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

(FOREST DISTRICTS: NAPANEE, TWEED, CARLETON PLACE, CORNWALL AND BROCKVILLE)

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GREAT LAKES FOREST RESEARCH CENTRE

CANADIAN FORESTRY SERVICE

GOVERNMENT OF CANADA

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SURVEY HIGHLIGHTS

This report describes the results of surveys carried out in the Eastern Region of Ontario by the Forest Insect and Disease Survey Unit in 1984.

Gypsy moth populations and defoliated areas continued to expand in 1984 with many smaller pockets joining to increase the main infestation around Kaladar. Two new large areas of infestation were detected: one in the Mount Moriah area, Tweed District and the other in the Devil's Lake-Birch Lake area, Napanee District. Sawflies continued to cause damage in the Region, particularly the redheaded pine sawfly, and in Brockville District the jack pine sawfly. Both sawflies have had control measures taken against them in the past but still caused appreciable damage at some locations. Pine false webworm has been on the increase in the Region and in 1984 controls against this insect were carried out in a 35-ha Scots pine plantation in Oxford (on Rideau) Township, Brockville District. Maples across the work area again suffered damage by the maple trumpet skeletonizer and maple leafcutter.

Scleroderris canker was again the object of a survey with aerial and ground observations, but so far no evidence has been detected in the Region. Fomes root rot, however, remains active in both Limerick and LaRose forests and is being closely monitored for spread.

Winter drying of foliage following the warm period in February was responsible for considerable browning of pine and spruce foliage in more open windswept areas and on the exposed edges of stands.

As expected, the drought in the summer of 1983 caused leaf dwarfing and branch mortality at many locations in the mapped area of drought damage described in last year's report.

Special surveys were carried out in spruce stands in the Region and spruce cones were sampled for detection of damage to seeds by insect or disease organisms. Work was done to further evaluate this damage in the red pine seed production area at Lemieux in Cornwall District.

Extremely heavy seed crops occurred in the Region, in many cases at the expense of larger, healthy foliage. This may cause some decline in crowns in the 1985 growing season.

A permanent acid rain sample plot was established in Brockville District as part of the Acid Rain National Early Warning System established in 1984 across Canada by the Canadian Forestry Service. These plots are to be monitored annually by the various Forest Insect and Disease Units in the different regions of Canada.

Frontispiece

Gypsy moth, *Lymantria dispar* L., just hatching from egg masses at base of red oak (*Quercus rubra* L.) tree on 14 May, 1984

Severe defoliation of hardwood trees on rocky ridges south of Kaladar

As in previous years, pests in this report are categorized as follows:

Major Insects or Diseases

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

Minor Insects or Diseases

capable of 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 which are of minor importance and have not been known to cause serious damage to forest trees,

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

The author would like to express his appreciation to the personnel of the Ontario Ministry of Natural Resources and Parks Canada in the Eastern Region for their continuing support and assistance in carrying out these surveys over the past summer.

W.A. Ingram

TABLE OF CONTENTS

(continued)

TABLE OF CONTENTS (continued)

(continued)

TABLE OF CONTENTS (concluded)

INSECTS

Major Insects

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

A marked increase in population levels was recorded in 1984. Red pine (*Pinus resinosa* Ait.) plantations 3 to 4 m in height appeared to suffer the heaviest damage.

Plantations throughout Oxford (on Rideau) and South Gower townships, Brockville District and in Marlborough Township, Carleton Place District have shown marked increases in population levels for the past two years.

There were high population levels in a 35-ha plantation of Scots pine (*P. sylvestris* L.) Christmas trees in Oxford (on Rideau) Township, Brockville District, where control measures had to be undertaken to insure a harvest this year. Satisfactory control was achieved with the insecticide Sevin when applied with an orchard sprayer on 25 June. Subsequent ground checks in the spray area revealed that complete larval mortality occurred within days of the application.

Numerous single or small clumps of trees suffered 60-80% defoliation throughout the Brockville, Carleton Place and Napanee districts.

Cedar Leafminer Complex, *Argyresthia thuiella* (Pack.) and *Pulicalvaria thujaella* (Kft.)

Eastern white cedar (*Thuja occidentalis* L.) was again defoliated by this insect in the extreme southwestern corner of the Napanee District. However, this year the degree of defoliation was greatly reduced from that of the previous year and in most cases was confined to individual trees within larger stands.

Heavy populations were recorded on cedar windbreaks in the G. Howard Ferguson Forest Station in the Brockville District, and necessitated control measures in early June. Due to the complex life cycle of this leafminer, the windbreaks were sprayed again in mid-September, with the insecticide, Cygon 2E, applied with an orchard sprayer. The second application resulted in excellent control; no live larvae could be found following the spray.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

A further reduction in the level of defoliation was recorded throughout the Region in 1984. Two small areas of light defoliation persisted in immature white spruce (*Picea glauca* (Moench) Voss) plantations in Cambridge and Clarence townships in LaRose Forest, Cornwall District.

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

Larch Casebearer, *Coleophora laricella* (Hbn.)

Heavy foliar browning of tamarack (*Larix laricina* [Du Roi] K. Koch) was recorded in several areas of the Region where the largest concentrations of host are found.

The heaviest areas of defoliation (80-90%) occurred in the Brockville District, in a 20-ha stand along Highway 6 in Elizabethtown Township, and in a 10-ha stand south of Oxford Station in Augusta Township.

In the remainder of the Region defoliation was confined primarily to the upper crowns of tamarack growing in low, wet areas. In these instances, defoliation ranged from 5 to 15% and the size of the stands ranged from 0.5 to 10 ha.

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

A marked increase in the occurrence and intensity of damage caused by the maple trumpet skeletonizer (see photo page) was recorded across the Region in 1984 (Fig. 1).

Heavy defoliation (75-100%) was recorded at a number of locations in areas of up to 20 ha in size. In the Cornwall District, a 3-ha stand in Alfred Township and a 10-ha stand in Williamsburgh Township suffered heavy defoliation. Similar damage levels occurred in a 12-ha stand in Effingham Township, and a 15-ha stand in Marmora Township, Tweed District. In the Napanee District, a 20-ha stand in Bedford Township was heavily defoliated and a 10-ha stand of sugar maple (*Acer saccharum* Marsh.) in Presqu'ile Provincial Park suffered complete defoliation.

Moderate defoliation levels, between 50 and 75%, were recorded in areas ranging in size from 0.5 to 5 ha in Goulbourn Township, Carleton Place District, Madoc and Marmora townships, Tweed District and in Rawdon Township, Napanee District.

Throughout the remaining portions of the Region all stands with larger concentrations of maple suffered some degree of defoliation.

EASTERN REGION

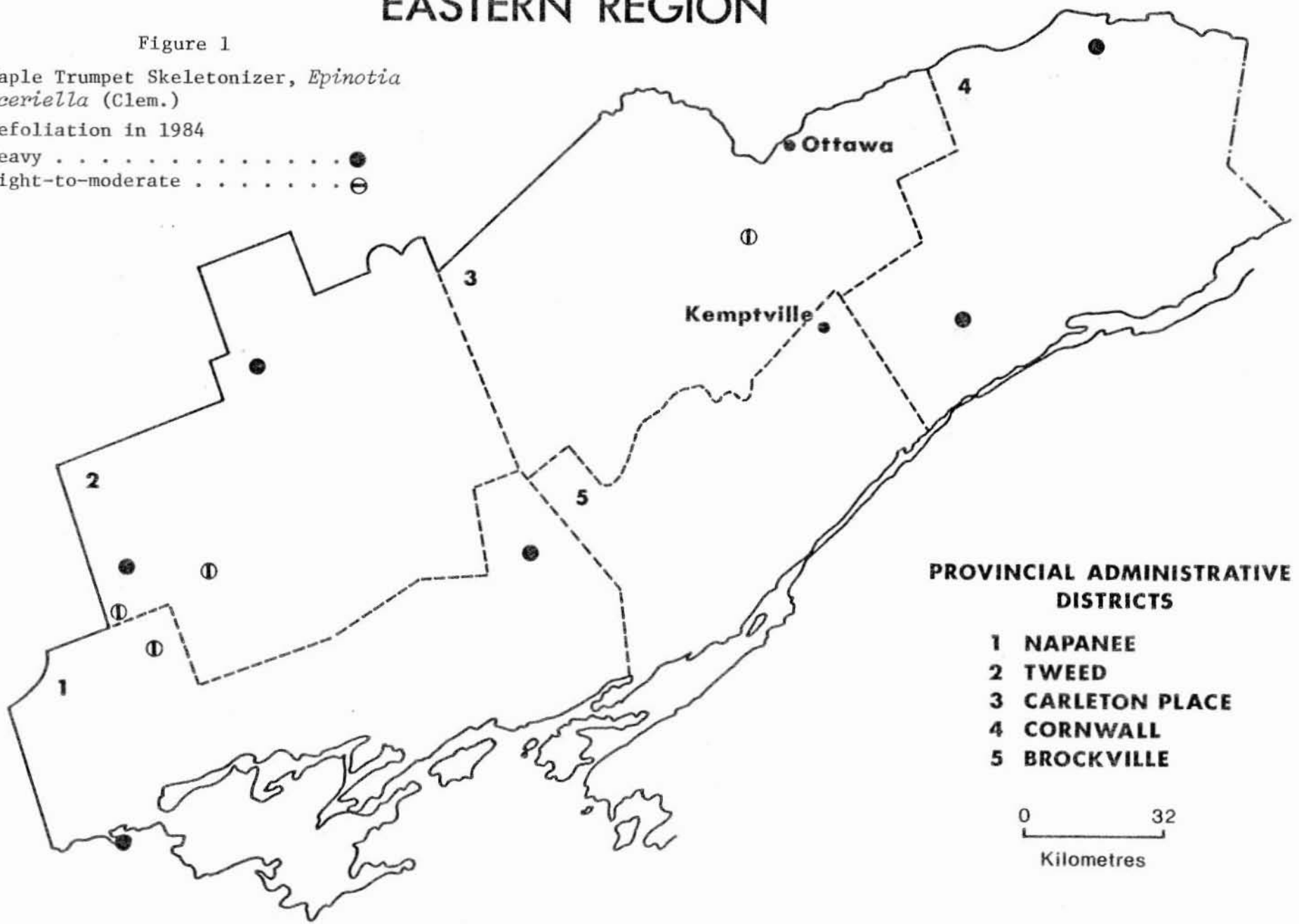
Figure 1

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

Defoliation in 1984

Heavy . . . . . ●

Light-to-moderate . . . . . ⊖



Fall Webworm, *Hyphantria cunea* (Dru.)

