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SURVEY BULLETIN

Forest Insect and Disease Conditions in Ontario

Summer 1988



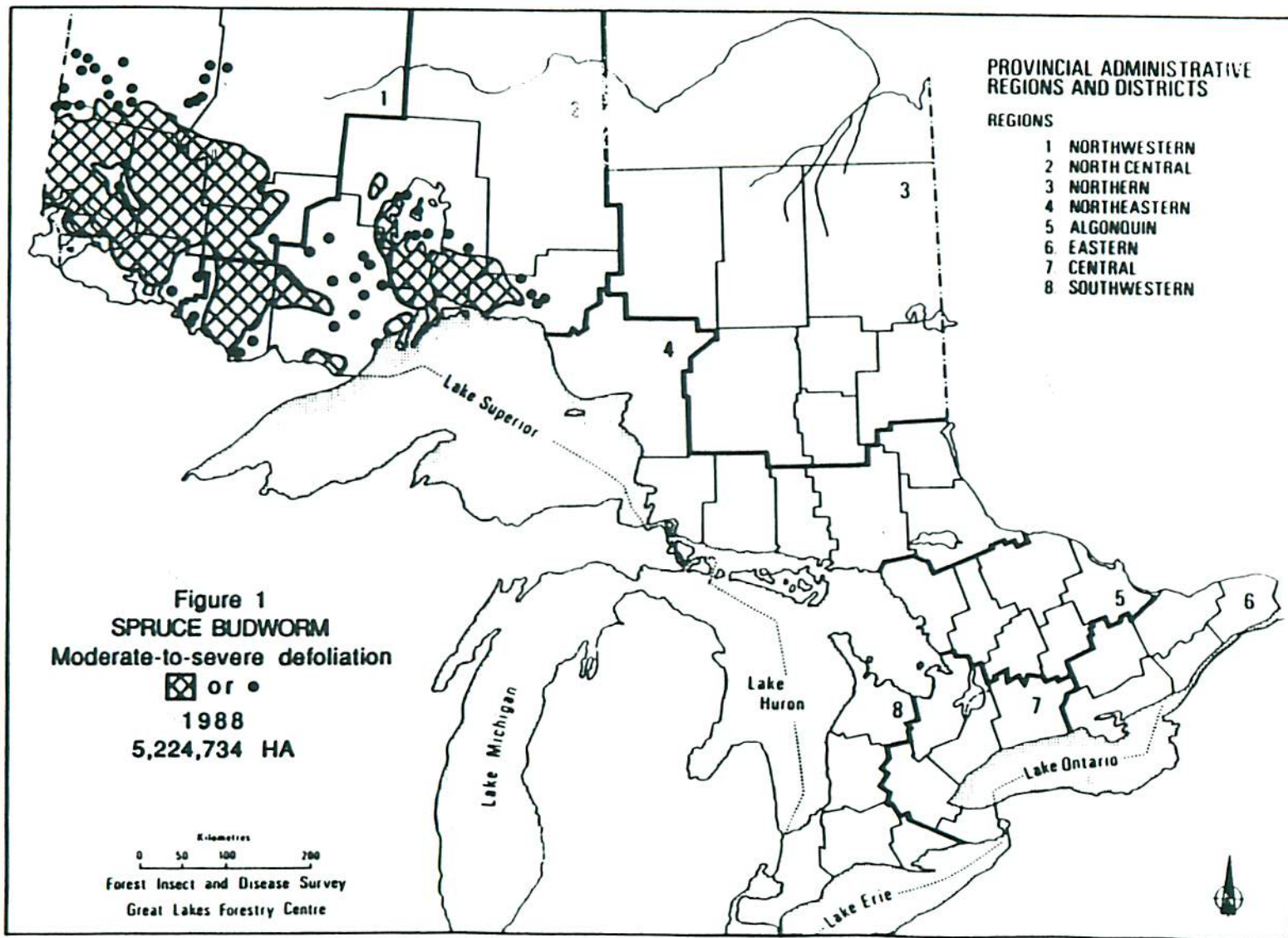
Drought damage on red oak.

GREAT LAKES FORESTRY CENTRE
Box 490 • Sault Ste. Marie Ontario

Table 1. Gross area of current moderate-to-severe defoliation by spruce budworm in Ontario from 1985 to 1988 (concl.)

Region	Area of moderate-to-severe defoliation (ha)				
	District	1985	1986	1987	1988
<u>Northwestern</u>					
Ignace		599,895	530,761	584,322	512,961
Dryden		952,385	891,997	835,308	907,685
Sioux Lookout		240,048	428,830	556,457	540,334
Fort Frances		700,172	542,176	497,579	275,817
Kenora		911,037	906,917	821,074	886,627
Red Lake		10	200,349	256,167	266,361
		<u>3,403,547</u>	<u>3,501,030</u>	<u>3,550,907</u>	<u>3,389,785</u>
<u>Northern</u>					
Chapleau		6,120	70	0	0
Cochrane		600	0	0	0
Gogama		11,570	428	0	0
Hearst		1,173,734	32,384	0	0
Kapuskasing		0	0	0	0
Kirkland Lake		1,125	0	0	0
		<u>1,193,149</u>	<u>32,882</u>	<u>0</u>	<u>0</u>
<u>Northeastern</u>					
Blind River		0	0	0	0
Espanola		1,980	408	0	0
North Bay		20,305	1,802	0	0
Sault Ste. Marie		7,875	0	0	0
Sudbury		105,805	455	0	0
Temagami		245	0	0	0
Wawa		1,386,547	11,389	0	0
		<u>1,522,757</u>	<u>14,504</u>	<u>0</u>	<u>0</u>
		<u>12,332,365</u>	<u>8,855,687</u>	<u>7,189,763</u>	<u>5,224,734</u>

The above declines notwithstanding, a large infestation persists, stretching from south-central Thunder Bay District west and north through the Atikokan, Ignace, Sioux Lookout, Dryden, Fort Frances, Red Lake and Kenora districts to the Manitoba border; the infestation encompasses 3,892,027 ha. A second large body of infestation occurred in the North Central Region, stretching from the central Terrace Bay District across the southwestern corner of Geraldton District and southern Nipigon District to eastern Thunder Bay District - a total of 820,249 ha. Numer-



ous smaller infestations were mapped around and between these two large areas; they ranged in size from a few hectares to an area of some 52,516 ha on the Sibley Peninsula of Thunder Bay District. A number of islands were infested in southern Lake Nipigon, including Kelvin, Shakespeare, Alexandra and Prince of Wales islands, along with Simpson, St. Ignace, Edward, Pie and Flatland islands along the northwest coast of Lake Superior.

It should be pointed out at this time that figures used throughout this bulletin are preliminary results derived from aerial surveys supported by numerous ground checks, and are subject to change should subsequent surveys turn up new information.

The Ontario Ministry of Natural Resources (OMNR), in an effort to protect high-value forests, aerially sprayed some 14,023 ha with the bacterial insecticide *Bacillus thuringiensis* (B.t.) in the Nipigon and Thunder Bay districts.

The annual spruce budworm egg-mass survey by which predictions for 1989 infestation levels will be made is under way, and results of this program will be presented in the fall Survey Bulletin.

Jack Pine Budworm, *Choristoneura pinus pinus* Free.

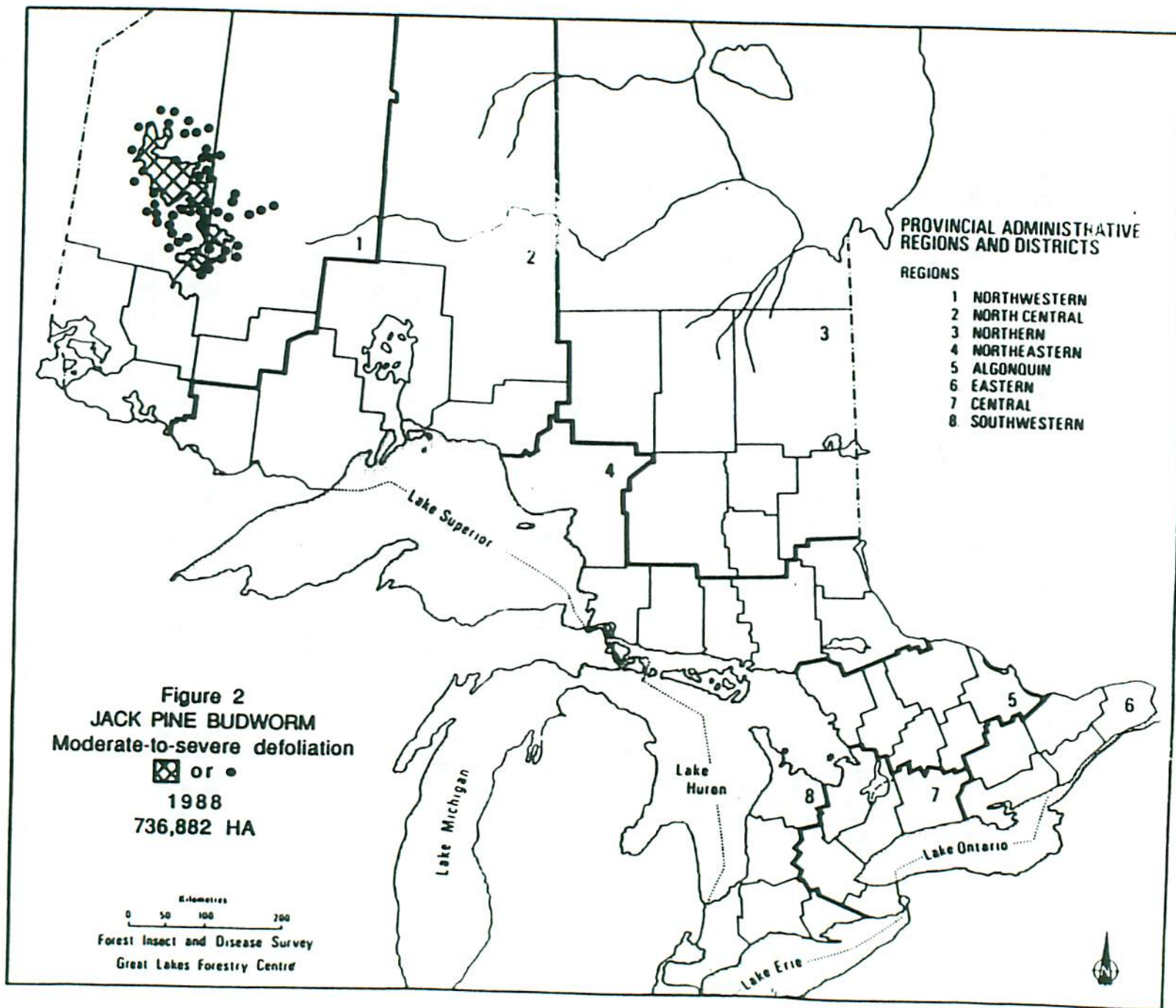
In 1987, populations of the jack pine budworm collapsed throughout the province except in the Northwestern Region, where 504,149 ha of moderate-to-severe defoliation occurred. On the basis of egg-mass counts and historical records of earlier outbreaks, a general population collapse with only a few scattered areas of moderate defoliation was expected in this area in 1988.

