SURVEY BULLETIN

Forest Insect and Disease Conditions in Ontario

Summer 1994

Natural Resources Canada
Canadian Forest Service

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Canada

FOREST INSECT AND DISEASE CONDITIONS IN ONTARIO

Summer 1994

This is the second of three bulletins issued annually by the Forest Insect and Disease Survey (FIDS) Unit of Natural Resources Canada, Canadian Forest Service–Ontario. It contains the results of ground and aerial surveys of Ontario forests from early May to mid-July. Data and figures presented here are preliminary and may change as results of additional surveys and analysis of data may provide new information.

OVERVIEW

A very severe winter in Ontario was followed by a cool, slow spring in the central and eastern parts of the province and a warm, early spring in parts of northwestern Ontario, particularly the Fort Frances area. As a consequence, insect development was accelerated in the northwest and slowed in the north central, northeastern, and southern parts of the province. Damage to trees by cold winter conditions was present in central areas between Sault Ste. Marie and North Bay and late spring frosts damaged numerous tree species in southern Ontario.

Populations of a number of pests including forest tent caterpillar, eastern spruce budworm, and gypsy moth declined markedly this year while the area affected by jack pine budworm increased. The European race of scleroderris canker disease was more prevalent within previously infected areas. Details on these and other pests follow.

FOREST INSECTS

Eastern Spruce Budworm, *Choristoneura fumiferana* Clem.

There was a large decline in the area of moderate-to-severe defoliation in 1994. A total of 4,266,656 ha was mapped by ground and aerial surveys compared with 8,991,177 ha in 1993. Most of the decline occurred in the Northwest Region, east of Lake Nipigon in the Nipigon and Geraldton districts. Here the infestation resulted in many small pockets of defoliation (Fig. 1). Moderate-to-severe defoliation in 1994 totaled 378,464 ha in the Nipigon District and 96,655 ha in the Geraldton District, compared with 1993 totals of 1,560,477 and 1,296,783 ha, respectively, (Table 1). Significant declines were also recorded in the Dryden, Kenora, Red Lake, Sioux Lookout, and Thunder Bay districts while an increase was recorded in the Fort Frances District. The intensity of defoliation also decreased with moderate rather than severe levels recorded in large areas of the Sioux Lookout, Kenora, and Dryden districts.

In the Northeast Region, the area of moderate-to-severe defoliation declined drastically in the Hearst and Wawa districts where large areas of contiguous defoliation broke up into numerous small patches. No defoliation was recorded in areas previously infested in the former Moosonee District, which is now part of the Cochrane District.

In the Central Region, infestations around the city of Sault Ste. Marie, in the Sault Ste. Marie District, declined. A number of small pockets of infestation in the vicinity of Warren on the Sudbury–North Bay district boundary merged to form one larger body of damage totaling 47,315 ha. Seven small patches totaling 3,030 ha were mapped between Gore Bay and Lake Manitou on Manitoulin Island. An infestation that caused moderate-to-severe defoliation on 20,405 ha in four townships in the northwest corner of the Algonquin Park District in 1993, increased to 57,505 ha in nine townships in 1994.

In the Southern Region, infestations in white spruce plantations in the Kemptville District increased from 85 to 570 ha and in the Midhurst District from 17 to 97 ha. A small, 20-ha white spruce plantation was moderately defoliated in the Cambridge District.

Egg-mass surveys to determine eastern spruce budworm population trends in 1995 are currently underway and results will be forthcoming in the fall survey bulletin.

Cover photos: Larvae of the introduced pine sawfly and damage to mature eastern white pine.

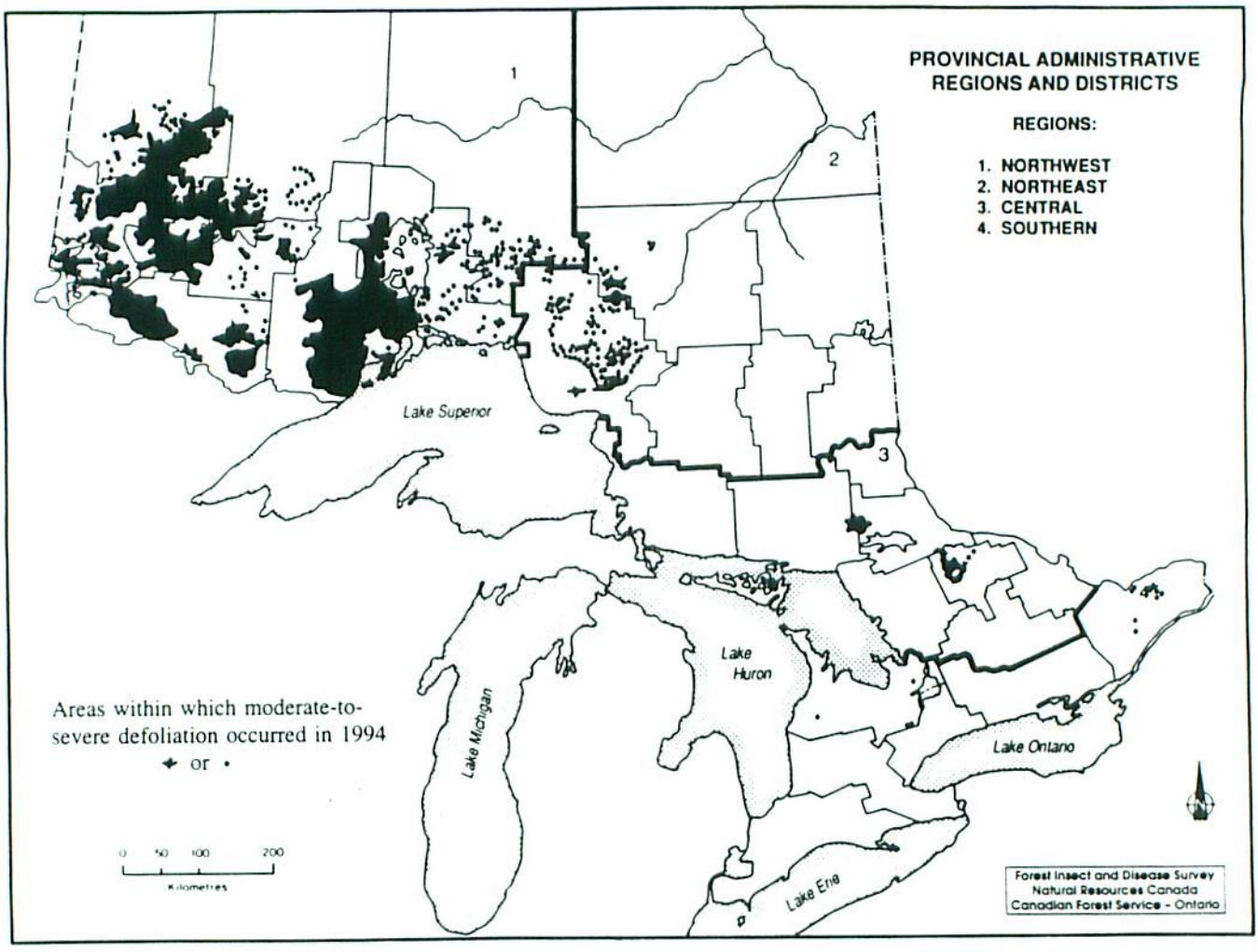

Figure 1. Eastern spruce budworm, Choristoneura fumiferana *(Clem.).*

Jack Pine Budworm, *Choristoneura pinus pinus* Free.

The total area of moderate-to-severe defoliation caused by jack pine budworm increased from 282,247 ha in 1993 to 419,344 ha in 1994 (Table 2). The largest infestation occurred along the Georgian Bay coast between Pointe au Baril Station, Parry Sound District and Beaverstone Bay Indian Reserve, Sudbury District. Defoliation was mapped as far inland as Brown Township, Parry Sound District and Delamere Township, Sudbury District, with 94,713 ha affected in the Parry Sound District and 38,186 ha in the Sudbury District (Fig. 2). A second infestation in east Parry Sound District occupied 10,655 ha in McKenzie, Wilson, and Ferrie townships along with 755 ha in adjacent East Mills Township, North Bay District.

In the Sudbury District, a number of small pockets of infestation that occurred in 1993 coalesced to form larger, more contiguous areas of defoliation. The largest of these infestations occurred between Cartier and Capreol (66,711 ha) and between Beebe and Bigelow townships (60,204 ha). Numerous other pockets of defoliation occurred in the eastern and central parts of the Sudbury District and ranged from 50 ha to 16,830 ha in area.

Most of the defoliation in the North Bay District occurred in scattered patches around the west end of Lake Nipissing. The largest pocket occupied 13,666 ha between the north bank of the French River and West Bay on Lake Nipissing.

In the Timmins District, small infestations occurred in Westbrook Township, south of Gogama, where 2,120 ha were defoliated and in Breadner and Battersby townships, where 1,300 ha were damaged as part of a larger infestation that extended south into the Sudbury District.

