

**RESULTS OF FOREST INSECT
AND DISEASE SURVEYS IN THE
SOUTHERN REGION OF ONTARIO
1995**

*Forest Districts: Aylmer, Cambridge,
Midhurst, Maple, Tweed, and Kemptville*

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SURVEY HIGHLIGHTS

This report describes the most significant biotic and abiotic conditions detected and evaluated in 1995 by the Forest Insect and Disease Survey (FIDS) Unit of the Canadian Forest Service in the Ontario Ministry of Natural Resources (OMNR) Southern Region of Ontario.

Population levels of the gypsy moth remained extremely low throughout the region in 1995. The only significant damage, 208 ha, was aerially mapped west of the town of Kingsville in the Aylmer District. Trace to light defoliation was recorded in the Pinery Provincial Park, which was sprayed in 1994 with Disparvirus. Population and defoliation levels of the eastern spruce budworm continue to increase in the central and eastern portions of the region. In 1995 approximately 6 560 ha of moderate to severe defoliation were aerially mapped. This compared to approximately 690 ha recorded in 1994. The majority of the expansion took place in the northern portion of the Kemptville District. For the third consecutive year, the area of moderate to severe defoliation caused by the hemlock looper increased and spread in the Kemptville and Tweed districts. In 1995, 585 ha were aerially sketch mapped; in 1994, 178 ha were recorded. Whole-tree mortality was mapped across 383 ha in these two districts; however the majority, 307 ha, occurred in the Kemptville District.

There was an overall increase in population and distribution levels of the pine false webworm in the region in 1995. One exception, however, was in the eastern portion of the Midhurst District. Here a noticeable decline took place after 2 years of very high populations. High webworm population levels were recorded in the western portion of the Midhurst District. Populations in the Tweed District remained unchanged, where 89 ha were aerially sketch mapped in Hope Township.

Approximately 1 338 ha of forest tent caterpillar defoliation was aerially sketch mapped in the eastern portion of the Kemptville District. A marked increase in the population levels of satin moth was also recorded across the region.

A control operation was conducted on the redheaded pine sawfly infestation reported in 1994 on the First Nations Lands at Christian Island in the Midhurst District. A total of 43 ha of juvenile red pine was aerially sprayed using the biological insecticide Lecontvirus. All indicators show that the spray operation was extremely successful.

Population levels of the cedar leafminer continued to increase across the central and northwestern parts of the region. However, a marked decrease occurred in the east.

The oak leaf shredder caused moderate to severe defoliation in the northeastern portion of the Midhurst District. This is the first time since 1987 that this very destructive pest has been recorded in the district.

Severe defoliation caused by the larch casebearer was commonly detected at scattered locations throughout the region.

A total of 3 031 ha of moderate to severe jack pine sawfly damage was aerially sketch mapped in the Tweed and Kemptville districts.

For the second consecutive year a marked decline in the incidence of, and damage level caused by, diplodia tip blight was recorded in the central portion of the region. Surveys conducted in pine plantings for Scleroderris canker yielded negative results. However, poplar leaf diseases and dutch elm disease were commonly encountered.

The unusually dry summer was responsible for some 26 119 ha of aerially detectable drought in areas of shallow soil and rocky sites across the Kemptville, Tweed, and Midhurst districts.

Late spring frost affected black ash and white ash in the Owen Sound, Midhurst, Kemptville, and Tweed districts. Violent thunderstorms accompanied by high winds severely damaged or uprooted trees in the town of Goderich; from Christian Island eastward to Orillia; and in many smaller, widely scattered pockets in the Tweed and Kemptville districts.

Annual evaluation of the fifty-five 25-tree sugar maple health plots revealed that the majority of trees were healthy; only 12.6 percent had sustained >20 percent dieback. Similar results were recorded in the 16 sugar maple plots in the North American Maple Project (NAMP). Annual assessment of the 751 trees in this project revealed that 99 percent were healthy. Less than 25 percent showed average crown dieback. For the third consecutive year an overall improvement in crown vigor was recorded throughout the ten permanent 100-tree oak plots in the region. Evaluation in 1995 revealed that 90.1 percent of the trees were healthy, with <20 percent average crown dieback. No evidence of acid rain damage was detected in the annual assessment of the eight Acid Rain National Early Warning System (ARNEWS) plots that target four specific tree species in the region. The 5-year major assessment period occurred in 1995 and extra measurements and sampling were conducted. Every conceivable aspect of tree growth and vigor was assessed, including the collection of three soil horizons, wood, bark, and foliage for analysis. The results of routine surveys conducted in the three OMNR forest tree nurseries in the region are also presented.

Insects and diseases described in this report are categorized on the basis of their importance:

Major Insects/Diseases

capable of causing serious injury to, or death of, living trees or shrubs.

Minor Insects/Diseases

capable of causing sporadic or localized injury but not usually a serious threat to living trees or shrubs.

Other Forest Insects/Diseases (Tables)

These tables provide information on two types of pest:

- (1) those that are of minor importance and have not been known to cause serious damage to forest trees, and
- (2) those that are capable of causing serious damage but, because of low population levels or for other reasons, did not cause serious damage in 1995.

The authors would like to express their appreciation to personnel of the various OMNR district and area offices and tree nurseries, and to various private individuals for their excellent cooperation during the 1995 field season. They also wish to apologize for any inconvenience during the 1995 field caused by Simon Melbourne's unexpected and lengthy illness.

*R.J. Sajan
B.E. Smith*

FRONTISPIECE



Severe drought conditions caused early browning and premature foliage drop in all tree species growing on shallow rocky sites.

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INSECTS

Major Insects

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

There was an overall increase in population and distribution levels of the pine false webworm in the region in 1995. Except for the eastern portion of the Midhurst District, where damage levels have been very high for the last 2 years, there was a noticeable decline. Whole-tree mortality, induced by the severe defoliation caused by this webworm, was recorded in two semimature red pine (*Pinus resinosa* Ait.) plantations in the region (Fig. 1). This is the first such record of whole-tree mortality recorded in the region, or in Ontario, in semimature trees.

Population increases were recorded in pine plantations in Holland, Sullivan, and Brant townships in the western portion of the Midhurst District. In the southern end of Holland Township virtually every pine area, natural or planted, was heavily infested. In evaluated areas defoliation levels averaged 85 percent. In adjacent Sullivan Township the majority of the damage was centered in the area of the

provincial fish culture station at Chatsworth. Here, defoliation levels ranged from 10 to 90 percent. Low webworm population levels were detected on fringe trees in two semimature eastern white pine (*P. strobus* L.) plantations in Brant Township. Average defoliation levels on the 16- and 20-m-tall trees were 10 to 15 percent. Complete results of the areas surveyed are presented in Table 1.

In Hope Township in the Tweed District the total area infested remained unchanged from last year. Approximately 89 ha were aerially sketched mapped during 1995. This compared with 90 ha in 1994. However, the actual plantations infested did change. The population collapsed for unknown reasons along the north edge of the area recorded in 1994, and in 1995 spread southward into different plantations.

For the second consecutive year the heaviest damage in this pocket of infestation occurred in a 10-ha, 13-m-tall red pine plantation where a standard 150-tree evaluation revealed that 100 percent of the trees had lost an average of 85 percent of their old foliage and 40 percent of the current foliage. A current whole-tree mortality rate of 5.3 percent was also detected in this plantation.

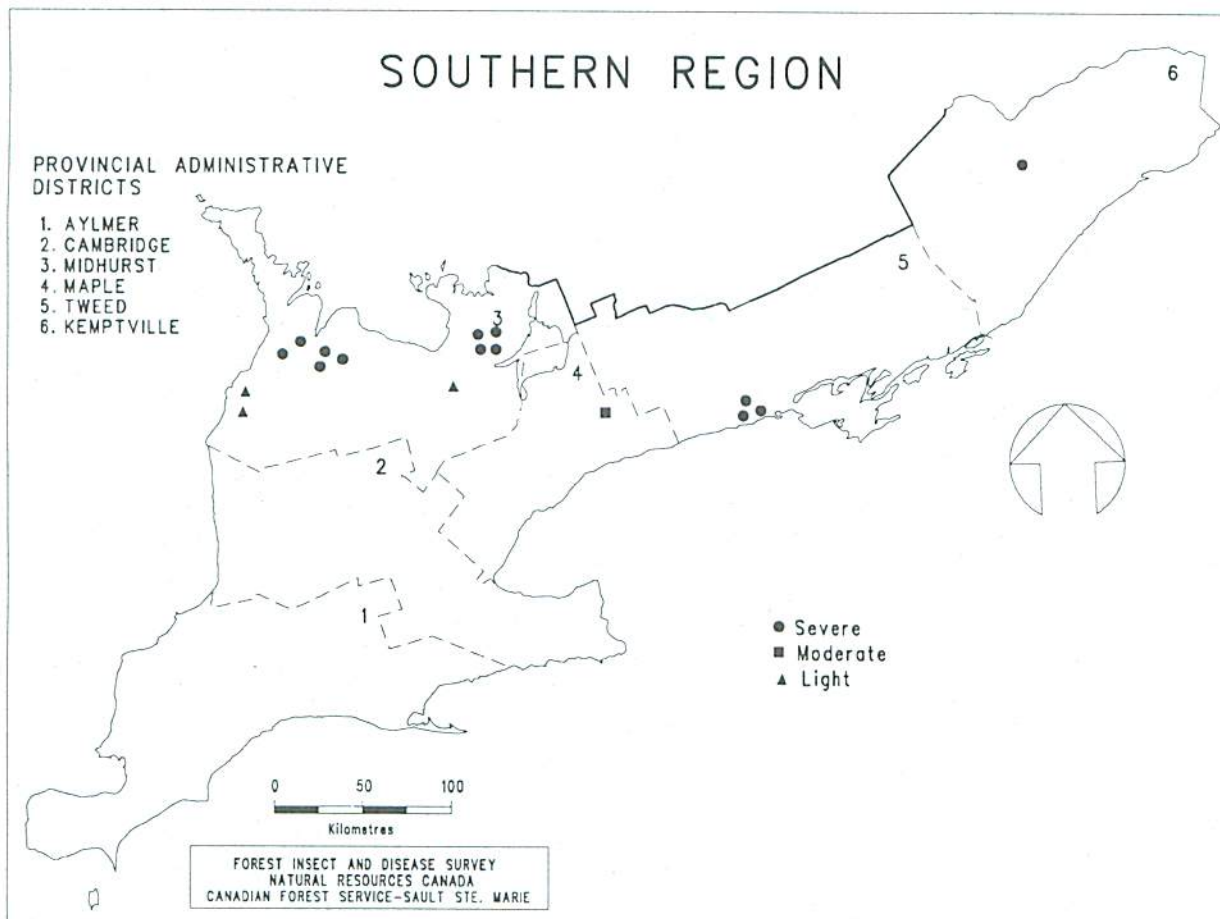


Figure 1. Areas where damage caused by the pine false webworm (*Acantholyda erythrocephala* [L.]) occurred in 1995.

Table 1. Summary of damaged caused by the pine false webworm in 18 pine plantations in the Southern Region of Ontario in 1995. (Counts are based on the examination of 150 randomly selected trees at each location.)

Location (Township)	Tree species ^a	Average height of trees (m)	Estimated number of trees per ha	Total area affected (ha)	Trees infested (%)	Average defoliation		Current mortality (%)
						Old (%)	Current (%)	
<i>Kemptville District</i>								
Oxford-on-Rideau	scP	1.0	2 100	8.0	100	70	0	0.0
<i>Midhurst District</i>								
Brant	ewP	16.0	600	80.0	5	15	0	0.0
Brant	ewp	20.0	2 000	10.0	5	10	0	0.0
Holland	ewp	5.0	1 100	35.0	100	90	0	0.0
Holland	scp	5.0	1 100	35.0	100	90	0	0.0
Holland	scp	1.7	2 400	1.5	30	80	5	0.0
Oro	rP	19.0	1 800	4.0	100	68	36	10.7
Oro	rp	16.0	1 750	2.0	100	21	1	0.0
Oro - SPA ^b	rp	15.0	800	2.5	100	63	10	0.0
Oro	rp	5.0	2 400	5.0	100	37	15	0.0
Sullivan	ewp	3.5	1 900	3.0	100	90	5	0.0
Sullivan	rp	5.0	1 000	3.0	10	10	0	0.0
Sullivan	scp	2.0	1 500	4.0	100	75	0	0.0
Sullivan	ewp	12.0	500	15.0	75	45	0	0.0
<i>Tweed District</i>								
Cavan	rp	3.1	1 200	25.0	100	70	17	0.0
Cavan	ewp	3.2	800	25.0	100	100	15	0.0
Hope	rp	13.0	2 000	10.0	100	85	40	5.3
Hope	rp	15.0	2 200	20.0	100	30	0	0.0

^a ewP = eastern white pine, rP = red pine, scP = scots pine (*Pinus sylvestris* L.).

^b SPA = seed production area.

In Oro Township, Midhurst District, the total area of moderate to severe defoliation declined from 375 ha in 1994 to 89 ha in 1995. Part of the decline was the direct result of the clear-cutting of 25 ha by the Ontario Ministry of Natural Resources (OMNR) in an attempt to help control webworm populations in the area. The area was clear-cut late in the fall of 1994 and the tree tops were left scattered across the site. In the spring of 1995 the overwintering insects completed their pupation period and emerged from the soil as adults to mate and lay their eggs on pine foliage. At this time the foliage on the cut tops was still green and healthy. Thus, the emerging adults actively laid their eggs on these needles. As the spring progressed and the eggs hatched the tree tops eventually dried out and the larvae that had hatched on the foliage of these dead tops died. This method, incorporating a late fall cut and then leaving the tops scattered across the site, proved to be a very successful control approach for a localized population. Because the foliage on the tops was still green in the spring, the adults did not disperse into adjacent plantations in a search for suitable egg-laying sites.

The major decline in this area however was attributed to feeding by several large flocks of the common grackle (*Quiscalus quiscula*) on the immature larvae. The birds were observed tearing apart the tubular, silken, frass-filled nests and consuming the larvae. Over the course of a few days the birds had methodically worked their way across the majority of the infested area and consumed most of the larvae.

A 4-ha area was left uncut along the edge of the 25-ha clear-cut as a control site to determine the full impact of the severe defoliation of the webworm on semimature red pine. A standard 150-tree evaluation conducted in this 19-m-tall red pine stand revealed a current whole-tree mortality rate of 10.7 percent. Every dead tree encountered during the survey was also found to be heavily infected with *Armillaria* root rot (*Armillaria ostoyae* [Romagn.] Herink). This is a very heavy infection rate and a future source of inoculum that could spread to adjacent stands.

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

Moderate to severe defoliation, caused by the oak leaf shredder, was detected in the northeastern portion of the Midhurst District in 1995. This is the first time since 1987 that this particular pest has caused damage in the district (Fig. 2).

Two small pockets, 57 ha and 10 ha in size, of moderate to severe defoliation were detected in 13-m-tall red oak (*Quercus rubra* L.) stands growing along the Georgian Bay shoreline, west of the town of Lafontaine in Tiny Township. The area where the infestation occurred is commonly referred to as the Tiny Beaches and the pockets of infestation were spread across the cottage subdivisions at Lafontaine, Ishpiming, and Sand Castle Beach. The actual level of defoliation varied from 5 percent to 95 percent on the individual trees throughout the infested areas.

Arborvitae Leafminers, *Argyresthia thuella* (Pack.), *Coleotechnites thujaella* (Kft.)

For the second consecutive year population levels of arborvitae leafminers, and subsequent defoliation levels, varied considerably across the region. Frequently, individual eastern white cedar (*Thuja occidentalis* L.) trees or small clumps of trees were found with heavy defoliation levels (>75 percent), while adjacent trees had sustained only trace defoliation (5 percent).

In 1995, there was a marked decrease in damage levels in the eastern portion of the region. In the central and northwestern portions, population levels continue to increase. The highest incidence rate and defoliation levels (>75 percent) occurred in the northwest end of the Tweed District. This high level of damage occurred at numerous sites from the Balsam Lake area of Bexley Township southeastward along the Kawartha Lakes through Fenelon, Verulam, Ennismore, and Smith townships. Scattered pockets of damage, with defoliation levels varying from 5 to 75 percent, were detected in Reach, North Gwillimbury, and Caledon townships in the Maple District and in Tiny, Rama, Innisfil, Essa, Adjala, Sullivan, and Amabel townships in the Midhurst District.

Defoliation levels averaging 30 percent were detected at numerous locations along the St. Lawrence River extending from the city of Brockville to the city of Cornwall in the Kemptville District. Elsewhere throughout the Kemptville and eastern half of the Tweed District, 5 to 15 percent defoliation levels were commonly encountered wherever host trees occurred.

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

Populations of the large aspen tortrix virtually collapsed in 1995 in the last remaining infestations in the Kemptville



Figure 2. Severe defoliation of red oak (*Quercus rubra* L.) caused by the oak leaf shredder (*Acleris semipurpurana* [Kft.]).

and Maple districts. The only defoliation detected, averaging less than 50 percent, occurred in a 20-ha stand of trembling aspen (*Populus tremuloides* Michx.) south of Johnston Corners in Gloucester Township in the Kemptville District.