However, populations rebounded in 1988, with the overall area of moderate-to-severe defoliation increasing from 504,749 ha in 1987 to 736,882 ha this year. While populations did collapse in the Dryden, Kenora, Ignace and Fort Frances districts, where no discernible defoliation occurred, these declines were more than offset by major increases in the Sioux Lookout and Red Lake districts (Table 2). The largest single infestation occurred in north-central Red Lake District, where some 500,038 ha were infested from the Needler Lake-Malprize Lake area, northwest to the north end of McInnes Lake (Fig. 2). Immediately south of this infestation two smaller infestations occurred on the northeast side (20,425 ha) and southwest side (9,929 ha) of Trout Lake. Two other sizeable infestations straddled the Red Lake-Sioux Lookout border; the northern infestation in the Agnew Township-Roadhouse River area totaled 73,009 ha and the southern infestation in the Celt Lake-Altimeter Lake area encompassed 87,060 ha. Numerous smaller pockets ranging from a few hectares to 6,355 ha surrounded the above infestations. In addition to the infestations in the Northwestern Region, a small area of moderate defoliation was mapped in the English River area of Thunder Bay District in the North Central Region.

The annual egg-mass survey is in full swing and results of this will be carried in the fall Survey Bulletin.

Table 2. Gross area of current moderate-to-severe defoliation by the jack pine budworm in Ontario from 1983 to 1988

Region	Area of moderate-to-severe defoliation (ha)						
	District	1983	1984	1985	1986	1987	1988
<u>Northwestern</u>							
	Red Lake		139,334	1,027,202	877,521	286,949	613,096
	Fort Frances		14,044	44,652	99,391	11,237	0
	Ignace		0	15,973	37,435	21,194	0
	Kenora		0	372,242	315,731	69,344	0
	Sioux Lookout		0	16,646	90,408	30,520	123,786
	Dryden		0	16,103	133,653	85,505	0
			<u>153,378</u>	<u>1,477,818</u>	<u>1,554,139</u>	<u>504,749</u>	<u>736,882</u>
<u>North Central</u>							
	Atikokan	6,970	335,770	278,623	31,391		
	Thunder Bay	0	34,798	6,783	0		
		<u>6,970</u>	<u>370,568</u>	<u>285,406</u>	<u>31,391</u>		
<u>Northern</u>							
	Sault Ste. Marie	0	746	14,262	0		
	Blind River	9,250	118,021	256,351	24,741		
	Espanola	8,880	233,027	217,665	1,212		
	Sudbury	11,840	76,896	385,762	30,129		
	Temagami	0	530	6,224	0		
	North Bay	0	0	6,792	545		
		<u>29,970</u>	<u>429,220</u>	<u>887,056</u>	<u>56,627</u>		
<u>Northern</u>							
	Chapleau		95,598	546,198	60,929		
	Gogama		49,102	334,815	32,540		
	Kirkland Lake		26,895	74,742	0		
			<u>171,595</u>	<u>955,755</u>	<u>93,469</u>		
<u>Algonquin</u>							
	Parry Sound	30,202	25,397	54,034	8,099		
		<u>67,142</u>	<u>1,150,158</u>	<u>3,660,069</u>	<u>1,743,725</u>	<u>504,749</u>	<u>736,882</u>



Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

For the fourth consecutive year an overall increase was recorded in the areas affected by this insect (Table 3). Throughout the province, 3,965,200 ha of moderate-to-severe defoliation were mapped by ground and aerial surveys; this figure was up from the 1,647,977 ha recorded in 1987.

Table 3. Gross area of current moderate-to-severe defoliation by the forest tent caterpillar in Ontario from 1986 to 1988

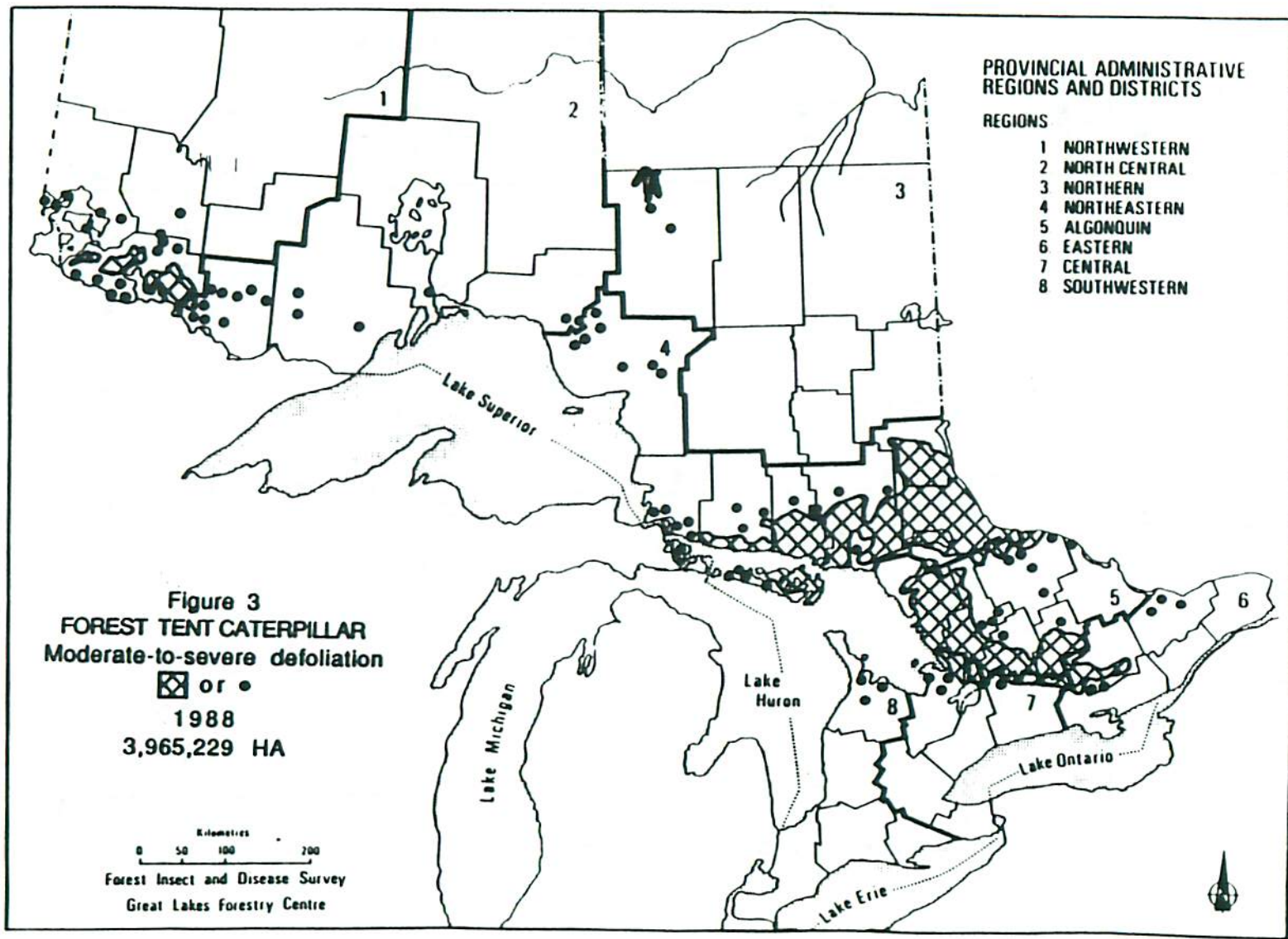
Region	Area of moderate-to-severe defoliation (ha)			
	District	1986	1987	1988
<u>Northwestern</u>				
	Dryden	0	0	610
	Fort Frances	0	5,025	257,305
	Kenora	0	0	15,070
		<u>0</u>	<u>5,025</u>	<u>272,985</u>
<u>North Central</u>				
	Atikokan	0	1,770	28,160
	Thunder Bay	250	280	4,230
	Nipigon	0	0	560
	Terrace Bay	0	380	690
		<u>250</u>	<u>2,430</u>	<u>33,640</u>
<u>Northeastern</u>				
	Wawa	14,335	10,720	12,087
	Sault Ste. Marie	0	11,340	26,560
	Blind River	4,940	35,867	102,852
	Espanola	5,230	67,010	415,273
	Sudbury	0	39,394	442,274
	Temagami	163,540	292,913	252,650
	North Bay	86,920	584,501	856,053
		<u>274,965</u>	<u>1,041,745</u>	<u>2,107,749</u>
<u>Northern</u>				
	Hearst	0	0	10,550
	Kirkland Lake	123,280	112,452	0
	Gogama	21,370	0	0
	Chapleau	1,975	460	0
		<u>146,625</u>	<u>112,912</u>	<u>10,550</u>

(cont'd)

Table 3. Gross area of current moderate-to-severe defoliation by the forest tent caterpillar in Ontario from 1986 to 1988 (concl.)

Region	Area of moderate-to-severe defoliation (ha)			
	District	1986	1987	1988
<u>Algonquin</u>				
Bancroft		0	28,628	148,125
Minden		0	53,653	268,633
Parry Sound	11,160		241,399	408,302
Bracebridge		0	150,104	330,845
Algonquin Park		0	0	62,579
Pembroke		0	180	39,425
		<u>11,160</u>	<u>473,964</u>	<u>1,257,909</u>
<u>Eastern</u>				
Cornwall		0	0	445
Carleton Place		0	78	3,835
Tweed		0	902	121,174
Napanee		0	0	190
		<u>0</u>	<u>980</u>	<u>125,644</u>
<u>Central</u>				
Lindsay		0	5,198	47,752
Huronie		0	7,723	104,240
		<u>0</u>	<u>12,921</u>	<u>151,992</u>
<u>Southwestern</u>				
Owen Sound		0	0	4,760
		<u>0</u>	<u>0</u>	<u>4,760</u>
		<u>433,000</u>	<u>1,649,977</u>	<u>3,965,229</u>

The largest single area of defoliation encompassed 1,755,353 ha; it stretched from the northern edges of the Pembroke and Algonquin Park districts north through the North Bay District to the South Lorrain-Canton townships area of Temagami District and west through the southern portions of the Sudbury, Espanola and Blind River districts to the Bruce Mines area of Sault Ste. Marie District. In addition, large areas of defoliation were mapped on Manitoulin Island, in the northwestern corner of St. Joseph Island, and along the north shore of the St. Mary's River to the city of Sault Ste. Marie. Numerous smaller pockets were mapped on the periphery of this large body of defoliation (Fig. 3).