A number of small infestations were recorded in the Pembroke District as follows: north and south of Lake Traverse in White, Edgar, and Barron townships; in the vicinity of Bonnechere Provincial Park in Hagarty Township; and along the east and west sides of Highway 17 between Deep River and Pembroke.

A single infestation occurred in Sagard Township, Sault Ste. Marie District, where 1,240 ha were affected.

E.B. Eddy Forest Products Ltd., Espanola and the Ontario Ministry of Natural Resources aerially sprayed 21,500 ha of jack pine forest on the Lower Spanish Forest Management Agreement (FMA) for jack pine budworm. Spraying started 19 June 1994 and was completed 27 June 1994. The treatment was a single application of Foray 76B at 30 BIU/ha.

Gypsy Moth, *Lymantria dispar* (L.)

Populations of the gypsy moth declined in Ontario for the third consecutive year. The gross area of moderate-to-severe defoliation stood at 5,645 ha, down from 9,784 ha recorded in 1993 (Table 3). This was the smallest area recorded since 1982 (Table 4). Most of the defoliation (5,543 ha) was again recorded in the Sudbury District, with the bulk occurring south and east of the city of Sudbury in the area between Timmins Chutes on the Wanapitei River and Makada and White Oak lakes, including the city of Sudbury itself (Fig. 3). Scattered pockets of defoliation were mapped between Lake Panache and Nairn as well as in the area between Espanola and Whitefish Falls. Most of the defoliation in these areas occurred on red oak and white birch growing on rocky ridge tops. Many trees sustained 100% defoliation. Red pine and trembling aspen suffered defoliation in the 30 to 60% range and some Manitoba maple was defoliated in the city of Sudbury.

The remainder of the defoliation this year (102 ha) was recorded in the western part of the Aylmer District where infestation declined and usually moderate damage was recorded. Small pockets of infestation persisted in Pinery Provincial Park and southeast of Courtright in Moore Township. Several new pockets of infestation were mapped in Mosa Township about midway between the towns of Wardsville and Bothwell. Infestations that occurred in 1993 in the Sarnia Indian Reserve and

Table 1. Gross area of moderate-to-severe defoliation by the eastern spruce budworm in Ontario, 1991–1994.

Region / District	Area (ha) 1991	1992	1993	1994
Northwest				
Dryden	947,061	853,616	997,273	507,450
Fort Frances	590,094	424,784	422,244	506,878
Geraldton	960,702	1,138,621	1,296,783	96,655
Kenora	1,088,331	867,632	850,187	571,555
Nipigon	2,028,532	1,488,098	1,560,477	378,464
Red Lake	319,121	805,912	638,964	559,847
Sioux Lookout	479,096	533,554	556,122	367,437
Thunder Bay	1,754,081	1,361,666	973,686	885,138
	8,167,018	**7,473,883**	**7,285,736**	**3,873,424**
Northeast				
Hearst	34,685	458,578	268,208	42,245
Moosonee	2,360	11,205	11,647	0
Wawa	849,965	1,621,297	1,370,822	241,335
	887,010	**2,091,080**	**1,650,677**	**283,590**
Central				
Algonquin Park	11,640	26,900	20,405	57,505
North Bay	10	1,545	10,468	27,995
Sault Ste. Marie	0	965	4,639	915
Sudbury	70	1,365	9,150	22,640
	11,720	**30,775**	**44,662**	**108,955**
Southern				
Cambridge	18	0	0	20
Kemptville	0	10	85	570
Maple	6	2	0	0
Midhurst	9	12	17	97
	33	**24**	**102**	**687**
Total	**9,065,781**	**9,595,762**	**8,991,177**	**4,266,656**

Table 2. Gross area of moderate-to-severe defoliation by the jack pine budworm in Ontario, 1991–1994

Region / District	Area (ha) 1991	1992	1993	1994
Northwest				
Dryden	2,591	0	0	0
Red Lake	69,903	693	0	0
Sioux Lookout	20	0	0	0
	72,514	**693**	**0**	**0**
Central				
Algonquin Park	0	495	380	1,590
Bancroft	20	30	0	0
North Bay	290	16,379	19,035	25,052
Parry Sound	51,276	77,551	91,645	106,898
Pembroke	0	2,704	4,202	3,875
Sault Ste. Marie	0	0	1,095	1,240
Sudbury	9,518	60,349	165,840	277,129
Temagami	0	0	50	110
	61,104	**157,478**	**282,247**	**415,894**
Northern				
Timmins	0	0	0	3,450
	0	**0**	**0**	**3,450**
Total	**133,618**	**158,704**	**282,247**	**419,344**

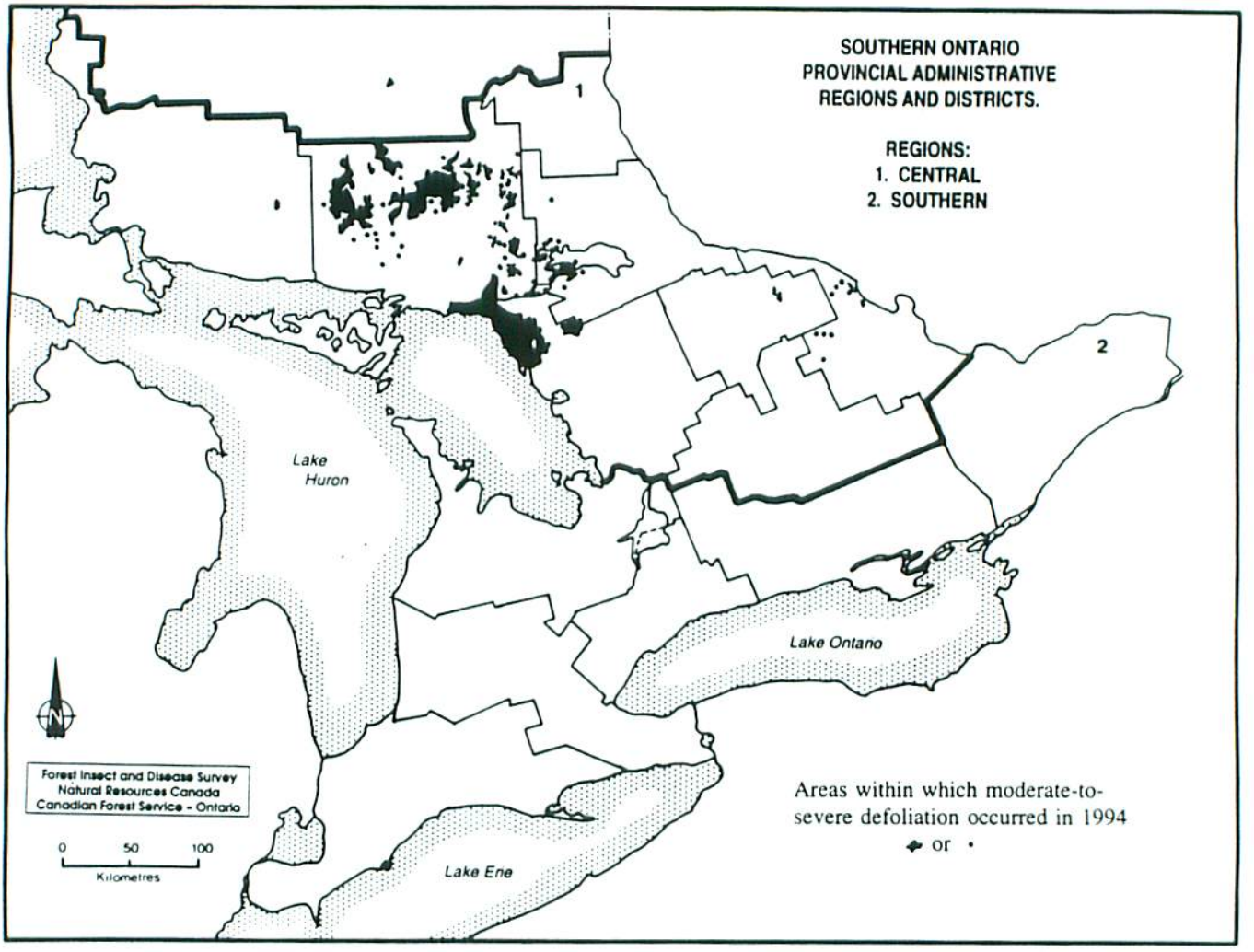

Figure 2. Jack pine budworm, Choristoneura pinus pinus *Free.*

Table 3. Gross area of moderate-to-severe defoliation by the gypsy moth in Ontario, 1991–1994.

Region / District	Area (ha) 1991	1992	1993	1994
Central				
Algonquin Park	915	591	0	0
Bancroft	61,840	13,205	0	0
Parry Sound	148,412	1,513	0	0
Pembroke	16,554	2,301	0	0
Sudbury	441	3,502	6,645	5,543
	228,162	**21,112**	**6,645**	**5,543**
Southern				
Aylmer	3,388	123	2,357	102
Cambridge	45,445	225	0	0
Kemptville	280	0	0	0
Maple	8,383	3,986	304	0
Midhurst	45,847	1,036	349	0
Tweed	15,910	7,978	129	0
	119,253	**13,348**	**3,139**	**102**
Total	**347,415**	**34,460**	**9,784**	**5,645**

Table 4. Gypsy moth infestations in Ontario, 1981–1994.