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

Provincial Situation

For the third consecutive year there was a marked decline in the area of moderate to severe defoliation caused by the eastern spruce budworm in the province. In 1995 a total of 3 451 098 ha was aerially sketch mapped. This compared with 4 266 656 ha in 1994. The majority of the decline occurred in the Fort Frances, Nipigon, Red Lake, and Thunder Bay districts. However, increases in infested areas were recorded in the Sioux Lookout, Dryden, Hearst, North Bay, and Sault Ste. Marie districts (Fig. 3).

The total area of eastern spruce budworm induced, whole-tree mortality continues to increase across the province. In 1995, a total of 7 910 424 ha of mortality was detected. This compared to 7 783 336 ha recorded in 1994. The largest increase, approximately 113 552 ha, occurred in the Northwest Region.

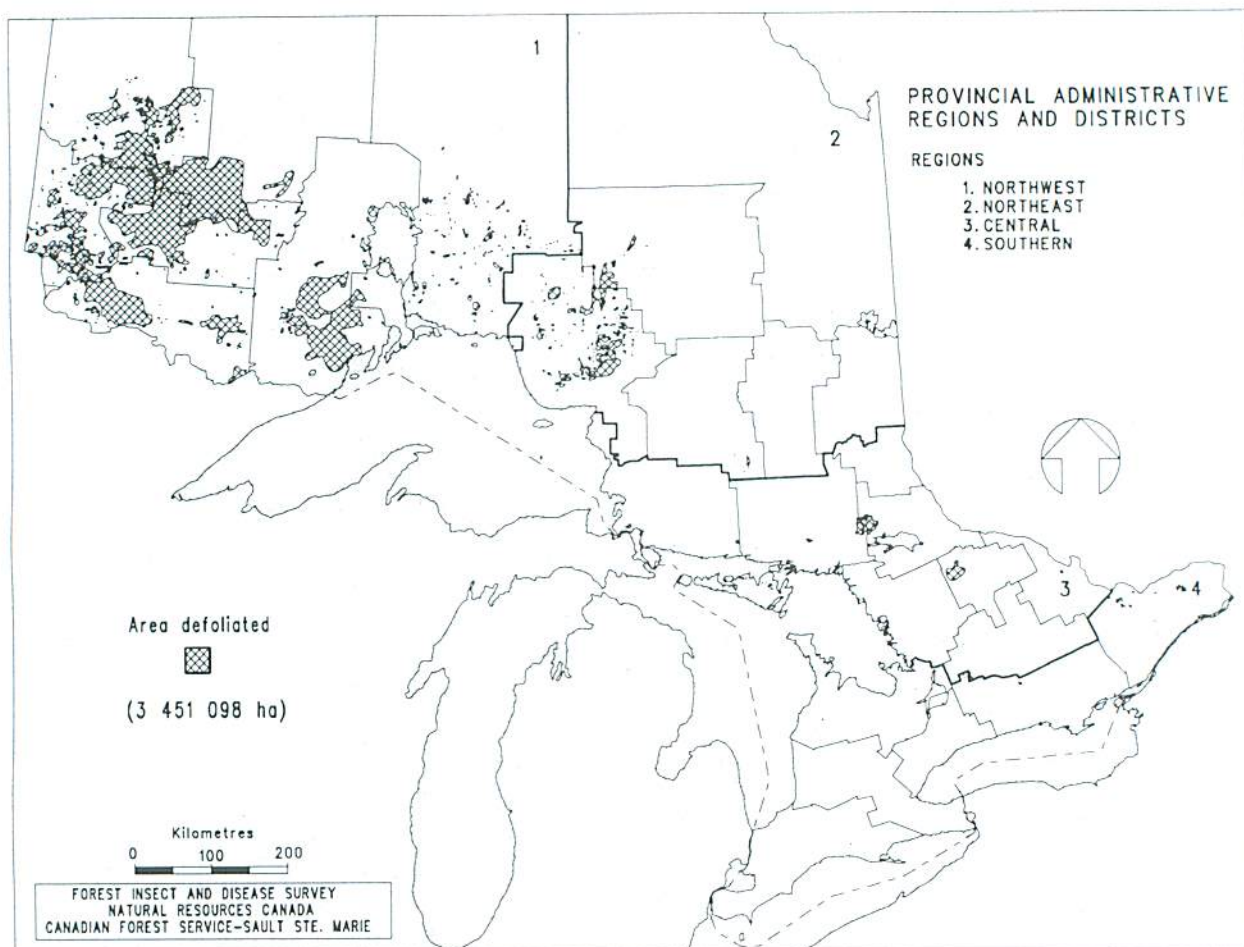


Figure 3. Areas of moderate to severe defoliation caused by the eastern spruce budworm (*Choristoneura fumiferana* [Clem.]) in 1995.

Southern Region

There was a significant increase in eastern spruce budworm population and damage levels across the Southern Region in 1995 (Fig. 4). The total area of moderate to severe defoliation, primarily in white spruce (*Picea glauca* [Moench] Voss) plantations, increased from 687 ha in 1994 to 6 557 ha in 1995 (Fig. 5).

The majority of the damage, 5 638 ha, occurred in the Kemptville District. This was a major increase from the 570 ha reported in this district last season. The defoliation was scattered mainly over two large areas. The first was located in the south end of Clarence Township and the adjacent north end of Cambridge Township, in the LaRose Forest. Moderate to severe defoliation was scattered across 18 white spruce plantations. The second area of defoliation was located north and east of the town of Almonte. Scattered areas of damage extended southeast from the northeast corner of Pakenham Township, through the east sides of Pakenham and Ramsay townships and the adjacent west sides of Fitzroy and Huntley townships. A single pocket of damage was also detected in the central portion of March Township. Severe defoliation was detected in a



Figure 4. Severe defoliation of balsam fir (*Abies balsamea* [L.] Mill.) caused by the eastern spruce budworm (*Choristoneura fumiferana* [Clem.]).

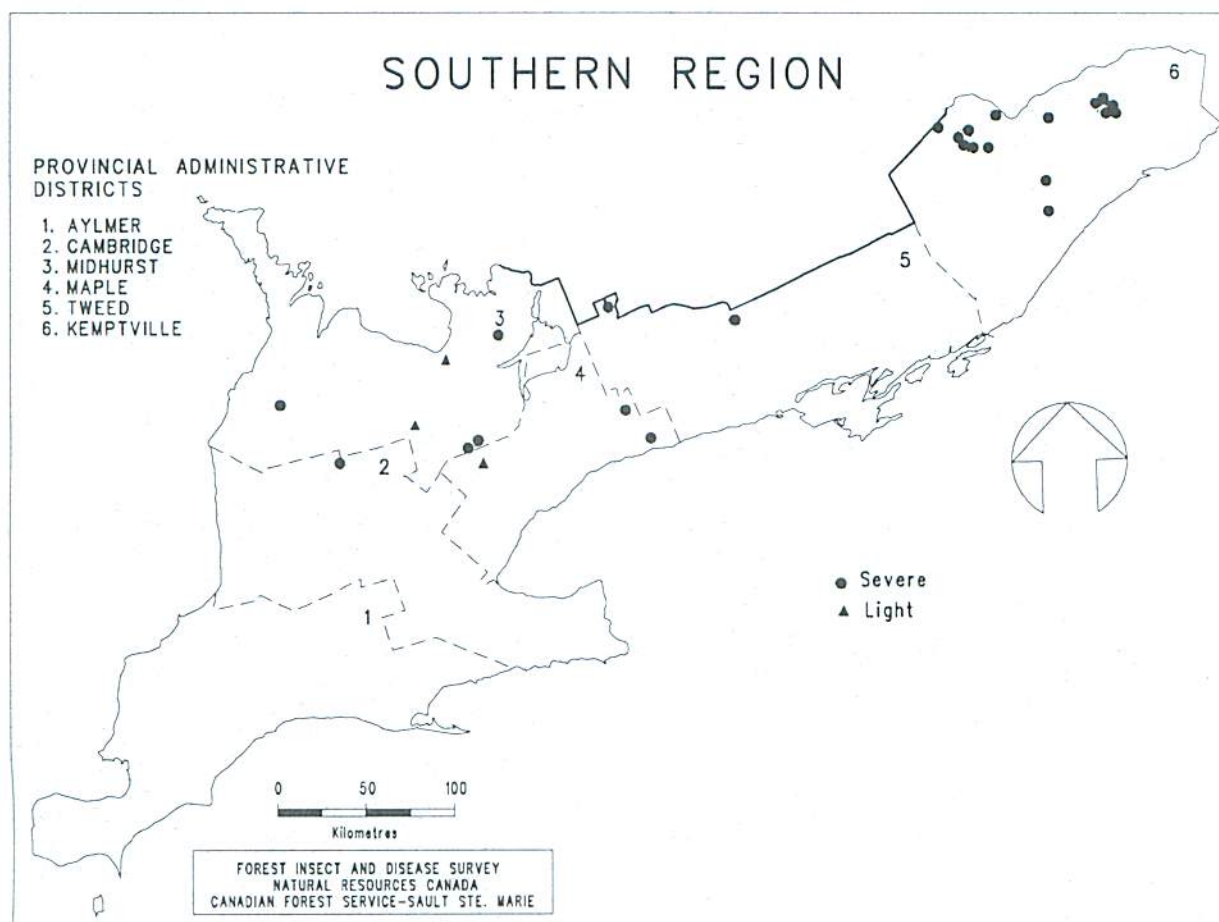


Figure 5. Areas where damage caused by the eastern spruce budworm (*Choristoneura fumiferana* [Clem.]) occurred in 1995.

75-ha, 14-m-tall white spruce plantation in the National Capital Commission green belt area in Gloucester Township and in two, 2-ha, 17-m-tall plantations at the OMNR G. Howard Ferguson Forest Tree Nursery in Oxford-on-Rideau Township. Fifteen ha of moderate to severe defoliation occurred in a 19-m-tall white spruce and Norway spruce (*Picea abies* [L.] Karst.) plantation in the Limerick County Forest in Oxford-on-Rideau and Edwardsburgh townships.

A total of 815 ha of damage was mapped in the Tweed District. The majority of this, 725 ha, occurred on mature white spruce growing in a swampy area west of Round Lake in Belmont Township, and extending westward into Dummer Township. Light defoliation that occurred for the past 3 years in a 40-ha, 9-m-tall white spruce plantation at Balsam Lake Provincial Park exploded this season into severe defoliation. Northwest of the park a pocket of moderate to severe defoliation, approximately 50 ha in size, was detected in a natural stand of mature white spruce.

There was virtually no change in the total area of moderate to severe defoliation (97 ha) in the Midhurst District. Spruce budworm induced whole-tree mortality

and top kill were detected throughout a 5-ha, 12-m-tall white spruce plantation in Oro Township that has been heavily infested now for at least 4 years. Top kill was also evident in the 7-ha white spruce plantations and a 5-ha white spruce seed production area in Adjala Township. Moderate to severe defoliation occurred for the third consecutive year in the 80-ha, 15-m-tall white spruce plantation in the County Forest in Brant Township.

In the Maple District, moderate to severe defoliation was reported in a 2-ha, 16-m-tall white spruce plantation in the Durham County Forest in Uxbridge Township. This plantation has been defoliated now for 5 consecutive years and the trees are in a severe state of decline; however, no whole-tree mortality has been observed. Similar damage levels were recorded in the 5-ha, 14-m-tall white spruce seed orchard at the OMNR Orono Forest Tree Nursery in Clarke Township.

In the Midhurst District, light defoliation levels (5 to 24 percent) were recorded throughout the white spruce plantings in the Dufferin County Forest in Amaranth Township and on white spruce in a mixed conifer plantation east of the provincial fish culture station in Sullivan Township. Similar levels of damage were detected in a

2-ha, 15-m-tall white spruce planting at the main north gate of Canadian Forces Base (CFB) Borden, in Essa Township. Light defoliation was also reported in a 15-ha, 17-m-tall white spruce plantation in Albion Township, Maple District.

A total of 12 areas was sampled in the region for the purpose of forecasting possible defoliation levels for 1996. Seven areas are forecasting severe defoliation, four are predicting moderate to severe defoliation, and one has a light to moderate forecast. A complete list of areas sampled, together with forecasts for 1996, is presented in Table 2.

In a heavily infested area in LaRose Forest in Clarence Township, Kemptville District, the OMNR clear-cut approximately 40 ha of semimature white spruce. In addition to severe defoliation caused by the eastern spruce budworm, the area also sustained severe drought conditions

throughout the summer of 1995. By late June the foliage had turned completely red and it was obvious that the trees were dying. Therefore, a salvage cut was conducted in the late fall and early winter before secondary insects and diseases could further reduce the quality of the timber.

Larch Casebearer, *Coleophora laricella* (Hbn.)

Severe defoliation caused by the larch casebearer was commonly detected at scattered locations throughout the region in 1995. In a 20-ha, 3.5-m-tall tamarack (*Larix laricina* [Du Roi] K. Koch) plantation in Haldimand Township, Tweed District, a standard 150-tree evaluation revealed that 100 percent of the trees were infested. Defoliation levels averaged 70 percent. In a 10-ha mixed conifer plantation in Sullivan Township in the Midhurst District, 75 percent of the 15-m-tall European larch (*Larix*

Table 2. Summary of eastern spruce budworm defoliation estimates and egg-mass counts from 12 locations in the Southern Region of Ontario in 1995 and infestation forecasts for 1996.

Location (Township)	Host ^a	Estimated defoliation in 1995 (%)	Number of egg masses per 9.29m ² of foliage	Infestation forecasts for 1996 ^b	Accumulated damage ^c
<i>Cambridge District</i>					
Minto	wS	52	100	M-S	2
<i>Kemptville District</i>					
Clarence (La Rose Forest)	wS	78	403	S	2
Gloucester	wS	78	689	S	2
Oxford-on-Rideau (Limerick)	wS	60	195	M-S	2
(OMNR Tree Nursery)	wS	28	45	L-M	2
<i>Maple District</i>					
Clarke (OMNR Tree Nursery)	wS	67	272	S	2
Uxbridge	wS	90	94	M-S	3
<i>Midhurst District</i>					
Adjala (Seed Production Area)	wS	92	715	S	4
Brant	wS	43	180	M-S	2
Oro	wS	94	224	S	5
<i>Tweed District</i>					
Bexley (Balsam Lake Provincial Park)					
- Main Road	wS	46	578	S	2
- Highway 48	wS	68	1 038	S	2

^a wS = white spruce.

^b S = severe, M = moderate, L = light, N = nil.

^c Accumulated damage: 0 = undamaged; 1 = light damage, <25 percent total defoliation, usually one season of severe defoliation; 2 = moderate damage, 25 to 60 percent total defoliation, two to three seasons of severe defoliation; 3 = severe damage, 60 to 80 percent total defoliation, three to five seasons of severe defoliation, will recover; 4 = moribund or dying, 80 to 100 percent total defoliation, crowns grey in appearance, 50–150 cm top dead or bare; 5 = <25 percent of stand dead; 6 = 25 to 50 percent of stand dead; 7 = 50 to 70 percent of stand dead; 8 = >70 percent of stand dead; 9 = <25 percent of stand dead, no significant (0–25 percent) defoliation for several years; + = 25 to 50 percent of stand dead, no significant defoliation for several years; - = 51 to 70 percent of stand dead, no significant defoliation for several years.

decidua Mill.) sustained 90 percent foliar damage. Similar defoliation levels were aerially detected throughout the Minesing swamp in Vespra Township.

In the Maple District, damage was detected in a 2.5-ha mixed eastern white pine and European larch plantation in Uxbridge Township. At this site 100 percent of the 12-m trees averaged 80 percent defoliation. In the north end of Caledon Township, numerous small, natural stands of tamarack, generally <3 ha in size, sustained 50–100 percent defoliation. At the OMNR Orono Forest Tree Nursery in Clarke Township, semimature European larch wind-break trees averaged 75 percent defoliation.

In the Kemptville District high casebearer populations caused 20 to 100 percent defoliation in pockets of scattered damage extending from the town of Arnprior south to the town of Carleton Place, and at numerous locations throughout the National Capital Commission green belt area around the city of Ottawa. Similar defoliation levels were commonly detected in the vicinity of the town of Kemptville in Oxford-on-Rideau Township and along the St. Lawrence River, wherever host trees occurred, extending from the city of Kingston eastward to the Cornwall area.

In a 3-ha mixed eastern white pine and European larch plantation in Townsend Township in the Aylmer District, 100 percent of the 20-m-tall larch sustained an average of 70 percent defoliation, and 100 percent of the 16-m-tall larch in a 0.5-ha mixed larch and eastern white cedar area in Erin Township, Cambridge District, averaged 50 percent defoliation.

Elsewhere throughout the central and eastern portions of the region trace to moderate defoliation levels were commonly encountered wherever host trees occurred.

Pitted Ambrosia Beetle, *Corthylus punctatissimus* (Zimm.)

