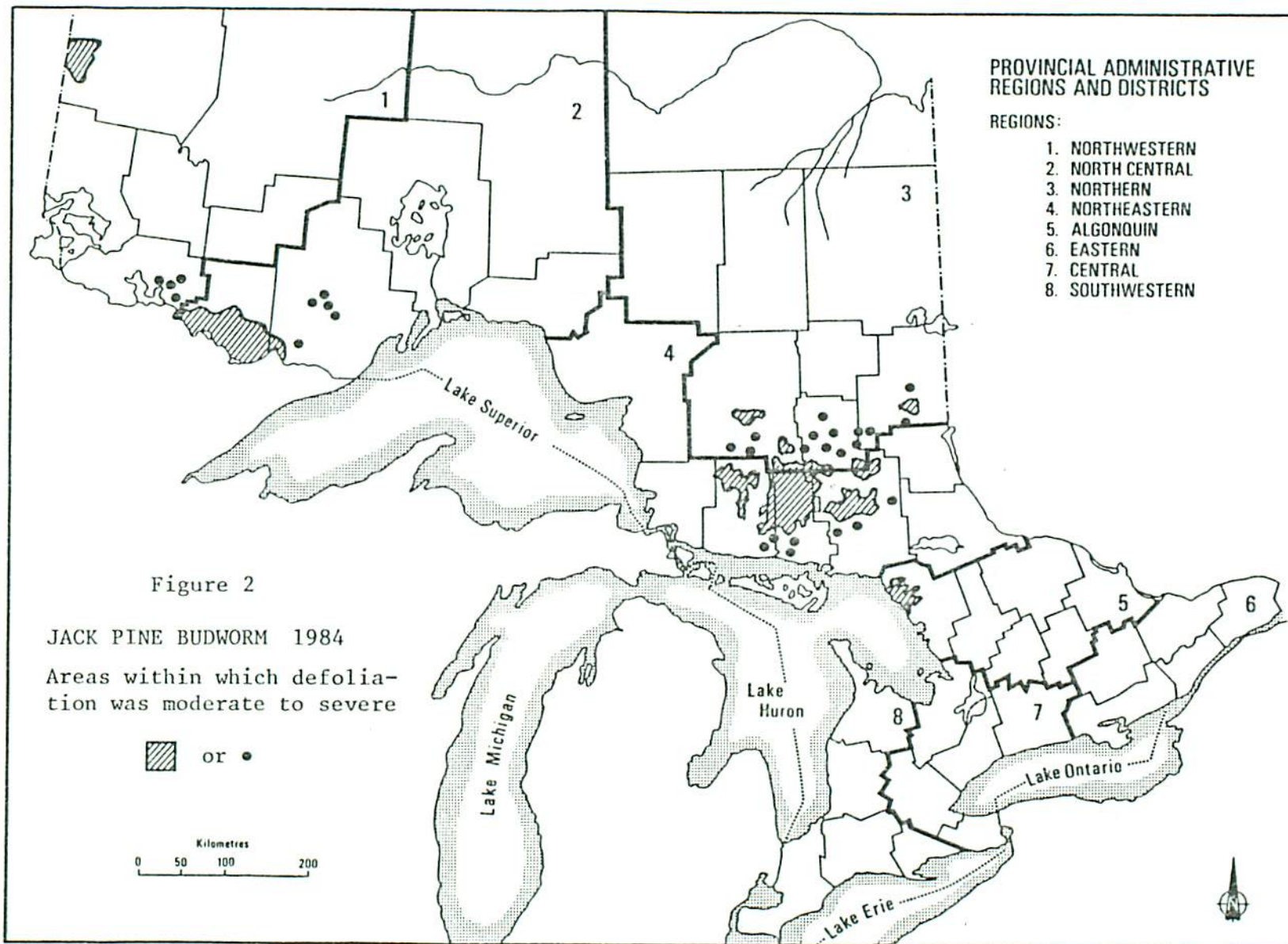


Table 3. Gross area of moderate-to-severe defoliation (current) by jack pine budworm (hectares).

Region and District		Area of moderate-to-severe defoliation	
		1983	1984
Northwestern Region	Red Lake	0	139,334
	Fort Frances	0	14,044
		<u>0</u>	<u>153,378</u>
North Central Region	Atikokan	6,970	335,770
	Thunder Bay	0	34,798
		<u>6,970</u>	<u>370,568</u>
Northeastern Region	Sault Ste. Marie	0	746
	Blind River	9,250	118,021
	Espanola	8,880	233,027
	Sudbury	11,840	76,896
	Temagami	0	530
		<u>29,970</u>	<u>429,220</u>
Northern Region	Chapleau	0	95,598
	Gogama	0	49,102
	Kirkland Lake	0	26,895
		<u>0</u>	<u>171,595</u>
Algonquin Region	Parry Sound	<u>30,202</u>	<u>25,397</u>
Total		67,142	1,150,158



Sables in the northern Espanola District, with extensions into adjacent areas of Sudbury and Blind River districts and the Gogama and Chapleau districts of the Northern Region. The second was located in the Simons-Morningstar-Havrot townships area of Blind River District, with a small extension in Handelman Township, Sault Ste. Marie District and encompassed some 50,046 ha. The third sizeable pocket was located in the Hart Township-Valley East area of Sudbury District and was 42,028 ha in area. The remainder of the area infested in the Northeastern Region consisted of 20 widely separated pockets totalling 22,264 ha.

Infestations in the Northern Region totalling 171,595 ha were composed of 30 scattered pockets varying in size from 178 to 32,394 ha across the southern Chapleau district (95,598 ha), Gogama District (49,102 ha) and Kirkland Lake District (26,895 ha).

In the Algonquin Region infestations were confined to an area on the north shore of Georgian Bay in the Parry Sound District. These consisted of a large pocket (24,070 ha) between Henvey and Harrison townships and four small pockets totalling 1,327 ha in Shawanaga and Carling townships.

In the North Central Region, a total area of 370,568 ha was infested. The largest infestation occurred in the southern Atikokan District where an area of some 335,770 ha was infested. There were small extensions into adjacent areas of Fort Frances and Thunder Bay districts. The Thunder Bay infestations consisted of five separate patches in the Shebandowan Lake-Burchell Lake area, a somewhat larger pocket east of Northern Lights Lake, and part of the Atikokan infestation in the area of Saganagons Lake, for a total area of 34,798 ha. In the Northwestern Region, four small pockets totalling 14,044 ha were mapped in the southwestern Fort Frances District between Rice Bay on Rainy Lake and Heron Lake. By means of aerial surveys a large infestation was detected northwest of Red Lake in the Red Lake District. Here some 139,334 ha are infested between Murclaw Lake and Adventure Lake. The infestation extends west into Manitoba in the area between Philips Lake and the Gammon River.