A general increase in both population levels and distribution was recorded across the Eastern Region in 1984.

A low-lying area of approximately 40 ha along Highway 10 in Goulbourn Township, Carleton Place District again experienced complete defoliation due to this insect. At this location virtually all black ash (*Fraxinus nigra* Marsh.) and some white elm (*Ulmus americana* L.) were encased with webbing and had little or no foliage remaining by early September.

Severe defoliation was also recorded on the black ash in a 20-ha mixed hardwood stand along Highway 16 in Edwardsburgh Township, Brockville District and in numerous pockets ranging in size from 5 to 25 ha along Highway 7 in Marmora and Elziver townships, Tweed District.

Elsewhere in the Region numerous low-lying areas of ash and elm displayed insect webbing and suffered defoliation ranging from 10 to 60%.

Gypsy Moth, *Lymantria dispar* (L.)

Population levels and areas of defoliation caused by this introduced pest increased in the Region in 1984. From the initial area of 1,000 ha of defoliation in 1981, the area defoliated by this insect increased to 4,800 ha in 1982, 40,950 ha in 1983 and 80,625 in 1984 (Fig. 2a).

The main body of the infestation located in the Kaladar area of the Tweed District increased to 52,120 ha this year with the merging of the numerous pockets recorded throughout Olden, Kennebec, Kaladar, Hungerford, Sheffield and Hinchinbrooke townships. This infestation extends from the village of Sulphide in Hungerford Township eastward to Oak Flats in Hinchinbrooke Township, and from the northern portion of Kaladar, Kennebec and Olden townships south to the town of Erinsville in Sheffield Township. Throughout this area the heaviest defoliation was confined to rocky, exposed ridges where red oak (*Quercus rubra* L.) and sugar maple are the main hosts (Fig. 2b and Frontispiece).

The three areas of defoliation west of the main body in Elzevir and Grimsthorpe townships in the Tweed District that were reported in 1983 merged to encompass an area of 11,347 ha centered on the hydro line just south of Mount Moriah.

Another area of 1,250 ha of defoliation was recorded on higher ground just off the northeast corner of Lingham Lake in Grimsthorpe Township. In the general area of the above infestation pockets of up to 200 ha in size were also recorded in Marmora Township near Jarvis Lake, in

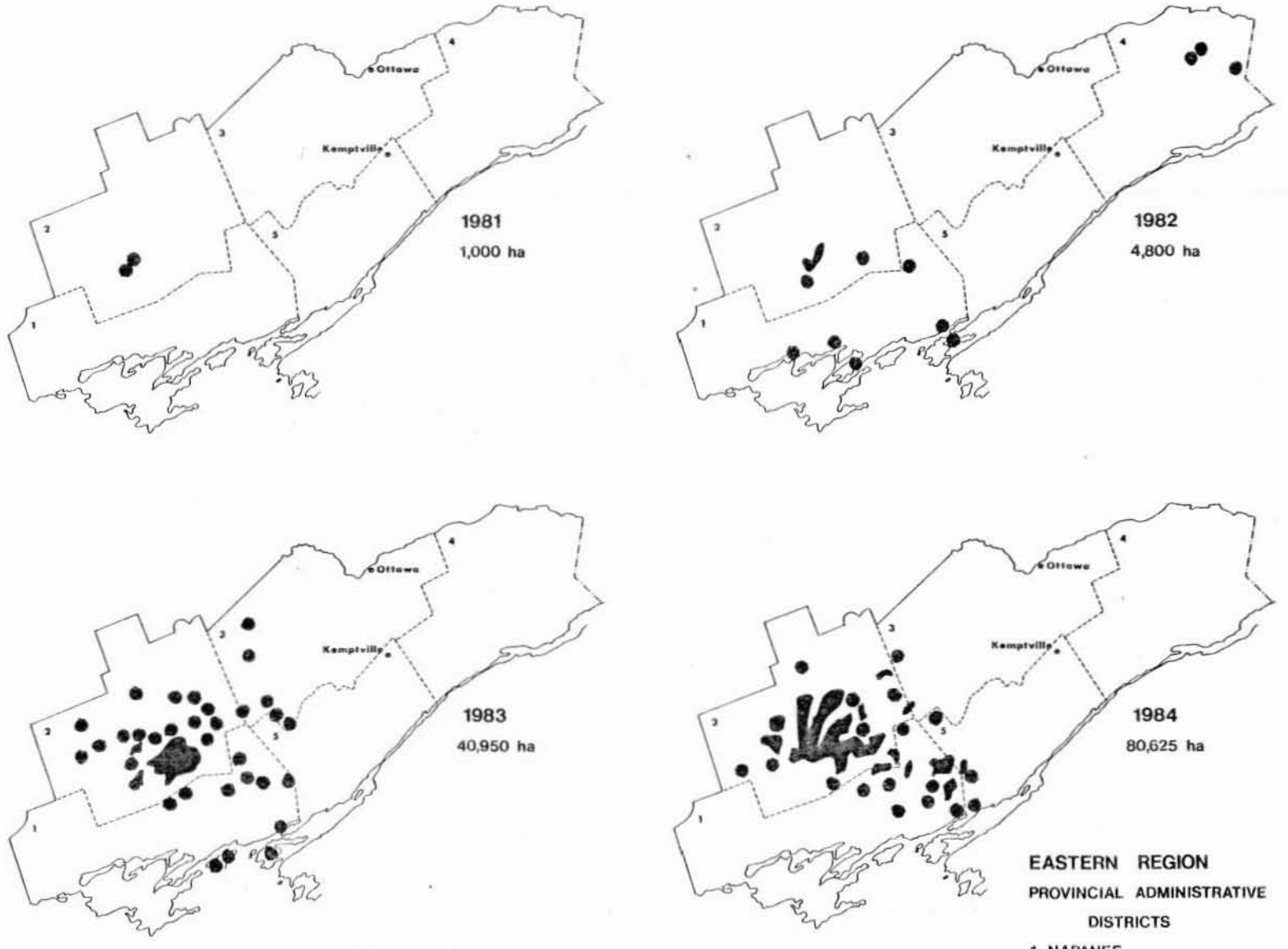


Figure 2a

GYPSY MOTH, *Lymantria dispar* (L.)

MODERATE-TO-SEVERE DEFOLIATION ■ OR ●

from 1981 to 1984

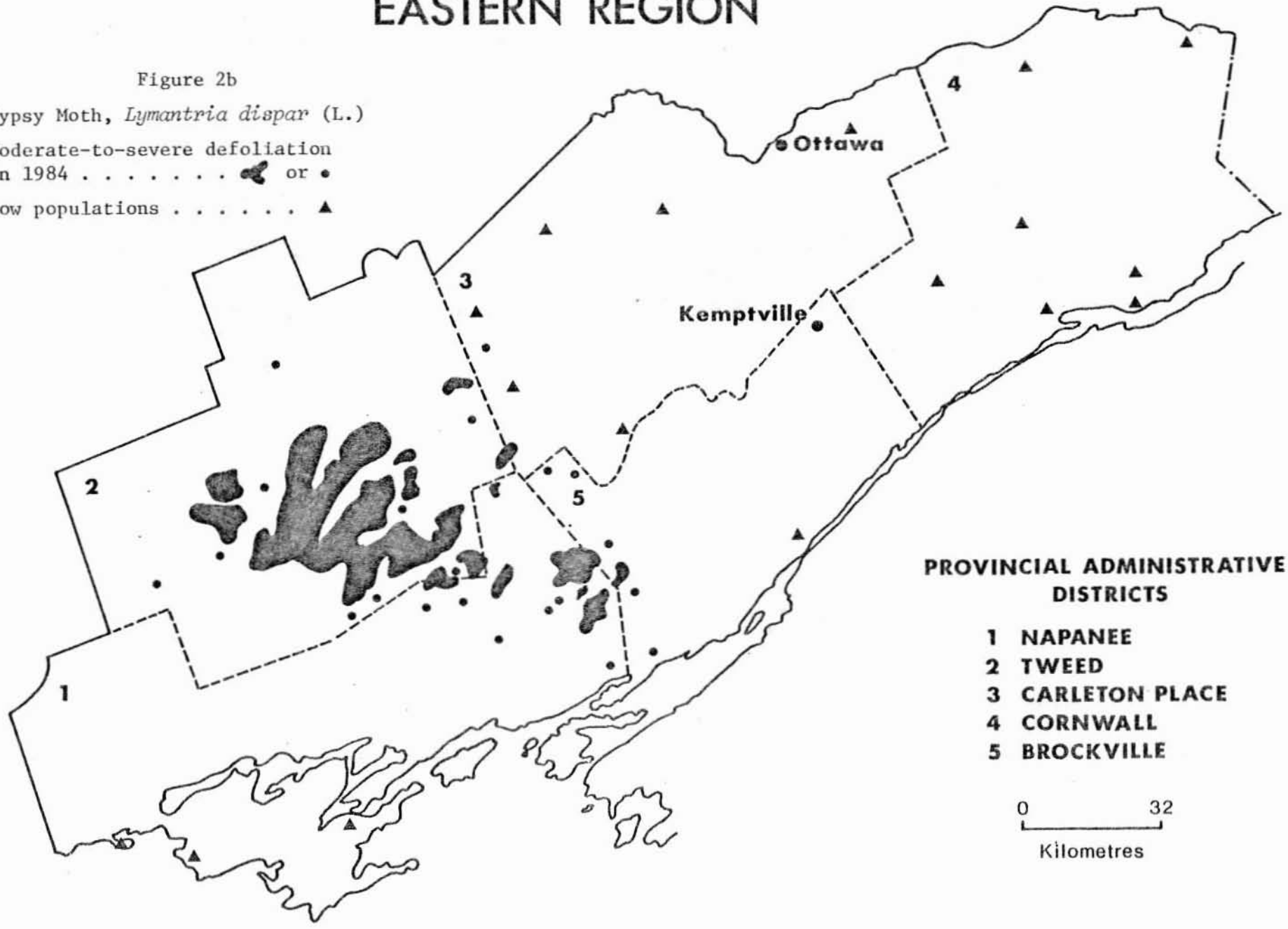
EASTERN REGION

Figure 2b

Gypsy Moth, *Lymantria dispar* (L.)