The pitted ambrosia beetle caused mortality in sugar maple (*Acer saccharum* Marsh.) regeneration in several stands in the region in 1995. Adults of this beetle bore directly into the main stems of young regeneration near the ground line and excavate tunnels, which encircle the stem and result in girdling of the tree.

The highest mortality rate, estimated at 20 percent, occurred in a 20-ha stand of mature sugar maple in the southern end of Adjala Township in the Midhurst District. This area had been commercially thinned in the fall of 1994. This was a very high incidence rate, as the norm was more in the 2 to 5 percent range.

Mortality levels of 5 percent were recorded in a 15-ha semimature stand near Craighurst in Oro Township and in a 50-ha stand south of the town of Owen Sound in Derby Township in the Midhurst District. Similar damage levels were detected in a 10-ha semimature stand in the Athens

area of the Rear of Yonge and Escott Township in the Kemptville District.

A 1 percent mortality rate was detected in a 50-ha semimature sugar maple stand north of the town of Milton in Nassagaweya Township in the Maple District.

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

Defoliation caused by the hemlock looper was recorded for the third consecutive year in the eastern portion of the region in 1995. The total area infested increased in size from 178 ha in 1994 to 585 ha in 1995. The majority of the defoliation occurred at new locations; all but two of the areas that were infested in 1994 completely collapsed in 1995. Whole-tree mortality was recorded this season at all of the sites that were infested in 1994.

A new pocket of severe defoliation, 294 ha in size, was aerially sketch mapped in a mature eastern hemlock (*Tsuga canadensis* [L.] Carr.) stand north of Sharbot Lake in Olden Township, Tweed District. In addition, three smaller areas, totaling 136 ha in size, were detected east of Highway 38 along the Portland–Loughborough township border (Fig. 6).

In 1994 a total of 47 ha of severe defoliation was recorded in six scattered pockets of eastern hemlock in the Temperance Lake area of the Rear of Yonge and Escott, and Front of Yonge townships in the Kemptville District. In 1995, four of these areas collapsed and the remaining two sites increased in size to encompass 155 ha of new defoliation.

The severe defoliation that occurred in the mature eastern hemlock and eastern white cedar stand east of the town of Grafton in Haldimand Township, Tweed District, and in the two pockets of eastern white cedar in the south end of Clarke Township, Maple District, completely collapsed in 1995.

Whole-tree mortality was mapped across 383 ha in the region. The majority of this damage, 307 ha, occurred in the Kemptville District. Severe defoliation of eastern hemlock has been occurring here since 1993 (Fig. 6). West of Charleston Lake in Rear of Leeds and Lansdowne Township, four scattered pockets of damage, totaling 99 ha, were mapped. East of Charleston Lake in the Temperance Lake area, six pockets, totaling 76 ha, were detected. Three areas, totaling 70 ha, were mapped south of Highway 401 in the south end of Front of Leeds and Lansdowne Township, and 46 ha of mortality occurred along the south shore of an island in South Lake. The last pocket of damage in this district, 15 ha in size, was detected on the north side of Highway 401 in the southwest corner of Elizabethtown Township.

In the Tweed District whole-tree mortality, totaling 33 ha, was aerially mapped in two pockets of eastern hemlock north of Highway 401, on the Ernestown–Kingston

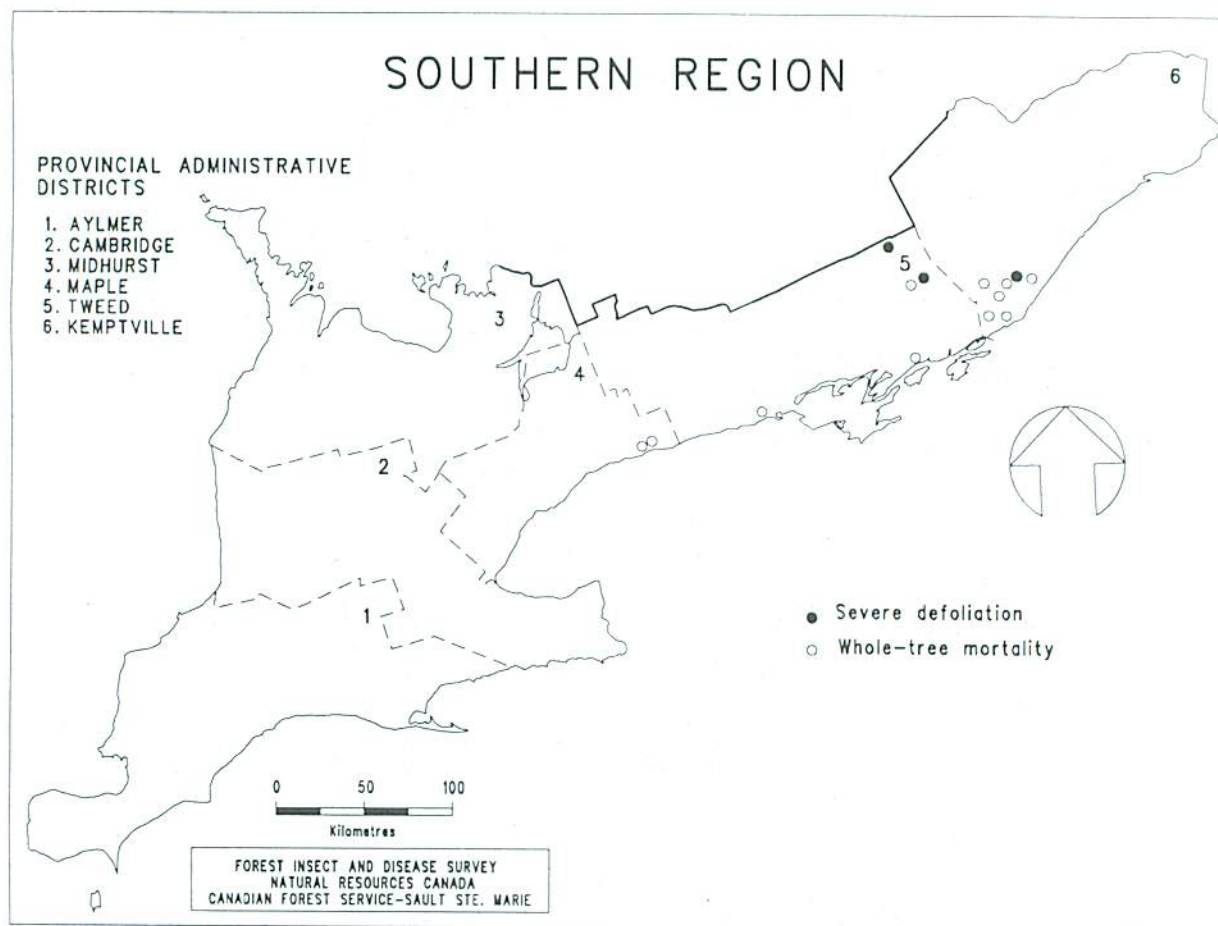


Figure 6. Areas where defoliation and whole-tree mortality caused by the hemlock looper (*Lambdina f. fiscellaria* [Gn.]) occurred in 1995.

township border. North of this site, along the Portland-Loughborough township border, three areas of mortality, totaling 35 ha, were mapped. West of these sites, south of Highway 401 and east of the town of Grafton in Haldimand Township, eastern hemlock mortality was scattered throughout the mixed 6-ha stand of eastern hemlock and eastern white cedar. Several 20-m-tall eastern hemlock trees were observed with only dead tops or branches within the living crown.

Along Highway 401, east of the town of Newcastle in the south end of Clarke Township, Maple District, whole-tree mortality occurred in two, 1-ha semimature eastern white cedar stands.

A standard 100-tree mortality plot established in 1994 in a severely defoliated mature eastern hemlock stand in Elizabethtown Township revealed a current whole-tree mortality rate of 42 percent. The infestation of hemlock looper in this stand collapsed and no defoliation occurred this season. However, the whole-tree mortality rate continued to increase to 56 percent by the fall of 1995.

Satin Moth, *Leucoma salicis* (L.)

There was a marked increase in the population of and defoliation levels caused by the satin moth across the central and eastern portions of the region in 1995. The heaviest and most numerous areas of damage occurred in the eastern half of the Midhurst and central part of the Maple districts.

In the Midhurst District complete defoliation was recorded on mature Carolina poplar (*Populus X canadensis* Moench) and European white poplar (*P. alba* L.) planted along Highways 400 and 27, extending from the city of Barrie southward to the city of Toronto. Defoliation levels ranging from 50 to 100 percent were also recorded on 20-m-tall ornamental and boulevard Carolina poplar throughout the residential areas of CFB Borden in Essa Township. This area has been aerially sprayed for the last 2 years to control this pest. Complete defoliation was detected on a planting of 60, 18-m-tall Carolina poplar southeast of the town of Creemore and on 30, 9-m-tall European white poplar growing along Highway 26 east of

the town of Stayner in Sunnidale Township. Similar defoliation levels were recorded on 18- to 20-m Carolina poplar at two locations in the southwest corner of Tosorontio Township.

In the Maple District severe defoliation extended along Highway 401, from the city of Toronto eastward through the city of Oshawa to the town of New Castle. At Durham College in the north end of the city of Oshawa, 35, 16-m-tall Carolina poplars sustained 100 percent defoliation. Elsewhere in the district severe defoliation was recorded on this host within the city of Richmond Hill and north of the city of Newmarket in East and North Gwillimbury townships.

In the Tweed District, severe defoliation continued along Highway 401 from the town of Port Hope eastward to the town of Napanee. Defoliation levels of 75 to 100 percent were also reported on small numbers of planted 18- to 20-m-tall trees from scattered locations in Ameliasburg, Brighton, Rawdon, Huntingdon, Hungerford, and Richmond townships. Similarly in the Kemptville District, 100 percent defoliation occurred on Carolina poplars growing in various locations in Augusta, Montague, Nepean, Gloucester, and Finch townships.

Gypsy Moth, *Lymantria dispar* (L.)

The overall population level of gypsy moth remained extremely low throughout the region in 1995. The only significant damage that was detected occurred, for the second consecutive year, in the Aylmer District.

A total of 208 ha of moderate to severe defoliation was aerially detected north and west of the Cedar Creek Conservation Area, west of the town of Kingsville (Fig. 7). This infestation is spread over three large stands and three smaller pockets of mature oak (*Quercus* spp.). Two of the larger and smaller areas are in Colchester South Township, along the Cedar Creek drainage basin. The remaining two pockets lie to the immediate northeast in Gosfield South Township.

Two small pockets of trace to light defoliation, <24 percent, were detected in the Pinery Provincial Park in Bosanquet Township. Portions of this park had been successfully aerially sprayed in the spring of 1994 with Disparvirus, a nuclear polyhedrosis virus (NPV), and *Bacillus thuringiensis* (B.t.) to control high population levels of the gypsy moth.

Elsewhere, trace numbers of larvae were commonly encountered across the eastern portion of the Tweed

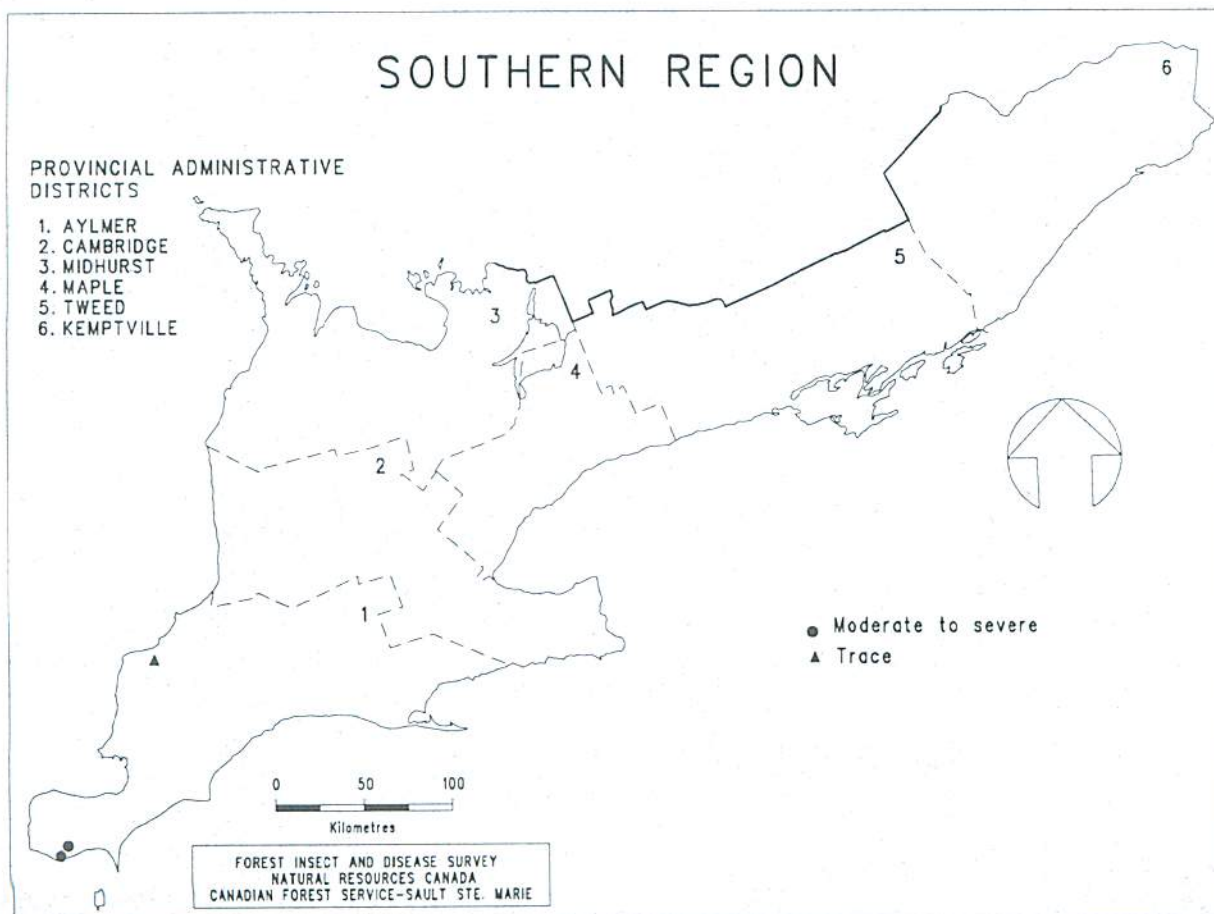


Figure 7. Areas within which defoliation caused by the gypsy moth (*Lymantria dispar* [L.]) occurred in 1995.

District and all of the Kemptville District. However, no noticeable defoliation was detected throughout the above mentioned areas. In the remaining portions of the region, especially in the Midhurst and Maple districts, population levels were extremely low.

Additional information on gypsy moth pheromone trapping is presented later in this report under *Special Surveys*.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

An increase in the total area of moderate to severe defoliation caused by the forest tent caterpillar occurred across the province in 1995. The current infestation peaked in 1991 with 18 870 508 ha of defoliation, and then steadily declined until 1994 to just 166 060 ha. However, in 1995 the provincial total increased to 243 125 ha. The majority of the defoliation occurred in the eastern portion of the Hearst District, in the south end of the Cochrane District, in the northern portion of the Timmins District.

An increase was also recorded in the Southern Region. A total of 1 338 ha of moderate to severe defoliation was

aerially sketch mapped in the northeastern portion of the Kemptville District. Three pockets of defoliation, varying in size, were mapped in trembling aspen stands in the northern end of Mountain Township, and at a single location in the northern portion of Roxborough Township. Defoliation was scattered across three poplar areas along the southern boundary of Cumberland Township and two small pockets of damage were located immediately to the west in Osgoode Township (Fig. 8).

High larval mortality rates were abundant throughout all of the areas of defoliation. A polyhedrosis virus, *Furia crustosa* (MacLeod & Tyrrell) Humber, was identified from dead larvae collected in Roxborough Township. This polyhedrosis viral disease usually occurs in the late or final stages of an infestation.