Year	Gross area of moderate-to-severe defoliation (ha)
1981	1,450
1982	4,800
1983	40,954
1984	80,624
1985	246,342
1986	160,776
1987	12,678
1988	29,693
1989	81,640
1990	77,648
1991	347,415
1992	24,460
1993	9,784
1994	5,645

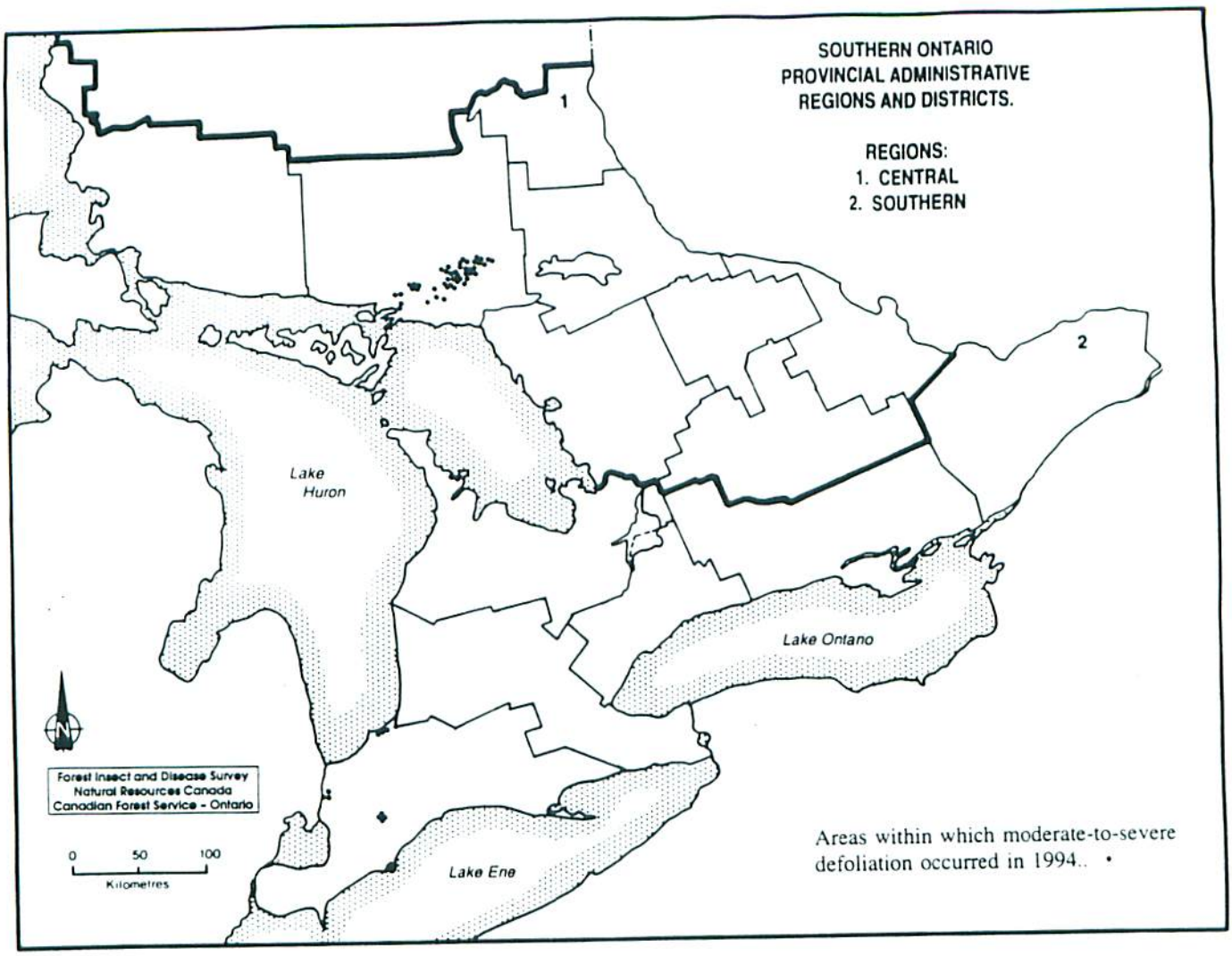

Figure 3. Gypsy moth, Lymantria dispar *(L.).*

in Rondeau Provincial Park collapsed this year. Small numbers of larvae were reported but no significant defoliation was observed. At one location near Lauzon Lake in Long Township, Sault Ste. Marie District, larvae were described as numerous but little or no defoliation resulted.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

The current forest tent caterpillar outbreak peaked in 1991 when a provincewide total of 18,870,508 ha of moderate-to-severe defoliation was recorded (Table 5). Populations have declined steadily since then with a total of 166,060 ha of moderate-to-severe defoliation recorded in 1994. All the defoliation this year occurred in the Cochrane and Hearst districts where a sizeable infestation straddled the district boundary between Nansen and Fauquier townships, Hearst District, on the west and Calder Township, Cochrane District, on the east (Fig. 4). A few small patches of defoliation occurred to the north and south of this main body of infestation. A second pocket of defoliation was mapped in Lamarche, Hanna, and St. John townships immediately south of the town of Cochrane and a small patch of damage occurred in Brower Township southeast of Cochrane.

Infestations that occurred in 1993 in the Sudbury, North Bay, and Bancroft districts of the Central Region and the Kemptville and Tweed districts of the Southern Region, collapsed in 1994 with no defoliation of any significance recorded.

The lingering effects of successive years of forest tent caterpillar defoliation, possibly combined with other factors such as drought, have caused widespread deterioration of poplar stands in the eastern Nipigon, southern Geraldton, and western Wawa districts (Fig. 5). Aerial surveys disclosed crown dieback and mortality of trembling aspen stands within a total area of 98,905 ha. Further surveys will be conducted to determine the exact nature and proportion of the damage.

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

Once again the most severe damage by this introduced pest occurred in Oro

Table 5. Gross area of moderate-to-severe defoliation by the forest tent caterpillar in Ontario, 1991–1994.

Region / District	Area (ha) 1991	1992	1993	1994
Northwest				
Dryden	2,119,485	461,440	0	0
Fort Frances	1,647,276	0	0	0
Geraldton	1,215,915	2,824,611	0	0
Kenora	1,306,741	192,154	0	0
Nipigon	1,468,417	1,751,983	0	0
Red Lake	1,248,065	1,263,947	0	0
Sioux Lookout	2,920,345	1,951,903	0	0
Thunder Bay	2,263,242	2,011,708	0	0
	14,184,526	**10,457,746**	**0**	**0**
Northeast				
Chapleau	0	0	1,520	0
Cochrane	0	541,507	141,389	116,720
Hearst	1,902,728	3,103,653	358,541	49,340
Moosonee	90,015	92,092	0	0
Timmins	495	0	0	0
Wawa	1,428,838	1,742,229	31,457	0
	3,422,076	**5,479,481**	**532,907**	**166,060**
Central				
Algonquin Park	0	3,555	0	0
Bancroft	115,720	28,279	31,628	0
North Bay	60,152	9,445	19,025	0
Parry Sound	24,408	3,993	0	0
Sault Ste. Marie	71,383	0	0	0
Sudbury	681,582	33,465	34,810	0
	933,245	**78,677**	**85,463**	**0**
Southern				
Kemptville	49,122	7,905	22,473	0
Maple	551	0	0	0
Midhurst	26,441	1,020	0	0
Tweed	229,547	26,595	14,413	0
	305,661	**35,520**	**36,886**	**0**
Total	**18,870,508**	**16,051,424**	**655,256**	**166,060**

Township, Midhurst District. Here, 375 ha of semimature red pine and white pine plantations were severely defoliated, a slight increase from the 287 ha recorded in the same area in 1993. The situation is unusual in that the affected trees are semimature and 15 to 20 m in height, which is much larger than trees normally attacked by this insect. In one severely damaged red pine block, 100% of the old foliage was destroyed along with 50–100% of the new foliage. Trees in this plantation are in poor condition and the Ontario Ministry of Natural Resources (OMNR) has scheduled the stand for cutting later this year. Defoliation in the remainder of this infestation ranged from 30 to 80% of old foliage and 10 to 20% of new foliage.

A second heavy infestation occurred in 90 ha of planted red pine in adjacent areas of Hope and Cavan townships and the municipality of Newcastle in Tweed District. Damage in these semimature trees varied from 30 to 80% of the old foliage.

Heavy damage was also recorded in young (<8 m) red pine in adjacent areas of Belmont and Dummer townships, Tweed District. In the Parry Sound District a 20-ha, 3-m red pine plantation in McMurrich Township was severely damaged, with 100% of the old foliage and most of the new foliage destroyed. Lighter infestations and less severe damage was reported in a number of other areas in southern Ontario. In northern Ontario, two small red pine plantations in Paipoonge Township, Thunder Bay District, sustained moderate levels of damage.