Moderate-to-severe defoliation in 1984 . . . . . or •

Low populations . . . . . ▲



Elzevir Township east of Queensborough and south of the hydro line, and in Anglesea Township just north of Deerock Lake.

In Loughborough, Storrington and Bedford townships, Napanee District, the previous infestation around Draper and Upper Rock Lake expanded west to Salmon Lake, north to Bedford Mills, then east into the area around Chaffey's Locks with occasional heavy defoliation south into the Dog Lake area and west into the area just north of Perth Road. This area sustained some 9,000 ha of severe defoliation of hardwood host, primarily on more open ridges.

Numerous pockets of defoliation were recorded to the east of the infestation as far as Westport in North Crosby Township, Brockville District. The size of the pockets ranged from 2 ha north of Leggat Lake in Olden Township, Tweed District to a 750-ha pocket along the Canadian Pacific railroad tracks, just south of Rock Lake, in Oso Township, Tweed District.

In conjunction with the Ontario Ministry of Natural Resources (OMNR) personnel in the 12 provincial parks in the Region, burlap trapping and adult pheromone trapping were again carried out this season. The burlap traps were set out in mid-May and monitored by OMNR parks personnel during the larval feeding period. The pheromone traps were exposed during the entire adult flight period and recovered in late September. The results of this survey did not reveal any larvae in either Ferris or Rideau River Provincial parks; however, male moths were successfully trapped at all locations (Fig. 3).

The monitoring plots for egg masses that were established in the five provincial parks in the Region were surveyed again in 1984 by OMNR timber personnel to record any change in insect numbers over the previous year (Table 1). This survey showed a marked increase in the numbers of egg masses detected over the levels recorded in 1983.

A similar monitoring of gypsy moth activity was conducted by the Parks Canada personnel at the Mallorytown campsite and on the many islands in the St. Lawrence River which they manage. This survey also indicated an increase in both larvae and egg masses in 1984.

Trace numbers of larvae and individual egg masses were detected throughout much of the remainder of the Region. In Carleton Place District larval populations and egg masses were found in Lavant, Dalhousie, Huntley and Gloucester townships. In the Brockville District additional larval populations were observed in Elizabethtown Township near Mallorytown. Similarly in the Cornwall District, the expanding populations were reflected in larval populations in Winchester Township, and egg masses throughout North Plantagenet, Roxborough, Osnabruck and Cornwall townships.

Figure 3

Gypsy Moth, *Lymantria dispar* (L.), provincial park monitoring in 1984

Larvae present . . . . . ■
Larvae absent . . . . . □

Adults present . . . . . ●
Adults absent . . . . . ○

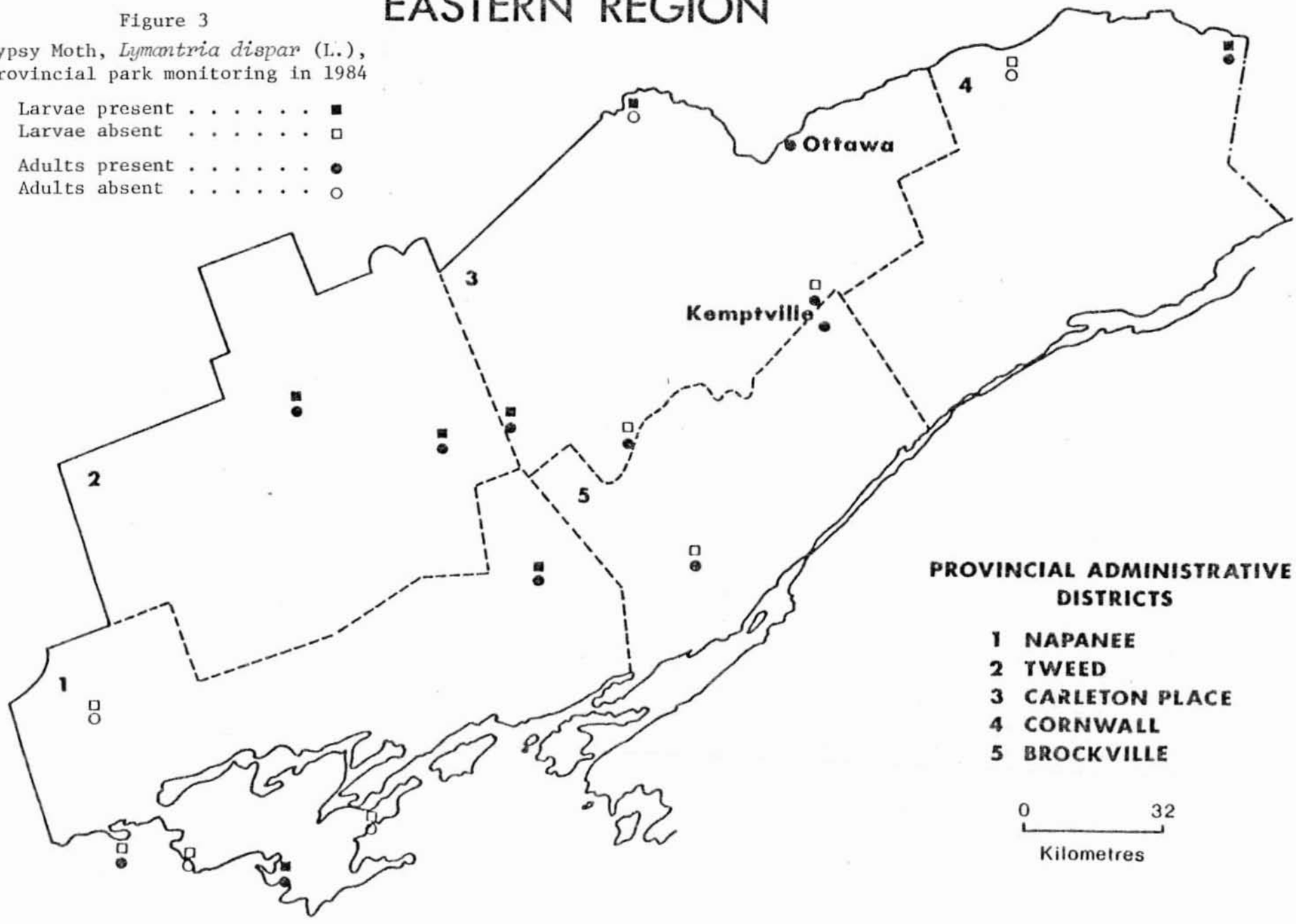


Table 1. Summary of gypsy moth egg-mass counts recorded in five provincial parks in the Eastern region.

Provincial Park		Egg masses/ha 1983	1984
Sharbot Lake	Plot 1	180	2,100
	Plot 2	20	1,980
	Plot 3	60	1,340
Frontenac	Plot 1	560	1,260
	Plot 2	1,380	3,140
	Plot 3	40	900
	Plot 4	740	760
Sand Banks	Plot 1	0	40
	Plot 2	0	20
	Plot 3	0	0
Silver Lake	Plot 1	0	120
	Plot 2	0	0
Murphy's Point	Plot 1	0	0
	Plot 2	0	0

Note: Each plot examined contained five subplots, each 0.01 ha in size, and was established with one center plot and four subplots at the four cardinal points of the compass.

Redheaded Pine Sawfly, *Neodiprion lecontei* (Fitch)

Population levels of the sawfly have been on the increase for the past three years in the Eastern Region, particularly in the 2- to 4-m height class of red pine, throughout Brockville, Cornwall and Carleton Place districts and have, in some cases, necessitated control measures.

OMNR personnel conducted two ground spray operations in the Brockville District in young red pine stands in Augusta and Elizabethtown townships. The insecticide Malathion was successful in reducing populations in both cases, but evaluations reveal that endemic populations persist.

Numerous trace populations of one to three colonies were recorded in the Region in many of the larger plantations examined.

Jack Pine Sawfly, *Neodiprion pratti paradoxicus* Ross

Moderate-to-heavy defoliation (60-90%) was recorded sporadically throughout the southern portions of both Brockville and Cornwall districts.

OMNR is concerned with the yearly defoliation of a 12-ha jack pine (*Pinus banksiana* Lamb.) stand near Glen Buell in Elizabethtown Township in Brockville District. This stand was again moderately defoliated although it was sprayed last year with the insecticide Malathion and the treatment appeared to have resulted in an excellent control of the pest. This recurring infestation may be explained by the influx of adult sawflies from nearby infested plantations, or by the fact that this still unresolved complex of sawflies may have a two-year life cycle in which some insects stay in the cocoon stage in the ground for an additional period of time.

Elsewhere in the Region populations remained quite low and were confined to light defoliation (5-8%) on fringe trees at most locations.

Maple Leafcutter, *Paraclemensia acerifoliella* (Fitch)

A marked increase in population levels was recorded throughout the Eastern Region in 1984.

Severe defoliation (70-100%) was aerially mapped in Marmora (567 ha) and Huntingdon (5 ha) townships, both in the Tweed District (see photo page). Similar levels of defoliation were recorded in a 10-ha stand in North Township, Brockville District during routine ground surveys (Fig. 4).