Infestations totaling 9,930 ha caused moderate-to-severe defoliation on narrow bands of trembling aspen along the Nagagami, Kenogami, Kabinakagami and Pitukupi rivers near their junction at the abandoned village of Mamamattawa in northern Hearst District. Three small pockets totaling 620 ha were mapped in Studholme, Stoddart and Kendall townships, Hearst District. An infestation of 8,067 ha occurred near the village of Missanabie and six pockets totaling 1,295 ha were mapped at the adjacent corners of Carmody, Dumas and Dubreuilville townships in Wawa District. Some 31 patches of infestation totaling 3,390 ha were found in the White Lake-Bomby Township area of the adjacent Wawa and Terrace Bay districts.

A second large area of moderate-to-severe defoliation totaling 1,312,195 ha occurred across southern Ontario. This major infestation stretched from the Big Gull Lake area of Tweed District, west through parts of the Bancroft, Lindsay, Minden and Huronia districts, and north through Bracebridge District to the vicinity of East Mills, Wilson and Brown townships in Parry Sound District. A number of smaller pockets also surrounded this infestation. Other small pockets of infestation were recorded in southern Ontario as follows: Owen Sound District (15 pockets, 4,760 ha), northwest Huronia District (19 pockets, 14,040 ha), Tweed District (14 pockets, 4,401 ha) and Carleton Place District (6 pockets, 4,280 ha).

In contrast to the above, infestations in southern Kirkland Lake District and northern Temagami District, which began in 1985, collapsed this year, and little defoliation was observed.

Infestations also expanded markedly in the northwestern part of the province. Here, the bulk of the defoliation occurred in southern Fort Frances District, in three large infestations that were surrounded by numerous smaller pockets. The largest infestation was located between Laseine in the extreme west of Atikokan District and Hostess Island in Rainy Lake, Fort Frances District—a total area of 130,575 ha, all but 3,605 ha of which were in Fort Frances District. The second pocket (65,220 ha) was located between Devil's Cascade on the Manitou River and Chappel Township and the third infestation (34,230 ha) was located in the Dewart Township-McInnes Creek area. Fifteen pockets totaling 15,070 ha were recorded in southern Kenora District.

In Atikokan District, defoliation was mapped in 19 pockets ranging in size from 75 ha to 6,230 ha along the Highway 11 corridor in the central part of the district. An additional eight pockets from 60 to 4,960 ha in size were located in the southwest corner of the district along the American border. Infestations in Thunder Bay District were located in two areas: near Kashabowie (four pockets, 4,100 ha) and near Mokomon, Conmee Township (one pocket, 130 ha). Two small pockets totaling 560 ha were mapped near Red Rock in Nipigon District and four small pockets totaling 610 ha occurred south and east of Wabigoon Lake in Dryden District.

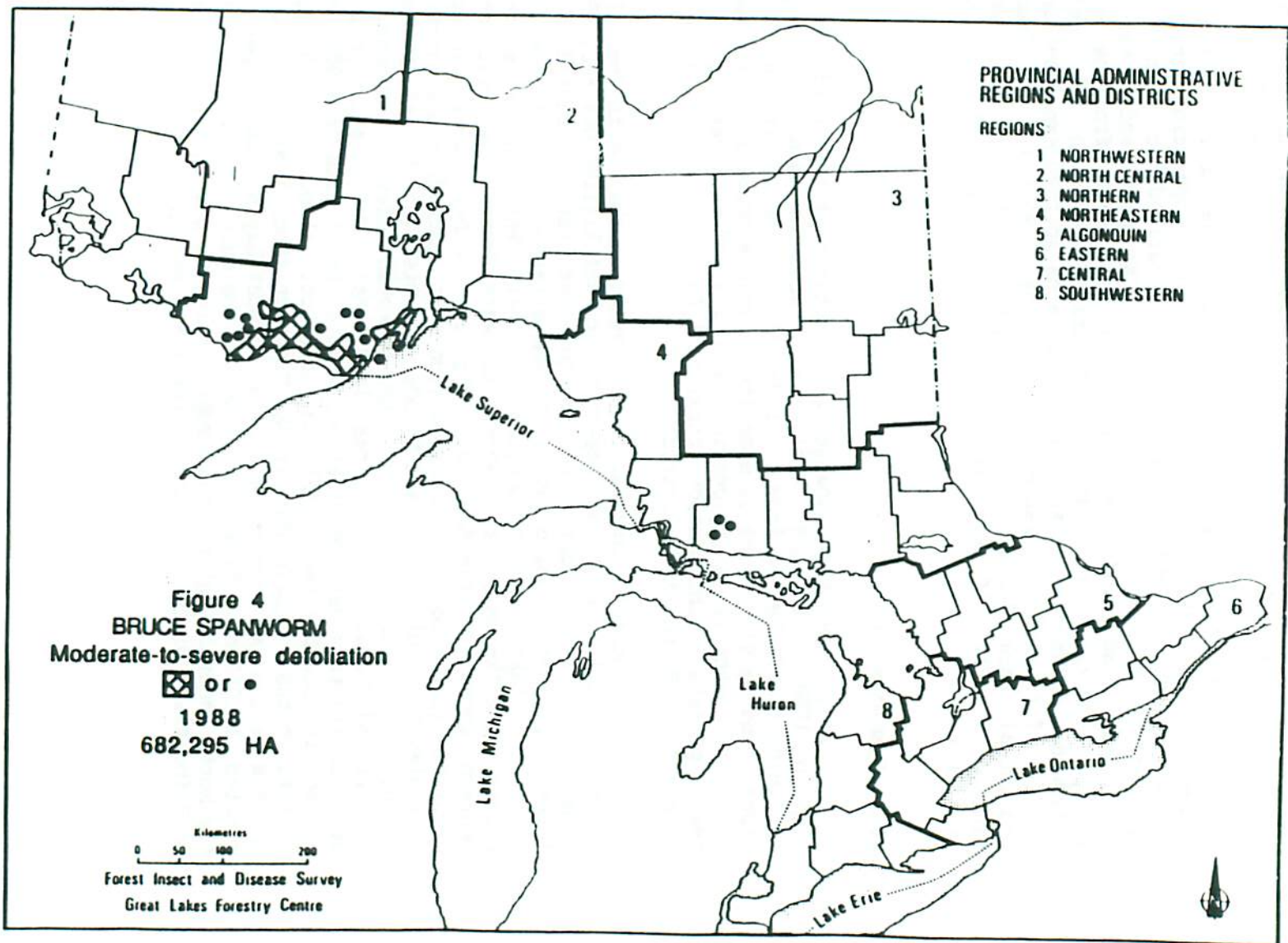
Egg-band counts for the forest tent caterpillar will be carried out later in the fall to determine population trends in 1989 and the results of these will be included in the fall Survey Bulletin.

In an effort to preserve aesthetic values and reduce the nuisance caused by this insect, OMNR carried out control operations in five provincial parks. Spraying operations were carried out with a skidder-mounted air blaster and a tractor-pulled mist blower and so were limited to access roads and trees that could be reached from the roadside. *Bacillus thuringiensis* was the insecticide used in all cases. The following parks were treated (proposed area sprayed expressed in kilometres of roadside): Oastler Lake Provincial Park 3.3 km, Grundy Lake Provincial Park 38.2 km, Arrowhead Provincial Park 22 km, Silent Lake Provincial Park 10 km and Six Mile Provincial Park (figure not available).

Bruce Spanworm, Operophtera bruceata (Hlst.)

There were major changes in the status of this hardwood defoliator in 1988, with the total area of moderate-to-severe defoliation declining to 682,295 ha from the 1,053,717 ha recorded in 1987. Infestations causing 436,117 ha of moderate-to-severe defoliation in the Algonquin and Northeastern regions in 1987 collapsed this year, and only four small pockets of infestation totaling 1,840 ha remained in the Tunnel Lake area of Blind River District.

In contrast, infestations increased in the North Central Region where the total area of moderate-to-severe defoliation was 680,455 ha (up from 617,000 ha last year). Most of this defoliation occurred in a large infestation that occupied 550,860 ha and extended from the Basswood Lake-Chatterton Lake area of Quetico Provincial Park in the southeastern corner of Atikokan District across southern Thunder Bay District to the western shore of Lake Superior (Fig. 4). Other sizable infestations occurred in the Gorham Township-Dorion area including the northern part of Sibley Peninsula in eastern Thunder Bay District (94,488 ha) and north of Highway 11 along the Thunder Bay-Atikokan district boundary in the Trotter and Weaver townships area (14,470 ha). Twelve additional pockets of moderate-to-severe defoliation, with a total area of 9,985 ha, were mapped in southeastern Atikokan District, along with 16 additional pockets in the southern Thunder Bay District (including two small pockets on Pie Island at the entrance to Thunder Bay on Lake Superior) that totaled 10,050 ha. Trembling aspen was the main host for the insect in the North Central Region, while sugar maple was the main species attacked in Blind River District of the Northeastern Region.

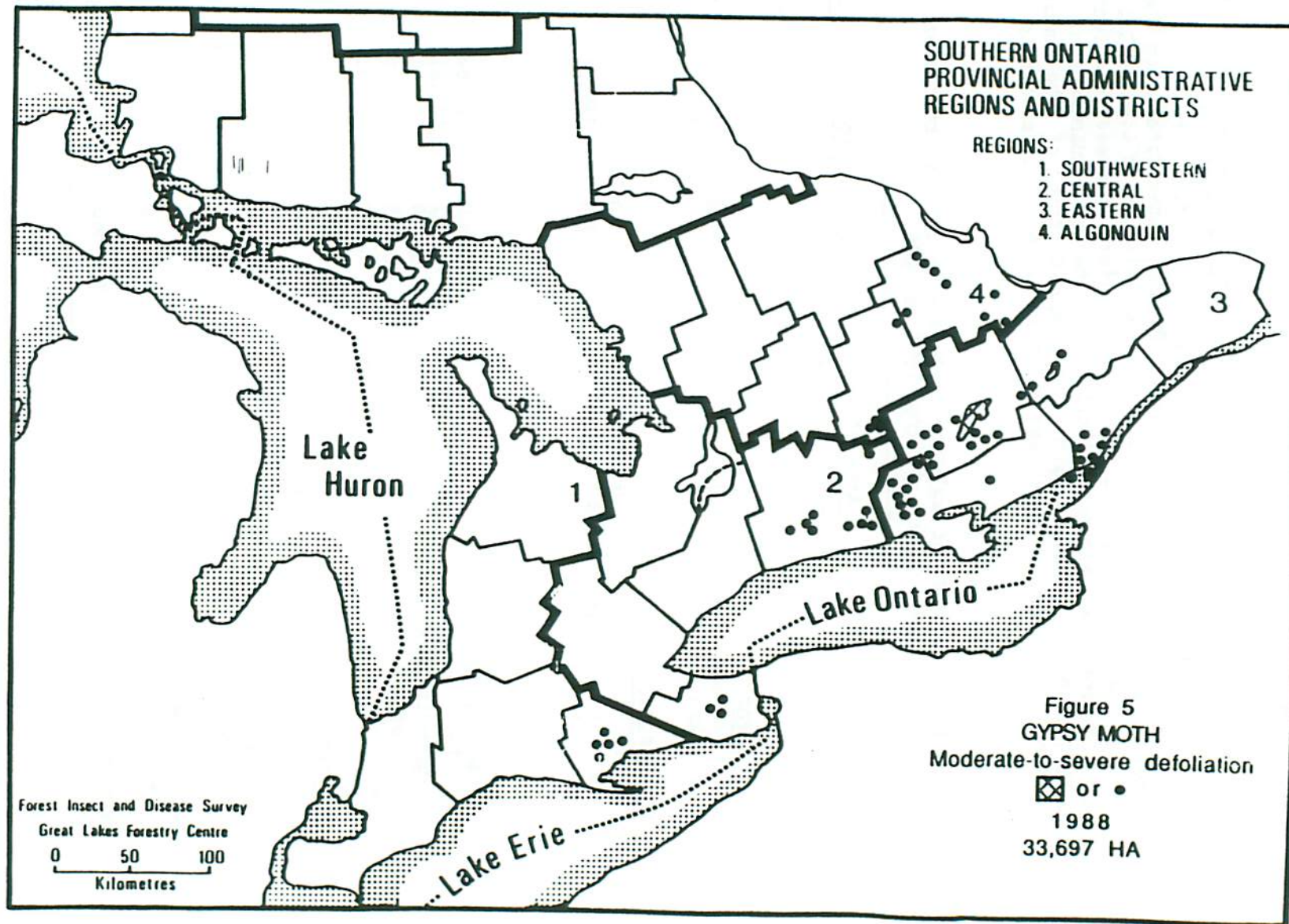


Gypsy Moth, *Lymantria dispar* (L.)