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

A single heavy infestation caused severe damage in a newly planted jack pine and black spruce plantation in Hambleton Township, Wawa District. Approximately 50% of the 392,000 seedlings planted over 220 ha were destroyed. Planting operations were suspended until after the larval feeding period in order to prevent further losses. The site had been burned in 1993 in preparation for planting. Nearby sites that are scheduled for burning in 1994 will be pheromone trapped in order to prevent a recurrence of this situation in the spring of 1995. Trace levels of damage were reported in other prescribed burn areas north of Dubreuilville in the Wawa District, but delayed planting is thought to have limited damage at these sites.

Fall Cankerworm, *Alsophila pometaria* (Harr.)

Increased populations of the fall cankerworm caused heavy defoliation of ornamental trees in a number of urban areas in northwestern Ontario. In the city of Thunder Bay defoliation of green ash, little leaf linden, and Manitoba maple varied from 50 to 70%. Increased populations were reported on Manitoba maple in the towns of Sioux Lookout, Hudson, and Dryden. Here defoliation by fall cankerworm, in conjunction with the larger boxelder leafroller, often reached 100%.

Poplar Leaf Beetle, *Altica populi* Brown

High populations of this pest were widely distributed in balsam poplar stands in eastern Ontario. Most stands in the Algonquin Park, Pembroke, Bancroft, and southern Parry Sound districts sustained 80 to 100% foliar damage. Similar damage levels were reported in many balsam poplar stands in the Kemptville District and the eastern Tweed District.

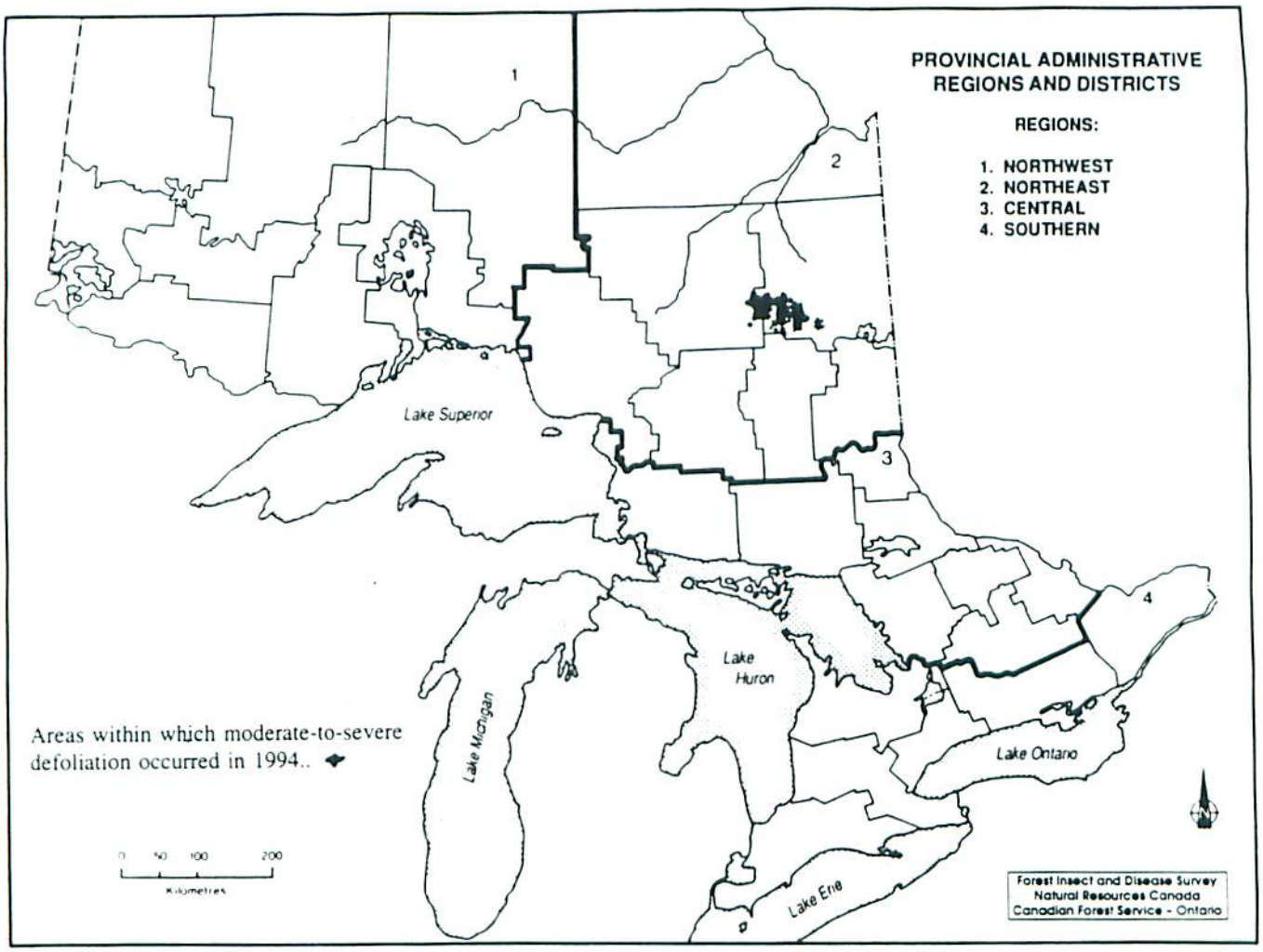

Figure 4. Forest tent caterpillar, Malacosoma disstria *Hbn.*

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

Populations of this leafmining complex increased somewhat in southern Ontario where the most widespread and severe damage occurred in the Kemptville District. Eastern white cedar in Bathurst, Drummond, Dalhousie, Montague, North Gower, and Nepean townships sustained an average of 80% foliar damage. Similar damage levels were recorded in Kingston and Ernestown townships, Tweed District, while slightly lower levels occurred in Harvey and Ennismore townships, Tweed District. Several small pockets of defoliation, ranging from 50 to 70%, were reported from the Aylmer District and one location in the Cambridge District. Population increases that were expected in the northern part of the Cambridge District in 1994 failed to materialize and most stands in this area remained green.

Jack Pine Resin Midge, *Cecidomyia resinicola* (O.S.)

High populations recurred for the third consecutive year in young jack pine stands in a number of areas in the Dryden and Sioux Lookout districts. The most severe damage occurred on young, 3–5-m roadside trees along Highway 17 between Dryden and English River in the Dryden District. Many trees suffered 100% new shoot mortality. Similar heavy damage levels were recorded in a jack pine seed orchard at the Dryden Tree Nursery, Dryden District and along Highway 642 and the Stanzhikimi Road area, Sioux Lookout District.

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

The total area of moderate-to-severe defoliation caused by this trembling aspen pest increased from 45,464 ha in 1993 to 197,756 ha in 1994. Most of this defoliation (177,330 ha) occurred in a large infestation in the northeast corner of the Wawa District and extended north into the Hearst District and south into the Chapleau District. A number of small patches of defoliation surrounded the northern