Jack pine budworm egg surveys are also in progress and results of these will be presented in the fall Survey Bulletin.

#### Gypsy Moth, *Lymantria dispar* (Linn.)

A significant increase was evident in both area affected and intensity of damage in the Eastern Region. The total area of moderate-to-severe defoliation increased from some 40,950 ha in 1983 to 79,589 ha this year. The bulk of this area occurred in a large infestation in the southeastern part of the Tweed District, which encompassed approximately 52,119 ha in Elzevir, Hungerford, Kaladar, Sheffield, Kennebec, Hinchinbrooke and Olden townships (Fig. 3). Two sizeable pockets located to

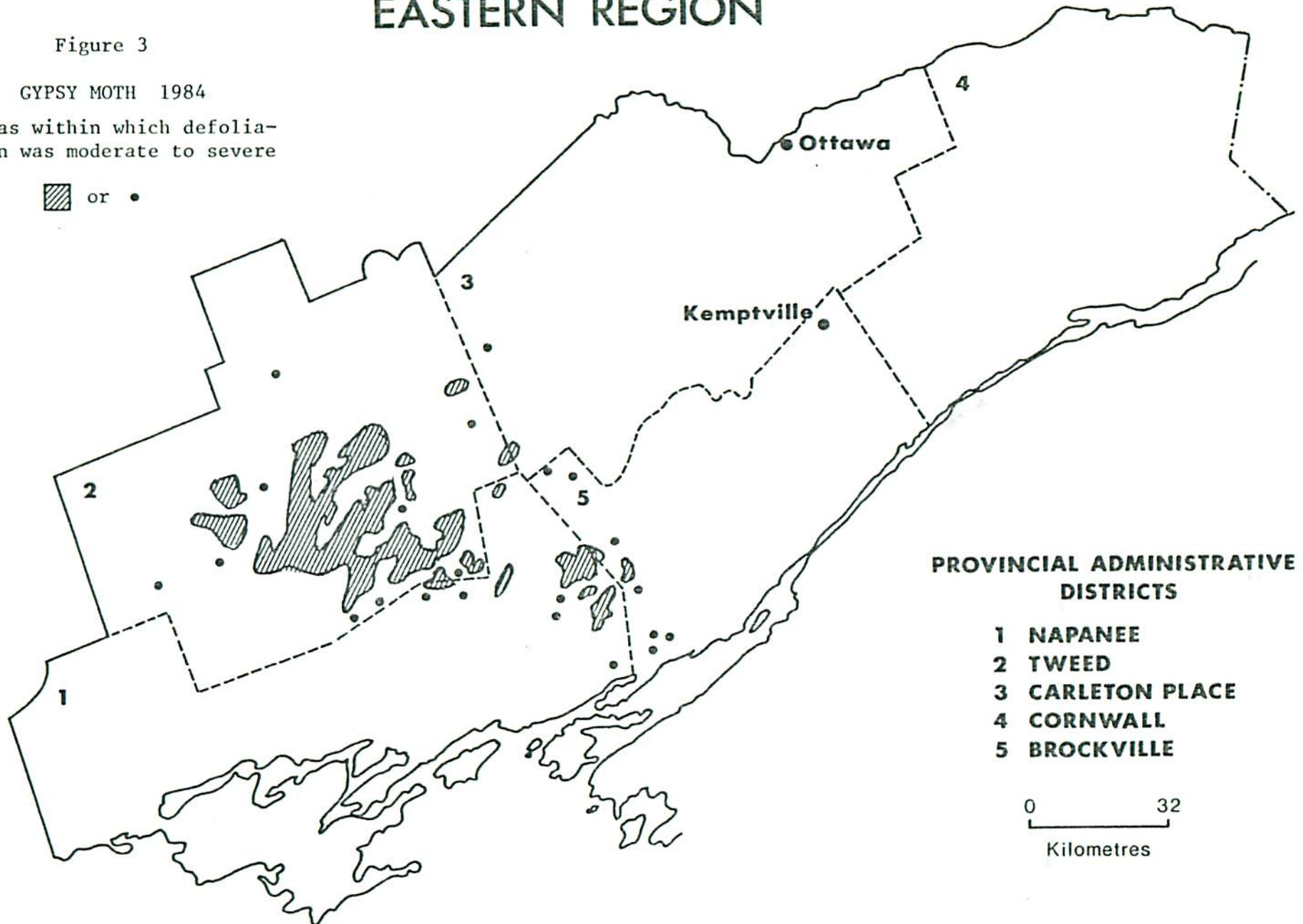
# EASTERN REGION

Figure 3

GYPSY MOTH 1984

Areas within which defoliation was moderate to severe

▨ or •



## PROVINCIAL ADMINISTRATIVE DISTRICTS

- 1 NAPANEE
- 2 TWEED
- 3 CARLETON PLACE
- 4 CORNWALL
- 5 BROCKVILLE

0 32  
Kilometres

the northwest of the main body in Grimsthorpe, Elzevir and Tudor townships covered an area of about 12,600 ha. Eight sizeable pockets to the southeast of the main body in Hinchinbrooke Township, Tweed District, Bedford, in Louborough and Storrington townships, Napanee District and in South Crosby Township, Brockville District covered approximately 12,180 ha. The remainder of the area affected, some 2,690 ha, consisted of numerous small pockets around the main body of infestation from Marmora Township, Tweed District in the west to Front of Leeds and Lansdowne Township, Brockville District in the east.

Elsewhere in southern Ontario, egg masses and small numbers of larvae were collected at Braeside and Renfrew in Horton and McNabb townships and at Calabogie in Bagot Township in the Pembroke District. Defoliation in all cases was insignificant. A single egg mass and two pupae were found at Oakville in the Cambridge District. In early August egg-laying female moths were detected within an area of approximately 32 ha in the Silver Bay area of Humberstone Township near Port Colborne on the north shore of Lake Erie in the Niagara District.

Gypsy moth larval and pheromone trapping programs are being carried out again this year and results of these will be given in the fall Survey Bulletin.