Gypsy moth populations, which had been declining in southern Ontario, rebounded in 1988; the total area of moderate-to-severe defoliation increased from 12,678 ha to 33,697 ha (Table 5, Fig. 5). Most of the increase occurred in the Eastern Region, specifically in the Tweed, Napanee and Carleton Place districts, as well as in Lindsay District of the Central Region (Tables 6 and 7). Smaller increases were recorded in the Pembroke and Bancroft districts of the Algonquin Region, Niagara District of the Central Region and Simcoe District of the Southwestern Region. Infestations decreased slightly in Brockville District of the Eastern Region.

Table 4. Gross area of moderate-to-severe defoliation by the Bruce spanworm in Ontario from 1986 to 1988

Region District	Area of moderate-to-severe defoliation (ha)				
	1984	1985	1986	1987	1988
<u>North Central</u>					
Thunder Bay	0	0	0	473,150	530,240
Atikokan	0	0	0	144,450	150,215
<u>Northeastern</u>					
Wawa	0	0	0	15,251	0
Sault Ste. Marie	4,160	22,000	23,400	159,166	0
Blind River	0	0	0	25,937	1,840
Espanola	125	6,000	5,925	1,852	0
<u>Algonquin</u>					
Bracebridge	0	0	3,100	18,645	0
Minden	0	45	70,912	133,816	0
Algonquin Park	0	0	5,050	4,755	0
Bancroft	0	400	97,788	76,380	0
Pembroke	0	300	3,800	315	0
<u>Eastern</u>					
Carleton Place	0	0	5	0	0
<u>Central</u>					
Huronia	0	0	15	0	0
<u>Southwestern</u>					
Owen Sound	0	0	4	0	0
TOTALS	4,285	28,764	209,999	1,053,717	682,295



A large part of the infested area was again located in Tweed District, where the largest infestation (10,558 ha) was located along Highway 7 in the Kennebec Lake-Sulphide area. Eleven additional pockets ranging in size from 30 to 766 ha and totaling 3,091 ha were located immediately south of this infestation in the Puzzle Lake-Otter Creek area. The remainder of the defoliation in Tweed District consisted of 17 small pockets, most of which were located in the central part of the district in the area between Actinolite and Crowe Lake, along with six small pockets in the southeast corner of Oso Township.

Table 5. Gypsy moth infestations in Ontario, 1981-1988

Year of infestation	Gross area of moderate-to-severe defoliation (ha)
1981	1,450
1982	4,800
1983	40,954
1984	80,624
1985	246,342
1986	167,776
1987	12,678
1988	33,697

Table 6. Gross area of moderate-to-severe defoliation by the gypsy moth, 1985-1988 (ha)

Region	District	1985	1986	1987	1988
Eastern	Tweed	172,232	73,525	3,329	16,089
	Napanee	58,326	57,780	4,781	6,198
	Carleton Place	4,197	13,386	1,355	3,918
	Brockville	11,232	22,283	2,099	1,865
Algonquin	Pembroke	90	221	0	124
	Bancroft	240	164	111	370
Central	Lindsay	25	417	888	4,865
	Niagara	0	0	0	28
Southwestern	Simcoe	0	0	115	240
		<u>246,342</u>	<u>167,776</u>	<u>12,678</u>	<u>33,697</u>

The gypsy moth situation in Tweed District was complicated by the fact that large numbers of the forest tent caterpillar fed in conjunction with gypsy moth; this made mapping of the two species very difficult. Infestations in the Napanee District consisted of single, small pockets northwest of the town of Napanee and on the northeastern side of Howe Island and 76 scattered pockets ranging from 8 to 406 ha in size in the townships of Rawdon, Sydney, Percy, Cramahe, Bright, Murray and Seymour in the western part of the district.

Table 7. Gross area of moderate-to-severe defoliation by the gypsy moth, 1986-1988 (ha)

County	1986	1987	1988
Northumberland	1,430	2,131	7,791
Peterborough	179	167	1,593
Hastings	11,668	4,511	5,625
Lennox and Addington	8,627	407	10,007
Prince Edward	540	0	0
Frontenac	109,442	1,775	1,861
Leeds	22,283	2,099	1,865
Lanark	13,356	1,355	3,918
Ottawa-Carleton	221	0	0
Durham	0	118	280
Haldimand-Norfolk ^a	0	115	240
Victoria	0	0	385
Renfrew	0	0	124
Niagara ^a	0	0	28
	<u>167,776</u>	<u>12,678</u>	<u>33,697</u>

^a regional municipality

The pattern of small, scattered pockets of infestation continued west into Lindsay District in the area south and west of Rice Lake in Haldimand, Hamilton, Hope, Cavan, Clarke and Manvers townships. In Brockville District, infestations consisted of five small pockets in the Jones Falls-Delta-Lindhurst area, a single small pocket on the north side of South Lake and 23 small pockets on the north shore of the St. Lawrence River between Gananoque and Butternut Bay. The latter included a number of small infestations on Grenadier and Hill islands in the St. Lawrence River. A single large infestation of 3,567 ha occurred in the Carleton Place District southwest of the village of Fallbrook in Bathurst Township, and there were two small areas of infestation along the Mississippi River in the northwest corner of adjacent Drummond Township. A small pocket occurred west of Feldspar in South Sherbrooke Township.

Infestations in Pembroke District consisted of single small pockets in Blithfield, Brougham, Richards and Raglan townships and three small pockets near Northcote in Admaston Township. A cluster of six small pockets was found on the north side of Golden Lake in North Algona Township, and there was another small pocket on an island in Golden Lake. In Bancroft District numerous small pockets were mapped in Methuen Township in the areas around Methuen, Kashabog and Oak Lakes, and a single small pocket was found in Carlow Township east of New Carlow.

In southwestern Ontario moderate-to-severe defoliation was mapped in several areas of the Niagara and Simcoe districts. Infestations in Niagara District consisted of five small pockets totaling 28 ha north of the city of Fonthill; in Simcoe District 240 ha of moderate-to-severe defoliation were mapped in North Walsingham, South Walsingham and Charlotteville townships. Most of this (200 ha) occurred in a single infestation in South Walsingham Township, which included the northeast corner of the St. Williams Forest Tree Nursery and adjacent private land.

Small numbers of larvae, which did not cause any appreciable defoliation, were collected at numerous other areas in southern Ontario. The gypsy moth larval and pheromone trapping programs have been continued in 1988 and complete results will be presented in the fall Survey Bulletin. However, preliminary results of the burlap trapping program show positive catches in several new areas; these include the capture of two larvae in Killarney Provincial Park, Sudbury District, the first time larvae of this insect have been found in the Northeastern Region.

OMNR carried out aerial spraying operations with *B. i.* on 13,784 ha of crown land (4,528 ha) and private land (9,256 ha). The crown land spraying was done in the Carleton Place, Brockville, Lindsay and Simcoe districts. The program started on 24 May and was completed on 17 June.

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

Populations of these periodic pests of eastern white cedar reached outbreak proportions in southern Ontario in 1988. Heavy infestations occurred throughout most of the Eastern Region, west across southern Minden District of the Algonquin Region and the northern Lindsay, southern Huronia and eastern Cambridge districts of the Central Region. Damage was more sporadic in the Bancroft and Pembroke districts of the Algonquin Region and Owen Sound District of the Southwestern Region. Heavy defoliation recurred along the southern sides of Manitoulin and Cockburn islands in Espanola District. The most severe defoliation (70-100%) occurred in the Eastern Region, in western Lindsay District of the Central Region and on Manitoulin Island in Espanola District of the Northeastern Region. Defoliation was in the 50-70% range on the west side of the Bruce Peninsula and in Saugeen and Amabel townships in Owen Sound District, in much of the Minden and Lindsay districts and near Arnprior in Pembroke District. Defoliation was usually in the 20-40%

range in the remainder of the areas described above. The insect was also reported at generally low population levels, mainly on cedar hedges and windbreaks in Niagara District of the Central Region and in the Simcoe, Aylmer, Wingham and Chatham districts of the Southwestern Region. Defoliation in most of these areas ranged from 3 to 8%.

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

Populations of this early pest of oak began increasing in 1987 after remaining at quite low levels for several years. The increase continued in 1988 with moderate-to-severe defoliation reported in several areas. In Huronia District defoliation in the 75-100% range was mapped in an area of about 92 ha southwest of Wyevale in the southwest corner of Tiny Township. Similar defoliation occurred within an area of 23 ha in the Wasaga Beach area of adjacent Flos Township. About 9 ha of moderate-to-severe defoliation were recorded along the southern edge of Vespra Township west of Barrie. Three pockets of heavy infestation totaling 58 ha occurred in the Coppins Corners area of Uxbridge Township, Maple District.

Heavy infestations caused severe defoliation of about 495 ha of red oak in the Maple Ridge area of Thessalon Township, Blind River District. The insect was also reported in very low numbers in several areas in the Niagara and Simcoe districts.

Fall Cankerworm, *Alsophila pometaria* (Harr.)

After several years of low populations, heavy infestations of this spring defoliator were observed in the towns of Sioux Lookout and Dryden. Manitoba maple was the tree species most commonly attacked, with defoliation averaging 40% in Sioux Lookout and 80% in Dryden.