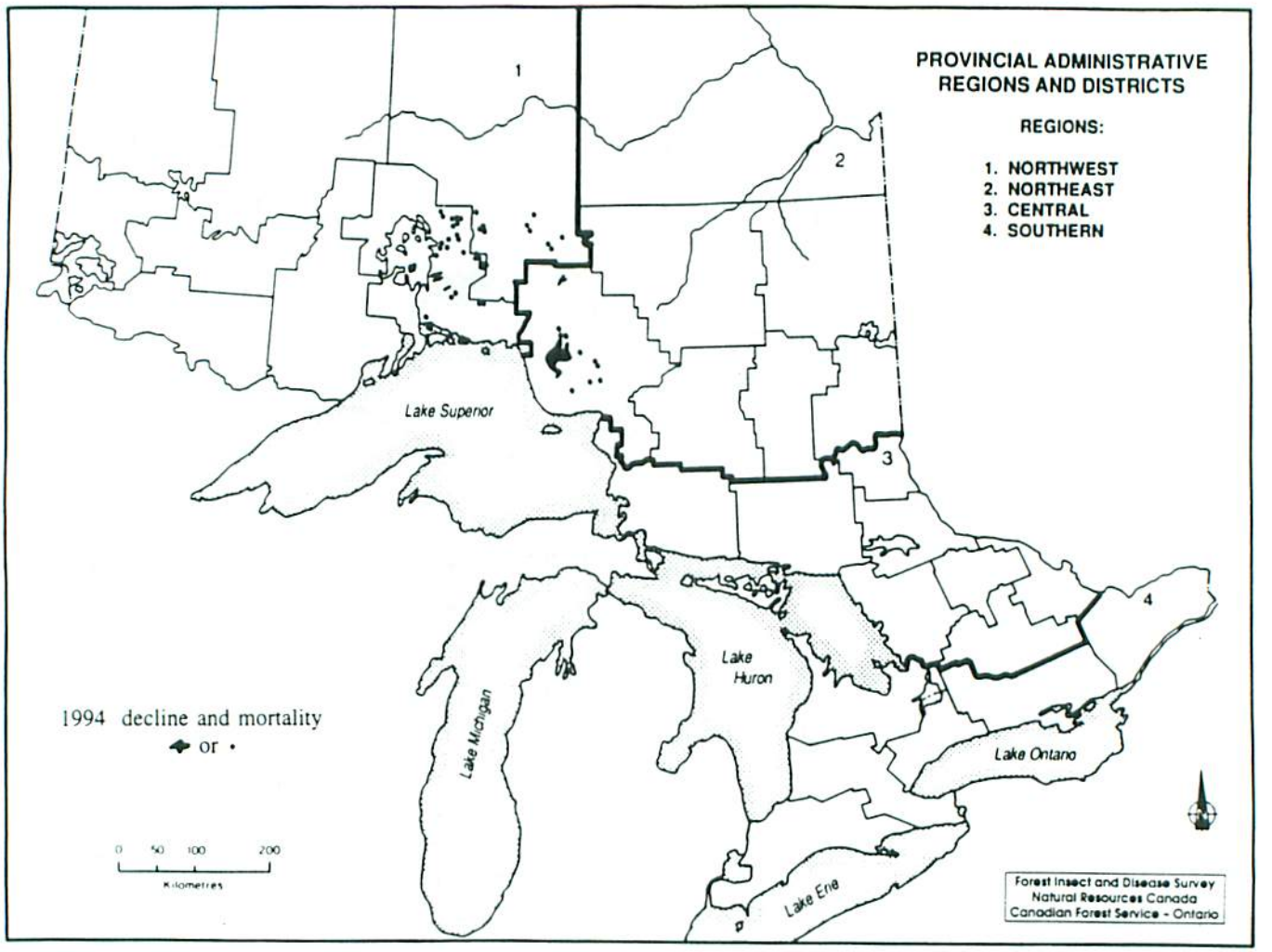

Figure 5. Forest tent caterpillar, Malacosoma disstria *Hbn.*

part of this infestation in the Wawa and Hearst districts and two large infestations of 8,910 ha and 4,810 ha occurred nearby in Missinaibi Provincial Park, Chapleau District. Pockets of infestation were mapped east of Wanapitei Lake in the Sudbury and North Bay districts and small areas of damage were recorded south of Halfway Lake Provincial Park, Sudbury District. A total of 2,590 ha of defoliation was mapped in the Sudbury District and 2,480 ha were noted in the North Bay District. Ground surveys disclosed 45 ha of defoliation in two small pockets south of the city of Ottawa in Gloucester Township and a single 1-ha stand was defoliated near Beaverton in the Maple District.

Larch Casebearer, *Coleophora laricella* (Hbn.)

Small pockets of damage caused by the larch casebearer were evident at a number of widespread locations in the Southern Region. Defoliation averaged about 75% on European larch and native tamarack in numerous stands in the eastern Midhurst District, the central Kemptville District, the Uxbridge area of Maple District, and in scattered locations in the Tweed District. The most severe damage occurred on 20-m European larch windbreak trees at the Orono Forest Station and on planted tamarack in Uxbridge Township, Maple District. Trees in both areas sustained 90% foliar damage. In Osgoode Township, Kemptville District, 12.5-m tamarack had 65–100% defoliation. Pockets of light and occasionally moderate defoliation occurred at scattered locations in the Cambridge and Aylmer districts. Populations were reduced in the Pembroke District of the Central Region where a single infestation caused 30% defoliation in a 12-m, 3-ha tamarack stand in McNab Township.

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

Populations of this potentially damaging pest have been at a low ebb in Ontario for several years. In 1994 there was an increased occurrence of the insect in the Sault Ste. Marie District. Fringe trees in oak stands in the north part of the city of Sault Ste.

Marie sustained an average 30% defoliation with damage on individual trees ranging from 20 to 80%. Defoliation varied from 10 to 15% on large red oak trees in Wells Township; along the Batchewana River in Fisher Township; and in Gladstone, Patton, and Thessalon townships, Sault Ste. Marie District. Very low levels of damage (2 to 5%) were reported on red oak trees along Highway 36 in Harvey Township, Tweed District.

Introduced Pine Sawfly, *Diprion similis* (Htg.)

Early surveys show that heavy infestations of the introduced pine sawfly persist along the Georgian Bay coast in the vicinity of Parry Sound. Mature white pine have been heavily attacked for the second consecutive year and in some areas are completely stripped of foliage. This may kill the trees. To determine the area affected and the level of damage, surveys will continue later in the summer after the second generation of this pest has completed feeding. Populations that were high in a white pine seed orchard in South Cayuga Township, Cambridge District, declined somewhat this year although defoliation was still evident. Trace levels of damage were recorded on white pine breeding orchard trees at the Thessalon Tree Nursery in the Sault Ste. Marie District.

Satin Moth, *Leucoma salicis* (L.)

Heavy infestations of satin moth recurred on ornamental Carolina poplar, trembling aspen, and balsam poplar at Canadian Forces Base Borden in the Midhurst District. An aerial spray program, using (*B.t.*) Foray 48B, achieved good control on parts of the base but heavy defoliation persisted on a few groups of trees outside the treated area. Small groups of Carolina poplar were severely defoliated in the city of Barrie and moderate damage occurred on a few ornamental Carolina poplar in Oro Township, Midhurst District. Heavy defoliation occurred on Carolina poplar along Highway 401 in the city of Oshawa, Maple District. Infestations in the Kemptville and Tweed districts, which began declining in 1993, collapsed in 1994.

Hemlock Looper, *Lambdina fiscellaria fiscellaria* (Gn.)

Preliminary surveys indicate that high populations of hemlock looper persist in the Charleston Lake area of the Kemptville District and significant mortality is evident in several eastern hemlock stands. New infestations have been mapped in the Crotch and Gull lakes area in Palmerston and Clarendon townships, Bancroft District. Hemlock and eastern white pine were affected in these areas but larvae are still feeding and area and damage level figures have not been compiled.

Balsam Fir Sawfly, *Neodiprion abietis* complex

Infestations of this pest of balsam fir and white spruce collapsed in Parry Sound and most of the Bancroft District, where populations had been high for several years. Defoliation as high as 60% was recorded in scattered balsam fir stands in Palmerston, Glamorgan, Monmouth, and Cardiff townships, Bancroft District and somewhat lower damage, in the 40% range, occurred in scattered stands in the southern Pembroke District. Declining populations were reported in the Sudbury and North Bay districts although light damage persisted in a number of areas. The highest populations were observed in Springer Township north of Sturgeon Falls, North Bay District, where defoliation averaged 30% on 10-m balsam fir trees. Infestations persisted, but at much lower levels, in the northwest corner of the Tweed District, where defoliation of scattered clumps of trees and small stands ranged from 10 to 30%. In contrast, there was a resurgence of populations in the Kemptville District and to a lesser degree in the eastern Tweed District. The most severe damage, 75% defoliation, occurred in a 10-ha stand of 15-m balsam fir near Lake Eloida in Rear of Yonge and Escott townships, Kemptville District. Similar defoliation levels were recorded in smaller stands in Oxford on Rideau and Elizabethtown townships. Defoliation ranged from 25 to 60% in a number of other areas in the Kemptville District and from 10 to 20% in several areas in the eastern Tweed District.

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

The widespread heavy infestations of the jack pine sawfly (*N. pratti paradoxicus*) that occurred in the Kemptville and Tweed districts in 1992 and 1993 declined drastically in 1994. The only remaining heavy infestation was in a small 3.5-m jack pine stand in North Crosby Township, Kemptville District, where 100% of the trees sustained an average of 65% defoliation. Single plantations were attacked in Hagarty and Horton townships, Pembroke District, where 30% defoliation on 80% of the trees and 34% on 100% of the trees, respectively, was recorded. A single infestation was observed in a 25-ha, 5.5-m jack pine stand in Methuen Township, Bancroft District, where defoliation ranged from 10 to 100%.

The closely related jack pine sawfly (*N. pratti banksianae*) caused 49% defoliation in a 5-ha, 3.2-m jack pine stand in Bedford Township, Tweed District. Low numbers of the same pest were reported in a few areas in the Kirkland Lake, Sudbury, and Fort Frances districts.

Increased populations of the red pine sawfly (*N. nanulus nanulus*) were recorded in the Kemptville District and five red pine plantations were infested; however, defoliation in all cases was light. Low levels of defoliation were also reported in McKim Township, Sudbury District; at Nym Lake Air Base, Fort Frances District; and on shoreline and island trees on Brunswick Lake in Ericson Township, Hearst District.

European Pine Sawfly, *Neodiprion sertifer* Geoff.

Populations of this early season pine pest, which had been on the increase in southern Ontario, collapsed in 1994. Only trace populations could be found at a few locations in the Tweed, Maple, Midhurst, Aylmer, and Cambridge districts. Light infestations were observed throughout Manitoulin Island, Sudbury District. The highest populations in this area caused 20% defoliation to 30% of the 2-m Scots pine in a 0.5-ha plantation in Gordon Township. Scattered mugho pine ornamentals in the city of Sault Ste. Marie, Sault Ste. Marie District, sustained 10% defoliation.