Balsam Fir Sawfly, *Neodiprion abietis* complex

The population level of the balsam fir sawfly continued to fluctuate across the eastern portion of the region in 1995. Light to moderate levels of defoliation were recorded from widely scattered areas throughout the central and

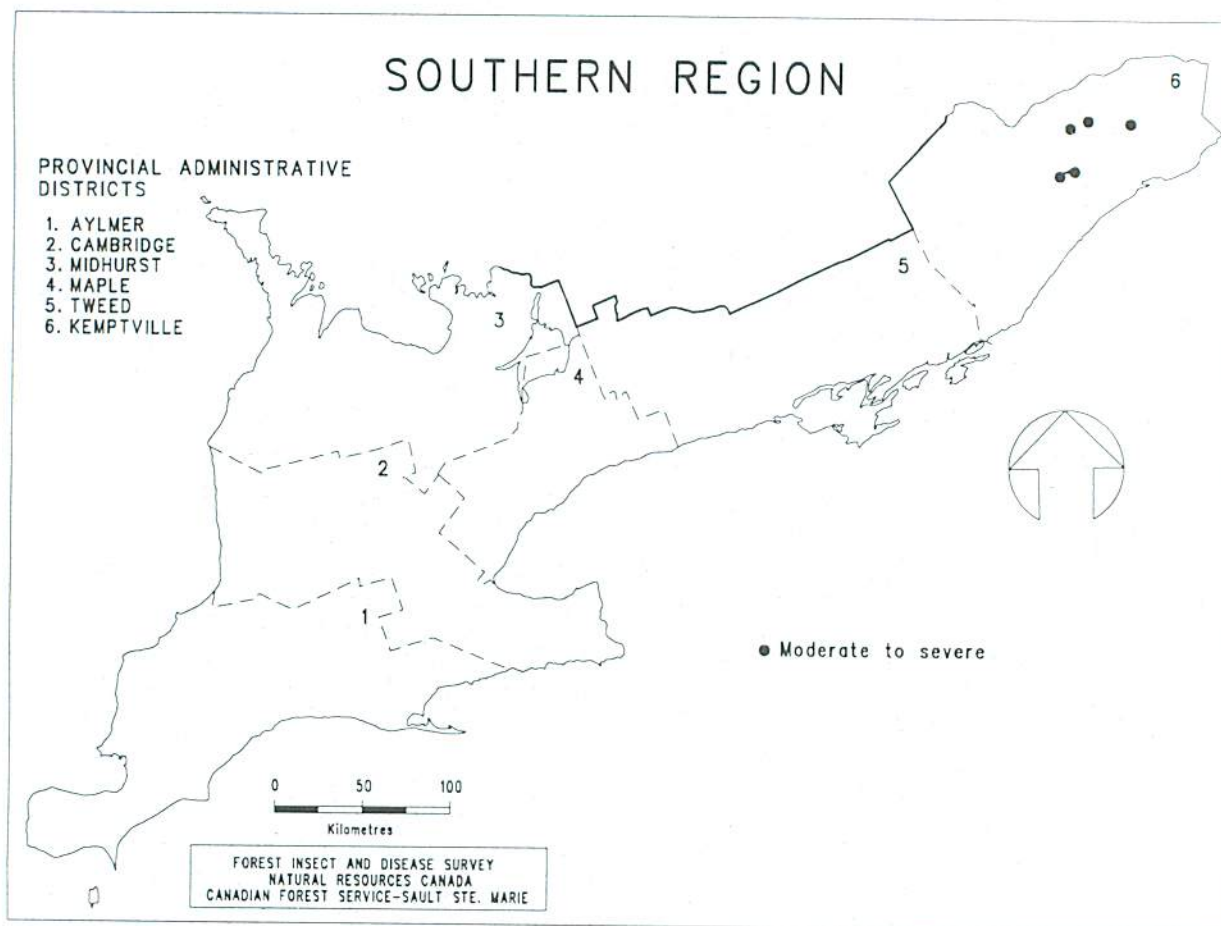


Figure 8. Areas within which moderate to severe defoliation caused by the forest tent caterpillar (*Malacosoma disstria* Hbn.) occurred in 1995.

northern areas of the Kemptville District. The heaviest defoliation, averaging 60 percent, occurred on individual 10-m-tall balsam fir (*Abies balsamea* [L.] Mill.) near the town of Hyndman in the northeast corner of Edwardsburgh Township. Defoliation levels of 40 percent were commonly encountered on single or on small clumps of balsam fir from the northern end of West Carleton Township southward to Rideau Township.

The decline that started 2 years ago in the western half of the Tweed District continued, and virtually no damage was recorded throughout the area this season.

Redheaded Pine Sawfly, *Neodiprion lecontei* (Fitch)

In 1994 a major infestation of redheaded pine sawfly was located in red pine plantations at the First Nations Lands on Christian Island in the Midhurst District. In July of 1995 an aerial control operation, totaling 43 ha in size and using Lecontivirus (nuclear polyhedrosis virus), was conducted by the Canadian Forest Service. The Lecontivirus was applied by a helicopter on 10 and 11 July when the larvae had developed to 50 percent first and 50 percent second instar. The Lecontivirus was applied at a dosage rate of 5×10^9 polyhedral inclusion bodies in 5.0 L/ha. A 26-ha plantation was treated with the virus in water alone and a combined area of 17 ha was treated with the virus in Novo Nordisk Virus Carrier 038. By 3 weeks postspray, ground surveys revealed that the population had been reduced to 0.6 percent and 0 percent healthy colonies in the two treated areas. At that point it was concluded that the spray operation had been extremely successful.

Jack Pine Sawfly, *Neodiprion pratti paradoxicus* Ross

There was a marked increase in jack pine sawfly populations and defoliation levels in the Tweed and Kemptville districts in 1995 (Fig. 9). Extensive aerial and ground surveys revealed a total of 3 031 ha of moderate to severe jack pine (*P. banksiana* Lamb.) defoliation (Fig. 10). This pine pest caused damage in both of the above districts in 1992 and 1993, but had completely collapsed in 1994.

In the Tweed District a total of 2 129 ha was detected in the Kaladar area. Five large pockets, ranging from 108 to 549 ha in size, were mapped along the rocky ridges in the northern end of Sheffield Township. Three additional areas, totaling 460 ha, were mapped to the immediate northwest in the south end of Kaladar Township. A single 76 ha pocket was found to the east in the south end of Kennebec Township.

In the Kemptville District a total of 902 ha of moderate to severe defoliation was widely scattered over 11 separate areas. The largest single area, comprised of 151 ha,



Figure 9. Mature larvae of the jack pine sawfly (*Neodiprion pratti paradoxicus* Ross) feeding on jack pine (*Pinus banksiana* Lamb.).

was located just west of the city of Cornwall in Cornwall Township. To the northwest a single pocket of damage, 65 ha in size, was detected along the Ontario–Quebec provincial border in Lancaster Township. At the LaRose Forest two single pockets, 52 ha and 54 ha in size, were found along the Cumberland–Russell and Clarence–Cambridge township borders, respectively. South of the city of Ottawa a single 40-ha area was mapped in the central portion of Gloucester Township. Single pockets, each approximately 75 ha in size, were mapped in Huntley and Lanark townships, and a 110-ha area occurred in the southeast corner of Wolford Township. Three pockets, totaling 250 ha, were detected along the north side of Temperance Lake in the south end of Rear of Yonge and Escott Township. A single 30-ha area was severely defoliated west of Smiths Falls in North Elmsley Township.

White Pine Weevil, *Pissodes strobi* (Peck)

The incidence of leader damage caused by the white pine weevil was determined to be very low across the region in 1995. In the Kemptville District a standard 150-tree evaluation conducted in a 1-ha eastern white pine plantation in Ramsay Township revealed that 10 percent of the 1-m-tall trees had sustained leader damage. In a 5-ha eastern white pine plantation in East Hawkesbury Township it was determined that 2 percent of the leaders of the 3.5-m trees were infested.

Similar surveys in eastern white pine plantations in the Midhurst District revealed that 4 percent of the leaders were infested in a 1-ha, 4.5-m-tall plantation in Euphrasia Township, and that 3 percent were infested in a 3-m-tall, 12-ha plantation in Sydenham Township.

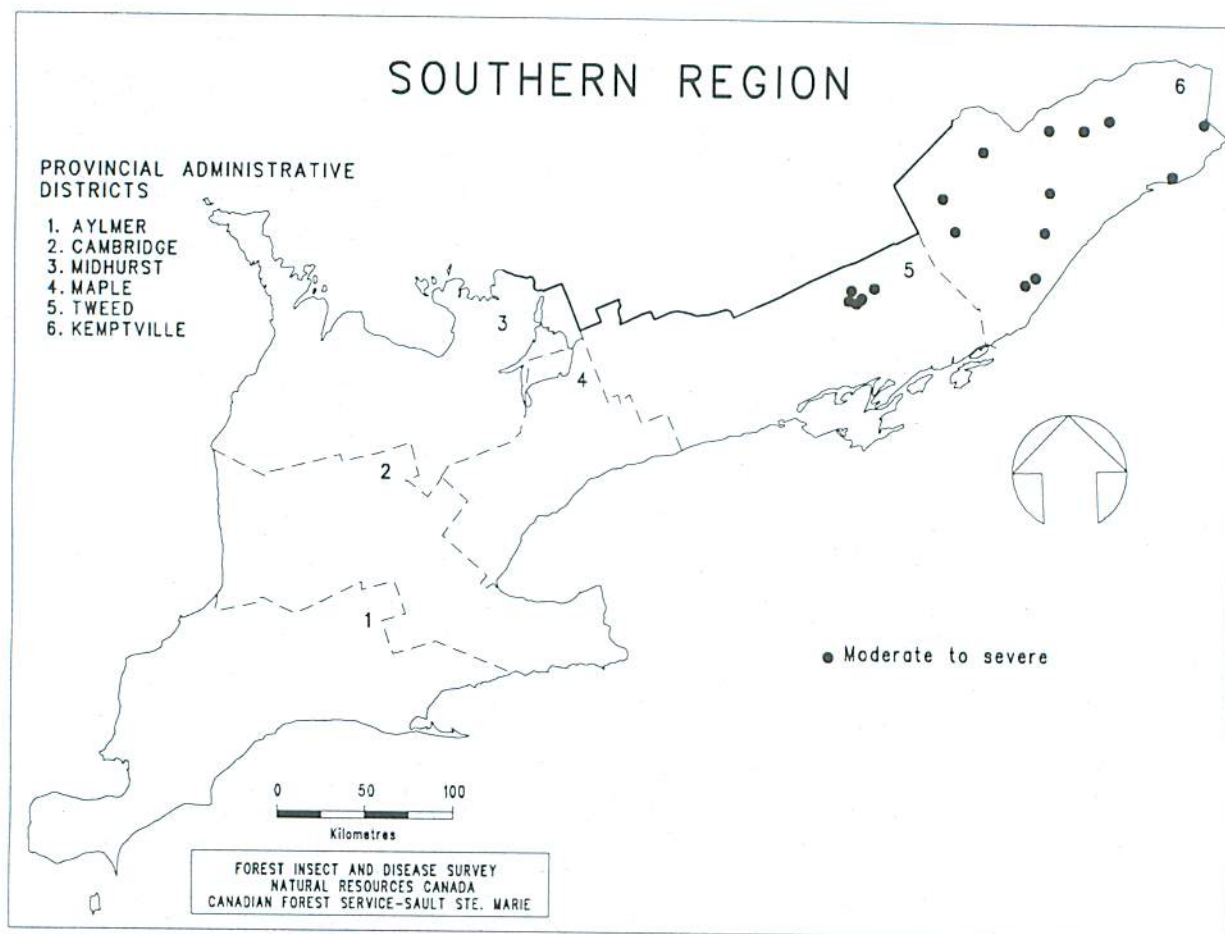


Figure 10. Areas within which moderate to severe defoliation caused by the jackpine sawfly (*Neodiprion pratti paradoxicus* Ross) occurred in 1995.

MINOR INSECTS

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

For the second consecutive year the maple trumpet skeletonizer was widespread across the region. In 1995 most of the sugar maple stands, and many ornamental trees, were infested with this pest. At numerous locations surveyed it was determined that 100 percent of the trees were infested, but in the majority of cases the actual defoliation level was trace to light (<24 percent).

The heaviest defoliation level occurred for the second consecutive year in a 5-ha sugar maple stand in the Presquile Provincial Park in Brighton Township, Tweed District. Here, it was estimated that 100 percent of the 24-m-tall maples in the stand had sustained an average of 75 percent defoliation.

Fall Webworm, *Hyphantria cunea* (Dury)

There was a marked increase in the overall incidence of this late fall hardwood pest in 1995, especially across

the central portion of the region. The heaviest population levels were detected in the northern portions of Dummer and Douro townships in the west end of the Tweed District. Throughout these areas pure stands of 6- to 10-m-tall black ash (*Fraxinus nigra* Marsh.) trees growing in marshy areas, generally <1 ha in size, were completely webbed. Defoliation levels of 100 percent were recorded at all of these sites.

Similar defoliation levels were encountered on single or smaller clumps of black ash growing in wet areas in Asphodel, Otonabee, Manvers, and Bexley townships in the Tweed District. Throughout the above mentioned areas other hardwoods, such as white ash (*F. americana* L.), white elm (*Ulmus americana* L.), butternut (*Juglans cinerea* L.), and ornamental flowering crab (*Malus* spp.), were often observed with at least one major branch within the crown completely webbed.

Severe defoliation levels on similar tree species was noted across the eastern half of the Tweed District, the entire Kemptville District, and the north central and southern portions of the Maple District. In the Midhurst District the majority of the defoliation occurred in Mara,

Vespra, and Essa townships. Severe defoliation was also recorded on 20-m-tall black walnut (*Juglans nigra* L.) trees scattered throughout Point Pelee National Park in the Aylmer District.

Elsewhere, at numerous locations in the region, single web masses resulting in 10 to 20 percent defoliation were commonly sighted on roadside and ornamental trees.

Other Forest Insects

A number of additional pests, of insignificant levels to have caused serious damage or of minor importance, were encountered during the course of routine surveys. Information on these is provided in Table 3.

Table 3. Other forest insects.

Insects	Host(s) ^a	Remarks
<i>Acleris variana</i> (Fern.) Eastern blackheaded budworm	eH	Trace defoliation was observed on mature trees near the town of Flinton in Kaladar Township, Tweed District and near Temperance Lake in Rear of Yonge and Escott Township in the Kemptville District.
<i>Adelges abietis</i> (L.) Eastern spruce gall adelgid	wS	Low population levels were scattered throughout a 5-ha plantation of 6-m trees along Peel County Road 11 in Caledon Township, Maple District.
<i>Adelges cooleyi</i> (Gill.) Cooley spruce gall adelgid	dF	Low population levels were detected in a 15-ha, 3.3-m-tall Christmas tree plantation in Clarke Township, Maple District.
<i>Alsophila pomataria</i> (Harr.) Fall cankerworm	Ba	Low population levels, causing trace defoliation, were detected on 6-m trees growing along concession roads south of the Wye Marsh in Tay Township, Midhurst District.
<i>Altica populi</i> Brown Poplar flea beetle	bPo	High population levels caused 80 percent defoliation on mature trees growing along Highway 7 in the Tweed and Kemptville districts.
<i>Anacampsis innocuella</i> (Zell.) Darkheaded aspen leafroller	tA ltA	In a 25-ha stand, 100 percent of the 14-m-tall trees sustained 25 percent defoliation in the southern end of Georgina Township in the Maple District. A similar level of damage was noted in a 10-ha stand growing along Simcoe County Road 26 in Tiny Township, Midhurst District.
<i>Aphrophora cribrata</i> (Wlk.) Pine spittlebug	ewP scP	This pine pest was very common throughout the entire region. At numerous locations every branch tip was infested.
<i>Archips cerasivorana</i> (Fitch) Uglynest caterpillar	pCh cCh	Defoliation was commonly encountered on roadside shrubs throughout the central portion of the Midhurst District. Often, entire 1-m-tall shrubs were completely webbed right to the ground.
<i>Choristoneura p. pinus</i> Free. Jack pine budworm	scP	Low population levels, causing 2 percent defoliation on 10 percent of the 1-m-tall trees, were detected in a 1-ha Christmas tree plantation in Oxford-on-Rideau Township in the Kemptville District.

(cont'd)

Table 3 . Other forest insects (cont'd).

Insects	Host(s) ^a	Remarks
<i>Contarinia baeri</i> (Prell) European pine needle midge	rP	This pest was commonly encountered at low population and host damage levels along the outside edges of plantations throughout CFB Borden in the Midhurst District.
<i>Dasychira dorsipennata</i> (B. & McD.) Hardwood tussock moth	rO	Trace populations were detected on semimature trees throughout the Dufferin County Forest in Mulmur Township, Midhurst District.
<i>Diprion similis</i> (Htg.) Introduced pine sawfly	ewP	Trace population levels were detected on 1.3 percent of the 4-m-tall trees at the Glencairn seed orchard in Tosorontio Township, Midhurst District.
<i>Fenusa ulmi</i> Sund. Elm leafminer	wE sE	Small, scattered pockets of heavily infested trees were detected in Hillie Township in the Tweed District, and in Montague and Augusta townships in the Kemptville District.
<i>Gargaphia tiliae</i> (Walsh) Basswood lace bug	Ba	High populations of this pest caused severe browning of foliage at numerous locations across the central and eastern portions of the region.
<i>Malacosoma americanum</i> (F.) Eastern tent caterpillar	cCh	Moderate defoliation levels, <75 percent, were commonly detected on roadside shrubs throughout the central and eastern portions of the region.
<i>Neodiprion sertifer</i> (Geoff.) European pine sawfly	scP	Moderate defoliation levels occurred on a pocket of 50, 2-m-tall trees in a plantation in Pittsburg Township in the Tweed District. Light defoliation was detected on scattered roadside trees in Tiny, Medonte, and Oro townships in the Midhurst District and in Clarke Township in the Maple District.
<i>Oligonychus ununguis</i> (Jac.) Spruce spider mite	wS	This spider mite caused heavy damage on ornamental trees throughout the central portion of the region, especially in the Maple District.
<i>Paraclemensia acerifoliella</i> (Fitch) Maple leafcutter	sM	An average of 25 percent defoliation was detected on 100 percent of the 24-m-tall trees in a 30-ha woodlot in Houghton Township in the Aylmer District. Trace populations were found on 21-m trees in a 10-ha woodlot at CFB Borden in Tosorontio Township and on fringe regeneration in a 15-ha hardwood stand in Mulmur Township in the Midhurst District.
<i>Retinia albicapitana</i> (Bsk.) Northern pitch twig moth	jP	Moderate population levels of this moth were detected on scattered, individual, 3-m-tall trees in south Plantagenet Township in the Kemptville District.