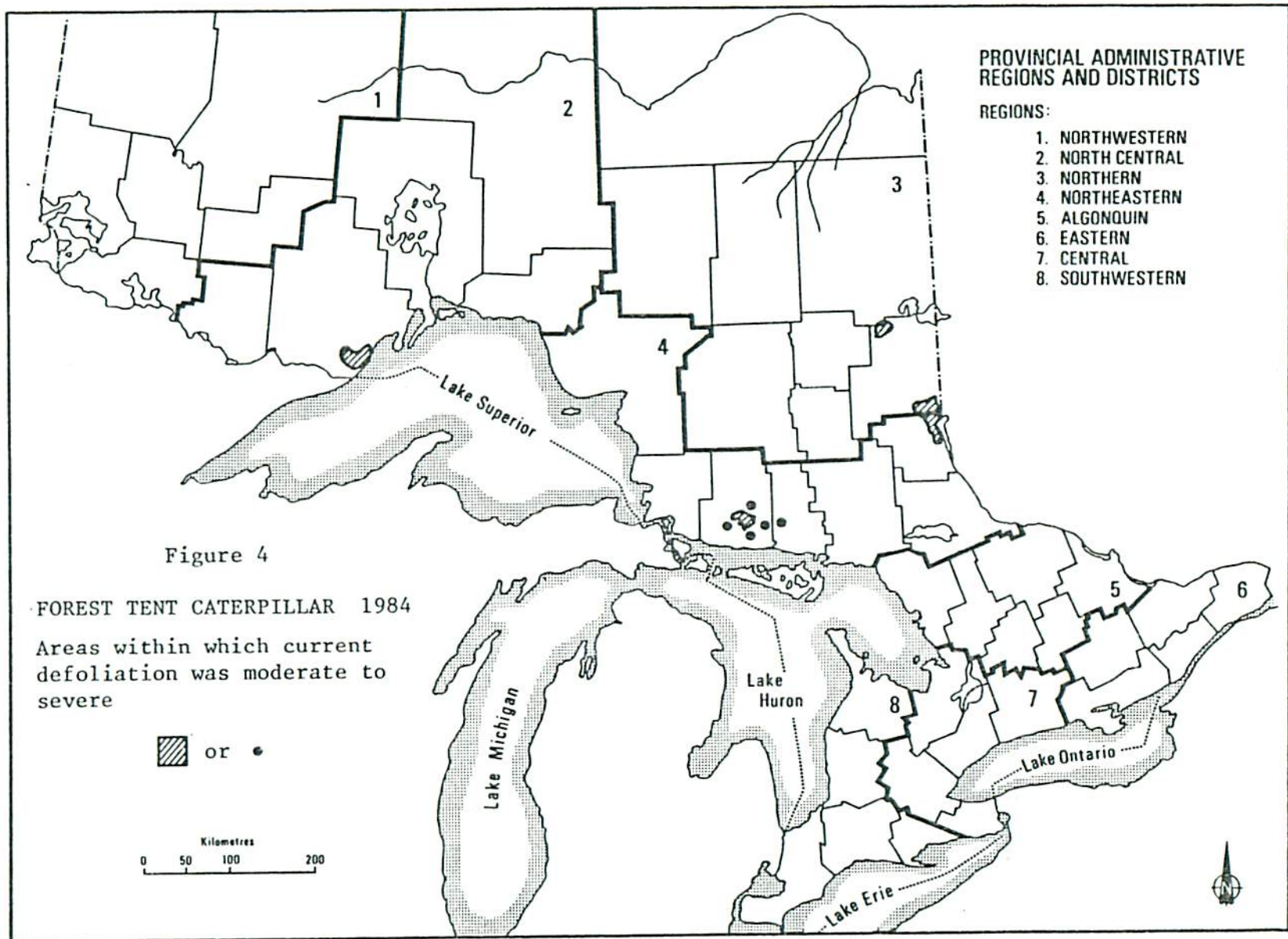
Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Populations of this hardwood defoliator rebounded somewhat in 1984 with a total area of approximately 124,750 ha suffering moderate-to-severe defoliation in comparison with 30,600 ha in 1983.

In the Thunder Bay District, the infestation south of the city of Thunder Bay increased slightly from 26,500 ha in 1983 to approximately 38,500 ha this year. The area of moderate-to-severe defoliation encompasses most of Blake Township as well as adjacent areas of Gillies, Scoble, Pearson, Crooks and Neebing townships and a small part of Indian Reserve No. 52.

In the Northern Region, the infestation northeast of Matheson in the Kirkland Lake District increased in size from 4,100 ha to 6,400 ha. A new infestation, some 78,650 ha in size, was located north and west of Lake Temiskaming in the adjacent Kirkland Lake and Temagami Districts (Fig. 4). This infestation includes all or part of five townships in the southeast corner of the Kirkland Lake District and all or part of seven townships in the northeast corner of the Temagami District.

Small areas of new infestation were also mapped south and east of Elliot Lake in the Blind River District and in the adjacent Espanola District of the Northeastern Region. A total area of approximately 1,200 ha in seven small pockets was affected in the two districts, with overall defoliation averaging about 30%. Occasional colonies and



wandering larvae were reported from the Tweed, Pembroke, Algonquin Park, Lindsay, Hearst and Huronia Districts.

Yellowheaded Spruce Sawfly, *Pikonema alaskensis* (Roh.)

Populations of this defoliator were high in a number of areas. In the Northern Region, heavy infestations were again evident on white spruce snow hedges and windbreaks in the Matheson area and at Swastika Forest Station in the Kirkland Lake District. High numbers of larvae were again present in black spruce plantations in Bond Township, Timmins District, although damage evaluations have not yet been completed. Open-grown ornamentals were heavily infested at Finlayson Point Provincial Park in the Temagami District and similar conditions were reported on ornamentals in the Remi Lake area of Kapuskasing District. Small numbers of open-grown trees suffered defoliation ranging from 25 to 50% at several locations in the Chapleau District.

In the Northwestern Region, high populations persisted in a number of areas in Ignace and Sioux Lookout Districts. In the Sioux Lookout District, ornamental plantings in Ojibway Provincial Park and open-grown roadside trees along Highway 72 between Sioux Lookout and Dinorwic suffered nearly complete defoliation. A 28-ha white spruce plantation along the Vermilion River had 11% of the trees infested and defoliation of approximately 50%. In the Ignace District defoliation was as high as 100% in white spruce plantations along pipeline right-of-ways. Incomplete surveys in the Thunder Bay, Atikokan and Nipigon districts show low and declining population levels. Moderate defoliation was reported on ornamental and roadside trees in McKim Township, Sudbury District.

Balsam Fir Sawfly, *Neodiprion abietis* complex

Heavy infestations occurred in a number of areas in the Northwestern and Algonquin regions.

In the Northwestern Region, balsam fir and white spruce in small groups of trees and stands had defoliation ranging from 50 to 75% within a total area of about 100,000 ha. The most widespread damage occurred in Kenora District where balsam fir was severely defoliated in numerous small pockets within an area of 51,000 ha stretching from Nestor Falls to the Redditt-Minaki area. Similar damage was detected in a 32,000-ha area east and west of Dryden in the Dryden District and in a 6,800-ha area along Highway 105 in the Ear Falls-Pakwash Lake area of Red Lake District. Stands were also damaged within an area of approximately 9,800 ha between Sandbar and Crystal lakes in the Ignace District.

In the Algonquin Region, heavy defoliation was reported on balsam fir growing in small, open stands and old pasture fields within an

area of approximately 500 ha in Admaston and McNabb townships, Pembroke District and McCraney Township, Algonquin Park District.