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

Increased populations were recorded in the Eastern and Algonquin regions and parts of the Central Region in southern Ontario. The heaviest infestations were in red pine plantations in Fitzroy and Ramsay townships, Carleton Place District, where affected red pine suffered 96% and 66% defoliation, respectively. A small red pine plantation in Cardiff Township, Bancroft District, sustained 80% defoliation. Somewhat less severe damage, with defoliation of 20 and 25%, respectively, was observed in two plantations in McMurrich Township, Parry Sound District. Control operations with the insecticide Sevin® reduced populations that were high in 1987 in plantations in Stanhope Township, Minden District, and in Monteagle and Carlow townships, Bancroft District. A small patch of heavy defoliation was recorded in a red pine plantation in Oro Township, Huronia District, and Christmas tree growers in the same district

reported various levels of damage. Low populations were encountered commonly in the above areas.

Beech Scale, *Cryptococcus fagisuga* Linding.

This important vector of the beech bark disease was collected in several areas in southern Ontario. Low populations were found in a mixed hardwood stand in South Monaghan Township, Lindsay District, and trace populations were found in Vaughan Township, Maple District. The insect was also observed on a few trees at the Toronto Metro Zoo. Despite careful searches, no trace of the disease was found at any of the sites.

Balsam Fir Sawfly, *Neodiprion abietis* complex

A provincewide decline in populations of this insect, which began in 1987, continued in 1988.

In the Northwestern Region, where some 14,000 ha of mainly light defoliation occurred in the Pakwash area of Red Lake District last year, populations declined to endemic levels in 1988. In Kenora District, light defoliation occurred on fringe trees along Hwy 17 from Sioux Narrows to Kenora and along Hwy 596 between Kenora and Minaki, with approximately 50% of the trees suffering an average of 13% defoliation. Light defoliation was reported in an area near Thunder Lake in Zealand Township, Dryden District.

In southern Ontario, low and declining populations were recorded in several areas in the Carleton Place, Brockville and Tweed districts. Similarly low and declining numbers were reported in Stafford and Horton townships, Pembroke District, and in Murchison, Sproule and Dickens townships, Algonquin Park District. Defoliation in these areas ranged from 10 to 20%.

Larch Casebearer, *Coleophora laricella* (Hbn.)

Heavy infestations caused 75-90% foliar damage in European larch plantations at two locations in West Gwillimbury Township, and medium infestations caused about 40% foliar damage to the same host near Orangeville in Huronia District. Similar damage levels were observed in two stands in Erin Township, Cambridge District. Moderate-to-severe defoliation was reported in a 10-ha stand of 11-m tamarack in Laudor Township, North Bay District. Ornamental European larch sustained various degrees of damage (up to 75%) at a number of widely separated areas in the Simcoe and Aylmer districts. Increased but still low populations were reported from central Chapleau District. The insect also caused 75% defoliation on 20 European larch windbreak trees in the Orono Forest Tree Nursery, Lindsay District.

Jack Pine Tip Beetle, *Conophthorus banksianae* McPh.

Heavy infestations of this insect were again evident in jack pine plantations in Lane and Timbrell townships, Blind River District, where 68% and 21% of the trees were infested, respectively. Leader damage at the same locations was 3% and 2%, respectively.

In Chapleau District, jack pine in Langlois Township had 35% of the trees infested and 6.7% leader damage and in Hutcheon Township 50% of the trees were attacked and there was 3% leader damage. A single heavy infestation was reported from Gogama District where 60% of the trees in a stand in Battersby Township had been attacked and there was 2% leader damage. Light infestations were reported from a number of other areas in the Sudbury, Espanola, Wawa, Timmins, Temagami, Kenora and Dryden districts.

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

Populations of this early spring defoliator remained generally low in 1988 except in the Chapleau and Gogama districts, where increased numbers were recorded in many areas. In these areas, defoliation was common on young, open-growing or roadside trembling aspen, with trees up to 5 m tall often completely defoliated. Small localized pockets of moderate defoliation occurred on large-toothed aspen at several locations in the Brockville and Tweed districts and a 2-ha pocket of severe defoliation was reported on trembling aspen in Cascaden Township, Sudbury District. A medium infestation was also reported on trembling aspen regeneration at one location in Hardwick Township, Thunder Bay District. Low populations usually causing light defoliation were encountered in the Timmins, Temagami, Kirkland Lake, Terrace Bay, Wawa, Geraldton, Nipigon, Thunder Bay and Atikokan districts.

Pine Sawflies, *Neodiprion pratti banksianae* Roh., *N. pratti paradoxicus* Ross, *N. nanulus nanulus* Schedl and *N. maurus* Roh.

Heavy infestations of *N. pratti paradoxicus* were reported in many areas in the Eastern Region, particularly on open-grown, ornamental and fringe jack pine trees. The most extensive damage occurred in small jack pine plantations near Marlbank in Tweed District and in Ernestown Township in Napanee District, where larval feeding resulted in 90% defoliation. Populations of this insect along with the closely related *N. pratti banksianae* were on the decline in the Pembroke and Bancroft districts. Defoliation in previously infested areas declined to generally less than 5% in 1988, although one small isolated plantation near Birds Creek, Bancroft District, sustained 25% defoliation. Populations of *N. pratti paradoxicus* in conjunction with the red pine sawfly *N. nanulus nanulus* increased in the Thunder Bay-English River area and along Highway 11 in the Shabaqua-Atikokan area, although associated defoliation remained generally low (5-10%). Scattered populations of the above three

species, generally at low levels, were reported from a number of other widely separated areas in the Ignace, Sioux Lookout, Wawa, Geraldton, Espanola, Sudbury, North Bay, Blind River, Dryden, Temagami and Kirkland Lake districts. In nearly all cases, however, defoliation was less than 10%. The pine sawfly, *N. maurus*, caused defoliation up to 100% on scattered jack pine in the Marson black spruce seed orchard and defoliation in the 80% range on jack pine in the Seine River area of Fort Frances District.

White Spotted Sawyer Beetle, *Monochamus scutellatus* (Say)

This insect, which breeds in recently dead or cut conifers, sometimes occurs in very high numbers in the vicinity of log piles, skidways, and cutover areas where there is an abundance of breeding material. The adult beetles, which sometimes occur in very high numbers, often damage adjacent conifer stands severely by feeding on twigs and branches. Several of these situations occurred in northern Ontario this year. The most severe damage was observed on fringe areas of a recent cutover south of Coones Bay on Lac Seul, Sioux Lookout District, where jack pine over an area of about 1 ha were killed. Similar-sized areas of severe damage occurred near Martins Siding and the nearby Canadian Pacific Forest Products Camp in McNevin Township, Ignace District and on the edge of a recent cutover south of Dixie Lake, Red Lake District.

In Dryden District approximately 8 ha of severely damaged jack pine were observed along the Deer Lake Road. Heavy damage was also recorded in a 5-ha jack pine plantation adjacent to log piles in Delaney Township, Chapleau District.

Eastern Tent Caterpillar, *Malacosoma americanum* (F.) and Northern Tent Caterpillar, *M. californicum pluviale* (Dyar)

Populations of *M. americanum* were extremely high at many locations in southern Ontario this year. Very heavy infestations occurred on roadside, fringe and open-grown shrubbery in southern Parry Sound District, in the western Bracebridge and Minden districts and in northern Lindsay district. Similar infestation levels were observed in the Owen Sound, Huronia and northern Maple districts. Widespread, heavy infestations were also present in the Pembroke, Bancroft and Algonquin Park districts, at a number of locations in Tweed District and in Bosanquet Township, Chatham District. Further north, heavy infestations were recorded in several townships on Manitoulin Island in Espanola District, between North Bay and Trout Lake in North Bay District and between Sault Ste. Marie and Echo Bay and on St. Joseph Island in Sault Ste. Marie District. In most cases, the insects fed on deciduous shrubbery such as pin cherry, choke cherry and wild apple; however, in a few instances, forest trees were attacked. Large black cherry in woodlots were attacked at numerous points in the Huronia, Maple and Owen Sound districts and red and bur oak

growing on poor sites were heavily attacked at several locations in the Minden and Bracebridge districts.

High populations of the closely related northern tent caterpillar, *M. californicum pluviale*, were evident in a number of areas in northern Ontario. Sporadic, heavy defoliation of roadside shrubbery was reported in the Fort Frances, Kenora and Dryden districts, and in the Mills Lake area of Sioux Lookout District. Somewhat less severe damage, with defoliation in the 50% range, was observed in the Stucco Lake area of Thunder Bay District. The insect was reported as common on cherry shrubbery in open and cut-over areas in the Timmins, Temagami and Kirkland Lake districts.

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

Preliminary reports indicate that once again the highest numbers of this pest occurred in the Timmins, Kirkland Lake and Temagami districts. Here, white and black spruce in windbreaks, snow hedges and plantations (including a one-year-old black spruce seed orchard in Chamberlain Township, Kirkland Lake District) sustained moderate-to-severe defoliation in many areas. In an effort to prevent defoliation, OMNR sprayed windbreaks in the Swastika Nursery with the insecticide Sevin, and similar spray operations were carried out by the Ministry of Transportation and Communications on snow hedges along Highway 11 between New Liskeard and Englehart. Defoliation ranging from 10 to 90% was reported on numerous roadside white and black spruce in Mowbray and Howels townships, Kapuskasing District. Persistent defoliation has caused 4% mortality in a 2-ha white spruce plantation in East Mills Township, North Bay District, where defoliation this year was in the 50% range. Similar sporadic mortality was reported on ornamental black spruce in the town of White River, Wawa District, and in a black spruce plantation at pipeline crossing 82, 25-63 on Highway 11, Geraldton District. A medium infestation occurred on white spruce along Highway 619 in Tovell Township, Fort Frances District, and low populations were reported from several other areas in Fort Frances District as well as in Cathcart Township, Ignace District.

A single infestation was reported from southern Ontario in Essa Township, Huronia District, where heavy defoliation occurred on a small hedgerow.

Birch Leafminer, *Fenusa pusilla* (Lep.)

Increased populations of this perennial pest were evident in northern Ontario, particularly in the Northern and Northeastern regions and the Thunder Bay and Nipigon districts of the North Central Region. Most white and ornamental birch trees growing in urban situations within these areas suffered moderate-to-severe defoliation. White birch growing in forest situations was also severely damaged in a number of areas. The

most notable of these was the Cobalt-Gillies-Latchford area of Temagami District, where about 200 ha of small white birch stands were approximately 75% defoliated. Defoliation in the 100% range occurred in a 10-ha pure white birch stand in Hudson Township, Temagami District. Forest stands totaling about 500 ha were heavily infested along the Kaministikwia River and its tributaries in the Kakabeka Falls-Sunshine area and in several townships adjacent to the city of Thunder Bay. Heavy infestations also occurred in Nipigon Township, Nipigon District and on ornamentals in the towns of Dryden, Fort Frances and Kenora in the Northwestern Region.

In southern Ontario, leaf-mining activity was evident on ornamentals in most urban areas; however, there was a pronounced reduction in the damage suffered by forest trees. The only exception was on white birch and wire birch in a 5-ha area near Bellamy Lake in Kitley Township, Brockville District, where severe foliar damage occurred.

Feeding by the second generation of this insect is under way and any further information will be carried in the fall Survey Bulletin.

Aspen Leafroller, *Pseudexentera oregonana* (Wlsm.)