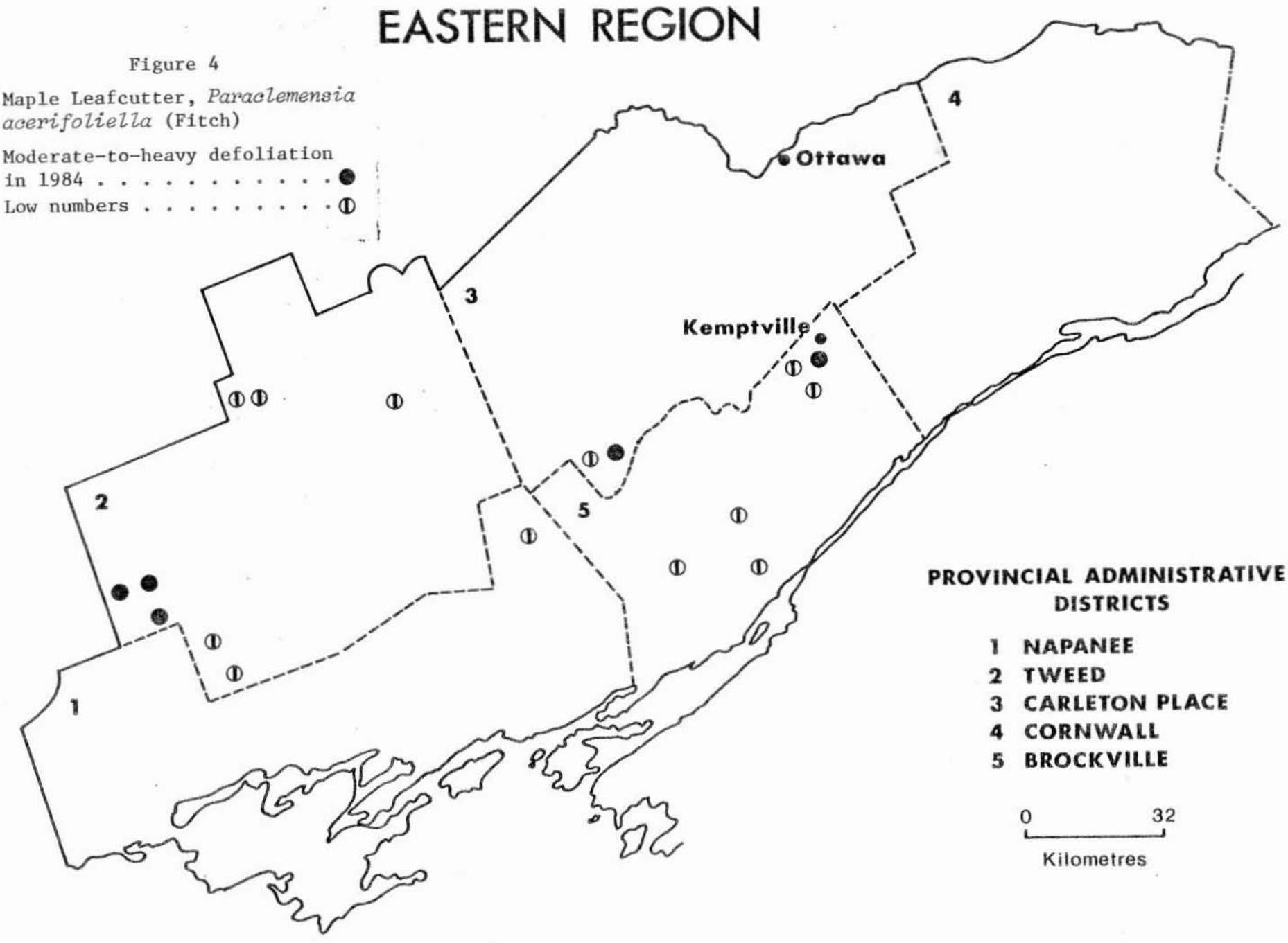
Low levels of defoliation (20-40%) were observed in hardwood stands ranging in size from 2 to 20 ha, particularly in Bedford Twp, Napanee District and Front of Yonge and Escott and Rear of Yonge and Escott townships, Brockville District.

Elswhere in the Region low populations could be found causing trace-to-light defoliation in many sugar maple stands.

Minor Insects

Aspen Webworm, *Tetralopha aplastella* (Hlst.)

Insect numbers increased from previous years, particularly in the Tweed and Napanee districts. Defoliation from 40 to 60% has been recorded for the past three years in the area between the towns of Tweed and Campbellford in the western portion of the Region. Throughout this area 6- to 15-ha pockets of trembling aspen (*Populus tremuloides* Michx.) sustained defoliation ranging from a low of 20% to complete defoliation.


EASTERN REGION
Figure 4
Maple Leafcutter, *Paraclemensia acerifoliella* (Fitch)
Moderate-to-heavy defoliation in 1984
Low numbers
Ottawa
Kemptville
1
2
3
4
5
PROVINCIAL ADMINISTRATIVE DISTRICTS
1 NAPANEE
2 TWEED
3 CARLETON PLACE
4 CORNWALL
5 BROCKVILLE
0
32
Kilometres

Low population levels were also recorded throughout the western portion of the Carleton Place and Brockville districts on open-grown or fringe trees at many locations.

Maple Webworm, *Tetralopha asperatella* (Clem.)

Low population levels of this hardwood defoliator were observed throughout the Region in 1984.

Defoliation ranging from 10 to 15% was recorded in the western portion of Tweed and Napanee districts in numerous small stands throughout Marmora and Huntingdon townships in Tweed District; Seymour and Brighton townships in Napanee District. In Front of Yonge Township, Brockville District, a 5-ha stand of maple suffered defoliation ranging from 8 to 10%.

As in previous years this insect was found at numerous other locations in the Region at population levels that would cause no appreciable impact on the hosts affected.

Table 2. Other forest insects.

Insect	Host(s)	Remarks
Altica populi Brown Poplar flea beetle	bPo	heavy defoliation found again in the lower wet areas with a high host content in the central and western portion of the Region
Amphibolips inanis (O.S.) Large oak apple gall	rO	common, heavy single-tree damage with up to 40% foliage affected in Lavant Twp, Carleton Place District
Aphrophora cribrata (Wlk.) Pine spittlebug	scP, wP	moderate populations on a 2-ha stand in Oxford (on Rideau) Twp, Brockville District and heavy populations in a 0.5-ha patch of white pine on the median of Hwy 417 in East Hawkesbury Twp, Cornwall District
Archips cerasivorana (Fitch) Uglynest caterpillar	pCh	heavy defoliation recorded on roadside clumps throughout Brockville and Carleton Place districts

(continued)

Table 2. Other forest insects (continued).

Insect	Host(s)	Remarks
Arge pectoralis (Leach) Birch sawfly	wB	heavy defoliation in a 0.5-ha stand in North Burgess Twp, Carleton Place District; common on ornamentals this year
Arge scapularis (Klug) Oak sawfly	rO rE	heavy defoliation on red oak and moderate damage to rock elm over a 0.5-ha area in Charleston Lake Provincial Park, Brockville District
Cameraria aceriella (Clem.) Maple leafblotch miner	I	light-to-moderate (20 - 50%) defoliation recorded in the eastern portion of Tweed District and southward to Brockville District to the vicinity of Charleston Lake Provincial Park, Brockville District
Cecidomyia resinicola (O.S.) Jack pine resin midge	jP	5% of the shoots affected on 12% of trees in a 4-ha stand in Marlborough Twp, Carleton Place District
Coleophora limosipenella Dup. Elm casebearer	tA	scattered heavy defoliation in Gloucester Twp, Carleton Place District and on a 0.5-ha white elm stand in the town of Spencerville, Brockville District
Coleophora pruniella Clem. Cherry casebearer	wB	heavy defoliation ranging from 60 to 80% over a 5-ha area in Murphy's Point Provincial Park, Carleton Place District
Croesia semipurpurana (Kft.) Oak leaf shredder	rO	10-15% defoliation recorded in a 5-ha red oak plot in Lavant Twp, Carleton Place District
Datana angusii G. & R. Striped caterpillar	bHi	5-10% defoliation over a 0.25-ha clump in North Burgess Twp, Carleton Place District

(continued)

Table 2. Other forest insects (continued).

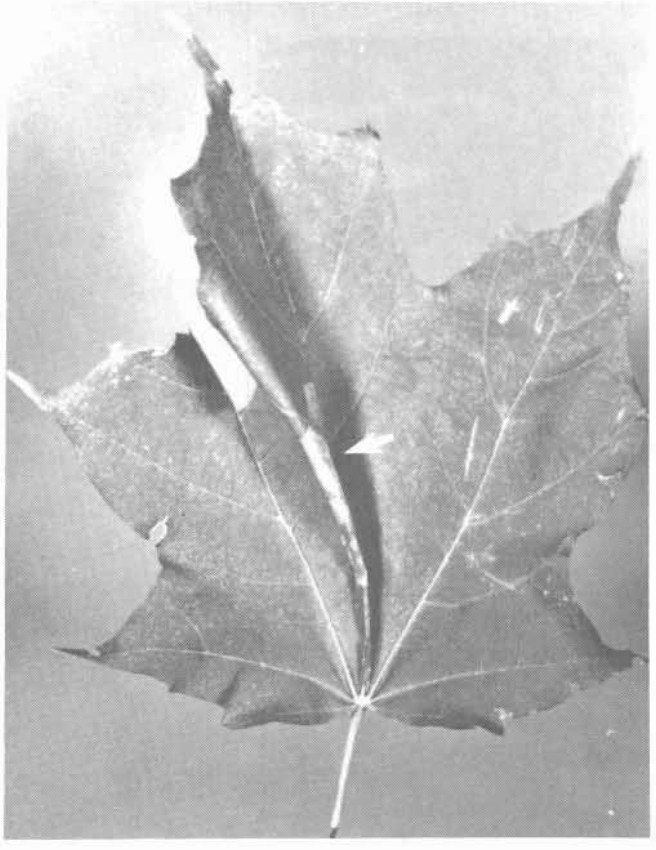
Insect	Host(s)	Remarks
Datana integerrima G. & R. Walnut caterpillar	wA Bu bHi	pocket of five walnut trees sustaining 30-50% defoliation observed in Clarence Twp, Cornwall District; small clump of bitternut hickory with heavy damage found in Seymour Twp, Napanee District; frequent low populations throughout the remainder of the Region
Datana ministra (Dru.) Yellownecked caterpillar	wB wO Ba rE	common on various hosts in the Brockville District in a 1-ha mixed hardwood stand; 40-60% defoliation in Front of Leeds and Landsdowne twps, Brockville District
Datana perspicua G. & R. Sumac caterpillar	sumac	5-15% defoliation recorded throughout a 0.5-ha clump in Front of Yonge Twp, Brockville District and a 1-ha clump in Bedford Twp, Napanee District
Diprion similis (Htg.) Introduced pine sawfly	rP	3% defoliation in young plantations in Rawdon Twp, Napanee District and in Cambridge Twp, Carleton Place District
Eucosma gloriola Heinr. Eastern pine shoot borer	wS rP scP	low damage levels ranging from 1 to 8% in a white spruce plantation in Hinchinbrooke Twp, Tweed District and on red pine and Scots pine in Edwardsburgh, Oxford and South Gower twps, Brockville District
Fenusa ulmi Sund. Elm leafminer	wE	defoliation of from 40 to 60% in a 2-ha stand in Elizabethtown Twp, Brockville District and in a 0.5-ha clump of rock elm in Bathurst Twp, Carleton Place District