Elsewhere in the province, small numbers of larvae were reported from Hearst, Kapuskasing, Thunder Bay, Chapleau and Geraldton districts.

Cedar Leafminers, *Argyresthia thuiella* Pack., *A. canadensis* Free., *A. aureoargentella* Brower and *Pulicalvaria thujaella* (Kft.)

Although an overall reduction in numbers of this insect complex is evident this year, high populations continue to infest cedar stands on the west side of the Bruce Peninsula in Owen Sound District. In this area, approximately 1,400 ha of eastern cedar were affected in St. Edmunds, Lindsay and Eastnor townships where scattered pockets of mortality are now evident. Heavy infestations were also mapped along the south side of Manitoulin Island from Burnt Island to Hungerford Point in the Espanola District. Small pockets of defoliation were also observed on Kitchener, Cockburn and Fitzwilliam Islands. The total area affected by these infestations was approximately 3,400 ha. The large area of moderate-to-severe damage which occurred in the Central Region in 1983 declined to numerous scattered pockets of light and occasionally moderate defoliation. A total area of about 1,000 ha remain affected as follows: Maple District, 400 ha, Cambridge District, 200 ha and Huronia District, 400 ha. Similar, light defoliation was reported in an area of approximately 500 ha in the Owen Sound District of the Southwestern Region. Low populations were also observed at several locations in the Tweed and Napanee districts of the Eastern Region and in the Aylmer, Wingham and Simcoe districts of the Southwestern Region. A single heavy infestation on cedar windbreaks in the G. Howard Ferguson Forest Station in the Brockville District was effectively controlled by a single application of the insecticide Cygon 2E.

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

Populations of this serious pest of red oak declined to the lowest levels recorded in many years. In the Huronia District of the Central Region, where the insect has been a persistent problem, only a light defoliation was recorded at one location near Farlain Lake in Tiny Township. Light defoliation was also noted in an area of about 50 ha in Uxbridge Township, Maple District. In the Northeastern Region, moderate defoliation was recorded in red oak stands approximately 5 ha each in size in Thessalon Township, Blind River District and Tarentorus Township, Sault Ste. Marie District. A 20-ha stand in Hilton Township, Sault Ste. Marie District and a 5-ha stand in Long Township, Blind River District, which suffered heavy and moderate defoliation in 1983, sustained only light damage this year. Low populations were reported from a number of areas in the Southwestern Region and at isolated locations in the Pembroke, Espanola and Carleton Place districts.

Bruce Spanworm, *Operophtera bruceata* (Hlst.)

Following a number of years of very low populations, heavy infestations of this defoliator were reported at two locations in the Northeastern Region. On St. Joseph Island in the Sault Ste. Marie District, approximately 4,160 ha of sugar maple stands suffered defoliation ranging from 30 to 100%. Similar heavy infestations were also reported from Manitoulin Island in the Espanola District where about 125 ha of sugar maple were severely defoliated at Maple Point in Allan Township. The insect was not reported elsewhere in the province.

Pine Spittlebug, *Aphrophora cribrata* (Walker)

Reports of this insect were again widespread in southern Ontario although damage levels are somewhat lower than those experienced in previous years. The highest populations were reported in a 0.5-ha white pine stand along Highway 417 in East Hawkesbury Township, Cornwall District. Medium infestations occurred on Scots pine in Oxford on Rideau Township, Brockville District; in Oro Township, Huronia District; in Beverly Township, Cambridge District; in Uxbridge Township, Maple District; and on white pine in Bexley Township, Lindsay District. Reports of low populations were also received from a number of other locations in the Eastern, Algonquin, Central and Southwestern regions as well as in the Wawa District of the Northeastern Region.

Blackheaded Budworm, *Acleris variana* (Fern.)

In 1983, unusually high populations caused moderate-to-severe defoliation of scattered hemlock and white spruce stands over an area of some 16,800 ha in the Sudbury, Parry Sound, Bracebridge and Minden districts. In 1984, populations collapsed throughout this area with only trace-to-light levels of defoliation observed and very small numbers of larvae collected. Elsewhere in the province, the insect caused light defoliation and cone damage to a white spruce seed orchard near Longlac in Geraldton District and small numbers of larvae were reported from several other widely separated locations.

Birch-Aspen Leafroller, *Epinotia solandria* Linn.

This species was present in a number of areas in the Northern, Northeastern and Algonquin regions; however, defoliation was usually less than 10%. The most severe damage occurred in a 5-ha area in Nimitz Township, Chapleau District, where immature white birch and trembling aspen had 25% defoliation.

Larch Casebearer, *Coleophora laricella* Hbn.

Increased populations were again prevalent in southern Ontario. In the Eastern Region, light and moderate defoliation was evident on small stands of tamarack at a number of locations in the Carleton Place, Brockville and Cornwall districts. In the Algonquin Region, moderate-to-severe defoliation was noted in numerous 1- to 2-ha stands of tamarack in Chandos, Wollaston, Limerick and Cashel townships, Bancroft District and in a 5-ha tamarack stand in Carling Township, Parry Sound District. Light infestations were also reported from a number of widely scattered locations in the Pembroke District as well as in Sabine Township, Algonquin Park District and Chaffey Township, Bracebridge District.

Scattered medium and heavy infestations persisted in the Central Region. Defoliation ranged from 60 to 100% in 10-ha plantations of European larch in West Gwillimbury Township, Huronia District and in Whitchurch Township, Maple District. Defoliation in the 30- to 40%-range was recorded in a 100-ha tamarack stand in the Minesing Swamp in Vespra Township, Huronia District and 50% defoliation occurred on the same host in a 20-ha stand near Uxbridge in the Maple District.

The only significant infestations in northern Ontario occurred in the Sudbury and Espanola districts of the Northeastern Region. In Sudbury District, severe defoliation occurred in a small tamarack stand in Carlyle Township and moderate defoliation recurred on the same host in Killarney Township. Increased populations caused severe defoliation in a 5-ha tamarack stand along Blue Jay Creek in Tehkummah Township on Manitoulin Island and light infestations were recorded near Massey in Salter Township, Espanola District. Light populations were reported on tamarack in Calder Township, Cochrane District in the Northern Region.

Birch Leafminer, *Fenusa pusilla* (Lep.)

Surveys are still in progress; however, reports on feeding activity of the first generation of this pest indicate that heavy infestations have occurred in a number of areas in southern Ontario. The most widespread damage occurred in the Eastern Region where white and grey birch in both urban and forest situations were heavily attacked. In the Central Region, heavy infestations were common on white and ornamental birches in urban settings but damage to forest trees was confined to scattered individuals in a few areas in Huronia and Maple districts. Light and moderate damage to ornamental trees was widespread in the Southwestern Region and heavy leafmining was reported on roadside trees along Highway 60 in Algonquin Park in the Algonquin Region.