Northern Pitch Twig Moth, *Petrova albicapitana* (Bsk.)

Reports of this insect on young jack pine were widespread in northern Ontario. Damage in most cases was light with the exception of a single infestation in the Kakabeka Falls seed orchard in Paipoonge Township, Thunder Bay District. Here, 46% of the 3-m jack pine trees in a 15-ha plantation were infested with first year nodules. A light infestation was reported on 12.5-m pitch pine in a 2-ha area near Charleston Lake, in Rear of Leeds and Lansdowne Township, Kemptville District.

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

The yellowheaded spruce sawfly is a pest of young white spruce and black spruce. Trees are most often attacked when they are open-grown, such as in young plantations, ornamentals, and on the fringes of forest stands or along roads and lake shores. In 1994, increased populations were evident in a number of areas in southern Ontario. Foliar damage ranged from 40 to 90% on roadside and fringe trees in a number of areas in the eastern Parry Sound District and in the Algonquin Park, Pembroke, and Bancroft districts. Somewhat lower levels of damage, in the 20 to 30% range, occurred in a number of locations in the Tweed and Kemptville districts.

In northern Ontario, high populations and heavy defoliation occurred in a number of areas in the Timmins, Kirkland Lake, and Temagami districts. Young roadside white spruce in Best and Strathcona townships and in Cane and Arnold townships, Kirkland Lake District, had defoliation in the 90% range. Defoliation at 40% was recorded on open-grown white spruce in a field in Barber Township, Kirkland Lake District, although some trees had defoliation as high as 100%. In Franz Township, Hearst District, 60% defoliation was recorded in a 5-ha white spruce plantation.

Early Aspen Leafcurler, *Pseudexentera oregonana* (Wlsm.)

A large infestation of this pest, which occurred in the Cochrane, Timmins, and Kirkland Lake districts in 1993, declined this year. In total, 399,390 ha of moderate-to-severe defoliation was caused by this insect in 1994 compared with 839,840 ha in 1993. However, a sizeable pocket of infestation persisted in the southern Cochrane District along with remnant patches of defoliation in the northern Timmins and Kirkland Lake districts (Fig. 6). The large 1993 infestation, centred on the town of Cochrane and extending from Greenwater Provincial Park southeast to Mann and Newmarket townships, covered an area of 116,810 ha. Several smaller patches occurred northeast of Smooth Rock Falls and north of Iroquois Falls. New infestations were mapped in the southeastern Chapleau and southern Timmins districts. Infestations here took the form of many small, scattered patches of defoliation, the largest of which occupied 6,350 ha in the adjoining corners of Smuts and Biscotasi townships, Chapleau District and Invergarry and Arden townships, Timmins District. Two large new infestations were also mapped in the North Bay District; one of these extended slightly into the Sudbury District. The smaller of the two infestations occurred north of Lake Nipissing and encompassed 78,600 ha between Hagar Township, Sudbury District and Fell and Grant townships, North Bay District. A larger infestation was mapped east of Lake Nipissing. It occupied 167,230 ha in a triangular shape between Himsworth, Mattawan, and Lockhart townships.

Other Noteworthy Insects

The larger boxelder leafroller (*Archips negundana* [Dyar]) caused moderate-to-severe defoliation of Manitoba maple in the towns of Fort Frances, Kenora, Sioux Lookout, Hudson, and Dryden in northwestern Ontario.

Feeding by adult sawyer beetles (*Monochamus* spp.) killed 100–150, 18-m jack pine trees along the fringe of single cutover areas in Matthews and Cooper townships, Wawa District.

The European spruce needleminer (*Epinotia nanana* [Treit.]) caused 20% foliar damage on 90% of the 10-m white spruce in a 0.5-ha stand in Puslinch Township, Cambridge District.

High populations of the European fruit lecanium (*Parthenolecanium corni* Bouché) were reported on sugar maple stands in several areas in the southeastern Algonquin Park District and northern Bancroft District. High populations were also observed in Gurd Township, North Bay District.

Generally low populations of the eastern tent caterpillar (*Malacosoma americanum* [F.]) were reported in southern Ontario but moderate defoliation occurred on roadside shrubbery in three townships in the Parry Sound District. Populations collapsed in the Sudbury District.

High populations of birch leafroller (*Caloptilia* sp.) occurred in white birch stands between the town of Ignace and the English River in the Dryden District. Lower numbers were encountered sporadically in other areas of the Dryden and Sioux Lookout Districts.

Spruce bud moths (*Zeiraphera* spp.) caused 30% damage to the new shoots of white spruce near Serpent River in the Sault Ste. Marie District. Populations declined to low levels in the Sudbury and North Bay districts.

A midge (*Cecidomyia candidipes* Foote) caused wounds 10 to 35 cm

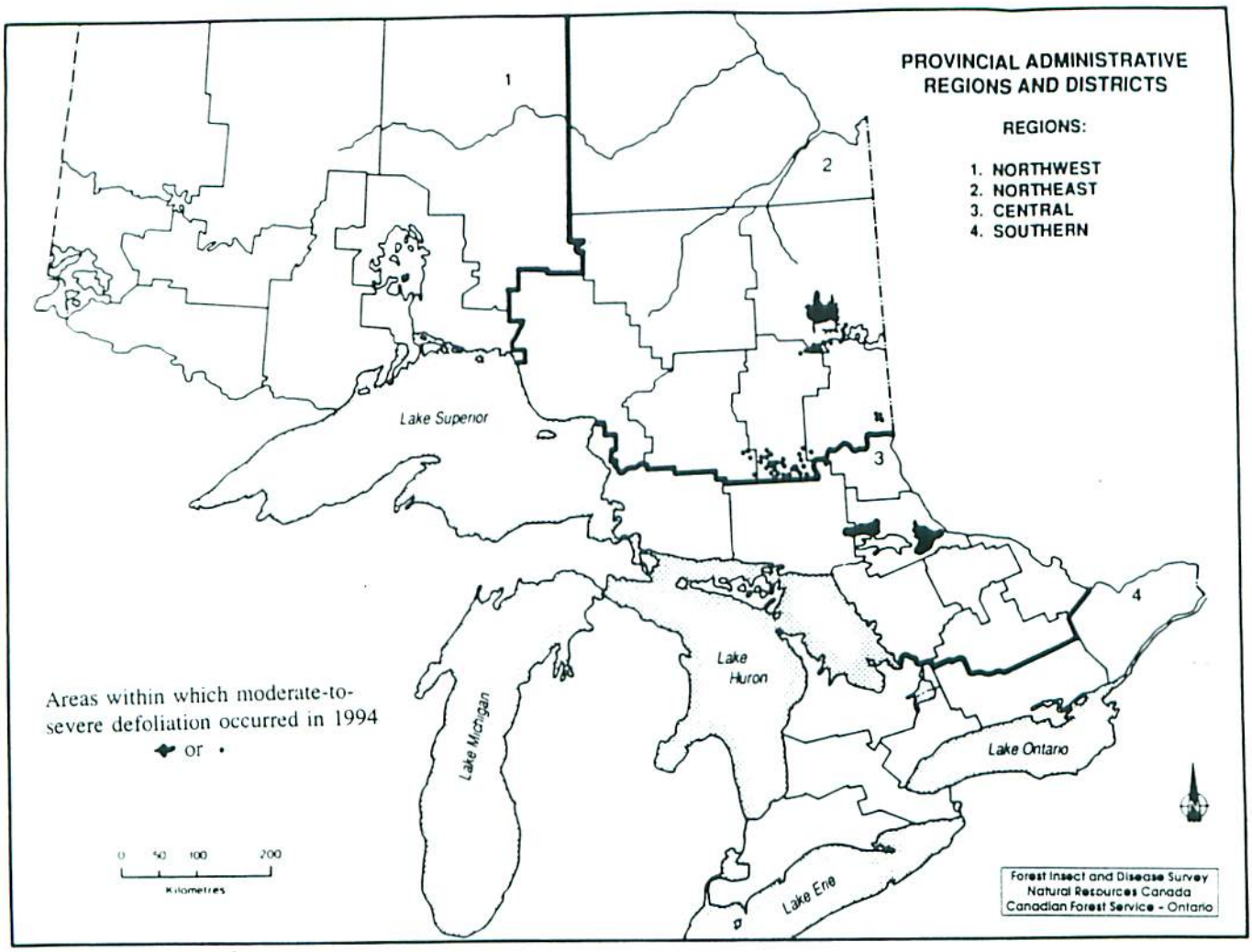

Figure 6. Early aspen leafcurler, Pseudexentera oregonana *(Wlsm.).*

long on white pine stems in a 2-ha plantation in Osgoode Township, Kemptville District.

The eastern larch beetle (*Dendroctonus simplex* LeC.) caused pockets of tree mortality in tamarack stands in the Larose Forest, Clarence Township, Kemptville District and near Harrowsmith in Portland Township, Tweed District.

Feeding by adult pales weevil (*Hylobius pales* [Hbst.]) caused 20% branch mortality on 80% of the trees in a 3.4-m Scots pine Christmas tree plantation in Sidney Township, Tweed District.