(continued)

Table 2. Other forest insects (concluded).

Insect	Host(s)	Remarks
Halysidota caryae (Harr.) Hickory tussock moth	wO Ba rO	low damage levels recorded in Frontenac Provincial Park, Napanee District and in Front of Yonge Twp, Brockville District
Halysidota tessellaris (J.E. Smith) Pale tussock moth	rO	40-60% defoliation recorded on 0.5-ha stand in Seymour Twp, Tweed District
Ips grandicollis (Eich.) Southern pine engraver	rP	high population levels in a pocket of 13 dead trees, causing branch mortality to surrounding healthy trees in Limerick Forest, Brockville District
Lecanium quercifex Fitch Oak lecanium	rO	low population levels recorded over a 500-ha area in Lavant Twp, a reduction from previous years
Neodiprion nanulus nanulus Schedl. Red pine sawfly	jP	30% defoliation to a pocket of about a dozen trees in a pine plantation in Lochiel Twp, Cornwall District
Neodiprion sertifer (Geoff.) European pine sawfly	rP scP	low population levels recorded in young pine plantations sampled in South Gower, Oxford and Marlborough twps, Carleton Place District
Phratora purpurea purpurea Brown Aspen skeletonizer	tA	low levels of defoliation ranging from 1 to 15% throughout Presqu'ile Provincial Park, Napanee District and between Heckston and Limerick Forest Headquarters, Brockville District
Rhabdophaga swainei Felt Spruce bud midge	wS	5% damage to the buds on open-grown, 4-m trees in Marlborough Twp, Carleton Place District

MAPLE DEFOLIATORS



Maple trumpet skeletonizer, *Epinotia aceriella* (Clem.)

Maple leafcutter, *Paraclemensia acerifoliella* (Fitch)

FOMES ROOT ROT

Heterobasidium annosum (Fr.) Bref. fruiting bodies at base of red pine (*Pinus resinosa* Ait.)

Pocket of diseased trees showing various stages of deterioration

TREE DISEASES

Major Diseases

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

The annual aerial and ground surveys for the European race of Scleroderris canker were conducted throughout the Region from late May through June. As in previous years, no evidence of this serious pathogen was found.

The 20 red pine plantations that have been monitored since 1978 were visited again this year and checked for any disease symptoms. A minimum of 500 trees were examined at each location where a search for this organism was conducted. In addition, numerous pine stands encountered during routine travel were examined for the presence of this organism.

Nine plantings of 1975 red pine stock from the Saratoga Tree Nursery in New York State have been checked annually since 1978. Since no evidence of Scleroderris canker has been detected to date, no special emphasis is planned for these plantations for the future.

Fomes Root Rot, *Heterobasidium annosum* (Fr.) Bref.

In 1984, two areas of damage were recorded on red pine in LaRose Forest, Cornwall District and one new area was recorded in Limerick Forest, Brockville District (see photo page).

The two areas of known mortality in LaRose Forest experienced additional mortality along the edge of the active pockets in 1984. Also at these two points, trees that otherwise appeared healthy were found to have Fomes root rot fruiting bodies growing at the base of the tree at the duff layer, indicating that the organism is active and further mortality can be expected.

Treatment of the new infection centre detected in Limerick Forest in Brockville District resulted in the removal of 14 trees at various stages of deterioration. An added problem at this lcoation was the abundance of a serious insect pest, the bark beetle, *Ips grandicollis* (Eich.). This pocket has been salvaged and all logging debris was burned to prevent further damage to the stand by either Fomes root rot or the bark beetle.

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

This organism was once again observed causing generally light damage levels in many of the red pine stands examined in 1984.

The heaviest damage was recorded in a jack pine stand 4 m in height planted over 0.5 ha in Clarence Township, Cornwall District. At this location tip mortality between 60 and 70% was recorded.

Tip mortality of from 2 to 3% was recorded in a mixed Scots pine-red pine stand 3 to 4 m in height over a 1-ha stand in Oxford on Rideau Township, Brockville District. Similar damage was recorded on ornamental Austrian pine (*Pinus nigra* Arnold) at the turnoff to group camping Presqu'ile Provincial Park in Napanee District.

Minor Diseases

Anthracnose, *Discula umbrinella* (Berk. and Broome) B. Sutton

Areas of heavy damage to foliage caused by these anthracnose fungi were recorded throughout the southern portions of Cornwall, Brockville and Napanee districts in 1984.

Ornamentals and small pockets of ash and hickory (*Carya* spp.) throughout the above areas suffered heavy (80-100%) damage and premature leaf fall.

Larger areas of damage to maple were observed commonly throughout the Brockville District and although anthracnose was suspected, laboratory confirmation of this disease was not possible based on the samples submitted.

Needle Cast, *Lophodermium* spp.

This organism was again recorded in numerous red pine plantations throughout the Region at up to 5% infection levels of old foliage. Several large clumps of ground juniper (*Juniperus communis* L.) over a 2-ha rocky area in Lanark Township in Carleton Place District suffered moderate-to-heavy defoliation. Similarly, red juniper (*J. virginiana* L.) along Highway 401 suffered light damage, particularly between Napanee and Deseronto, and near Kingston.

Leaf Spot, *Marssonina juglandis* (Lib.) Magn.

Heavy early leaf discoloration and subsequent early leaf fall were observed on butternut (*Juglans cinerea* L.) throughout the southern portion of both Napanee and Brockville districts in areas adjacent to Highway 2.

Defoliation attributed to this leaf spot disease affecting butternut and black walnut (*J. nigra* L.) occurred more commonly on larger open-grown trees along Lake Ontario and the St. Lawrence River system. In

most areas the trees affected had turned various shades of yellow-green by early August and by the end of the month had prematurely lost 75-100% of their foliage.

Leaf Blight, *Mycosphaerella populicola* G.E. Thomps.

Throughout the range of balsam poplar *(Populus balsamifera* L.) in the Eastern Region, heavy leaf damage and early leaf fall were caused by this leaf spot organism.

Throughout the northern portion of Napanee and Tweed districts, and in the extreme western portion of the Carleton Place District, large areas of balsam poplar growing in the low, wet areas of the rolling, hilly country experienced the heaviest damage. Stands of up to 50 ha in size suffered heavy foliar damage (70-100%) and early leaf fall. In the remainder of the Region, damage was confined to scattered pockets, much smaller in size, and with foliar damage ranging from 5 to 40%.

Table 3. Other forest diseases.

Disease	Host(s)	Remarks
Chrysomyxa ledi (Aib. & Schw.) de Bary Spruce needle rust	wS	1-3% defoliation in Clarence Twp, Cornwall District
Ciborinia whetzelii (Seav.) Seav. Ink spot of aspen	tA	defoliation rates of up to 10% in 0.5-ha pockets in Brockville and Tweed districts
Coleosporium asterum (Diet.) Syd. Pine needle rust	jP rP	low levels of foliar damage found on 50% of trees in a 2-ha jack pine plantation in Elizabethtown, Brockville District; low damage levels found on 15% of trees in a 4-ha red pine plantation in S. Plantagenet Twp, Cornwall District
Cronartium ribicola J.C. Fisch. White pine blister rust	wP	A 2-ha plantation suffered 4% mortality in Marlborough Twp and a single tree was killed in a 4-ha plantation in Oxford on Rideau Twp, Brockville District.

(continued)

Table 3. Other forest diseases (concluded).

Disease	Host(s)	Remarks
Marssonina brunnea (Ell. & Ev.) Magn. Leaf spot	tA	Throughout much of the area affected by drought in 1983, foliage of aspen was smaller than usual and the disease caused premature leaf fall of 80-100% along Hwy 2 from Mallorytown to Brockville.
Microstroma juglandis (Bereng.) Sacc. White mold	Hi	heavy levels of damage encountered along Hwy 2 from Mallorytown to Gananoque in the Brockville District

DIEBACKS AND DECLINES

Maple Dieback and Canker Survey

A special survey was conducted at four randomly located sugar maple stands in the Region. At each location a minimum of 100 host trees were examined for the presence of Eutypella canker, *Eutypella parasitica* Davidson & Lorenz, and the current and accumulative level of crown dieback (Fig. 5).

Eutypella canker was found at one location only, in Goulbourn Township, Carleton Place District where two of the sample trees displayed cankers. The average length of the cankers was 53 cm at an average height of 1.07 m. An evaluation of the crowns of the 434 trees examined revealed that 11% had greater than 20% of the crowns currently dying. Table 4 is a summary of the results of this survey.