In northern Ontario, heavy damage was recorded in most urban areas of the Northern Region and aerial surveys revealed heavy defolia-



tion in about 26 ha of white birch stands in the Latchford-Cobalt-Haileybury area of Temagami District and in 100 ha in McNaught Township, Chapleau District. In the Northeastern Region, high populations occurred on ornamentals in most urban areas and heavy infestations were reported on roadside and fringe trees in Hardy Township, North Bay District, along the Newe River and in Burwash Township, Sudbury District and in Fenwick and Hodgins townships, Sault Ste. Marie District.

In the North Central Region, populations generally declined although browning of ornamentals was reported as common in the Thunder Bay-Kakabeka Falls area of Thunder Bay District. Infestations which occurred in a number of areas in the Atikokan District last year declined to very low levels in 1984.

Fall Cankerworm, *Alsophila pometaria* (Harr.)

Heavy infestations were reported from a number of areas in the Northwestern, North Central and Central regions. In the Northwestern and North Central regions, ornamental white elm and Manitoba maple were severely defoliated in the towns of Dryden, Sioux Lookout and Fort Frances for the second consecutive year and new heavy infestations occurred on the same species in the town of Ignace and the city of Thunder Bay. The most severe damage again occurred in Dryden and Sioux Lookout where defoliation was often 100%.

In the Central Region populations declined to low levels in areas along the Grand River in North Dumfries, Brantford and Onondaga townships, with defoliation of roadside and riverbank Manitoba maple averaging 10%. In the Maple District, defoliation ranging from 20 to 100% was recorded in the north part of the city of Richmond Hill and in Uxbridge Township, with areas of about 100 ha affected at each location. At these locations defoliation was recorded on oak, ash, maple and hazelnut trees.

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

This insect again caused moderate-to-severe defoliation of trembling aspen in the Webbwood area of Espanola District. Approximately 3,200 ha were mapped by aerial surveys in the townships of Shakespeare, Gough, Salter, Hallam and May. Aerial surveys also detected new areas of moderate-to-severe defoliation totalling approximately 1,200 ha in Allan and Burpee townships on Manitoulin Island. Infestations which persisted for several years in Georgina Township, Maple District declined to trace levels this year.

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Pine False Webworm, *Acantholyda erythrocephala* (Linn.)

There was little change in the status of this introduced pest. In the Central Region, the insect is most abundant in the Huronia District, with most young pine stands suffering some degree of defoliation, although populations appear to be declining in the older infested areas. High populations occurred at Balsam Lake Provincial Park in the Lindsay District, where 97% of the trees in a young white pine plantation were infested, although actual defoliation was quite low. Heavy infestations were also reported from a number of areas in Marlborough and Oxford on Rideau townships in the Carleton Place and Brockville districts, respectively, of the Eastern Region. At one location in Oxford on Rideau Township, a Scots pine Christmas tree plantation sustained defoliation ranging from 20 to 100%. A control program using the insecticide Sevin achieved excellent results. Sevin, in the form of Sevin-4-oil, was also used to control the insect in a white pine seed orchard in Snowdon Township, Minden District with similar results. Occasional infested plantations were reported from the Owen Sound, Cambridge and Maple districts.

Black Army Cutworm, *Actebia fennica* (Tausch.)

Heavy infestations of this insect were reported from a number of locations in the Northern Region. The most severe damage occurred in Township 239, Hearst District, where a 250-ha burned area was being planted with eight-month-old black spruce stock. Numbers of larvae were so high within the burned area that the planting operation was curtailed and approximately 89,000 trees already in the ground were destroyed. A similar heavy infestation also occurred in an 80-ha burned area in Miramichi Township, Gogama District. In this area, 2-0 jack pine stock was much less severely damaged, with 5 to 10% of the trees defoliated. In this case it appears that the cutworm larvae preferred to feed on competing ground cover and small shrubs which were 100% defoliated. Small numbers of larvae were also reported feeding on pine and spruce seedlings in several compartments of the Thunder Bay Forest Station in the North Central Region.

Oak Skeletonizer, *Bucculatrix ainsliella* Murt.

Preliminary surveys indicated that a significant decline in numbers of this insect has occurred. In the Central Region, where approximately 1,800 km<sup>2</sup> of moderate-to-severe damage were recorded in 1983 in the Niagara Cambridge and Maple districts, only one area of similar defoliation was recorded in a 40-ha woodlot near Oakville in the Cambridge District in 1984. Two other small areas in the cities of Burlington and Cambridge had 20% defoliation. Only very low numbers of larvae were encountered elsewhere. Surveys for the second generation will be carried out in late summer and results will be reported in the fall Survey Bulletin.

American Aspen Beetle, *Gonioctena americana* (Schaeff.)

A marked decline was evident in populations of this pest of trembling aspen. Widespread low populations were reported in the Chapleau and Gogama districts, with the most severe damage recorded in a 3-ha stand near the Chapleau airport, where defoliation of about 15% occurred. Low populations were also reported in Arnott and Larkin townships, Hearst District and at several locations in the Timmins, Temagami and Kirkland Lake districts. A medium infestation caused 30% defoliation of open-grown trembling aspen in Buchanan Township, Pembroke District and low populations occurred in Burleigh Township, Bancroft District. The insect was not reported elsewhere in the province.

Saratoga Spittlebug, *Aphrophora saratogensis* (Fitch)

In 1983 this insect caused patches of mortality in a 3-m red pine plantation in Hagarty Township, Pembroke District. Intensive surveys in the area in 1984 showed high numbers of spittlebugs feeding on the alternate host, sweetfern, although they had not yet attacked the red pine trees at this location. A similar situation occurred in Richards Township, with numerous spittle masses evident on sweetfern but no damage on adjacent red pine. One new area of medium infestation was discovered in a 4-ha red pine plantation in Fraser Township where 53% of the trees were attacked by spittlebug and foliar damage was about 18%. A small pocket of mortality in this plantation may have been caused by the insect. Insects were not found elsewhere and surveys are continuing.

Pine Needle Sheathminer, *Zelleria haimbachi* Busck.

For the second consecutive year the pine needle sheathminer caused noticeable browning of new foliage at a number of locations in the Northeastern Region. Open-grown semimature jack pine in Windy Lake Provincial Park near Dowling, Sudbury District were again heavily attacked as were mature jack pine near Worthington in Lorne Township. Medium infestations were also recorded in Hess and Cartier townships, Sudbury District.