Unusually heavy infestations of this early pest of trembling aspen occurred in Red Lake District. Trembling aspen stands within an area of some 1,032,130 ha suffered 75-100% defoliation. The infestation was located in an area stretching from the Barton Lake-Gullrock Lake area west to the Manitoba border. The infested area included the towns of Red Lake, Balmertown and Cochenour, where up to 100% of the foliage of ornamental trembling aspen was affected. Although the principal pest in this area was *P. oregonana*, significant numbers of the paleheaded aspen leafroller, *Compsolechia niveopulvella* (Chamb.), were also observed.

Further south in Kenora District, some 200 ha of moderate-to-severe defoliation were mapped near Longbow Lake in Kirkup Township, along with an additional 285 ha in four pockets along the Winnipeg River in Rice Township.

High populations caused moderate-to-severe defoliation in northern Hearst District along the Kabinakagami, Nagagami and Kenogami rivers near the abandoned village of Mammamattawa and along the Ridge River east of Indian Reserve No. 66. High populations also occurred on scattered aspen stands in Cross Township, Hearst District.

Light and occasionally moderate damage was recorded within an area of 2,600 ha in the North Central Region. Of this total, 1,100 ha were located in McCaul and Weaver townships and the Horseshoe Lake areas of Atikokan District, 200 ha occurred near the junction of Highways 527 and 811 in Thunder Bay District and 1,300 ha occurred near Gull Bay on Lake Nipigon, near Albert Lake, and in Adamson Township, Nipigon District. Low populations were also reported at several other locations in

the Nipigon and Geraldton districts and in Armour Township, Bracebridge District.

Variable Caterpillar, *Pyrrhia exprimens* (Wlk.)

Very high populations of this cutworm were observed in a 600-ha area in Haig Township, Hearst District, where a prescribed burn had been carried out as a method of site preparation for planting. Initially the caterpillars fed on ground cover plants, mainly wild geranium; however, when this food supply was exhausted, they severely damaged the new shoots and buds of recently planted white spruce seedlings. Follow-up surveys will be conducted to see if the seedlings set new buds or if the damage is permanent.

Linden Looper, *Erannis tiliaria* (Harr.)

There was a marked increase in populations of this pest in the southern Terrace Bay District. Pockets of defoliation ranging in size from 35 to 2,700 ha and totaling 8,835 ha were mapped along the north shore of Lake Superior between Marathon and Schreiber. A 360-ha pocket of defoliation was found immediately west of Terrace Bay where the basswood looper and large aspen tortrix, *Choristoneura conflictana* Wlk., were found in about equal numbers. White birch seemed to be the preferred host, particularly in mature, hilltop stands, but trembling aspen and a variety of roadside shrubbery were also attacked. No reports of the insect were received from elsewhere in the province.

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

The collapse of the infestation, which began in 1987, continued this year. The infestation that caused 121,830 ha of moderate-to-severe defoliation in the Dorion-Silver Falls area of Thunder Bay District in 1987 virtually disappeared this year, with no defoliation of any significance reported. The only exception to this trend occurred in Terrace Bay District, where two pockets of moderate-to-severe defoliation totaling 260 ha were mapped south of Hay Lake in P里斯 Township. In another area immediately to the east in P里斯 and Strey townships, 360 ha of moderate-to-severe defoliation caused by the combined feeding of the large aspen tortrix and the basswood looper, *Erannis tiliaria* (Harr.), were noted. Small numbers of larvae were also recorded at one location in Nipigon District.

Other Noteworthy Insects

Heavy infestations of the spruce bud moth, *Zeiraphera canadensis* Mut. & Free., were observed on roadside, fringe and open-grown white spruce in several townships in Blind River District. Moderate numbers were found in Neys Provincial Park, Terrace Bay District.

The northern pitch twig moth, *Petrova albicapitana* (Bsk.), damaged the terminal whorl on 12.7% of the trees in a 50-ha jack pine plantation near Coli Lake, Red Lake District. Low populations were also reported from locations in the Ignace, Sioux Lookout, Terrace Bay, Wawa and Espanola districts.

The maple petiole borer, *Caulocampus acericaulis* (MacG.), caused defoliation in the 10-35% range at a number of locations throughout the Eastern Region.

Populations of the oak skeletonizer, *Bucculatrix ainsliella* Murt., declined to very low levels in the Southwestern Region and in Niagara District of the Central Region.

The balsam shootboring sawfly, *Pleroneura brunneicornis* Roh., caused 80% shoot mortality on balsam fir in the Depot Lake area of Proctor Township, Blind River District. Light damage was recorded near Gladstone Lake in Gladstone Township, Blind River District.

The spiny ash sawfly, *Eupareophora parca* (Cress.), caused 30% defoliation in a black ash stand in Langlois Township, Chapleau District. Light defoliation was observed in numerous other black ash stands in Chapleau District and on white ash trees in Caliper Lake Provincial Park, Fort Frances District.

High numbers of the European snout beetle, *Phyllobius oblongus* (L.), were reported on most deciduous hosts in the Algonquin Park, Pembroke and Bancroft districts.

The pine gall weevil, *Podapion gallicola* Riley, was reported as numerous in stressed red pine stands in the Pembroke, Bancroft and Algonquin Park districts and in older red pine plantations in Huronia District.

Drought-stressed red pine trees were commonly attacked by the pine engraver beetle, *Ips pini* (Say), in the Pembroke, Bancroft and Algonquin Park districts. Large numbers of the beetle were collected from red pine logs in the Victoria County Forest, Somerville Township, Minden District.

A heavy infestation of the solitary oak leafminer, *Cameraria hamadryadella* (Clem.), caused 80% defoliation of bur oak within a 5-ha area in Baldwin Township, Espanola District. Low damage levels were reported on regeneration bur oak in Delaware Township, Aylmer District.

Large numbers of the lesser birch casebearer, *Coleophora comptoniella* (McD.), were reported on wire birch in Murphy's Point Provincial Park, Carleton Place District, and South Nation Provincial Park, Cornwall District. Low populations occurred on white birch in Drayton Township, Sioux Lookout District, and in Antrim and McKim townships, Sudbury District.

Light infestations of the European pine shoot moth, *Rhyacionia buoliana* (D. & S.), occurred on jack pine trees in an 8-ha area in Merritt Township and in a 2-ha jack pine plantation in Nairn Township, Espanola District.

The elm casebearer, *Coleophora limosipennella* (Dup.), caused 100% foliar browning on white elm along the Thousand Island Parkway near Butternut Bay in Elizabethtown Township, Brockville District. Similarly high populations occurred in the town of Madoc, Tweed District.

The spruce coneworm, *Dioryctria reniculelloides* Mut. & Mun., accounted for about 15% of the larvae in heavy spruce budworm infestations along the Sapawe-Upsala road, Atikokan District, in Adamson Township, Nipigon District, and near McKenzie, Thunder Bay District.

The alder tubemaker, *Acrobasis rubrifasciella* Pack., caused 80% defoliation of speckled alder growing around most lakes in the central part of Algonquin Park District.

The European pine sawfly, *Neodiprion sertifer* (Geoff.), caused 40% defoliation of some trees in a Scots pine genetic trial at Orono Forest Tree Nursery, Lindsay District. Low populations were observed at scattered locations in the Sault Ste. Marie, Tweed and Carleton Place districts and increased numbers were reported in parts of the Central Region.

TREE DISEASES

Scleroderris Canker, *Ascocalyx abietina* (Lagerb.) Schläpfer-Bernhard

A widespread and intensive program of aerial and ground surveys is carried out each year in southern Ontario for the purpose of detecting infection centers of the European race of this disease. To date, such centers have been detected in Mayo Township, Bancroft District, Macaulay Township, Bracebridge District, and the adjacent townships of Ryerson and McMurrich, Parry Sound District. This year, new infections, as confirmed by serological testing, were found in red pine plantations at Con. XIV, Lot 25, Mayo Township; Con. V, Lot 26, McMurrich Township; and Con. VII, Lot 25, Ryerson Township. All were close to previous finds and do not represent any significant spread of the disease.

Reports of the North American race of the disease were scarce in 1988. The heaviest infections encountered this year were in Haughton Township, Blind River District, and Smilsky Township, Sault Ste. Marie District. In Haughton Township, 67% of the 2.3-m red pine were infected, 15% were severely damaged, and there was 2% mortality. In Smilsky Township, 90-100% of the 4-m jack pine were infected. Trace infection levels were reported on jack pine at one location on the Pickle Lake Road north of Otokwin River, Sioux Lookout District, and on jack pine at one location on road 17-2, Geraldton District.

Tip Blight, *Sphaeropsis sapinea* (Fr.) Dyko & B. Sutton

An increased incidence of this disease was reported from a number of areas in southern Ontario. The largest increases occurred in Lindsay District where 5-m-tall trees in a 3-ha Scots pine plantation in Manvers Township exhibited 70% shoot damage. In a 6-ha Christmas tree plantation in Darlington Township, 15% of the trees were destroyed in an effort to curb the disease in the heavily infected stand. Roadside and ornamental Scots pine, mugho pine and Austrian pine were heavily infected at several locations in the Brockville, Tweed and Napanee districts and sporadic damage of a similar nature on the same hosts was reported from the Minden and Niagara districts. Observations indicate that the disease has intensified in Huronia District, where up to 30% branch mortality was observed in two 15-m Scots pine stands in Tiny Township, and low infection levels were noted in a Scots pine and red pine compartment at the Midhurst Forest Tree Nursery. Heavy infections causing 9% tree mortality and 35% crown mortality, along with an 83% infection rate, were recorded in a 20-m-tall Scots pine plantation covering 5 ha in South Walsingham Township, Simcoe District. The disease continues to be a problem at various infection levels in Scots pine plantations in the Uxbridge-Newmarket area of Maple District and at a few points in Cambridge District.

Western Gall Rust, *Endocronartium harknessii* (J.P. Moore) Y. Hirats.

Reports indicate that infections of this disease were widespread in northern Ontario in 1988. The most severe attacks were recorded in young jack pine stands in the Red Lake, Ignace and Sioux Lookout districts, where the incidence of infected trees ranged from 10 to 40% and that of stem galls ranged from 4 to 26%. Slightly lower infection levels occurred in the Dryden, Fort Frances and Kenora districts, with the incidence of infected trees in stands <3 m in height ranging from 1.3 to 24% and stem-galling in the same stands ranging from 0.7 to 11.3%. The disease was reported as widespread in the North Central Region, which consists of the Geraldton, Terrace Bay, Nipigon, Thunder Bay and Atikokan districts. Evaluations in young stands showed infection levels ranging from 1 to 45% and severe stem-galling that ranged in incidence from 1 to 19%. Generally high infection levels were reported in young jack pine stands in the Chapleau and Gogama districts of the Northeastern Region, with the incidence of attack in the 30-40% range in a number of areas and severe gall attacks affecting from 2 to 29.3% of trees. In the Kirkland Lake District of the same region, bare-root stock from Gogama Tree Nursery, which had been planted at a number of locations, was found to be heavily infected. At one location in Ben Nevis Township, 32.6% of the trees had stem galls, and many of these trees are expected to die. Surveys of this nursery stock are continuing.