A bark beetle (*Pityophthorus* sp.) caused light branch mortality on 3.0-m and 4.5-m jack pine in two separate plantings in the Swastika Tree Nursery.

The European snout weevil (*Phyllobius oblongus* [L.]) caused defoliation as high as 25% on sugar maple regeneration in Dennis, Jocelyn, and Gladstone townships, Sault Ste. Marie District.

The strawberry root weevil (*Otiorhynchus ovatus* L.) damaged 25% of the 3–0 white spruce and 10% of the 2–0 white spruce in two compartments at the St. Williams Tree Nursery.

TREE DISEASES

Scleroderris Canker Disease, *Gremmeniella abietina* [Lagerb.] M. Morelet

A total of 39 collections have been identified as the European race of this disease thus far in the 1994 field season. Most of these were in McMurrich, Ryerson, Stisted, Macaulay, Chaffey, Perry, Strong, and Ryde townships, Parry Sound District. In addition, two collections in Mayo Township, Bancroft District, contained the European race. All were identified within areas where it had been previously found and do not represent any significant spread of the disease. However, a single collection from Minden Township, Bancroft District, represents a new location. The disease appears to have intensified somewhat within previously infected areas, particularly in McMurrich Township where more and larger trees were infected.

The North American race of the disease was also encountered at a number of the above locations as well as in several areas in northern Ontario. The

heaviest infection was in Van Koughnet Township, Sault Ste. Marie District, where 62% of the 2.3-m red pine were infected. A 10-ha plantation of 2.5-m red pine in Olrig Township, North Bay District, had 20% of the trees infected. Collections of the North American race were also received from Skead and Burt townships, Kirkland Lake District; Ivanhoe Township, Chapleau District; and Haughton Township, Sault Ste. Marie District.

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

There were widespread reports of this foliage disease in jack pine stands in northern Ontario as well as in the Algonquin Park District in southern Ontario. The most severe damage this year occurred in a 30-ha area of 4-m jack pine near Goodie Lake, Sioux Lookout District, where 90% of the trees were infected and foliar damage ranged from 70 to 90%. In the Kathlyn Lake area of the Sioux Lookout District, 80% of the 3.5-m trees were infected and foliar damage was as high as 90%. In Villeneuve Township, Sault Ste. Marie District, 8% of the trees in a 12-ha, 4.0-m jack pine stand sustained an average of 40% foliar damage. In the Algonquin Park District, a 10-ha, 7-m jack pine stand south of Lake Traverse had 100% of the trees infected with an average of 40% foliar damage. However, individual trees sustained foliar damage as high as 75%. Reports of the disease were also received from the Wawa, Chapleau, Timmins, Thunder Bay, Fort Frances, Sudbury, North Bay, Dryden, Temagami, and Kirkland Lake districts but, although infection levels were sometimes high, foliar damage was usually less than 20%.

Diplodia Tip Blight, Sphaeropsis sapinea [Fr.] Dyko & B. Sutton

This year, the most severe damage resulting from diplodia tip blight was reported in the Aylmer and Cambridge districts of the Southern Region. In Brantford Township, Cambridge District, a 5-ha plantation of 16-m Scots pine had 100% of the trees infected, with 75% foliar damage and 30% whole-tree mortality. The disease was particularly noticeable on ornamental Austrian pine along Highway 401 in both districts. Damage was exacerbated by stress from road salt. In the St. Williams crown forest, 50 fringe Austrian pine sustained 5–10% branch mortality, and in Beverly Township, Cambridge District, 50% of the open-grown Scots pine were infected and showed 20% branch mortality.

In the Fort Frances District, infections on Reef Point and Windy Point on Rainy Lake declined although 3% of the red pine host remained infected. Damage ranged from 20 to 90%. The disease also caused low levels of branch mortality on understory red pine near Sandbar Lake, Dryden District.

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

This organism infected young white pine stands in numerous, widely separated locations in the province. The more severely infected stands were as follows: 16.7% severely damaged trees in a 2.5-ha, 3.3-m plantation in Fitzroy Township, Kemptville District; 24% severely damaged trees in a 2.1-m, 1.5-ha stand in Olrig Township, North Bay District; 30% severely infected and 19.3% dead trees in a 3-ha, 0.5-m stand in Askin Township, Temagami District; 10.7% severely damaged and 1.3% dead trees in a 2-m, 5-ha plantation in Mayo Township, Bancroft District; and 12% severely damaged and 2% dead trees in an 8-ha, 2.1-m plantation in Monteagle Township, Pembroke District.

Butternut Canker, *Sirococcus clavigignenti-juglandacearum* V.M.G. Nair, Kostichka & Kuntz

A total of five new infection centres of this organism were found in the Cambridge and Aylmer districts. The most severe damage occurred in Arthur Township, Cambridge District, where 80% of the trees examined had cankers. A new infection centre was also found at the Orono Forest Station in Clarke Township, Maple District, where several trees sustained 60% crown dieback. In the Kemptville District, infection centres were found in Clarence, Ramsay, and North Crosby townships where branch dieback ranged from 20 to 80% on trees 12.8 to 16 m in height.

Western Gall Rust, *Endocronartium harknessii* [J.P. Moore] Y. Hiratsuka

There were numerous reports of western gall rust in young jack pine stands in northern Ontario. This disease causes conspicuous galls on branches and stems of young trees. Infected trees are considered severely damaged if the main stem and/or 25% of the branches are galled. The most severe infection this year occurred in the Vermilion River seed orchard in the Sioux Lookout District. Here 15% of the 0.8-m trees were severely damaged. In Maness township, Wawa District, 6% of the 2.3-m jack pine in a 12-ha stand were severely damaged and at a family test site in Olinyk Township, Sudbury District, 4% of the stems were severely damaged. Infection levels in a 10-ha, 2.5-m stand at Stanzhikimi Lake, Sioux Lookout District, stood at 35% with 8% severely damaged.

In southern Ontario, western gall rust severely damaged 4.5-m Scots pine and mugho pine in a small area in Summerville Township, Bancroft District. Light damage occurred on Scots pine in Puslinch Township, Cambridge District; Charlotteville Township, Aylmer District; and Tiny and Sunnidale townships, Midhurst District.

Pine Needle Rust, *Coleosporium asterum* [Dietel] Sydow

This rust was widespread in young jack pine stands and occasionally in red pine stands in 1994. While infection levels were often quite high, sometimes 100%, actual foliar damage was usually very light. The heaviest infection this year was in a 100-ha stand of 3-m jack pine in Ames Township, Thunder Bay District, where 100% of

the trees were attacked and foliar damage averaged 23%. In Askin Township, Temagami District, 100% of the 1-m jack pine were infected with an average of 20% foliage damage in a 1-ha stand. However, some individual trees in this stand sustained 90% foliar damage. A 5-ha stand in Rowell Township, Dryden District, also had 100% of the 3-m trees infected. Foliar damage averaged 15%, but a few trees sustained damage as high as 40%. A small plantation of red pine in North Sherbrooke Township, Kemptville District, had 83% of the trees infected with an average of 52% foliar damage. A closely related pine needle rust (*Coleosporium viburni* Arthur) caused 20% foliar damage on 5% of the 2.8-m red pine in a small plantation in Huntingdon Township, Tweed District.

Armillaria Root Rot, *Armillaria ostoyae* (Romagn.) Herink

Armillaria root rot occurs on both coniferous and deciduous hosts in Ontario. It is often present in young coniferous plantations and natural stands and, although annual mortality is usually quite low, the cumulative losses over a period of years can be quite serious. In 1994 there were reports of the disease in young coniferous stands in the Midhurst, Parry Sound, Bancroft, Timmins, Kirkland Lake, Temagami, Dryden, and Sioux Lookout districts. With one exception, infection levels were all less than 2%. A single, 1.9-m, 5-ha jack pine plantation in Breithaupt Township, Dryden District, had 3% of the trees infected.

The organism was also associated with dead and dying red oak trees at several locations in the Aylmer and Cambridge districts and at one location in Tiny Township, Midhurst District.

Dutch Elm Disease, *Ophiostoma ulmi* [Buisman] Nannf.

This disease continues to plague young white elm and remnant older trees in Ontario. In 1994, the incidence of the disease was down slightly in the Aylmer and Cambridge districts although infected young elm were common along roadsides and field fencelines. Increased infection was reported in the Sudbury District where 4% of the trees were infected along the Veuve River between Hagar and Markstay. In the town of Fort Frances, Fort Frances District, 16% of the mature and overmature white elm were infected.

Rodent Damage

Squirrels

High numbers of red squirrels caused conspicuous and widespread damage to jack pine, and to a lesser extent red pine, at numerous locations in the Northwest Region. Damage is caused when the animals remove cones for their winter food supply. Often they tear the branch tissue and kill all or part of it. The dead branches or "flags" show up conspicuously on the trees. The most severe damage occurred in the Pace Lake and Detour Lake areas of the Thunder Bay District, where 6- to 9-m jack pine had 60% branch mortality. The same level of branch mortality occurred on individual trees in a few areas of the Kenora, Red Lake, and Fort Frances districts. Less severe, but widespread, damage was apparent in the Dryden, Sioux Lookout, Nipigon, and Wawa districts.