Ground surveys detected high numbers of larvae of this insect on open-grown trees and in small stands of jack pine in Wallbridge, Harrison, Shawanaga, Carling and McDougall townships in Parry Sound District, Algonquin Region. However, in this area, damage caused by the pine needle sheathminer was often masked by heavy feeding by the jack pine budworm. High numbers of larvae were also noted in a few jack pine stands in Temagami and Kirkland Lake districts and low populations were reported from several areas in Sault Ste. Marie and Blind River districts.

Red Pine Sawfly, *Neodiprion nanulus nanulus* Schedl.

High populations of this defoliator were reported from the Northwestern and North Central regions for the second consecutive year. The most widespread damage occurred in an area along Highway 17 in the Corman-Skey townships area of Ignace District. Here, fringe and under-story jack pine and red pine within an area of some 55,000 ha suffered defoliation ranging from 75 to 100%. In the Dryden District, similar defoliation was observed on jack pine and red pine within an area of about 8,700 ha in Smellie and Wabigoon townships. Small pockets of moderate-to-heavy defoliation were also noted on roadside trees in the Pickle Lake area and along the Marchington Road in Sioux Lookout District. Moderate-to-severe defoliation was also reported on roadside jack pine in the Shebandowan-Shabaqua area of Thunder Bay District.

In the Northern Region, moderate-to-severe defoliation occurred on roadside jack pine in Jack and Noble townships, Gogama District while populations in the Gowganda area of Kirkland Lake District declined to low levels. The insect was also found abundantly along the shores of Temagami Lake, Temagami District.

Light infestations were recorded from a number of other areas as follows: along the Biscotasing Road in Carew Township, Chapleau District; at numerous points in the Thunder Bay and Atikokan districts; at Nagamisis Provincial Park, Frost Township, and in McMillan Township, Hearst District; near Halfway Lake Provincial Park, Sudbury District; and near Wildgoose Lake in Lindsley Township, Geraldton District. Moderate defoliation was reported on a few trees in Lochiel Township, Cornwall District.

Jack Pine Sawflies, *Neodiprion pratti paradoxicus* Ross and *N. pratti banksianae* Roh.

Large numbers of *N. pratti banksianae* were reported feeding in conjunction with the red pine sawfly on roadside and fringe trees in Jack, Noble and Churchill townships, Gogama District and in the town of Chapleau, Chapleau District. Heavy infestations causing defoliation as high as 100% occurred in approximately 19 ha of jack pine plantations in North Algona, Wilberforce and Hagarty townships, Pembroke District. Light infestations occurred on jack pine at a number of other locations in the Pembroke District as well as in Attlee Township, Sudbury District, Hodgson Township, Ignace District and Marlborough Township, Carleton Place District. A Scots pine plantation was lightly infested in South Gower Township, Brockville District.

The closely related species *N. pratti paradoxicus* was reported causing moderate-to-severe defoliation of planted jack pine at a number of locations in Elizabethtown Township, Brockville District and to single plantations in Lochiel and South Plantagenet Townships, Cornwall District.

Spruce Bud Moth, *Zeiraphera canadensis* Mut. and Free.

Medium and heavy infestations which occurred in a number of areas in the Central and Southwestern regions in 1983 collapsed this year. The only reports of the insects were received from the Southwestern Region where very low populations were recorded on white spruce in a number of widely separated locations.

#### Other Noteworthy Insects

Heavy infestations of the European pine shoot moth, *Rhyacionia buoliana* (Schiff.), persisted in Osprey Township, Owen Sound District where 87% of 2- to 4-m trees were attacked. Low populations were also reported in Nottawasaga Township, Huronia District, West Nissouri Township, Aylmer District and Mariposa Township, Lindsay District.

Light infestations of the jack pine tip beetle, *Conophthorus banksianae* McPherson, were reported from Wawa, Nipigon, Sudbury and Espanola districts.

The larger boxelder leafroller, *Archips negundanus* (Dyar), caused severe defoliation of Manitoba maple within a 10-ha area in the city of Sudbury, Sudbury District.

The cherry casebearer, *Coleophora pruniella* Clem., caused severe defoliation of balsam poplar along the Bidwell Road in Bidwell Township, Espanola District. The same insect, feeding in conjunction with the elm casebearer, *Coleophora limosipenella* Dup., severely defoliated 5 ha of white birch at Murphy's Point Provincial Park, and scattered trembling aspen in Gloucester Township, Carleton Place District.

In addition to the damage reported above, the elm casebearer also caused heavy defoliation of white elm in the town of Spencerville, Brockville District and somewhat less damage to ornamental elm along the Niagara Parkway, Niagara District.

High populations of the basswood looper, *Erannis tiliaria* (Harr.), caused conspicuous defoliation of several tree species, particularly Manitoba maple and apple in the city of Sault Ste. Marie.

The eastern tent caterpillar, *Malacosoma americanum* F., caused conspicuous defoliation of roadside and open-grown deciduous trees, particularly apple, cherry and hawthorn at numerous locations in the Central, Eastern and Algonquin regions and in a few locations in the Espanola and North Bay districts of the Northeastern Region. The closely related northern tent caterpillar, *Malacosoma californicum pluviale* Dyar, was found commonly on white birch, trembling aspen and cherry in open-grown situations in the Timmins, Kirkland Lake, and Temagami districts and in Reaume Township, Cochrane District in the Northern Region.

Heavy infestations of the European elm scale, *Gossyparia spuria* (Modeer), were reported on open-grown white elm in Bagot Township, Pembroke District.

Increased populations of the European pine sawfly, *Neodiprion sertifer* (Geoff.), were reported in young red pine plantations. The highest incidence occurred in a red pine plantation in Mono Township, Huronia District, where 23% of the trees suffered 30% defoliation. The insect was also reported causing light defoliation in a Scots pine plantation in Billings Township on Manitoulin Island, Espanola District, at several locations in South Gower and Oxford on Rideau townships, Brockville District and in Marlborough Township, Carleton Place District.

Heavy infestations of the European snout beetle, *Phyllobius oblongus* (Linn.), caused conspicuous leaf damage to ornamental white elm and willow trees in Gurd and Banfield townships, North Bay District. Widespread low populations were reported in the Owen Sound and Huronia districts, and in the vicinity of the city of Sault Ste. Marie, Sault Ste. Marie District.

The pine root collar weevil, *Hyllobius radicis* Buch., damaged 54% of 8-m red pine trees in the Brentwood Tract in Sunnidale Township, Huronia District. The insect was also reported damaging Scots pine Christmas trees at several locations in Oro Township, Huronia District and red pine in a 4-ha plantation in Richards Township, Pembroke District.

The spruce spider mite, *Oligonychus ununguis* (Jac.), damaged 11% of the trees in a 28-ha white spruce plantation near the Vermillion River in the Sioux Lookout District.

High numbers of the northern pine weevil, *Pissodes approximatus* Hopk. were associated with disease-damaged red pine trees in a 10-ha plantation in McMurrich Township, Parry Sound District. The insect was also found causing light damage in a 1-ha red pine plantation in Salter Township, Sudbury District.