Oak Decline

The two oak plots established in 1977 in Levant Township, Carleton Place District were retallied in early June to evaluate the vigor of the plot trees. Commencing in 1984, the current crown deterioration level of the trees in the plot was also categorized and tallied (Table 5).

Of the 100 trees evaluated at Joe Lake, only 19% had more than 40% of the crowns currently dying; however, when the accumulative crown dieback was taken into account, 31% of the trees evaluated had more than 40% of the crowns dead. Similarly in the plot at Flower Station, 15% of the trees had more than 40% of the crown currently dying, but 32% had more than 40% accumulated crown dieback. Table 5 summarizes these data.

EASTERN REGION

Figure 5

Eutypella Canker, *Eutypella parasitica* Davidson & Lorenz

Eutypella survey plot locations in 1984

Location and plot number . . . . . ● (1)

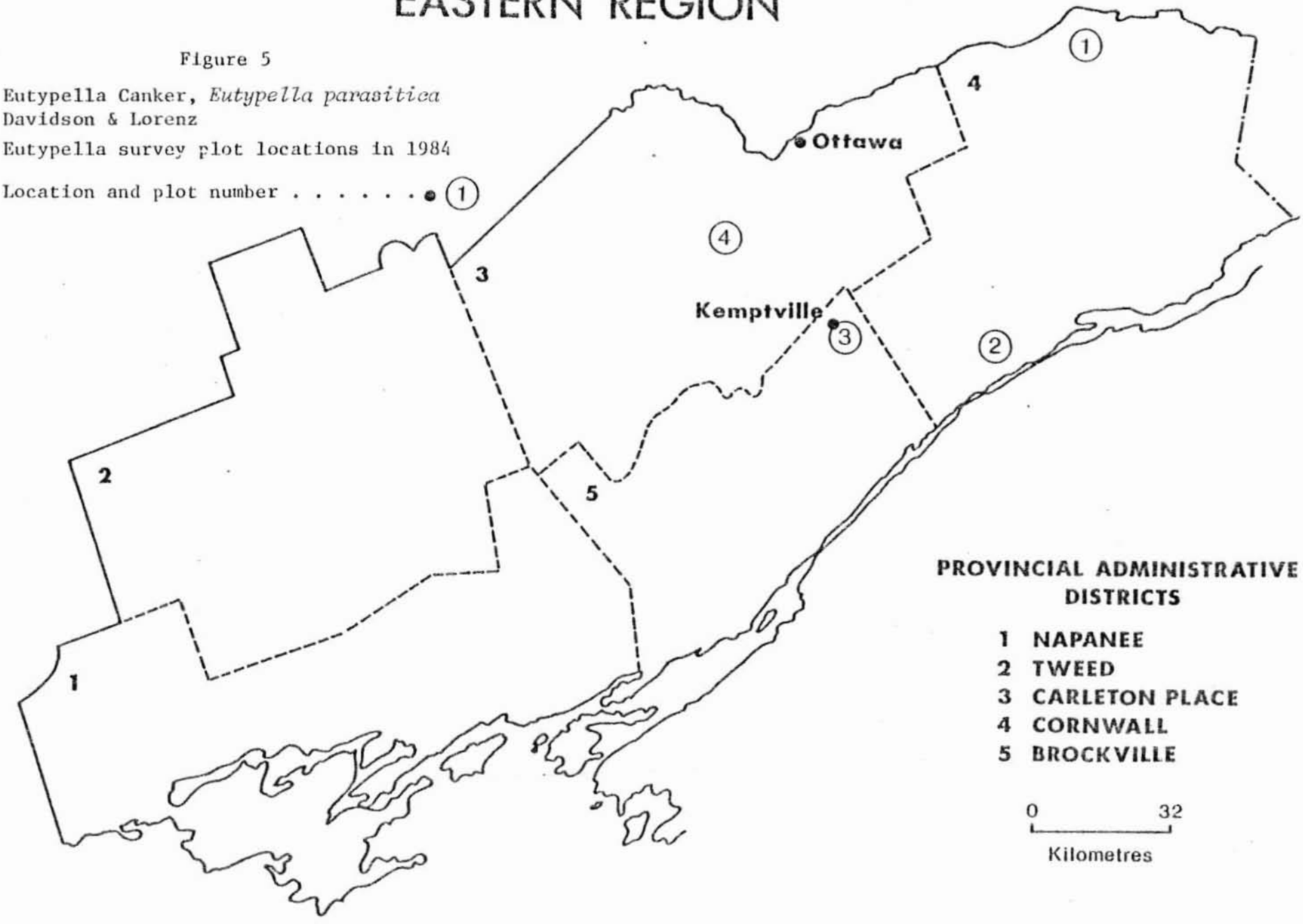


Table 4. Summary of the results of a sugar maple stand survey conducted at four locations in the Eastern Region in 1984 (data based on the examination of a minimum of 100 host trees at each location).

Location (Twp)	Avg DBH (cm)	Avg ht (m)	Stand size (ha)	Host trees per ha	Total trees cankered	Crown dieback[a]											
						Current						Accumulative					
						0	1	2	3	4	5	0	1	2	3	4	5
						(No. of trees surveyed)											
Carleton Place District																	
Goulbourn	27.3	18.2	15	75	2	81	14	7	0	0	1	60	31	11	0	0	1
Brockville District																	
Oxford (on Rideau)	39.9	21.6	20	120	0	94	7	3	0	0	2	74	23	7	0	0	2
Cornwall District																	
Williamsburgh	15.7	14.6	45	200	0	73	21	11	4	0	8	53	27	18	11	0	8
Alfred	11.2	13.5	10	275	0	90	4	11	0	0	3	62	16	20	7	0	3

[a]Dieback ratings 0 = 0-5%, 1 = 6-20%, 2 = 21-40%, 3 = 41-60%, 4 = > 61%, 5 = dead tree.

Table 5. Summary of the results of a retally of the two oak plots established in the Eastern Region in 1977 to monitor oak decline (data based on the examination of 100 trees at each location).

Location	Avg. DBH of sample trees		Stand size (ha)	Dieback classes[a]											
				Current						Accumulative					
	1977 (cm)	1984 (cm)		0	1	2	3	4	5	0	1	2	3	4	5
				(No. of trees retallied)											
Carleton Place District															
Lavant Twp															
Joe Lake	24.0	26.3	40	10	51	20	6	6	7	0	26	43	16	8	7
Flower Station	19.0	21.4	15	19	48	18	3	2	10	0	19	49	19	3	10

[a]Dieback classification 0 = 0-5%, 1 = 6-20%, 2 = 21-40%, 3 = 41-60%, 4 = > 61%, 5 = dead trees.

ABIOTIC DAMAGE

Drought

The effects of the drought conditions experienced across the Region in 1983 were manifested in widespread dwarfed foliage and early leaf fall on many tree species throughout the Region, particularly in the Cornwall District (Fig. 6).

Although numerous twig and some large branch mortality did occur, no pockets of whole tree mortality were observed. Small pockets of aspen and maple trees from 0.5 to 2 ha in size, along Highway 2 in the Brockville and Cornwall districts, suffered heavy branch mortality.

Another possible effect of the 1983 drought was an unusually heavy seed crop on most of the tree species throughout the Region. Of the conifers affected, white spruce was by far the heaviest producer of seed, to the point where tops became so laden with cones that those of young trees (up to 6 m in height) snapped off. Similarly, heavy cone crops were experienced on sugar maple and oaks at all locations examined. Even ironwood (*Ostrya virginiana* [Mill.] K. Koch) were so laden with seed that foliage was smaller than normal and the trees took on a brown appearance.

Ice Damage

Precipitation in the form of freezing rain, experienced across the central portion of the Eastern Region in late January, caused heavy damage throughout pine stands in the Flinton area of the Tweed District. Throughout the pine plantations in this area, trees were bent over to the ground or broken off at the 0.5- to 1.5-m level. The trees averaged 25 cm DBH and were of merchantable size. All salvageable materials were eventually removed from the site. Lower levels of damage were also recorded on hardwood trees in the same area.

Elsewhere in the Region there were isolated incidents of individual tree damage.