Although the disease was common in the Northeastern Region, only one heavy infection was reported in Lane Township, Blind River District, where 54% of the trees were infected and 19.3% bore severe stem galls.

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

This disease is widespread in young conifer stands and plantations throughout Ontario, although a wide variety of other hosts is also affected. Numerous reports of the disease were received this year, although in most cases infection and mortality rates were <3%. The exceptions were in Geraldton District, where a 2-ha jack pine plantation on Highway 584 sustained 25% mortality. About 50% mortality occurred on ornamental jack pine and red pine at Neys Provincial Park, Terrace Bay District. A mortality rate of 5% was recorded in an 8-ha red pine plantation in Dungannon Township, Bancroft District.

Tar Spot Needle Cast, *Davisonmycella ampla* (J. Davis) Darker

This foliage disease was reported at various infection levels from a number of districts in northern Ontario. Probably the most severe damage was recorded in the Chapleau and Gogama districts, where infection levels in stands evaluated for the disease ranged from 21.3 to 42% and actual foliar damage varied from 5 to 13%. In a jack pine stand in Lane Township, Blind River District, 62.7% of the trees were infected, and average foliar damage was 24%. In Hardwick Township, Thunder Bay Dis-

trict, 20% of the trees examined sustained 5% foliar damage and near Mack in the same district, 3% of the trees suffered 10% defoliation. The disease was also reported at generally low infection levels from numerous other locations in northern Ontario.

Sweet Fern Blister Rust, *Cronartium comptoniae* Arthur

Sweet fern blister rust was observed causing stem cankers on jack pine in a number of areas in the Northern, North Central and Northwestern regions. In most cases the incidence of attack was less than 2%. However, in Furniss Township, Ignace District, 10.4% of the 3.8-m jack pine in an 876 ha stand sustained stem cankers and 6.7% of the trees were severely infected in a 20-ha, 1.6-m stand in Hutcheon Township, Chapleau District.

Pine Needle Rust, *Coleosporium asterum* (Dieterl) Sydow

Sporadic, heavy infections of this disease occurred across the province. The most severe damage occurred in a small jack pine stand at Little Clay Lake, Fort Frances District, where complete defoliation was recorded. Infection levels of 100% were evident in a number of jack pine stands in Chapleau and Gogama districts, and the accompanying foliar damage ranged from 15 to 66%. An 8-ha jack pine stand in Merritt Township, Espanola District, sustained an average of 15% defoliation on 95% of the trees. Twenty percent foliar damage was recorded on 80% of the trees in a small stand near the Granite River in Thunder Bay District, and 40% foliar damage occurred in a 50-ha two-year-old jack pine plantation in Township 238, Hearst District. A small red pine plantation in Ramsay Township, Carleton Place District sustained 11% foliar damage on 66% of the trees and 11% foliar damage was recorded on 100% of the trees in a small jack pine stand near Flynne Creek, Geraldton District. Trace and light infections occurred at many other locations.

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

This disease is present in many white pine stands throughout the province. The highest infection level reported this year was on a small group of white pine in Neil Township, Chapleau District, where 27% of the stems were infected. An infection level of 16% was recorded on a small group of trees in Kosny Township, Chapleau District, and 13% of natural regeneration trees were infected along the Premier Lake Road in Atikokan District. A 2% infection rate was noted on natural reproduction in a 20-ha cut-over area in Street Township, Espanola District.

Other Noteworthy Diseases

Orange stalactiform blister rust, *Cronartium coleosporioides* Arthur, caused branch infections on 0.3-1.3% of jack pine trees at three locations in Atikokan District. A single jack pine tree with stem cankers was observed at one location in Aubrey Township, Dryden District.

A root rot, *Cylindrocladium floridanum* Sob. & C.P. Seym., caused 25% mortality of rising 2-0 red pine in three compartments at the G. Howard Ferguson Nursery, Kemptville District.

Comandra blister rust, *Cronartium comandrae* Peck, caused branch infections on 19% of the trees in a 150-ha jack pine stand in Aubrey Township, Dryden District. In Rowe Township, Fort Frances District, 2% of the trees in a 1-ha stand had stem cankers and 1-3% of the trees were infected in a 40-ha stand in McMeekin Township, Kenora District.

Red pine plantations in Wicklow Township, Bancroft District, and in Airy Township, Algonquin District, had 33% of their trees infected by a needle cast, *Lophodermium* sp. The disease was found commonly at low infection levels on jack pine at the Island Lake Tree Improvement Centre, Chapleau District and was noted on single trees at two locations in Edwardsburg Township, Brockville District.

A small pocket of fomes root rot, *Heterobasidion annosum* (Fr.) Bref., was discovered in a mature red pine plantation in the St. Williams Tree Nursery, Charlotteville Township, Simcoe District.

A 1-ha plantation of Douglas fir in the central forest research area of the National Capital Commission's Greenbelt Forest in Carleton Place District had 20% of its trees infected with Swiss needle cast, *Phaeocryptopus gaeumannii* (Rhode) Petrak.

ABIOTIC CONDITIONS

Bud Failure

An unknown abiotic condition caused conspicuous bud failure on young white spruce, black spruce and balsam fir trees in a number of areas in the central Cochrane and eastern Kapuskasing districts. The most severely affected trees were in plantations of open-grown white spruce and black spruce 1-3 m tall, in which all buds above the 60- to 70-cm level failed to flush and remained dormant. Below this level bud flush and subsequent shoot development were normal. The most severe damage evaluated was in a compartment of 2.3-m nine-year-old black spruce at the Bonner Tree Improvement Centre, Kapuskasing District, where bud failure was evident in the upper crown and leader of 65% of the trees. Similar damage levels were apparent in Clute, Calder and Colquhoun townships, Cochrane District. Varying but lower levels of damage were noted in a number of other townships in Kapuskasing District and in Studholme and Elgie townships, Hearst District.

Drought

Unusually high temperatures combined with low rainfall have caused extensive drought damage. Although surveys are still in progress, it is now evident that unusually warm and dry weather conditions this summer caused unprecedented amounts of drought damage to forest stands in several parts of the province. For example, the mean June temperature at Sault Ste. Marie Airport was 15.2°C in comparison with a normal of 14.6°C , and rainfall at the same location was 10.2 mm in comparison with a normal of 74.2 mm. The most extensive areas of drought damage mapped to date have been in the Northeastern Region, where aerial surveys have disclosed approximately 26,184 ha of damage. The bulk of the damage occurred in the southern parts of Sault Ste. Marie District (5,790 ha) and Blind River District (20,394 ha). As might be expected, the most severe damage occurred in exposed areas such as hilltops, ridges and other areas where trees are stressed by shallow, dry or rocky soils. Although most tree species were affected to some degree, red oak, sugar maple and red maple were the most severely damaged, followed by yellow birch, white birch and, to a lesser extent, white pine. A wide range of damage was observed, including outright mortality of trees, twig and branch mortality, and premature leaf drop; however, an apparently healthy set of new buds formed for next year. In some cases, especially on red oak, the new buds had flushed, forming adventitious shoots or a very sparse and stunted new crop of foliage. It is expected that the effects of the drought, in the form of dying trees, growth reduction, and crown deterioration, will persist for one or more years.

Drought conditions also occurred in southwestern Ontario, as illustrated by a record low June rainfall at London airport—9.6 mm in comparison with a normal of 73.6 mm. Slightly increased temperatures (mean 18.1°C , normal 17.9°C) were recorded at the same location. Drought

symptoms were widespread but less dramatic in this part of the province. Young ornamental trees in most areas in the Chatham, Wingham, Simcoe, Aylmer and Niagara districts suffered various degrees of damage, including mortality. Windbreaks and hedges, particularly eastern white cedar, were widely affected, although severe damage and mortality were evident in only a few cases. Norway spruce seedlings in one compartment at the St. Williams Forest Tree Nursery sustained drought-caused mortality ranging from 11 to 44% in several beds. Forest and woodlot trees were only sporadically affected, with edge trees, usually on the windward side of stands, suffering the most damage. Sugar maple, beech and white birch, shallow-rooted species, were most often affected.

A further report on drought damage will be presented in the fall Survey Bulletin when surveys are complete.

Wind

Violent windstorms caused widespread damage to forest trees in the Red Lake, Sioux Lookout, Ignace, Dryden, Fort Frances and Thunder Bay districts (Fig. 6 and 7). The most severe storm occurred on or about 24 June; it traveled in a northwest-southeast direction and left a trail of broken, blown down and uprooted timber through northern Dryden District, parts of southern Sioux Lookout District, northern Ignace District and the northeast corner of the Thunder Bay District. Probably the most extensive areas of damage were in the northern Dryden District, where large patches of trees were blown down from the Zizania and Anishinabi Lakes area, southeast along the south side of Lac Seul to the Lynx Lake-Webster area on the Dryden-Sioux Lookout boundary. Small patches of blowdown occurred in the Webster area of the western Sioux Lookout District and in the Marchington Lake-Nagron lake area of the eastern Sioux Lookout District. Severe damage began again in the Lake of Bays area, across northern Ignace District in the Sturgeon Lake-Seseganaga Lake area and into the northwest corner of Thunder Bay District in the Harmon Lake-Waterhouse Lake area. Small isolated pockets of blowdown damage were mapped on the north side of Armistice Lake, Thunder Bay District (560 ha), and in the Rickaby-Bee Lakes area of Kenora District (160 ha).

A separate storm caused extensive damage to timber in 11 pockets in the Mine Centre area of Fort Frances District. Preliminary estimates, which will probably be revised when more detailed surveys are completed, show that a total area of 26,166 ha of blowdown was mapped in the above areas (Table 8).