Heavy infestations of the European fruit lecanium, *Lecanium corni* Bouche, which occurred on red oak in Lavant Township, Carleton Place District in 1983, were reduced to very low levels this year. This scale insect was also found causing severe shoot damage to honey locust in the town of Port Dover, Simcoe District.

Little change was evident in the range of the satin moth, *Leucoma salicis* (Linn.), which is confined to the Eastern Region. Two small new infestations were detected on silver poplar near Brockville in the Brockville District and near Winchester in the Cornwall District.

The slug sawfly, *Caliroa* sp., caused 20% defoliation of small groups of red oak trees at Bass Lake Provincial Park, Huronia District and in Thorah and Uxbridge townships, Maple District.

High numbers of the bark beetle, *Orthotomicus caelatus* (Eich.), were associated with disease-caused red pine mortality in a 10-ha plantation in McMurrich Township, Parry Sound District.

High populations of the pine bark adelgid, *Pineus strobi* (Htg.), were reported from a mature white pine stand in a small 1-m white pine plantation in South Walsingham Township, Simcoe District.

The jack pine resin midge, *Cecidomyia resinicola* (O.S.), damaged 5% of the shoots on 12% of the trees in a 2-ha jack pine stand in Marlborough Township, Carleton Place District. The insect was also reported as common at low population levels in jack pine stands in the Timmins, Temagami and Kirkland Lake Districts.

#### National Early Warning Systems for Acid Rain

In keeping with its new role as part of a national early warning system for acid rain, the Ontario FIDS Unit has established five study plots in strategic areas across the province. These are the first of 12 which it is hoped will be established this year. The plots are designed so that FIDS staff can forecast or detect as early as possible any damage that may occur to the forest because of acid precipitation. They will be located in stands of the major commercial tree species in Ontario, including black spruce, jack pine, trembling aspen, white birch, sugar maple and yellow birch. Among the parameters measured on each plot are vertical and radial growth, crown structure and density, mortality, incidence of insect and disease attack and specific acid rain symptoms. The five plots established to date are located as follows: at Hawkeye Lake, north of the city of Thunder Bay in Fowler Township, Thunder Bay District; near Turkey Lake, north of Sault Ste. Marie in Wishart Township, Sault Ste. Marie District; near High Falls, north of Nairn Centre in Drury Township, Sudbury District; and at Plastic Lake and the Leslie Frost Centre near Dorset in Sherborne and Ridout townships, Bracebridge District. All are located on land which is currently reserved for various study purposes to ensure a minimum of outside disturbance to the sites selected. Further reports will be presented in the Survey Bulletin as the program develops.

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## TREE DISEASES

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

Each year FIDS technicians in southern Ontario carry out an intensive search for the European race of this pathogen. Aerial surveys are conducted in May and suspect areas are then ground checked for the disease. In addition, some 70 strategically located red pine plantations are closely scrutinized and numerous other plantations are checked in the course of day-to-day survey activities. In spite of these efforts the European race has not yet been detected in Ontario although several samples from this year's survey are still in culture.

Reports of the North American race of Scleroderris canker disease were received from a number of areas in northern and southern Ontario. The most significant of these were in Houghton and Kirkwood townships, Blind River District where 79.3% and 33.6% of the trees were infected with mortality of 16.8% and 2.2%, respectively. Roadside jack pine trees in Lastheels Township, Wawa District were 26% infected. In McMurrich Township, Parry Sound District, three plantations totalling 22.9 ha in area had an average of 24.6% of the trees severely damaged and an average mortality of 1.3%. The disease was also reported at low incidence in the Geraldton and North Bay districts.

### Globose Gall Rust, *Endocronartium harknessii* (J.P. Moore) Y. Hirat.

In Furniss Township, Ignace District 12.4% of the 2-m trees in a 355-ha jack pine stand were severely damaged. Severe damage was also reported on 10% of the trees in a 2-ha stand of 2-m jack pine in Neelands Township, Chapleau District. The disease was also reported at varying infection levels from a number of other locations in the North Central, Northeastern, Algonquin and Central regions but in all cases severe damage occurred on less than 5% of the trees.

### Ink Spot of Aspen, *Ciborinia whetzellii* (Seaver) Seaver

Preliminary reports indicate a large increase in both extent and severity of infections of this foliar disease in the Northern Region. The most extensive foliar damage was mapped in the Kirkland Lake and Timmins districts where numerous evaluations showed pockets of infection ranging in size from 2 to 10 ha and foliar damage ranging from 30 to 80%. The disease was also reported at similar damage levels from a number of other areas in the Northern Region, as well as from a few areas in the Northeastern, Algonquin and Eastern regions.



Needle Cast, *Davisonmycella ampla* (Davis) Darker

Generally low and declining infection levels occurred at a number of locations in northern Ontario and in the Pembroke District of southern Ontario. The highest incidence was in an 8-ha jack pine stand near Deep River, Pembroke District where 30% of the trees had defoliation ranging as high as 30% and in Lomond Township, Sioux Lookout District where foliar damage of 21% was recorded in a 100-ha jack pine stand. Elsewhere, foliar damage did not usually exceed 5%.

Pine Needle Rust, *Coleosporium asterum* (Diet) Syd.

Heavy infections of this disease have occurred in a 50 ha, 2.4-m jack pine plantation in Arnott Township, Hearst District for the past 3 years. Infection levels remained high this year, with 100% of the trees suffering foliar damage of 43% on average. In spite of this, the trees in the plantation show little sign of permanent damage. The disease also caused 50% defoliation of 10% of the 2-year-old seedlings in a red pine plantation in Uxbridge Township, Maple District. Low levels of infection were also reported from the Sudbury, Cornwall, Brockville, Wingham, Cochrane, Chapleau, Gogama, Blind River and Thunder Bay districts.

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

Little change occurred in the status of this disease in 1984. The organism was reported causing damage in young conifer plantations and natural stands throughout the province but mortality usually was less than 2%. Exceptions to this trend occurred in McMurrich Township, Parry Sound District where a 10% mortality rate was recorded on trees damaged by Scleroderris canker disease in a 15-ha red pine plantation and in Stanhope Township, Minden District where the disease was present on 23 porcupine-damaged trees in a 2-ha red pine plantation.

White Pine Blister Rust, *Cronartium ribicola* J.C. Fisch.

The most severe damage reported this year occurred in a 1.5-ha white pine plantation in Reaume Township, Cochrane District where severe damage, usually in the form of stem cankers, occurred on 48% of the 2.6-m trees and 4% mortality was recorded. Similar damage levels occurred in a 2.4-ha, 2-m white pine plantation in Dungannon Township, Pembroke District where 20% of the trees had stem cankers and mortality was 5%. The disease was also reported, usually at low infection levels, in the Eastern, Algonquin, Central and Northeastern regions.