Mouse Damage

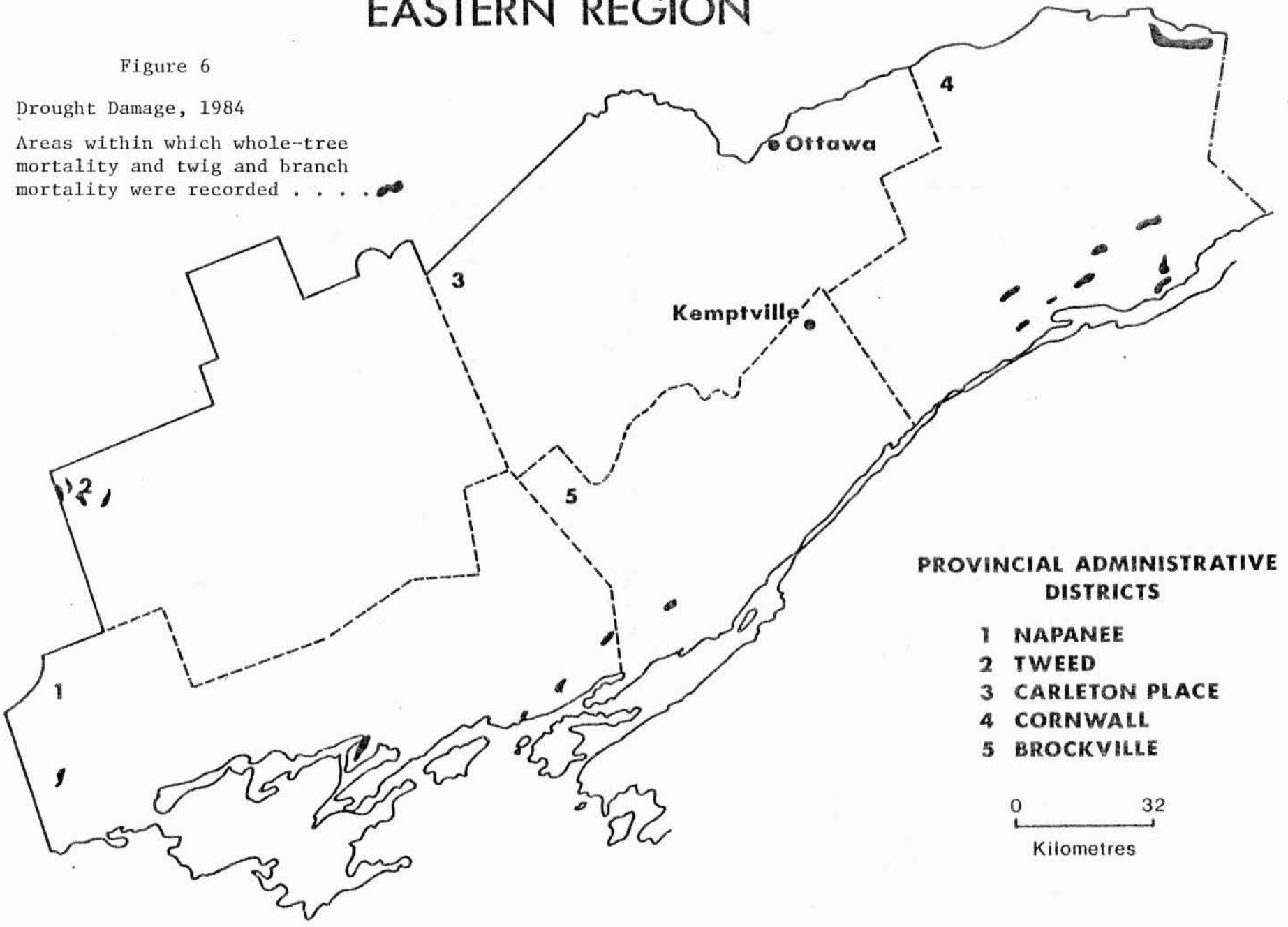
Heavy mouse feeding was responsible for 5% mortality of jack pine trees 2 m in height over a 4-ha plantation in Percy Township near Warkworth in Napanee District. A pocket of approximately 25 chlorotic yellow-green trees was observed in an open portion of the stand with a heavy grass content. Upon examination of the trees it was found that mice had completely girdled the base of the trees by gnawing on the bark, to a height of 14 cm in some cases.

EASTERN REGION

Figure 6

Drought Damage, 1984

Areas within which whole-tree mortality and twig and branch mortality were recorded . . . .



Salt Damage

Salt damage was hard to distinguish from winter drying conditions that existed throughout the Region in 1984, particularly along exposed edges of stands adjacent to roadways.

However, at the G. Howard Ferguson Forest Station at Kemptville in the Brockville District, large white spruce trees, 10 m in height, suffered heavy foliar damage and some tree mortality due to salt damage. Trees adjacent to a roadway leading into the back of the nursery had been damaged by trenching when a new pipeline was installed in the nursery the previous winter. Subsequent heavy salting of this roadway to gain access into the nursery in early spring resulted in damage to the trees. Examination of the affected windbreak trees revealed that 3% of the trees died, 20% lost all old foliage but produced new foliage, and a further 10% lost all old foliage and produced chlorotic new foliage.

Winter Drying

Warm weather experienced throughout the Eastern Region between 22 and 25 February caused heavy winter drying in most exposed areas of conifer stands throughout the Region. Damage to foliage occurs when unusually warm weather occurs after an extended cold period. The excessive loss of water from the foliage during these warm periods cannot be replaced by the still frozen root system. The foliage or the entire tree may become completely dried out, and partial or whole tree mortality can occur. However, damage is usually confined to foliage and, occasionally, buds.

The heaviest damage encountered was along Highway 417 in the area of Anderson Road in Gloucester Township, Carleton Place District, over an area of 2 ha. At this location white pine (*Pinus strobus* L.) as well as red pine, averaging 7 m in height, suffered 70-100% discoloration of old foliage. Bud damage, however, did not occur and as new growth developed and the old, discolored foliage was lost, the trees took on a somewhat better general appearance. Subsequent fall visits to the affected area revealed that the 1984 growth was less than normal and the trees showed an overall decline in vigor.

Elsewhere in the Region clumps of trees of up to 0.5 ha in size suffered damage similar to that described above, particularly on more exposed sites and in areas with shallow soils.

SPECIAL SURVEYS

Acid Rain National Early Warning System (ARNEWS)

In conjunction with a national program, a permanent ARNEWS plot was established in the Eastern Region in Brockville District. The plot was located in Rear of Yonge and Escott townships just west of the town of Athens on the Oak Leaf Road. The plot was established in a predominantly sugar maple stand that had less than 10% content of other hardwoods (principally oak and ironwood).

At this location a plot measuring 40 m x 10 m was set out and the specific location of each tree on the plot was mapped. For each tree species that comprised more than 10% of the plot trees, 10 additional trees in the immediate vicinity, but off the plot, were also examined.

The data recorded for each sampled tree (on and off the plot) included host species, dominance, height, DBH, length and width of crown, height of crown, length of dead top if present, foliage size and color, current dieback conditions of the crown, the presence of insect and disease conditions and the abundance of or lack of a seed crop. Further surveys, including analysis of foliage and soil in the plots, will be carried out from time to time.

White Spruce Flower, Cone and Seed Survey

A special survey was conducted at two locations in the Region to determine the various pests affecting white spruce flowers and cones. In Cambridge Township in Cornwall District, 200 female flowers were collected in late May. At the same location, and also in the G. Howard Ferguson Forest Station at Kemptville in Oxford (on Rideau) Township in the Brockville District, 100 mature cones were collected in early August. To ascertain the impact of the feeding of spruce budworm larvae, the area from Cambridge Township was chosen because of existing populations of budworm in 1983 and forecasted populations for 1984. The G. Howard Ferguson Forest Station location was relatively free of known budworm populations.

In Cambridge Township 23% of the flowers were damaged, showing complete or partial seed loss. Often damaged flowers are aborted by the tree and never produce cones. Mature cone samples submitted from the same area as the flower collection in Cambridge Township revealed that 35% of the cones suffered insect damage, resulting in a 30% seed loss. In Oxford (on Rideau) Township, the cones collected showed an overall damage level of 26% with a seed loss of only 11%. These data are summarized in tables 6a and 6b.

Table 6a. Summary of the data of the white spruce female flower survey conducted at one location in the Eastern Region in 1984 (counts based on the examination of 200 female flowers).

Location (Twp)	Total no. of flowers damaged	Causal agent	No. of flowers damaged
Cornwall District			
Cambridge	45	Spruce budworm	3
		Spruce coneworm *Dioryctria reniculelloides*	1
		Unknown Lepidoptera	41

Table 6b. Summary of the data of the white spruce cone survey conducted at two locations in the Eastern Region in 1984 (counts based on the examination of 100 mature cones).

Location	Total no. of cones damaged	Seed loss per damaged cone (%)	Causal agent	No. of cones damaged
Cornwall District				
Cambridge	35	30	Spruce cone axis midge *Dasineura rachiphaga*	6
			Spruce cone gall midge *Dasineura canadensis*	1
			Spruce cone maggot *Hylemya anthracina*	1
			Unknown Lepidoptera	27
Brockville District				
Oxford on Rideau	26	11	Spruce cone maggot *Hylemya anthracina*	7
			Spruce cone gall midge	4
			Spruce cone axis midge	3
			Spruce seed moth *Laspeyresia youngana*	3
			Unknown Lepidoptera	9

White Spruce Plantation Survey

Special surveys this year concentrated on white spruce plantations across the Region where baseline data were gathered on pests associated with this species. Six stands were examined (Fig. 7), two in each of three height classes (< 2 m, 2-6 m and > 6 m). Each plantation was inspected twice during the field season (23-26 June and 23-26 July) in order to sample insect and disease conditions encountered throughout the growing season. Results of pest problems encountered are recorded in Table 7.

In South Plantagenet Township, Cornwall District, 3% of the trees were lightly defoliated by the yellowheaded spruce sawfly, *Pikonema alaskensis* (Roh.). At this location numerous stand openings containing dead trees suggested a past mortality problem of undetermined origin. In Hinchinbrooke Township, Tweed District, 13% of the trees examined suffered defoliation of 2-5% as a result of gypsy moth feeding. At this location the eastern pine shoot borer and the coneworm, *Dioryctria abietivorella* (Grt.), damaged 1% of the shoots and 11% of the cones, respectively.

The following insect and disease organisms were part of this survey, but were not found to be present in any locations: white pine weevil, *Pissodes strobi* (Peck); dwarf mistletoe, *Arceuthobium pusillum* Peck; broom rust, *Chrysomyxa arctostaphyli* Diet.; spruce needle rust, *C. ledi* (Aib. & Schw.) de Bary and *C. ledicola* (Peck) Lagerh.; and cone rusts, *C. pirolata* (Körn) Winter.

Similar to the previous white spruce plantation survey the two insects found causing appreciable damage were spruce budworm and yellowheaded spruce sawfly. In addition, gypsy moth was found causing damage in the plantation in Hinchinbrooke Township in 1984.

The incidence of frost damage was greatly reduced from the 1980 survey.