(cont'd)

Table 3 . Other forest insects (concl.).

Insects	Host(s) ^a	Remarks
<i>Pikonema alaskensis</i> (Roh.) Yellowheaded spruce sawfly	wS	This sawfly was very common at trace levels throughout the western portion of the Tweed District. Ninety percent defoliation was detected on scattered, open-grown, 2-m-tall trees in a 2-ha area in Lanark Township in the Kemptville District.
<i>Podapion gallicola</i> Riley Pine gall weevil	rP	Along the edge of a 20-ha, 17-m-tall plantation in Mulmur Township, 15 percent of the branches had been killed by this weevil on a total of 17 trees.
<i>Pristiphora geniculata</i> (Htg.) Mountain-ash sawfly	aMo	Single ornamental trees were defoliated within the towns of Carleton Place in the Kemptville District and in Orono in the Maple District.
<i>Tetralopha asperatella</i> (Clem.) Maple webworm	sM	This webworm was very common throughout the region. The incidence level of infested trees often exceeded 75 percent, however the actual foliar damage levels were generally very low, usually less than 5 percent.

^a aMo = American mountain-ash (*Sorbus americana* Marsh.), Ba = basswood (*Tilia americana* L.), bPo = balsam poplar (*Populus balsamifera* L.), Cch = choke cherry (*Prunus virginiana* L.), dF = Douglas-fir (*Pseudotsuga* spp.), eH = eastern hemlock, ewP = eastern white pine, jP = jack pine, ltA = largetooth aspen (*Populus grandidentata* Michx.), pCh = pin cherry (*Prunus pennsylvanica* L.f.), rO = red oak, rP = red pine, scP = Scots pine (*Pinus sylvestris* L.), sE = slippery elm (*Ulmus rubra* Muhl.), sM = sugar maple, tA = trembling aspen, wE = white elm, and wS = white spruce.

TREE DISEASES

Major Diseases

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

Routine surveys in 1995 of pine plantations throughout the central portion of the region continued to detect discrete pockets of dead or dying trees. Examination of the affected trees at these sites revealed that they were heavily infected with *Armillaria* root rot.

A standard 150-tree evaluation conducted in a 4-ha, 19-m-tall red pine plantation in Oro Township in the Midhurst District revealed a current whole-tree mortality rate of 11 percent. Examination of the infected trees showed mycelial fans and rhizomorphs, produced by this fungus, growing as high as 2 meters above the ground just under the bark on the main stems. This plantation has been severely defoliated for the past 2 years by the pine false webworm.

In a 15-ha, 18-m-tall red pine plantation in Sunnidale Township, Midhurst District, a pocket of 17 old, dead

trees was detected. The dead trees were surrounded by an additional five trees that showed obvious symptoms of infection by this root rot. South of this area, in a 10-ha red pine plantation in Tosorontio Township, three recently killed 25-m-tall trees were heavily infected with this root rot. Surveys in a 20-ha, 14-m-tall red pine plantation in Uxbridge Township in the Maple District revealed an *Armillaria* pocket of five recently killed trees. A standard 150-tree evaluation conducted in a 7-ha, 2-m-tall red pine plantation in Marmora Township in the Tweed District revealed a current 1 percent mortality rate.

A single 20-m-tall red oak in a natural hardwood stand in Tiny Township, Midhurst District, was also killed by this fungus.

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

A total of 30 pine plantations was examined across the region in 1995 to detect the presence of the North American or European race of *Scleroderris* canker (Fig. 11). Twenty-two red pine and eight Scots pine plantations, ranging in height from 0.7–15.5 m, were checked at various locations

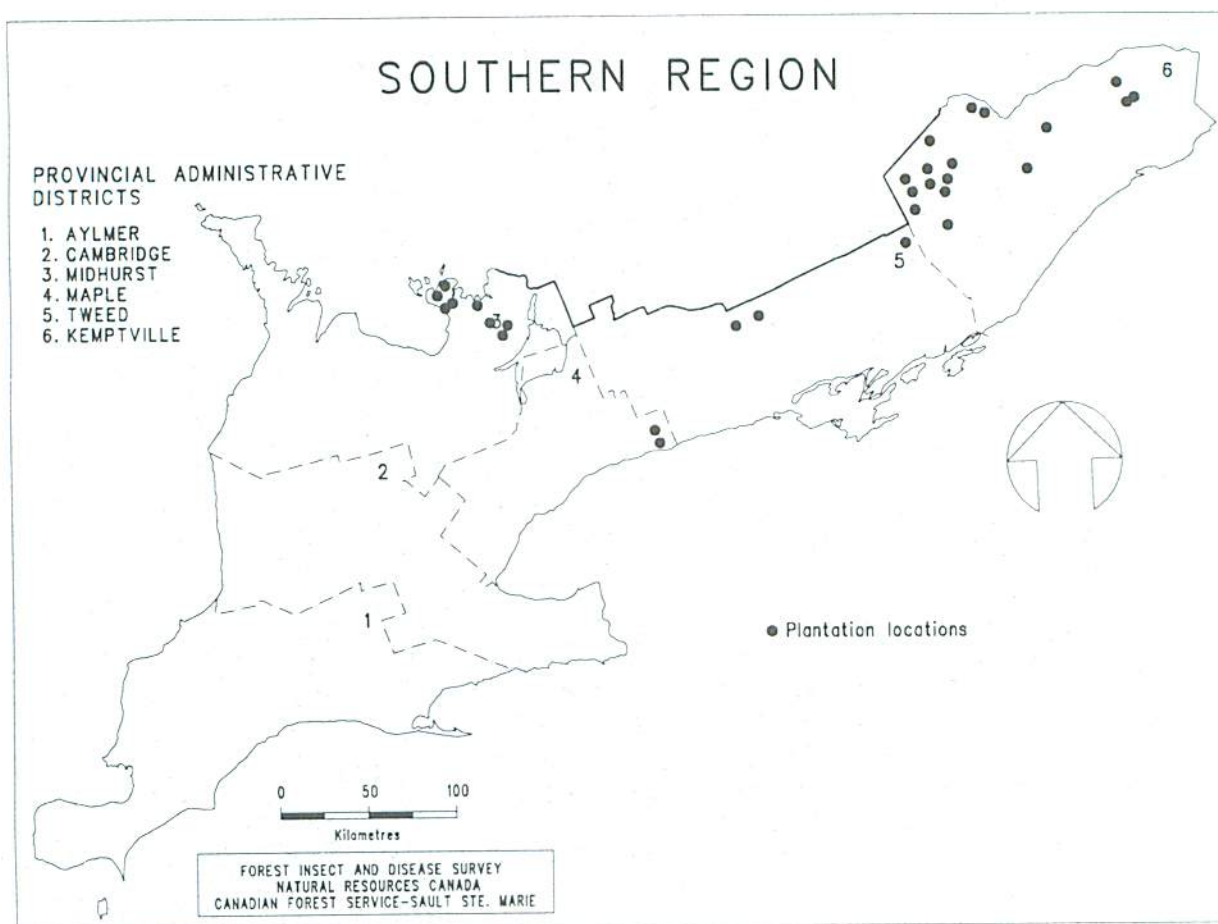


Figure 11. Location of pine plantations surveyed for *Scleroderris canker* (*Gremmeniella abietina* [Lagerb.] M. Morelet) in 1995.

in the Kemptville, Maple, Midhurst, and Tweed districts. No evidence of either race of the disease was detected. A complete list of the actual plantations surveyed is presented in Table 4.

Dutch Elm Disease, *Ophiostoma ulmi* (Buisman) Nannf.

Dutch elm disease was widespread across the region in 1995. This fatal elm disease has been very active in the region for the last few years, and current whole-tree mortality is commonly observed on juvenile elm trees growing along roadsides and fencelines.

The highest incident rate encountered occurred on the east side of Lake Simcoe in the south end of Mara Township in the Midhurst District, and in the adjacent northern portion of Thorah Township in the Maple District. Most of the juvenile white elm throughout this area have been killed by this disease.

High incident levels have also been observed throughout the entire Maple District and the western portion of the Tweed District. The disease is widespread and appears to be on the increase throughout the Kemptville District.

Very low incidence levels were reported in the western portion of the Midhurst District and throughout the entire southwestern portion of the region.

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

No formal survey was conducted in 1995 to locate new areas in the region that were not previously known to be affected with butternut canker. Surveys completed in the last 4 years have indicated that wherever butternut trees occurred in the region, so also did the disease. However, during routine surveys in 1995, whenever butternut trees were detected that displayed typical crown dieback symptoms, samples were taken.

Butternut canker was recovered from three locations in the Midhurst District. The first was from a single 12-m-tall roadside tree, with an estimated 75 percent crown dieback, south of the town of Meaford in Euphrasia Township. This was the first time the disease was collected in this particular township. The disease was also collected from a 15-m-tall roadside tree that had 80 percent crown dieback in Oro Township and from a 9-m roadside tree,

Table 4. Summary of the results of a *Scleroderis* canker survey conducted at 30 pine plantations in the Southern Region in 1995 (Counts are based on the examination of 500 trees at each location.)

Location (Township)	Tree species ^a	Average height of trees (m)	Estimated number of trees per ha	Total area affected (ha)	Leaders attacked (%)
<i>Kemptville District</i>					
Bathurst	rP	0.7	2 400	5	0
Clarence	scP	3.0	500	4	0
Darling	rP	3.6	2 500	3	0
Drummond	rP	5.0	2 400	2	0
Lanark	rP	1.5	2 500	4	0
Lavant	rP	2.0	2 500	6	0
Lavant	rP	3.5	2 500	1	0
North Sherbrooke	rP	1.7	2 400	5	0
Osgoode	rP	6.0	2 500	6	0
Pakenham	rP	2.7	2 500	7	0
Ramsay	rP	8.0	2 000	2	0
Ramsay	rP	5.0	1 800	2	0
Rideau	scP	8.0	1 500	5	0
South Plantagenet	scP	4.0	2 400	2	0
South Plantagenet	scP	4.0	2 000	2	0
Torbolton	rP	12.0	2 000	3	0
Torbolton	rP	6.5	2 500	4	0
<i>Maple District</i>					
Clarke (Orono Forest Tree Nursery)	rP	15.5	800	3	0
Clarke (Orono Forest Tree Nursery)	rP	8.0	1 700	2	0
<i>Midhurst District</i>					
Medonte	rP	1.3	2 400	1	0
Medonte	rP	1.3	2 450	5	0
Medonte	rP	2.8	2 200	5	0
Tay	rP	2.1	2 300	6	0
Tiny	scP	2.0	2 000	10	0
Tiny	scP	2.1	2 000	2	0
Tiny	scP	1.4	2 400	4	0
Tiny	scP	2.0	1 700	2	0
<i>Tweed District</i>					
Madoc	rP	7.0	2 000	3	0
Marmora	rP	2.0	2 500	3	0
Oso	rP	8.0	2 500	3	0

^arP = red pine, scP = Scots pine.

with 30 percent dieback, in Medonte Township. The disease had been previously collected in these two townships.

The butternut canker was also recovered from a single 24-m-tall roadside tree, with 50 percent crown dieback, in Darling Township in the Kemptville District. It had been previously collected in this area as well.

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

For the second consecutive year the overall incidence of diplodia tip blight continued to decline across the region in 1995. Low to moderate foliar damage levels were detected on widely scattered individual or small plantings

of Scots and Austrian pine (*Pinus nigra* Arnold). The tip blight was most common on trees growing along the major highways in the central portion of the region.

The heaviest foliar damage, averaging 60 percent, was detected on 5-m-tall Scots pine growing along Highway 7 west of the town of Marmora in the Tweed District. Foliar damage levels, averaging 40 percent, were detected on 6.5-m-tall Austrian pine at three locations along Highway 400 at the city of Barrie and on several 7-m trees along Highway 9 in Adjala Township in the Midhurst District. Along the edge of a semimature red pine plantation at CFB Borden, several naturally regenerated 1.5-m-red pine were detected with approximately 30 percent foliar damage.

Foliar damage levels of 10 percent were detected on 8- and 11-m-tall Austrian pine in the city of Newmarket, in the town of Uxbridge in the Maple District, and on 13-m Austrian pine at the main gate to Sauble Falls Provincial Park in the Midhurst District.

Minor Diseases

Pine Needle Rust, *Coleosporium asterum* (Dietel) Syd. & P. Syd.

Routine surveys conducted in pine plantations in the central and eastern portion of the region in 1995 revealed low levels of damage due to pine needle rust.

A standard 150-tree evaluation conducted in a 1-ha red pine plantation in Ramsay Township in the Kemptville District revealed that 100 percent of the 1-m trees sustained 5 percent defoliation. A survey in a 4-ha red pine plantation in Lanark Township, in the same district, showed a 5 percent defoliation level on 30 percent of the 1.5-m-tall trees. In a 20-ha red pine plantation in Caledon Township in the Maple District, an evaluation disclosed that 5 percent of the 7-m-tall trees had also sustained 30 percent defoliation.

Surveys in the Tweed District showed that pine needle rust had affected only 1 to 2 percent of the foliage on 100 percent of the 2-m trees in a 3-ha plantation in Marmora Township, 2 percent of the 7-m trees in a 3-ha plantation in Madoc Township, and 1 percent of the 8-m trees in a 3-ha plantation in Oso Township.

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

The incidence of this rust fungus remained very low across the region in 1995. Standard 150-tree evaluations conducted in the Kemptville District revealed a 2 percent infection rate in a 8-ha, 0.7-m-tall eastern white pine plantation in Bathurst Township, and a 1 percent rate in

a 5-ha, 1-m-tall plantation in Ramsay Township. Similar infection rates were found in a 2-ha, 4-m-tall plantation in March Township. At each of the locations the trees were considered to be severely affected because the main stems of the trees were damaged.

In a 10-ha eastern white pine plantation in Mulmur Township in the Midhurst District, 3 percent of the 7-m-tall trees were severely affected.

Leaf Spot, *Gnomonia leptostyla* (Fr.:Fr.) Ces. & De Not., *Mycosphaerella effigurata* (Schwein.) House, *M. populicola* G.E. Thomps., *Phyllostica tiliae* Sacc. & Speg., and *Stegophora ulmea* (Schwein.:Fr.) Syd. & P. Syd.

The overall incidence of leaf spot diseases was noticeably lower across the region in 1995 than in the previous 2 years. A marked reduction was noted especially on balsam poplar, a tree species that has been heavily affected across the region over the past few years.

Gnomonia leptostyla caused an average of 90 percent defoliation on 20, 10- to 12-m-tall butternut trees along a concession road in Holland Township in the Midhurst District. *Mycosphaerella effigurata* affected 75 percent of the foliage on three fringe 10-m-tall white ash trees in Sullivan Township in the Midhurst District, 40 percent of the foliage on a single 2-m black ash in Dummer Township in the Tweed District, and 40 percent of the foliage on numerous 6-m black ash growing along the edge of a wet area in Brock Township in the Maple District. *Mycosphaerella populicola* was commonly detected on 30–50 percent of the foliage on roadside 4- to 6-m-tall balsam poplar along Peterborough County Road 40 in Dummer Township in the Tweed District. This same leaf spot affected 75 percent of the foliage on 10-m balsam poplar trees at the Crane River in Edmunds Township, Midhurst District. *Phyllostica tiliae* caused 10 percent foliar damage on five, 7-m-tall fringe basswood trees in Brock Township in the Maple District and on several fringe 7-m-tall basswood trees in Sullivan Township in the Midhurst District. *Stegophora ulmea* affected 60 percent of the foliage on several fringe 6-m-tall white elm in Sullivan Township in the Midhurst District.

Other Forest Diseases

Various additional diseases, of insignificant levels to have caused serious damage or of minor importance, were encountered during the course of regular surveys. Information on these is provided in Table 5.

Table 5. Other forest diseases.