Leaf and Twig Blight of Aspen, *Venturia macularus* (Fr.) Müller and Arx

Surveys for this organism are still in progress but preliminary reports indicate that infection levels have increased in the Hearst District, and numerous pockets of severe damage have been observed. Small pockets of infection, usually at low damage levels, were also reported from a number of widely scattered areas in the remainder of the Northern Region as well as in the Algonquin, Eastern and Southwestern regions.

Sweetfern Blister Rust, *Cronartium comptoniae* Arth.

In Calvert Township, Cochrane District 28% of the trees in a 10-ha jack pine stand were affected by stem cankers caused by this rust. Similar damage levels were also recorded at Wakami Provincial Park, Chapleau District, where 24% of the overmature jack pine had stem cankers and 8% mortality was observed. The disease was also recorded at varying damage levels at numerous other locations in the Northern Region.

#### OTHER DISEASES OF NOTE

Heavy infections of a needle cast, *Lophodermium seditiosum* Minter et al., caused 70% needle infection on 95% of the trees in a 40-ha red pine stand in Gurd Township, North Bay District. The disease also caused 30% foliar damage to the same host in a 1-ha area in Lloyd Township, Chapleau District.

The leaf blister rust *Taphrina caerulescens* (Mont. & Desm.) Tul. caused moderate damage to red oak foliage in Fairbanks Provincial Park and heavy leaf damage to the same species in Killarney Provincial Park, Sudbury District.

Brown spot needle blight of pines, *Scirrhia acicola* (Dearn.), Siggers, was reported causing 50% defoliation of ornamental mugho pine at Inverhuron Provincial Park, Owen Sound District.

The twig blight *Sirococcus strobilinus* Preuss was common on understory red pine trees at French Lake Ranger Station in the Atikokan District.

An evaluation in a 40-ha Douglas-fir Christmas tree plantation in Clarke Township, Lindsay District revealed infection by the needle cast *Rhabdocline pseudotsugae* Syd. on 100% of the trees, and an average of 18% foliar damage.

An evaluation in a 6-ha Douglas fir Christmas tree plantation in Tiny Township, Huronia District disclosed that the Swiss needle cast, *Phaeocryptopus gauemanni* (Rohde) Petr., was present on 29% of the trees and that foliar damage was 40%.

New infection centres of fomes root rot, *Heterobasidion annosum* (Fr.) Bref., were found on red pine at two locations in the Larose Forest, Cornwall District and at one location in the Limerick Forest, Brockville District.

Light infections by the fir broom rust, *Melampsorella caryophyllacearum* Schroet, were detected on balsam fir trees in Greenwater Provincial Park, Cochrane District and in Fushimi Provincial Park, Hearst District.

The fireweed rust, *Pucciniastrum epilobii* Otth., caused defoliation in the 10% range in balsam fir stands at a number of locations in Daoust and Gallagher townships, Chapleau District.

The leaf spot, *Marssonina brunnea* (Ell. & Ev.) Magn., caused 100% foliar damage in a 0.5-ha stand of 13-m trembling aspen in Sherwood Township, Pembroke District. The same organism also damaged 80% of the hybrid poplar clone D198 at the Orono Forest Station, Lindsay District.

Late spring leaf scorch was reported at varying levels on sugar maple from a number of locations in the Lindsay, Simcoe, Aylmer, Niagara and Bancroft districts.

The needle cast *Lophodermium* sp. caused 75% foliar damage to 5 ha of open-grown jack pine in Harrison Township, Parry Sound District and 40% foliar damage to roadside white pine in Lloyd Township, Chapleau District.

An ice storm caused severe damage to red pine plantations in the vicinity of the village of Flinton in the Tweed District. Trees in the 10-m height range were broken off and uprooted in patches up to 0.5 ha in size throughout the area.

High winds caused scattered blowdown of trees throughout the Central Region. The most severe damage was reported in a recently thinned jack pine stand in Albion Township, Maple District and on the same species adjacent to a recent clearcut in Vespra Township, Huronia District.

On 15 July, 1984 a tornado blew down approximately 60 ha of mixed hardwoods on the northeast side of Ralph Township, Pembroke District. The tornado then crossed the Ottawa River, causing more damage in the province of Quebec.

## ABIOTIC DAMAGE

### Winter Drying

This condition is caused by warm, dry weather in late winter and early spring: the foliage of conifers becomes dehydrated at a time when frozen roots and stems cannot replace the lost moisture. The foliage thus damaged turns brown in the spring and early summer and is later shed. In extreme cases the buds are also destroyed and occasional mortality occurs.

This year, winter drying was widespread in southern Ontario. Red pine and white pine were the species most commonly affected but reports of damage on white and Norway spruce, balsam fir and eastern cedar were also received. The most widespread damage was reported from the Pembroke and Lindsay districts, although the condition was also observed frequently throughout the Eastern Region, and in the Cambridge, Maple, Huronia and Owen Sound districts. Evaluations of damaged white pine plantations in Bentinck Township, Owen Sound District and Erin Township, Cambridge District showed an average of 65% of the trees affected and foliar damage in the 20% range. A single report of winter drying was received from Merritt Township, Espanola District where 1.3% mortality was recorded in a 5-ha plantation of 1.5-m red pine.

### Frost

Reports of severe frost damage on early flushing trembling aspen stands were received from the Northwestern Region and the southern Sault Ste. Marie and Blind River districts of the Northeastern Region. The most severe damage occurred in the Lake of the Woods areas of Kenora and Fort Frances districts and south of Dryden in the Dryden District where defoliation was often in excess of 75%. In many cases the trees produced a second crop of leaves with no apparent permanent damage but in some areas this did not occur and foliage remained dwarfed and very sparse.

Reports of frost damage on other tree species, mainly white spruce, balsam fir and tamarack, were also received from the Owen Sound, Cambridge, North Bay, Kapuskasing, Cochrane and Hearst districts. Although the number of trees affected at these locations ranged as high as 95%, foliar damage was less than 10% in all cases.

### Salt Damage

This perennial problem was reported from the Eastern, Central and Southwestern regions. As usual, trees along major highways and in

heavily salted areas at interchanges, hills and curves suffered the most damage. In the Eastern Region the salt damage was often compounded with severe winter drying and at one location near the town of Kemptville in the Brockville District, 9-m roadside white spruce trees had 3% mortality. In Flos Township, Huronia District and Albion Township, Maple District, white pine plantations totalling 8 ha in area had an average of 67% of the trees affected and 24% foliar damage. Somewhat lower levels of damage occurred on red pine in Turnberry and Minto townships, Wingham District and in North Walsingham Township, Simcoe District.

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7 September 1984

ISSN 0705-503X