G. Howard Ferguson Forest Station

Insects: Populations of the cedar leafminer complex were once again recorded throughout the cedar hedges at levels that required control measures. The first application was carried out in the early spring and was repeated when heavy feeding was recorded again in late August. Cygon 2E, applied with an orchard sprayer, provided excellent coverage and adequate control of the pest. The spruce windbreaks suffered damage, caused by the spruce budworm and spruce needleminer, *Pulicalvaria piceaella* (Kft.), but to a much lesser extent than in 1983. Willow (*Salix* spp.) clones in compartments 5A, 72 and 73 suffered heavy damage by the imported willow leaf beetle, *Plagiodera versicolora* (Laich.), which was controlled with repeated applications of Malathion. Red pine stock in compartments 8, 42 and 43 suffered light defoliation by

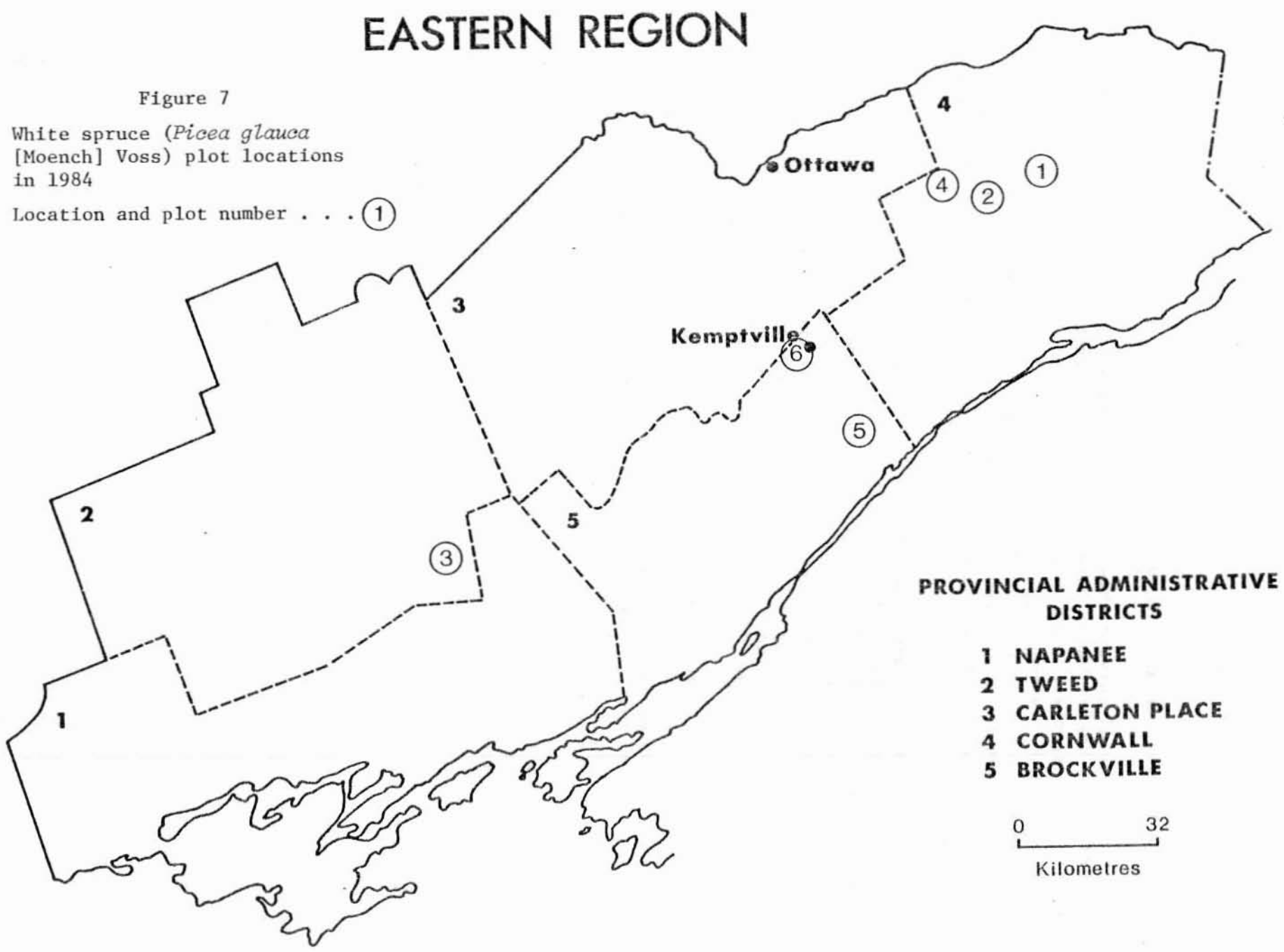


Figure 7

White spruce (*Picea glauca* [Moench] Voss) plot locations in 1984

Location and plot number . . . (1)

Table 7. Summary of the results of a white spruce plantation survey conducted at six randomly selected locations across the Eastern Region in 1984 (counts based on the examination of 150 trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	% trees attacked		Defoliation by spruce budworm and spruce coneworm (%)	Trees attacked by spruce coneworm (%)	Yellowheaded spruce sawfly	
				Spruce budworm	Spruce coneworm			Trees attacked (%)	Defoliation (%)
Cornwall District									
South Plantagenet	0.8	2,093	1.7	0	0	1	1	1	1
Cambridge	1.6	2,392	4.3	3	0	2	0	3	8
Cambridge	0.5	2,691	14.3	19	0	2	0	0	0
Brockville District									
Oxford	0.6	2,542	15.5	8	0	2	0	0	0
Edwardsburgh	1.2	2,242	3.8	6	0	1	0	1	1
Tweed District									
Hinchinbrooke	0.8	1,457	2.3	0	1	1	0	0	0

(continued)

Table 7. Summary of the results of a white spruce plantation survey conducted at six randomly selected locations across the Eastern Region in 1984 (counts based on the examination of 150 trees at each location) (concluded).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Total no. of stand openings	Chlorosis		Frost injury		*Armillaria mellea*
					faded green (%)	yellow (%)	Trees affected (%)	Foliage affected (%)	trees affected (%)
Cornwall District									
South Plantagenet	0.8	2,093	1.7	20	0	0	1	1	1
Cambridge	1.6	2,392	4.3	0	0	0	1	1	0
Cambridge	0.5	2,691	14.3	2	0	0	0	0	0
Brockville District									
Oxford	0.6	2,542	15.5	0	0	0	2	1	0
Edwardsburgh	1.2	2,242	3.8	0	2	0	0	0	0
Tweed District									
Hinchinbrooke	0.8	1,457	2.3	9	0	0	0	0	0

the redheaded pine sawfly and several seedlings in compartment 8 suffered damage by the eastern pine shoot borer.

In the area adjacent to the nursery compartments, red pine was lightly damaged by jack pine sawfly, redheaded pine sawfly and pine false webworm, and the mixed hardwood suffered negligible damage from several defoliators, including maple leafcutter and maple trumpet skeletonizer on sugar maple, and fall webworm, aspen webworm, birch leafminer, *Fenusa pusilla* (Lep.), and European alder leafminer, *F. dohrnii* (Tischb.), on the birches (*Betula* spp.), ash, and alder (*Alnus* spp.).

Diseases: The larch-poplar rust, *Melampsora medusae* Thüm, once again caused severe foliar damage that resulted in early leaf fall on aspen clones throughout the nursery. In particular, clones in compartments 1 and 41 were completely defoliated by this organism by the third week of August. Willow clones in compartments 72 and 73 had 2-8% of the current shoots damaged by tip blight, *Pollacia saliciperda* (Allesch. & Tub.) Arx.

Heating problem: Following an extended period of heavy precipitation and high temperature in the Kemptville area in early to mid-August, considerable damage was observed in the 2-0 and 3-0 white pine stock. The heaviest damage occurred in compartment 37 where 3-0 white pine was heavily stocked. In this compartment patches of seedlings of up to 0.5 m in diameter suffered complete mortality. The total impact on the seedbeds was an overall loss of 2-3% of the growing stock.

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

The presence of this insect and the resultant wilt disease to conifers have been confirmed in the United States and Manitoba over the past few years. When high numbers of this insect invade the resin canals, they cause stress symptoms to the tree in the form of foliar discoloration and eventual mortality.

For the past few years, wilted and recently dead pines have been sampled at several locations across the Region for the presence of this pest. To date only one sample, from the Limerick County Forest, Brockville District taken in July 1984, was found to contain this nematode.

Climatic Data

Variations in seasonal climatic conditions have a direct and obvious affect on forest pests. For example, a cold, wet spring could retard the development of insect eggs, emerging larvae or the production of sporophores. Sudden and extreme changes in normal weather patterns have often been the cause of the decline of infestations over large areas.

For such reasons, daily weather conditions are monitored and permanently recorded for numerous weather observation stations across the province. The data from two of these stations, the Ottawa International Airport and the Trenton Air Base, are summarized in Table 8 for the 12-month period of January to December, 1984.

Table 8. Summary of climatic data for 1984 at two atmospheric environmental stations in the Eastern Region.

Location	Month	Mean temperature (°C)		Total precipitation (mm)	
		Actual	Normal[a]	Actual	Normal[a]
Napanee District					
Trenton Air Base	Jan.	-9.5	-7.6	37.6	68.9
	Feb.	-2.1	-6.5	88.2	57.0
	Mar.	-5.5	-1.0	40.5	72.0
	Apr.	7.5	6.4	161.0	76.1
	May	10.3	12.5	89.3	73.0
	June	18.1	17.8	134.3	63.7
	July	19.9	20.6	44.0	60.9
	Aug.	20.5	19.7	81.0	71.9
	Sept.	19.0	15.3	44.6	72.8
	Oct.	10.1	9.2	28.6	70.1
	Nov.	2.3	3.2	75.0	86.1
	Dec.	-1.1	-4.5	67.0	82.9
Carleton Place District					
Ottawa International Airport	Jan.	-12.7	-10.9	37.4	61.0
	Feb.	-4.0	-9.5	83.4	60.3
	Mar.	-6.8	-.30	30.0	67.5
	Apr.	7.5	5.6	124.3	69.1
	May	10.9	12.8	118.3	67.9
	June	19.0	18.0	56.6	73.4
	July	21.0	20.6	53.2	85.9
	Aug.	13.6	19.2	172.1	88.4
	Sept.	20.8	14.3	15.4	79.3
	Oct.	9.4	8.1	52.8	68.1
	Nov.	1.6	1.2	72.2	77.7
	Dec.	-4.8	-7.7	107.6	80.7

[a]Normal temperature and precipitation are based on those for the period 1930-1980.