Organism	Host(s) ^a	Remarks
<i>Apiognomonia errabunda</i> (Roberge) Höhn. Anthracnose	wAs	Approximately 40 percent defoliation was detected on two, 9-m-tall roadside trees in Oro Township. Along Simcoe County Road 60 in Tiny Township, Midhurst District, 5–10 percent of the foliage was damaged on 10- to 15-m trees.
<i>Cryphonectria parasitica</i> (Murrill) M.E. Barr Chestnut blight	aCh	Heavy infection levels were reported on two, 2-m-tall trees in a small plantation along Highway 3, west of the town of Leamington in South Gosfield Township in the Aylmer District.
<i>Cytospora</i> spp.	wAs	A single roadside 15-m-tall tree was recorded with 75 percent crown dieback in Oro Township in the Midhurst District.
<i>Endocronartium harknessii</i> (J.P. Moore) Y. Hirats. Western gall rust	scP	Approximately 50 percent of the 2.1-m-tall trees in a 2-ha Christmas tree plantation in Tiny Township in the Midhurst District were severely affected with this rust. Trees averaged 30 to 50 galls. An additional 10 percent of the trees had been removed due to heavy infection rates.
<i>Guignardia aesculi</i> (Peck) V.B. Stewart Horse-chestnut leaf blotch	hCh	A single 12-m-tall roadside tree was detected in Adjala Township, in the Midhurst District, with 100 percent of the foliage affected by this leaf disease.
<i>Gymnosporangium juniperi-virginianae</i> Schwein. Cedar–apple rust	erC	This rust was common in natural stands, averaging ten to 20 fruiting bodies per 7-m tree in Sophiasburgh Township and up to 10 per tree in 4-m trees in North Fredericksburgh Township in the Tweed District.
<i>Heterobasidion annosum</i> (Fr.:Fr.) Bref. Fomes root rot	rP	This root rot was present at detectable levels on mature trees in LaRose Forest in Clarence Township in the Kemptville District.
<i>Mycosphaerella dearnessii</i> M.E. Barr Brown spot needle blight	mP	Ornamental trees had 60 percent of their old foliage affected in Sauble Falls Provincial Park in Amabel Township in the Midhurst District.
Scorch	sM	Trace to moderate levels of foliar damage was detected on fringe and open-grown trees in many parts of the Tweed and Kemptville districts.
<i>Venturia macularis</i> (Fr.:Fr.) E. Müll. & Arx Shoot blight	tA	Trace levels of this blight were common across the work area.

^a aCh = American chestnut (*Castanea dentata* (Marsh.) Borkh.), erC = eastern red cedar (*Juniperus virginiana* L.), hCh = Horse-chestnut (*Aesculus hippocastanum* L.), mP = mugho pine (*Pinus mugo* var. *mughus* Zenari), rP = red pine, scP = Scots pine, sM = sugar maple, tA = trembling aspen, and wAs = white ash.

ABIOTIC CONDITIONS

Drought Damage

Drought damage was aerially sketch mapped across approximately 26 119 ha in the Southern Region in 1995. The majority of the damage occurred on high, shallow soil or rocky sites on 20 900 ha in the Tweed District, on 4 551 ha in the Kemptville District, and on 1 219 ha in the Midhurst District (Fig. 12).

In the Tweed District, various hardwood species exhibited the typical drought-induced yellowing of foliage and premature leaf drop. Damage was noted throughout the southern portions of Hastings, Lennox and Addington, and Frontenac counties. The largest pocket, 3 992 ha, was detected southwest of Devil Lake in the south end of Bedford Township and in the adjacent northern portion of Loughborough Township. This hardwood damage extended eastward into the southwest portion of Leeds and Grenville County in the Kemptville District. Mature eastern white pine growing on rocky shallow soil sites were severely discolored southwest of Charleston Lake in Rear of Leeds and Lansdowne Township.

A narrow band of drought damage occurred along the upper edge of the limestone escarpment on the southwest shore of Nottawasaga Bay in the Midhurst District. The damage extended from northeast of the town of Meaford in St. Vincent Township, southeastward to the town of Creemore in the south end of Nottawasaga Township. The affected area is primarily covered with scrub hardwoods, i.e., choke cherry (*Prunus virginiana* L.), pin cherry (*P. pensylvanica* L.f.), and staghorn sumac (*Rhus typhina* L.). Young white ash and trembling aspen were affected in the areas between the towns of Thornbury and Collingwood in Collingwood Township.

Elsewhere, smaller, widely scattered pockets of damage were mapped in Madoc and Belmont townships and on the western side of Prince Edward County, Tweed District.

Frost Damage

Late spring frost damage was recorded across a large portion of the Southern Region in 1995. The tree species that were most affected were black ash and white ash. Shortly after the young leaves unfolded in mid-May they suddenly turned black, curled, and dropped off. This

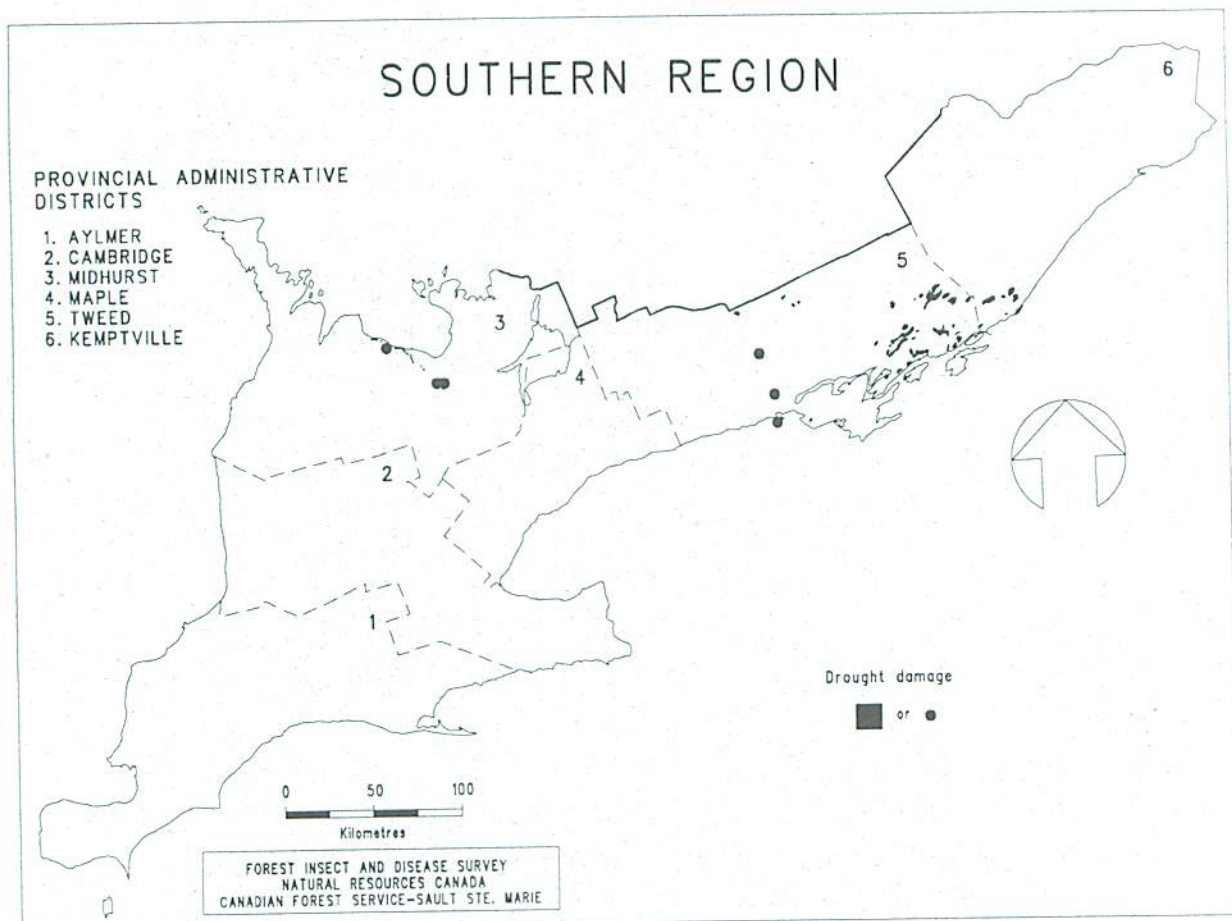


Figure 12. Areas within which drought damage occurred in 1995.

phenomena was reported, primarily on ornamental trees, from the Owen Sound area eastward throughout the Midhurst District, the northern portion of the Maple District, and most of the Tweed and Kemptville districts. The level of defoliation varied greatly across the affected area (from 5 to 95 percent). In almost all circumstances the trees successfully flushed a second crop of leaves.

Wind Damage

On several occasions during the summer of 1995 severe thunderstorms, accompanied by very high winds, hit southern Ontario. The worst storms, on 13 and 14 July, caused tremendous amounts of damage to ornamental and open-grown trees in numerous communities. Trees were either completely uprooted, had their main stems snapped off, or had major branches broken off within the main crown (Fig. 13).

In the town of Goderich in the Cambridge District, an estimated 500 mature trees were completely destroyed and virtually every remaining tree had some level of crown damage. Similar damage to ornamental trees occurred in a band extending from the community of Christian Island, eastward through the towns of Penetanguishene, Midland, Washago, and the city of Orillia in the Midhurst District. In the town of Washago an estimated 200 trees were severely damaged or uprooted. The storms then moved across Lake Simcoe and damaged trees in an area from the north end of Lake Scugog to the town of Lindsay in the Tweed District.

Other storms on these same nights struck the eastern portion of the region and caused similar levels of damage. The town of Kemptville, in the Kemptville District, was severely hit and numerous ornamental trees were uprooted or completely snapped off. Various levels of wind damage



Figure 13. At many locations across southern Ontario trees were uprooted or severely damaged by the very high winds that accompanied violent thunderstorms.

were reported in most of the communities extending from the city of Kingston in the Tweed District, northeast to the city of Ottawa, and east to the city of Cornwall in the Kemptville District.

FOREST HEALTH

Maple Health

Annual assessment of the sugar maple health plots, consisting of 26 woodlot, 14 urban, and 15 roadside plots, was completed across the region in 1995. The individual crowns of trees on each plot were rated for the percentage of total branch dieback and for any pest conditions that might affect overall vigor. The majority of the sugar maple trees were found to be very healthy. Complete results of the crown assessments conducted in 1994 and 1995 for the three plot types are presented in Tables 6, 7, and 8.

Evaluation of the woodlot revealed that 86.4 percent of the trees were considered to be very healthy, with <5 percent crown dieback. A further 11.6 percent were considered healthy, with <20 percent dieback. An additional 1.0 percent of the trees sustained 21–60 percent crown dieback.

Assessment of the urban plots disclosed that 56.5 percent of the trees were very healthy and had <5 percent crown dieback. This figure increased considerably, to 90.6 percent, when those trees with <20 percent crown dieback were included. The remaining 7.2 percent of the living trees had moderate levels (21–60 percent) of crown dieback. Severely declining trees in an urban setting are often cut down and removed for safety reasons. If the 36 trees in this category had not been removed throughout the 7 years of the study, the percentage of trees considered healthy would obviously be less than 90.6 percent. In 1995 five trees were removed.

Roadside plots have annually shown the highest level of dieback. This is expected, in part, due to the harsh environment within which the trees are growing. The 1995 survey revealed that only 37.9 percent could be considered very healthy, having <5 percent crown dieback. The number increased to 74.8 percent when added to the percentage of trees considered to be healthy (<20 percent crown dieback). A total of 19.2 percent had moderate levels (21–60 percent) of crown dieback and 2.1 percent were in a decline (>61 percent crown dieback). Ten trees, on various plots, had been cut down. As is the case with the urban plots, often it is the most severely deteriorated trees that are removed and this impacts on the overall impression of the health of the plots.

Table 9 summarizes yearly trends in the crown condition of trees on the three different plot types. This table shows that the overall health of the woodlot plots declined during 1994–1995. The percentage of unchanged or static

trees has declined from 79 to 71 percent for urban trees, from 92.5 to 88.8 percent for woodlot trees, and from 74.3 to 71.3 percent for roadside trees.

The average defoliation level was very low across the three plot types. It averaged 2.9 percent for the woodlot

plots, 0.4 percent for the roadside plots, and 0 percent for the urban plots. The highest defoliation levels for the woodlot plots occurred on the plot in Houghton Township, Aylmer District (24.0 percent) and on the plot in Trafalgar Township, Maple District (12.2 percent). At Houghton

Table 6. Summary of data collected at 26 woodlot maple health plots in the Southern Region of Ontario for 1994 and 1995. (Counts are based on the examination of 25 sugar maple trees at each location.)

Location (Township)	Average		Year	Cumulative dieback class						Cumulative number of dead/cut trees ^b
	Height (m)	DBH (cm)		Number of trees						
				0	1	2	3	4	5 ^a	
<i>Aylmer District</i> Houghton	24	33.3	1994	25	0	0	0	0	0	0
			1995	25	0	0	0	0	0	0
Malahide	22	35.3	1994	25	0	0	0	0	0	0
			1995	24	1	0	0	0	0	0
North Norwich	21	31.0	1994	25	0	0	0	0	0	0
			1995	25	0	0	0	0	0	0
Plympton	22	29.3	1994	21	1	0	0	0	0	3
			1995	21	0	1	0	0	0	3
Warwick	27	31.3	1994	22	0	0	0	0	0	3
			1995	21	1	0	0	0	0	3
<i>Cambridge District</i> Morris	21	29.5	1994	25	0	0	0	0	0	0
			1995	25	0	0	0	0	0	0
Onieda	27	40.4	1994	22	2	0	0	0	0	1
			1995	24	0	0	0	0	0	1
South Cayuga	21	21.2	1994	23	2	0	0	0	0	0
			1995	24	1	0	0	0	0	0
<i>Kemptville District</i> Lavant	22	37.6	1994	20	4	0	0	0	0	1
			1995	17	7	0	0	0	0	1
Nepean	20	37.1	1994	20	4	0	0	0	0	1
			1995	16	8	0	0	0	0	1
Oxford	24	35.6	1994	21	4	0	0	0	0	0
			1995	22	3	0	0	0	0	0
Pakenham	25	50.5	1994	14	7	3	0	0	0	0
			1995	5	15	4	0	0	0	0
Rear of Leeds and Lansdowne	28	66.4	1994	15	1	0	0	0	0	9
			1995	10	6	0	0	0	0	9

(cont'd)

Table 6. Summary of data collected at 26 woodlot maple health plots in the Southern Region of Ontario for 1994 and 1995. (Counts are based on the examination of 25 sugar maple trees at each location.) (concl.)

Location (Township)	Average		Year	Cumulative dieback class						Cumulative number of dead/cut trees ^b
	Height (m)	DBH (cm)		Number of trees						
				0	1	2	3	4	5 ^a	
<i>Maple District</i>										
Albion	29	39.7	1994	25	0	0	0	0	0	0
			1995	24	1	0	0	0	0	0
Trafalgar	35	43.6	1994	24	1	0	0	0	0	0
			1995	20	5	0	0	0	0	0
Whitchurch	21	35.5	1994	25	0	0	0	0	0	0
			1995	23	23	2	0	0	0	0
<i>Midhurst District</i>										
Derby	24	31.6	1994	23	2	0	0	0	0	0
			1995	24	0	0	1	0	0	0
Flos	27	33.4	1994	25	0	0	0	0	0	0
			1995	25	0	0	0	0	0	0
Keppel Concession I	20	27.0	1994	24	1	0	0	0	0	0
			1995	24	1	0	0	0	0	0
Keppel Concession XIII	16	23.0	1994	24	0	0	0	0	0	1
			1995	24	0	0	0	0	0	1
Keppel Concession XXI Lot 22	24	32.1	1994	23	0	1	0	0	0	1
			1995	22	1	0	0	1	0	1
Keppel Concession XXI Lot 40	22	38.3	1994	25	0	0	0	0	0	0
			1995	25	0	0	0	0	0	0
Medonte	30	38.0	1994	17	8	0	0	0	0	0
			1995	12	13	0	0	0	0	0
Sullivan	26	42.2	1994	23	1	0	0	0	0	1
			1995	19	0	0	0	0	0	6
<i>Tweed District</i>										
Brighton, Staff	23	53.9	1994	21	2	1	0	0	0	1
			1995	23	1	0	0	0	0	1
Brighton, Camp	24	45.2	1994	16	3	0	1	1	0	4
			1995	14	6	0	0	1	0	4
Total percent			1994 1994	573 92.0	43 6.9	5 0.8	1 0.2	1 0.2	0 0.0	27 4.2
Total percent			1995 1995	538 86.4	72 11.6	5 0.8	1 0.2	2 0.3	0 0.0	32 4.9

^a 0 = 0–5 percent, 1 = 6–20 percent, 2 = 21–40 percent, 3 = 41–60 percent, 4 = >60 percent, 5 = dead tree.
^b Since plot establishment.

Table 7. Summary of data collected at 14 urban maple health plots in the Southern Region of Ontario for 1994 and 1995. (Counts are based on the examination of 25 sugar maple trees at each location.)