NORTHWESTERN REGION

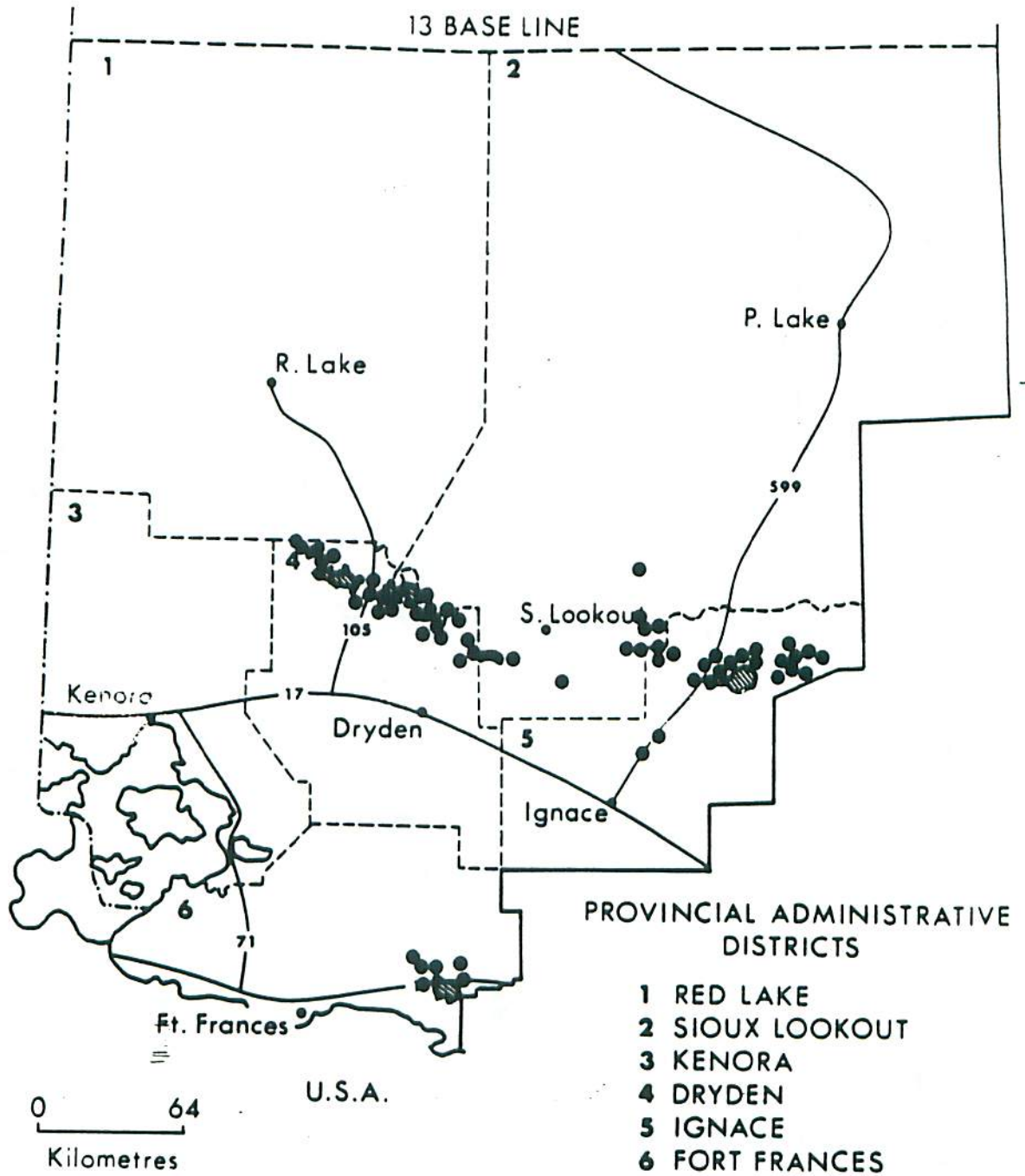


Figure 6
BLOWDOWN
severe damage  or •
1988
22,636 HA

Figure 7
BLOWDOWN
 severe damage ▨ or •
 1988
 3,530 HA

PROVINCIAL ADMINISTRATIVE DISTRICTS

- 1 **ATIKOKAN**
- 2 **THUNDER BAY**
- 3 **NIPIGON**
- 4 **GERALDTON**
- 5 **TERRACE BAY**

NORTH CENTRAL REGION

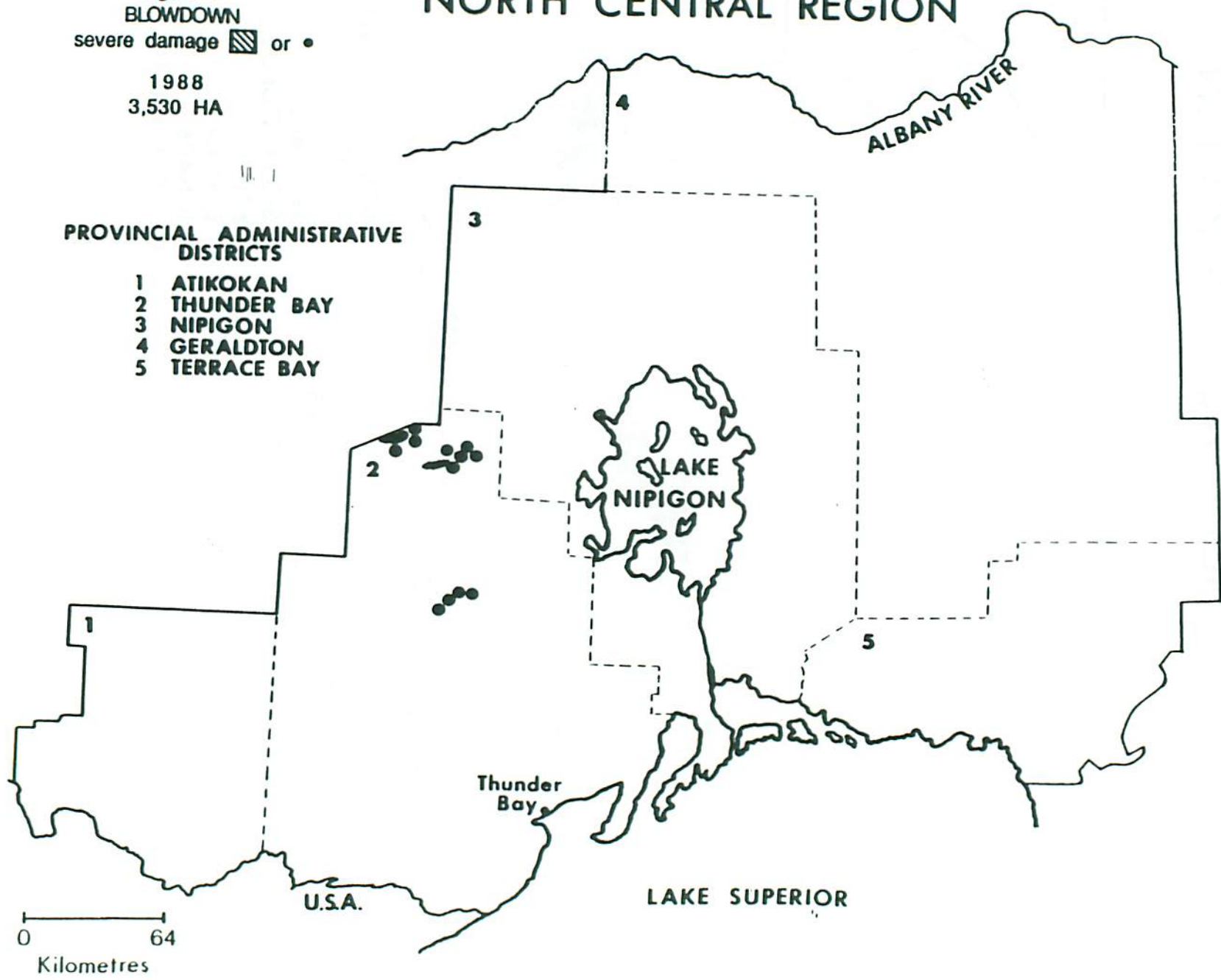


Table 8. Summary of wind damage in the North Central and Northwestern regions of Ontario, 1988

<u>Region</u> <u>District</u>	Area of blowdown (ha)
<u>Northwestern</u>	
Kenora	160
Dryden	10,445
Sioux Lookout	2,036
Ignace	7,912
Fort Frances	2,343
<u>North Central</u>	
Thunder Bay	3,530
TOTAL	26,166

Winter Drying

This condition occurs when unusually warm temperatures in late winter and early spring cause moisture losses in conifer foliage and buds that cannot be replaced by frozen root systems. In most cases, the damaged foliage falls off and is replaced by new spring growth; however, in extreme cases, the buds are killed, and twig, branch and, occasionally, tree mortality result.

In 1988, this condition was prevalent in the North Bay, Algonquin Park, Bancroft and Pembroke districts. Trees growing in locations with southerly exposures along roadsides and in open fields were most seriously damaged, with foliar damage as high as 70% recorded on white pine and red pine in the North Bay area and somewhat lesser damage (20-30%) recorded in the Warren-Sturgeon Falls area. Winter drying was also widespread on eastern cedar hedges and windbreaks in the Niagara, Simcoe, Chatham and Aylmer districts, although in most cases foliar damage was less than 10%. The condition also caused light levels of foliar damage to single red pine and pitch pine plantations in Timbrell and Parkinson townships, Blind River District. Winter drying, as a result of low snow cover, was deemed to be responsible for losses up to 50% in two eastern cedar compartments at the G. Howard Ferguson Forest Tree Nursery, Kemptville District. Follow-up surveys in areas affected in the Algonquin Park, Pembroke and Bancroft districts indicate that the winter drying problem has been exacerbated by drought conditions and that recovery of affected stands is much slower than normal.

Salt Damage

Salt damage is a perennial problem on trees adjacent to Ontario highways where heavy salt applications are used to alleviate winter driving conditions. The most severe damage this year was reported along Highway 69 in Parry Sound District, Highway 11 in the Bracebridge District, Highway 35 in the Minden District, highways 401, 35, 115 and 7 in Lindsay District, and Highway 17 in the Sault Ste. Marie and Blind River districts. Red pine, white pine and Scots pine are the species most often damaged, although most other coniferous species suffer various degrees of damage.

Frost

Frost damage was much less prevalent in 1988 than last year although severe damage was reported from numerous locations in the Algonquin Park, Bancroft and Pembroke districts. The most severe damage occurred in a 5-ha white spruce plantation along the Indian River in Fraser Township, Pembroke District, where shoot damage in the 90% range was recorded. Frost damage was also observed across northern Sudbury and North Bay districts, where white spruce and balsam fir in a number of areas had 80-100% of their new shoots killed. Elsewhere, frost damage was noted on 70% of hybrid poplar stools in the Orono Forest Tree Nursery and scattered trembling aspen suffered foliar damage of about 15% in Inwood Park, Thunder Bay District.

Frost heaving caused 18% mortality of black spruce seedlings in compartment W5 of the Dryden Forest Tree Nursery, Dryden District.

Hail

A severe hail storm on 8 June caused extensive damage to forest areas in Barron and Master townships, Algonquin Park District, and in adjacent areas in McKay and Alice townships, Pembroke District. Severe defoliation was aeri ally mapped in trembling aspen, large-toothed aspen and red maple stands as well as in scattered white pine stands within an area of about 3,440 ha. Follow-up surveys have disclosed small, scattered pockets of mortality of trembling aspen and large-toothed aspen within an area of about 2,583 ha. Much concern has been expressed over the condition of mature white pine stands; to date, however, no mortality of this species has been observed.

Heat

Unusually warm weather was thought to be responsible for losses of a number of tree seedlings at the Orono Forest Tree Nursery in Lindsay District. The damage occurred in Compartment T33, where approximately 30% of 1-1 Norway spruce seedlings died. Unusually warm conditions were

also thought to be implicated in the loss of about 20,000 white spruce seedlings in greenhouses 3 and 4 and about 60,000 white pine seedlings in greenhouses 2 and 6.

Moose Browse

In a semipermanent jack pine plot in Nairn Township, Espanola District, about 9% of the trees suffered branch damage ranging from 20 to 70% of the branches.

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