Mice

Winter feeding by mice, whereby tree bark under the snow is chewed off, often damages and sometimes girdles and kills young trees. Damage by these rodents was unusually prevalent this year. Severe stem damage was observed on 21% of the 0.8-m white pine in Curtis Township, Sault Ste. Marie District and on 25% of the 0.3-m jack pine in Carney Township, Wawa District. In Woodhouse Township, Aylmer District, mice, along with rabbits, severely damaged or killed 85% of the 1.8-m Scots pine in a 0.5-ha plantation. A similar situation occurred in West Garafraxa Township, Cambridge District, where 1-m white pine in a 2-ha plantation sustained 45% severe damage. Lower levels of damage were reported on a variety of hosts, but particularly on eastern cedar and white pine, in the Cambridge, Aylmer, and North Bay districts.

Porcupines

Porcupine feeding girdled 9% of the 4.5-m jack pine archive trees at the Swastika Forest Tree Nursery.

ABIOTIC DAMAGE

Winter Damage

Unusually prolonged cold temperatures during the winter of 1993–1994 damaged many hardwood trees in the Sault Ste. Marie, Sudbury, and North Bay districts. This became apparent in the spring when trees did not leaf out or only partially leafed out. In some cases the young, more succulent growth of 1993 was killed. This resulted in shortened branches and adventitious growth. In other cases, tufts of foliage survived in the tree crowns or trees had enough energy to accomplish bud flush but the foliage soon drooped and dieback occurred. Ornamentals in urban areas or in rural situations were most seriously damaged. Tree species such as apple, cherry, lombardy poplar, black locust, butternut, and willow were all heavily damaged. Red oak, English oak, and walnut were also seriously damaged in urban situations. Red oak growing on rocky, exposed areas near Sudbury was affected by winter damage, but in most cases dieback was less serious, usually in the 10 to 20% range.

Frost

Freezing temperatures on May 13, 14, and 27 caused widespread damage to the foliage of a number of hardwood species in southern Ontario. In the Aylmer and Cambridge districts the frost usually killed a portion of the leaf but was not severe enough to cause leaf drop. The most severe damage occurred in the Niagara Peninsula area of the Cambridge District, and in the area between Brantford Township and the north shore of Lake Erie in the

Cambridge and Aylmer districts. In these areas 40 to 60% of the sugar maple foliage was affected. At one location in Turnberry Township, 50% of the trees in a 1-ha white spruce plantation had 85% of the new shoots killed.

Frost damage was somewhat more severe in the Midhurst, Maple, and Tweed districts. Here, the foliage of white spruce, white oak, sugar maple, and white ash was affected; damage varyed from partial discoloration to complete leaf drop. The damage was located in a large area between the Walkerton–Markdale area of the Owen Sound District and the west end of Rice Lake in the Tweed District. Observations in white spruce plantations at several locations in the Midhurst District showed incidence levels of 10 to 100% with new shoot damage of 75 to 95%. In the western Tweed District, damage was sporadic on open-grown sugar maple but more prevalent east of Ottawa in the Kemptville District where silver maple, Manitoba maple, and white ash were also affected. Foliar damage in some stands was as high as 65%.

Frost damage was recorded on a variety of coniferous and deciduous species in the Bancroft and Parry Sound districts, but the heaviest damage occurred on young balsam fir. In a number of areas these sustained 90–100% destruction of new shoots.

Frost damage was also widespread in northern Ontario but, generally, damage levels were low. At the Swastika Tree Nursery, 30% of the black spruce seedlings in one compartment were damaged. White spruce was affected in Curtis Township, Sault Ste. Marie District, where 30% shoot damage was recorded on 100% of the 2-m generation at one location. At the Thessalon Tree Nursery, 50% of the 2-m trees in a white spruce breeding orchard sustained an average of 20% shoot damage.

Winter Drying

Winter drying is caused by the evaporation of moisture from the foliage of conifers during unusually warm days in late winter and early spring. Frozen stems and root systems cannot replace the lost moisture and, consequently, the needles die and turn bright red in the spring. In extreme cases, buds are killed and branch or whole-tree mortality may occur. In 1994, winter drying was very widespread in northern Ontario and in the Bancroft and Parry Sound districts of southern Ontario. Red pine and eastern white pine were the species most often affected but there were also reports of damage to Scots pine, pitch pine, juniper, eastern white cedar, white spruce, jack pine, and Douglas-fir. While incidence and foliar damage were often in the 80 to 100% range, actual reports of branch and tree mortality were rare. One such case occurred in the city of Thunder Bay where ornamental eastern white cedar and juniper were killed and extensive branch mortality was evident on ornamental Douglas-fir.

Flood Damage

High water levels combined with beaver activity has resulted in increased flood damage to trees growing along streams between rock outcroppings. This condition was particularly noticeable during aerial surveys over the Haliburton Highlands area of the Bancroft District and in adjacent areas of the Parry Sound District.

Wind Damage

A severe thunderstorm on July 17 caused breakage and uprooting of a variety of tree species in Ingram and Evanturel townships, Kirkland Lake District. Most of the damage occurred as breakage to small groups of trees where stocking was not dense or to fringe trees along stand edges or openings. Trembling aspen, jack pine, black spruce, balsam fir, and balsam poplar were affected.

Single Tree Mortality of Balsam Fir

Single tree balsam fir mortality was conspicuous during aerial surveys in the Hearst and northern Cochrane districts. The most noticeable damage occurred along the northern rivers, particularly the Missinaibi and Mattagami, and the northern part of the Abitibi and Moose rivers and their tributaries. Notable damage was observed along the Ontario Northland Railway between Renison and Moose River Crossing and in the vicinity of Abitibi Canyon.

Other Noteworthy Diseases and Abiotic Conditions

Sweetfern blister rust (*Cronartium comptoniae* Arthur) caused 0.7% mortality of 1-m jack pine in a 3-ha area in Arnold Township, Kirkland Lake District. It also infected 15% of the 8-m jack pine in a 4-ha stand in Moncrieff Township, Sudbury District.

A 5-ha hybrid poplar plantation in Wainfleet Township, Cambridge District, sustained 100% infection and 20% mortality by Septoria canker (*Septoria musiva* Peck). A 2-ha stand in South Cayuga Township, Cambridge District, had 92% of the trees infected and 10% mortality.

A needle blight (*Rhizosphaera kalkhoffii* Bubák) caused 75% loss of old foliage in 1.3-m Douglas-fir Christmas trees in Manvers Township, Tweed District and on 3.7-m white fir in Essa Township, Midhurst District. It also infected 17% of the 7-m black spruce at the Barbara Lake seed production area in Geraldton District and caused 33% foliar damage.

Shoot blight of aspen (*Venturia macularis* [Fr.] E. Müller & v. Arx) was reported at generally low levels in the Sault Ste. Marie, North Bay, Midhurst, Bancroft, Hearst, Cochrane, and Thunder Bay districts. Shoot damage ranged from 2 to 25%.

Red band needle disease (*Mycosphaerella pini* Rostrup) severely damaged 3,000 Austrian pine in Goulbourn Township, Kemptville District and caused 50 to 85% foliar damage on the 3-m trees. In Osgoode Township, Kemptville District 50% foliar damage was recorded on 80% of the 7-m Austrian pine in a 1-ha plantation.

Heavy infections of a needle cast (*Lophodermium* sp.) were aerially detected in a number of red pine plantations in the Kemptville District.

Infection levels ranged from 65 to 100% with accompanying foliar damage between 40 and 80%.

Varying levels of infection by ink spot of aspen (*Ciborinia whetzelii* [Seaver] Seaver) were reported in a few trembling aspen stands in the Kemptville and Hearst districts. Foliar damage varyed from 25 to 75%.

Fomes root rot (*Heterobasidion annosum* [Fr.:Fr.] Bref.) caused pockets of mortality in 22-m red pine stands in Larose Forest, Clarence Township, Kemptville District.

A shoot blight (*Sirococcus conigenus* [DC.] P. Cannon & Minter) caused severe branch damage on understory red pine at the entrance to Blue Lake Provincial Park, Dryden District.

Spruce cone rust (*Chrysomyxa pirolata* [Körn] Winter) infected 26% of the white spruce cones at one location in Sewell Township, Timmins District.

Heavy infections of fireweed rust (*Pucciniastrum epilobii* Otth.) occurred on the new foliage of balsam fir in the southern half of the Hearst District.

Spruce broom rust (*Chrysomyxa arctostaphyli* Dietel) was common on scattered black spruce along Highway 599, northeast of Ignace, Ignace District.

Heavy snow caused light branch breakage in a jack pine seed orchard in Chamberlain Township, Kirkland Lake District.

Salt damage was heavy on white pine along Highway 11 in the Martin River area of the North Bay District and along Highway 69 between Highway 637 and the French River in the Sudbury District.

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