(Counts are based on the examination of 25 sugar maple trees at each location.)										
Location (Township)	Average		Year	Cumulative dieback class						Cumulative number of dead/cut trees ^b
	Height (m)	DBH (cm)		Number of trees						
				0	1	2	3	4	5 ^a	
<i>Aylmer District</i>										
Strathroy	24	82.5	1994	22	1	0	0	0	0	2
			1995	20	3	0	0	0	0	2
Woodstock	23	63.4	1994	16	2	1	3	0	0	4
			1995	12	6	0	2	1	0	4
<i>Cambridge District</i>										
Blyth	23	74.3	1994	12	7	1	0	0	0	5
			1995	11	7	1	0	0	0	6
Guelph	18	70.5	1994	21	3	1	0	0	0	0
			1995	15	9	1	0	0	0	0
<i>Kemptville District</i>										
Brockville	23	64.0	1994	18	2	4	0	0	0	1
			1995	12	7	1	2	0	0	3
Gananoque	24	59.0	1994	17	4	1	1	0	0	2
			1995	16	6	0	1	0	0	2
<i>Maple District</i>										
Oakville	20	82.5	1994	12	11	0	0	0	0	2
			1995	11	11	1	0	0	0	2
Richmond Hill	15	57.9	1994	18	4	0	0	0	0	3
			1995	17	4	1	0	0	0	3
<i>Midhurst District</i>										
Orillia	21	66.1	1994	15	5	1	0	0	0	4
			1995	15	5	1	0	0	0	4
Owen Sound	26	91.0	1994	22	3	0	0	0	0	0
			1995	20	5	0	0	0	0	0
<i>Tweed District</i>										
Campbellford	21	68.0	1994	7	7	3	0	0	0	8
			1995	1	12	2	1	1	0	8
Cobourg	18	68.5	1994	15	6	2	0	0	0	2
			1995	9	11	1	1	0	0	3
Kingston	23	53.0	1994	12	9	3	0	0	0	1
			1995	6	12	6	0	0	0	1
Peterborough	19	51.1	1994	22	3	0	0	0	0	0
			1995	14	10	0	1	0	0	0
Total			1994	229	67	17	4	0	0	33
percent			1994	71.6	20.9	5.3	1.2	0.0	0.0	9.4
Total			1995	179	108	15	8	2	0	38
percent			1995	56.5	34.1	4.7	2.5	0.6	0.0	10.9

^a 0 = 0–5 percent, 1 = 6–20 percent, 2 = 21–40 percent, 3 = 41–60 percent, 4 = >60 percent, 5 = dead tree.

^b Since plot establishment.

Table 8. Summary of data collected at 15 roadside maple health plots in the Southern Region of Ontario for 1994 and 1995. (Counts are based on the examination of 25 sugar maple trees at each location.)

Location (Township)	Average		Year	Cumulative dieback class						Cumulative number of dead/cut trees ^b
	Height (m)	DBH (cm)		Number of trees						
				0	1	2	3	4	5 ^a	
<i>Aylmer District</i>										
Bayham	20	85.9	1994	25	0	0	0	0	0	0
			1995	21	4	0	0	0	0	0
Windham	23	81.9	1994	14	10	0	1	0	0	0
			1995	14	9	0	2	0	0	0
<i>Cambridge District</i>										
Goderich	19	72.4	1994	5	3	3	1	0	0	13
			1995	4	5	2	0	0	0	14
North Easthope	18	69.2	1994	6	2	1	6	2	0	8
			1995	3	3	3	6	2	0	8
<i>Kemptville District</i>										
Edwardsburgh	21	47.0	1994	18	5	0	0	0	0	2
			1995	19	2	0	0	0	0	4
North Elmsley	22	68.0	1994	17	3	0	0	0	0	5
			1995	14	6	0	0	0	0	5
<i>Maple District</i>										
Chinguacousy	18	70.9	1994	8	6	2	3	4	1	2
			1995	5	8	1	4	1	0	6
Clarke	15	72.9	1994	8	6	8	1	0	1	2
			1995	4	8	9	2	0	0	2
<i>Midhurst District</i>										
Mono	18	54.0	1994	5	6	2	3	3	0	6
			1995	3	8	0	6	2	0	6
Sullivan	20	84.4	1994	11	10	2	0	0	0	2
			1995	11	10	2	0	0	0	2
West Gwillimbury	15	69.9	1994	7	12	4	0	2	0	0
			1995	7	9	5	2	0	2	2
<i>Tweed District</i>										
Fenelon	14	57.3	1994	6	13	3	1	0	0	2
			1995	3	12	6	2	0	0	2
Hallowell	26	59.0	1994	11	10	3	0	0	0	1
			1995	11	8	5	0	0	0	1
Hillier	19	67.0	1994	4	13	0	0	3	0	5
			1995	0	14	3	0	2	0	6
Loughborough	22	70.0	1994	10	12	3	0	0	0	0
			1995	5	14	3	0	0	1	3
Total percent			1994	155	111	31	16	14	1	48
			1994	45.9	32.8	9.2	4.7	4.1	0.3	12.8
Total percent			1995	124	120	39	24	7	3	61
			1995	37.9	36.7	11.9	7.3	2.1	0.9	16.3

^a 0 = 0–5 percent, 1 = 6–20 percent, 2 = 21–40 percent, 3 = 41–60 percent, 4 = >60 percent, 5 = dead tree.

^b Since plot establishment.

Table 9. Summary of the yearly trend in maple health at 26 woodlot, 14 urban and 15 roadside plots in the Southern Region of Ontario from 1987 to 1995. (Counts based on the examination of 25 sugar maple trees are in each location.)

Plot Type	Years	Number of trees	Yearly trend (% of trees)			Cut/windfall trees (%)
			Improved	Static	Declined ^a	
Woodlot ^b	1987-1988	500	1.6	91.0	7.2	0.2
	1988-1989	548	2.2	83.2	13.9	0.7
	1989-1990	543	3.3	89.0	7.7	0.0
	1990-1991	613	11.6	82.0	5.7	0.6
	1991-1992	631	14.1	80.2	5.5	0.2
	1992-1993	628	5.4	91.9	2.1	0.6
	1993-1994	623	5.5	92.5	2.1	0.0
	1994-1995	623	2.7	88.8	7.7	0.8
Urban	1989-1990	274	8.0	73.4	15.7	2.9
	1990-1991	341	15.8	72.1	9.9	2.0
	1991-1992	334	23.6	62.6	11.1	2.7
	1992-1993	325	14.5	78.1	6.1	1.2
	1993-1994	319	8.8	79.6	10.7	0.9
	1994-1995	317	4.7	71.0	22.7	1.6
Roadside	1989-1990	299	7.4	71.9	19.4	1.3
	1990-1991	365	18.9	64.4	13.7	3.0
	1991-1992	353	23.5	64.0	11.6	0.8
	1992-1993	350	12.0	73.4	11.4	3.1
	1993-1994	338	8.0	74.3	14.8	2.9
	1994-1995	327	4.6	71.3	21.1	3.1

^a Declined category includes current mortality.

^b Excludes the four plots established in Keppel Township, Midhurst District.

Township the damage was caused by the maple leafcutter, the maple trumpet skeletonizer (*Epinotia aceriella* [Clem.]), and the maple webworm.

The sugar maple borer (*Glycobius speciosus* [Say]) was found on 1.3 percent of the trees in the woodlot plots, on 0.3 percent of the trees in the roadside plots, and on 0.3 percent of the trees in the urban plots.

During the course of the survey, any fruiting of fungi that was observed on the main stem of the plot trees was collected for identification. Occurrences of fruiting fungi were 41.3 percent on the roadside plots, 33.4 percent on the urban plots, and 10.9 percent on the woodlot plots.

The stem disease *Eutypella* canker (*Eutypella parasitica* R.W. Davidson & R.C. Lorenz) was found on 0.8 percent of the trees in the woodlot plots, on 0.3 percent of the trees in the roadside plots, and on 1.3 percent of the trees in the urban plots.

North American Maple Project (NAMP)

In 1988 a major project was established, involving four Canadian provinces and seven American states, to

annually monitor the crown conditions of sugar maple trees and to determine any possible causes of decline. To this effect, 16 plots (totaling 778 trees) were set up across the Southern Region of Ontario.

All of the stands within which the plots are located are actively managed. Half are tapped annually for the production of maple syrup; the remainder are in untapped woodlots. Different management techniques exist throughout the plots and impact upon the data. In a woodlot that is managed for maple syrup production, trees with high levels of dieback are generally removed, whereas in a woodlot managed for sawlogs, the healthy, dominant trees are removed. Therefore, woodlots managed for maple syrup production may appear healthier than those under other management techniques.

During 1995, a total of 382 trees was evaluated in the eight nontapped sugar maple woodlots. The overall condition of the majority of the trees was very healthy, with a slight improvement from that recorded in 1994. The percentage of trees considered to be very healthy, with <5 percent dieback, was 93.5 percent. This compared with 89.6 percent in 1994. There was a slight decrease

(5.5 percent) in 1995 in the percentage of trees considered to be healthy (6–25 percent dieback) compared to 9.1 percent recorded in 1994. No trees were recorded in the more severe categories of decline (>46 percent) in 1995. One new dead tree was recorded in 1995. A noticeable improvement was evident in Blandford Township, Aylmer District; in Rear of Yonge and Escott Township, Kemptville District; and in Hallowell Township, Tweed District. The largest increase in dieback occurred in the plot in Adjala Township, Midhurst District (Table 10).

In the eight tapped woodlots, 369 trees were evaluated and, as in the nontapped plots, the majority of the trees were considered very healthy (<5 percent dieback). There was an increase in the percentage of trees recorded in this class. In 1994, 85.8 percent of the trees were in this

category and 12.4 percent were in the healthy class (6–25 percent). In 1995, 90 percent of the trees showed <5 percent dieback; 8.4 percent were in the 6–25 percent dieback class. There was virtually no change in the more severe categories (Table 11). No new dead trees were recorded this year.

Two plots showed marked increases in the percentage of trees that were considered to be very healthy. In Goderich Township, Cambridge District, evaluation revealed that the percentage of trees in the 0–5 percent dieback category rose to 100 percent compared with 81.5 percent in 1994. In Belmont Township in the Tweed District, 84 percent of the trees were considered very healthy in 1995. This figure compared to 69.2 percent in 1994.

Table 10. Summary of crown conditions of sugar maples at eight North American Maple Project plots not tapped for maple syrup production in the Southern Region of Ontario for 1994 and 1995.

Location (Township)	DBH (cm)	Year	Number of trees examined	Dieback classes Number of trees					Annual number of dead trees	Annual number of cut trees
				0-5	6-25	26-45	46-65	>65		
<i>Aylmer District</i>										
Blandford	29.6	1994	42	38	4	0	0	0	0	0
		1995	42	42	0	0	0	0	0	0
Warwick	26.5	1994	42	39	3	0	0	0	0	0
		1995	42	41	1	0	0	0	0	0
<i>Cambridge District</i>										
West Wawanosh	29.9	1994	37	34	2	0	0	1	0	0
		1995	37	37	0	0	0	0	0	0
<i>Kemptville District</i>										
Rear of Yonge and Escott	19.1	1994	62	54	7	0	0	0	1	0
		1995	61	59	2	0	0	0	0	0
<i>Maple District</i>										
Nassagaweya	30.0	1994	47	43	4	0	0	0	0	0
		1995	47	45	2	0	0	0	0	0
<i>Midhurst District</i>										
Adjala	30.4	1994	60	56	1	1	1	0	1	0
		1995	59	52	5	0	0	0	2	0
Oro	23.5	1994	64	58	6	0	0	0	0	0
		1995	64	56	7	1	0	0	0	0
<i>Tweed District</i>										
Hallowell	33.0	1994	30	22	8	0	0	0	0	0
		1995	30	25	4	0	0	0	1	0
Total percent		1994	384	344	35	1	1	1	2	0
		1994	100	89.6	9.1	0.3	0.3	0.3	0.5	0.0
Total percent		1995	382	357	21	1	0	0	1	2
		1995	100	93.5	5.5	0.3	0	0	0.3	0.5

Trace levels of defoliation caused by various pests were recorded in 13 of the 16 plots. The maple trumpet skeletonizer was by far the most common pest encountered. Open defoliators, leafrollers, leafminers, and skeletonizers were also observed on many of the plots. The highest level of defoliation was recorded in South Burgess Township, Kemptville District and in Hallowell Township, Tweed District. Here, maple trumpet skeletonizer caused an average of 15 percent foliar damage. The maple webworm was detected at trace levels in four districts in the western half of the region. Seed production was virtually nil across all of the plots.

During evaluation, numerous disease fruiting structures were recorded on the main stems of the trees in two plots, in Blandford Township, Aylmer District and in Saugeen Township, Midhurst District.

Oak Health

The ten permanent oak plots in the region are monitored annually to determine the current level of crown conditions, foliar pest damage, stem defects, and abiotic damage. In 1995 this was reduced by one plot after the plot in Uxbridge Township, Maple District, was cut. Each plot consists of 100 mature or semimature oak trees. Overall assessment for 1995 indicated that the majority of the trees, 90.1 percent, were healthy and had <20 percent crown dieback. Only 6.9 percent were considered to have moderate levels of dieback and just 0.9 percent sustained >61 percent crown dieback. The current, annual whole-tree mortality rate averaged 1.9 percent across the entire study area. In most circumstances, the trees that died in 1994 and 1995 had been in a severe state of deterioration

Table 11. Summary of crown conditions of sugar maples at eight North American Maple Project plots currently tapped for maple syrup production in the Southern Region of Ontario for 1994 and 1995.

Location (Township)	DBH (cm)	Year	Number of trees examined	Dieback classes Number of trees					Annual number of dead trees	Annual number of cut trees
				0-5	6-25	26-45	46-65	>65		
<i>Aylmer District</i>										
Bayham	73.5	1994	40	35	4	1	0	0	0	0
		1995	40	35	3	2	0	0	0	0
Townsend	41.1	1994	30	24	4	0	0	1	1	0
		1995	29	23	5	0	0	1	0	0
<i>Cambridge District</i>										
Goderich	32.3	1994	60	55	5	0	0	0	0	0
		1995	60	60	0	0	0	0	0	0
<i>Kemptville District</i>										
South Burgess	38.4	1994	42	36	5	1	0	0	0	0
		1995	42	38	3	0	0	0	0	0
<i>Maple District</i>										
Vaughan	30.8	1994	56	55	1	0	0	0	0	0
		1995	56	53	3	0	0	0	0	0
<i>Midhurst District</i>										
Orillia	36.7	1994	54	44	10	0	0	0	0	0
		1995	54	48	6	0	0	0	0	0
Saugeen	30.8	1994	38	34	3	1	0	0	0	0
		1995	38	33	4	1	0	0	0	0
<i>Tweed District</i>										
Belmont	26.6	1994	52	36	14	0	0	0	2	0
		1995	50	42	7	1	0	0	0	0
Total percent		1994	372	319	46	3	0	1	1	2
		1994	100	85.8	12.4	0.8	0.0	0.3	0.3	0.5
Total percent		1995	369	332	31	4	0	2	0	0
		1995	100	90.0	8.4	1.1	0.0	0.5	0.0	0.0

since 1992. Complete results of the annual crown conditions in 1994 and 1995 are presented in Table 12.

Table 13 summarizes the yearly trend in crown conditions for the trees on the nine healthy oak plots. After the continual improvement in crown conditions reported from 1991 to 1994, a slight decrease occurred in 1995.

The average defoliation level ranged from a low of 0.0 percent in Clarke Township, Maple District, to a high of 8.5 percent in Lavant Township, Kemptville District. Stem decay and stem-boring insects were recorded on 6.0 and 0.1 percent of the trees, respectively.

Acid Rain National Early Warning System (ARNEWS)

Eight ARNEWS plots are evaluated annually across the region. These are part of a nationwide program that monitors the effects of airborne pollutants on forest trees. The evaluation process also includes all biotic and abiotic conditions. Because this was the fifth year of the 5-year assessment period, much more of this field season was allotted to the study. Every conceivable aspect of tree growth and vigor was assessed, including the collection of three soil horizons, wood, bark, and foliage for analysis.

Table 12. Summary of data collected at nine oak health plots in the Southern Region of Ontario in 1994 and 1995. (Counts are based on an examination of 100 oak trees at each location since 1977.)

Location (Township)	Average height (m)	DBH (cm)	Year	Dieback classes Number of trees ^a						Cumulative number of dead/cut trees ^b
				0	1	2	3	4	5	
<i>Aylmer District</i>										
Bosanquet	16.6	29.0	1994	50	25	2	0	2	5	21
			1995	50	21	1	2	1	4	25
Charlotteville	20.1	32.0	1994	57	33	0	0	1	1	9
			1995	42	36	8	0	1	3	13
South Walsingham	17.0	22.0	1994	62	15	0	0	0	0	23
			1995	59	17	1	0	0	0	23
<i>Kemptville District</i>										
Lavant - Flower Station	13.6	20.6	1994	3	54	8	3	1	2	31
			1995	7	49	9	1	1	2	33
Lavant - Joe Lake	12.5	25.5	1994	1	56	18	4	3	0	18
			1995	3	56	15	4	1	3	21
<i>Maple District</i>										
Clarke	20.6	24.5	1994	62	19	0	1	0	0	18
			1995	49	30	1	0	1	1	19
<i>Midhurst District</i>										
Mulmur	21.0	28.8	1994	58	22	2	0	0	1	18
			1995	58	23	1	0	0	0	18
Tiny - Awenda Provincial Park	22.1	28.5	1994	55	10	0	1	1	0	33
			1995	51	15	1	0	0	0	33
Tiny - Farlain Lake	22.0	26.0	1994	42	8	2	1	1	2	46
			1995	42	7	3	0	1	0	47
Total percent			1994	390	242	32	10	9	11	217
			1994	56.2	34.9	4.6	1.4	1.3	1.6	24.1
Total percent			1995	361	254	40	7	6	13	232
			1995	52.9	37.2	5.9	1.0	0.9	1.9	25.8

^a 0 = 0–5 percent, 1 = 6–20 percent, 2 = 21–40 percent, 3 = 41–60 percent, 4 = 61–100 percent, 5 = dead tree.

^b Cumulative total from 1977 (based on the original 100 trees per plot).

Table 13. Summary of the yearly trend in oak health at nine oak plots in the Southern Region of Ontario from 1984 to 1995. (Counts are based on the examination of 100 oak trees at each location.)

Years	Yearly trend (% of trees)			Number of newly cut trees per year
	Improved	Static	Declined ^a	
1984-1985	25.9	67.3	6.7	1
1985-1986	38.8	55.0	5.8	3
1986-1987	19.7	73.7	6.6	0
1987-1988	10.4	74.8	14.8	0
1988-1989	8.8	58.0	33.3	0
1989-1990	7.4	65.7	26.9	0
1990-1991	24.5	59.0	16.3	1
1991-1992	18.6	59.5	21.9	0
1992-1993	33.1	58.0	8.8	1
1993-1994	14.7	78.5	6.8	0
1994-1995	10.0	73.5	16.3	2

^a Declined category includes current mortality.

Sugar maple stands are monitored in Howard Township, Aylmer District; in West Wawanosh Township, Cambridge District; in Rear of Younge and Escott Township, Kemptville District; and in Oro Township, Midhurst District. Eastern white pine plantations are monitored in Erin Township, Cambridge District and in Hungerford Township, Tweed District. A white spruce plantation in Gloucester Township, Kemptville District and a mixed red oak and black oak (*Quercus velutina* Lam.) stand in South Walsingham Township, Aylmer District, are also monitored.

To date, no visible damage caused by airborne pollutants has been recorded on any of the plot trees. Pest damage varies annually. As such, a summary of the most significant pest damage encountered in 1995 is provided below.

The eastern spruce budworm continued to cause moderate to severe defoliation on 100 percent of the trees in the Gloucester Township plot. Populations are forecasted to recur at the same intensity in 1996, and add to the overall decline of this plot. In the Oro and West Wawanosh township plots, the maple trumpet skeletonizer was recorded on 100 percent of the trees at a trace damage level. The maple webworm was recorded on all of the trees in West Wawanosh and Howard township plots. The pine bark adelgid (*Pineus strobi* [Hartig]) was recorded on 100 percent of the trees at trace damage levels in the plot in Hungerford Township. In West Wawanosh Township, 7.7 percent of the trees have eutypella canker (*Eutypella parasitica* R.W. Davidson & R.C. Lorenz).

SPECIAL SURVEYS

Gypsy Moth

A special adult pheromone trapping program was conducted at eight locations in southern Ontario in 1995 in cooperation with the Plant Health Risk Assessment Unit of Agriculture Canada, Food Production and Inspection Branch, Animal and Plant Health Directorate. The objective was to collect a representative sample of gypsy moth from infested areas that had a high or low probability of having introduced Asian biotypes so as to compare the prevalence of genetic markers. Areas of high probability included harbors and

military bases; low probability areas included sites well removed from such areas. The collection was also to be used in conjunction with specimens previously sampled in Europe and Asia so as to evaluate whether newly developed genetic markers can be used as diagnostic tools to distinguish biotypes.

In the Southern Region one high probability area, at CFB Trenton, and one low probability area, east of the town of Perth, were systematically trapped. Personnel from the Plant Health Risk Assessment Unit conducted the trapping program at CFB Trenton and personnel from the Forest Insect and Disease Survey Unit of the Canadian Forest Service conducted the program at the site east of the town of Perth. At these sites a 40-km X 30-km trap grid was selected. The intertrap distance within the grid was 5 km. This gave a total of 63 traps per grid. The cardboard traps, which consist of a sticky inside surface and attached pheromone lure, were set out on 12 July and collected on 6 September. One visit to the traps was scheduled during the season. If the traps were water-soaked, moldy, or lost, they were replaced.

A total of 61 traps was finally recovered from the Perth location. On average, 20 adult male moths were caught per trap. The relationship between the number of moths caught in these traps and the size of the population in an area is often weak, and should not be used to determine present or forecasted infestation levels. However, research is improving the accuracy of such predictions.

At the time of the writing of this report, results of the genetic marker testing were not available. They will be presented at a later date.

Forest Tree Nursery Reports

There are three OMNR nurseries in the Southern Region: the G. Howard Ferguson Forest Tree Nursery in the Kemptville District, the Orono Forest Tree Nursery in the Maple District, and the St. Williams Forest Tree Nursery in the Aylmer District. The following is a summary of pest data collected from these nurseries during the 1995 field season.

G. Howard Ferguson Forest Tree Nursery

Six routine inspections were completed at this provincial forest nursery in 1995. The eastern spruce budworm continues to be a problem in a 2-ha white spruce plantation in the forested tract at the nursery. Moderate to severe defoliation occurred this season on the 17-m-tall trees but an egg-mass sample, used to forecast possible defoliation levels in 1996, indicated a decline in populations with only light to moderate damage predicted.

Low population levels of the pine false webworm infested 2 percent of the 1-m-tall eastern white pine in Compartment 61, and trace numbers of gypsy moth larvae caused 2 percent defoliation on potted eastern white pine, butternut, sugar maple, tamarack, and white spruce stock in three separate greenhouses. The rusty tussock moth (*Orgyia antiqua nova* Fitch) also caused low levels of defoliation on potted eastern white pine, butternut, and sugar maple stock in the greenhouses. The European pine sawfly (*Neodiprion sertifer* [Geoff.]) caused 25 percent defoliation on approximately 8 percent of the 3-0 red pine in Compartment 16. Repeated heavy infestation of the spruce spider mite (*Oligonychus ununguis* [Jac.]) has resulted in whole-branch mortality on several 15-m-tall white spruce windbreak trees. Two of these trees have died as a result of the impact of the heavy branch mortality levels. Trace population levels of the pine bark adelgid (*Pineus strobi* [Htg.]) affected 1 percent of the rising 2-0 eastern white pine in Compartment C1. The white pine weevil caused trace damage levels to the leaders of juvenile white spruce and eastern white pine windbreak trees throughout the nursery.

As a result of very little snow cover in the winter and early spring of 1995, winter drying caused 60 percent mortality in the rising 2-0 eastern white cedar in Compartments 2 and 4 and 1 percent damage in the white spruce in Compartment 35. A nutrient deficiency resulted in the browning of 1 percent of the rising 2-0 eastern white pine seedlings in Compartment C1, and the severe wind storm that occurred on 14 July resulted in numerous windbreak and ornamental trees being toppled throughout the nursery.

Orono Forest Tree Nursery

Five routine inspections and one unscheduled visit were completed at the Orono nursery in 1995. The eastern spruce budworm caused severe defoliation, averaging 85 percent, throughout the 7-ha, 13-m-tall white spruce seed orchard. An egg-mass sample, used to forecast possible defoliation levels, indicated that severe defoliation will recur in 1996. The pine spittlebug (*Aphrophora cribrata* [Wlk.]), which infested 100 percent of the trees, averaged 20 spittle masses per tree in the 7-ha, 9-m-tall eastern white pine seed orchard. The fruittree leafroller (*Archips argyrospila* [Wlk.]) and the aspen leafblotch miner (*Phyllonorycter ontario* [Free.]) each caused 2 percent defoliation in the 2-m-tall hybrid poplar in Compartment T22. Trace populations of the obliquebanded leafroller (*Choristoneura rosaceana* [Harr.]) caused less than 1 percent defoliation on the red pine seedlings in Greenhouse Number 2. The European alder leafminer (*Fenusa dohrnii* [Tisch.]) caused an estimated 75 percent defoliation on 75 percent of the 8-m-tall European black alder (*Alnus glutinosa* (L.) Gaertn.) in Compartment S50. The fall webworm was commonly encountered and caused an average of 10 percent defoliation on various hardwood tree species throughout the nursery. However, this webworm caused 60 percent defoliation on 15-m-tall butternut and black cherry (*Prunus serotina* Ehrh.) trees growing along the edge of Compartment H18. For the second consecutive year the cranberry leaf beetle (*Pyrrhalta viburni* [Paykull]) caused severe defoliation to the highbush-cranberry (*Viburnum trilobum* Marsh.) in Compartment S34.

A 3-ha, 15-m-tall red pine seed orchard and a 2-ha, 8-m-tall red pine plantation were surveyed, with negative results, for any evidence of the European race of Scleroderris canker. A poplar leaf rust, *Marssonina tremulae* (Lib.) Kleb., caused 20 percent defoliation on 100 percent of the 2-m-tall hybrid poplar in Compartment T22, and the aspen shoot blight (*Venturia macularis* [Fr.:Fr.] E. Müll. & Arx) affected 5 percent of the leaders of these hybrid poplars. One hundred percent of the highbush-cranberry seedlings in Compartment S11 sustained 75 percent defoliation as a result of downy mildew (*Plasmopara viburni* Peck).

St. Williams Forest Tree Nursery

Due to illness no routine surveys were conducted at this nursery in 1995 by the District Forest Insect and Disease Survey Ranger assigned to that portion of the region.

Climatic Data

The FIDS Unit maintains daily and monthly averages of weather conditions for numerous locations throughout the province because seasonal variations and sudden and extreme changes in normal weather patterns can have a direct effect on the occurrence of both biotic and abiotic conditions. Data is also compiled to permit accurate

predictions of the emergence of overwintering larvae of some of the major forest pests. Table 14 summarizes the weather data for 1995 provided by Atmospheric Environment Service weather offices in the Southern Region of Ontario. The "normals" quoted were taken directly from the Canadian Climate Normals for Ontario from 1951 to 1980.

Table 14. A summary of temperatures and precipitation in 1995 at seven locations in the Southern Region of Ontario, and deviations from the 30-year norm.

Location	Month	Mean temperature (C°)		Deviation from normal (C°)	Total precipitation (mm)		Deviation from normal (mm)
		Normal	Actual		Normal	Actual	
Blyth	January	-7.9	-3.7	+4.2	105.8	146.8	+41.0
	February	-8.2	-8.4	-0.2	67.2	141.0	+73.8
	March	-2.8	0.6	+3.4	62.7	59.5	-3.2
	April	5.1	2.8	-2.3	71.9	104.5	+32.6
	May	11.8	11.6	-0.2	73.7	58.0	-15.7
	June	17.0	20.1	+3.1	75.0	179.5	+104.5
	July	19.7	21.7	+2.0	76.6	106.5	+29.9
	August	18.8	22.0	+1.6	96.3	130.0	+33.7
	September	15.1	13.8	-1.3	88.4	34.5	-53.9
	October	8.7	10.5	+1.8	90.3	143.0	+52.7
	November	2.5	-0.4	+1.5	101.4	243.7	+142.3
	December	-4.3	-6.9	-1.3	116.2	185.4	+68.2
Delhi	January	-6.0	-2.1	+3.9	68.8	140.4	+71.6
	February	-5.4	-6.5	-1.1	56.8	28.2	-28.6
	March	-0.3	2.3	+2.6	84.4	43.9	-40.5
	April	6.7	4.8	-1.9	93.6	75.0	-18.6
	May	12.8	13.3	+0.5	73.7	78.9	+5.2
	June	17.0	20.5	+3.5	75.0	58.4	-16.6
	July	20.7	22.2	+1.5	76.6	57.7	-18.9
	August	19.8	22.5	+2.7	96.3	79.3	-17.0
	September	15.9	14.9	-1.0	88.4	39.4	-49.0
	October	9.9	11.3	+1.4	90.3	188.3	+98.0
	November	3.7	1.3	+1.2	101.4	141.3	+39.9
	December	-2.9	-4.5	-1.6	116.2	34.6	-81.6
Lester B. Pearson International Airport	January	-6.7	-3.1	+3.6	50.4	133.3	+82.9
	February	-6.1	-7.3	-1.2	46.0	20.8	-25.2
	March	-1.0	1.9	+2.9	61.1	50.8	-10.3
	April	6.2	4.1	-2.1	70.0	76.6	+6.6
	May	12.3	13.3	+1.0	66.0	84.0	+18.0
	June	17.7	19.9	+2.2	67.1	52.5	-14.6
	July	20.6	21.9	+1.3	71.4	55.4	-16.0
	August	19.7	21.8	+2.1	76.8	135.4	+58.6
	September	15.5	14.0	-1.5	63.5	27.5	-36.0
	October	9.3	11.0	+1.7	61.8	131.8	+70.0
	November	3.3	1.0	-2.3	62.7	121.6	+58.9
	December	-3.5	-5.1	-1.6	64.7	35.8	-28.9

(cont'd)

Table 14. A summary of temperatures and precipitation in 1995 at seven locations in the Southern Region of Ontario, and deviations from the 30-year norm. (concl.)

Location	Month	Mean temperature (C°)		Deviation from normal (C°)	Total precipitation (mm)		Deviation from normal (mm)
		Normal	Actual		Normal	Actual	
London	January	-6.6	-3.3	+3.3	75.2	108.1	+32.9
	February	-6.1	-7.6	-1.5	60.5	50.6	-9.9
	March	-0.9	1.3	+2.2	75.1	63.4	-11.7
	April	6.4	4.5	-1.9	81.2	110.0	+28.8
	May	12.4	13.0	+0.6	66.9	104.4	+37.5
	June	17.9	20.1	+2.2	73.6	99.3	+25.7
	July	20.3	21.3	+1.0	72.4	31.6	-40.8
	August	19.5	21.7	+2.2	80.3	65.6	-14.7
	September	15.4	14.2	-1.2	78.6	34.2	-44.4
	October	9.4	10.6	+1.2	73.4	110.4	+37.0
	November	3.1	0.6	-2.5	84.7	137.1	+52.4
	December	-3.5	-5.4	-1.9	87.5	45.4	-42.1
Ottawa International Airport	January	-7.6	-7.0	+0.6	61.0	146.0	+85.0
	February	-9.5	-10.4	-0.9	60.3	30.1	-30.2
	March	-3.0	0.7	+3.7	67.5	29.9	-37.6
	April	5.6	3.5	-2.1	69.1	40.2	-28.9
	May	12.8	13.4	+0.6	67.5	74.0	+6.5
	June	18.0	20.2	+2.2	73.4	100.6	+27.2
	July	20.6	21.8	+1.2	85.9	111.2	+25.3
	August	19.2	20.3	+0.5	88.4	77.8	-10.6
	September	14.3	12.8	-1.5	79.3	58.3	-21.0
	October	8.1	10.4	+2.3	68.1	188.8	+120.7
	November	1.2	-2.4	-3.6	86.1	102.3	+16.2
	December	-7.7	-9.5	-1.8	82.9	61.6	-21.3
Peterborough Airport	January	-9.3	-5.6	+3.7	44.1	133.2	+89.1
	February	-8.5	-9.9	-1.4	48.9	23.0	-25.9
	March	-2.5	0.7	+3.2	62.9	33.0	-29.9
	April	6.0	3.5	-2.5	71.8	60.0	-11.8
	May	12.1	12.1	0.0	57.1	106.6	+49.5
	June	16.8	18.3	+1.5	60.4	52.6	-7.8
	July	19.2	19.5	+0.3	77.9	94.0	+16.1
	August	18.1	19.4	+1.3	74.2	118.4	+44.2
	September	14.0	11.7	-2.3	72.9	55.6	-17.3
	October	7.9	9.0	+1.1	59.9	183.6	+123.7
	November	2.1	-1.3	-3.4	69.4	166.4	+97.0
	December	-6.0	-8.3	-2.4	74.3	41.8	-32.5
Trenton	January	-7.6	-4.3	+3.3	68.9	116.7	+47.8
	February	-6.5	-8.3	-1.8	57.0	29.5	-27.5
	March	-1.0	1.7	+2.7	72.0	32.0	-40.0
	April	6.4	4.0	-2.4	76.1	68.2	-7.9
	May	12.5	12.6	+0.1	73.0	73.2	+0.2
	June	17.8	19.7	+1.9	63.7	8.4	-55.3
	July	20.6	21.0	+0.4	60.9	85.6	+24.7
	August	19.7	20.5	+0.8	71.9	115.3	+43.4
	September	15.3	13.0	-2.3	72.8	66.3	-6.5
	October	9.2	10.2	+1.0	70.1	201.4	+131.3
	November	3.2	0.2	-3.0	86.1	140.0	+53.9
	December	4.5	-6.4	-10.9	82.9	38.8	-44.1