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

(FOREST DISTRICTS: PARRY SOUND, BRACEBRIDGE, ALGONQUIN PARK, PEMBROKE, MINDEN AND BANCROFT)

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CANADIAN FORESTRY SERVICE

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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 authors would like to express their appreciation to personnel of the Ontario Ministry of Natural Resources, wood-using industries and private individuals for their excellent cooperation during the 1984 field season.

R.J. Sajan

B.E. Smith

SURVEY HIGHLIGHTS

This report deals with the more important insect and disease conditions encountered during aerial and ground surveys in the Algonquin Region of Ontario in 1984.

The spruce budworm infestation of the late 1960s, 1970s and early 1980s continues to decline, with only small scattered pockets of moderate-to-severe defoliation occurring in the extreme northern portion of the Region. The area in the Parry Sound District, in which jack pine budworm caused severe defoliation along the Georgian Bay shoreline, remained virtually unchanged, but the infestation of the eastern blackheaded budworm in the Bracebridge District completely collapsed. The maple trumpet skeletonizer was commonly detected across the Region, with some 23,500 ha of heavy defoliation occurring throughout the Bracebridge and Parry Sound districts. Jack pine sawflies caused an estimated 20 ha of severe defoliation to immature jack pine in the Pembroke District. Extensive ground surveys detected very low numbers of gypsy moth eggs and larvae in the southern portion of the Pembroke District.

Continued ground and aerial surveys did not detect any evidence of the European race of Scleroderris canker, although a high incidence of the native race of this fungus was found in the Parry Sound and Bracebridge districts. Armillaria root rot caused low levels of mortality at several locations across the Region, and poplar leaf diseases were very common.

The effects of the 1983 drought were evident, with some 1,600 ha of whole tree mortality, mainly oaks, aerially mapped across the southern portion of the Region. High winds in July and August caused scattered blowdown of trees across the northern portion of the Region. Winter drying was observed throughout much of the central and southern portions of the Region, probably as a result of warm temperatures in February.

Special surveys included two visits to nine randomly selected white spruce plantations as part of the ongoing program to determine the impact of specific insects and diseases on high-value plantation trees. Eight sugar maple stands were evaluated for crown dieback and stem cankers. The oak decline plots, established in 1977, were retallied, and two out of the three plots showed a slight recovery in vigor.

Two permanent acid rain plots were established, one in each of the Bracebridge and Minden districts, as part of the Acid Rain National Early Warning System established in 1984 across Canada by the Canadian Forestry Service, and are to be monitored by Forest Insect and Disease Survey Staff.

In this report, the following categories are used to determine the importance of insects and diseases:

Frontispiece

Adult female moth and egg mass of the gypsy moth, *Lymantria dispar* (L.)

Mature gypsy moth larva feeding on foliage

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INSECTS

Major Insects

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

The pine false webworm was detected at several locations across the Region, causing varied levels of damage. In an 8-ha white pine (*Pinus strobus* L.) seed orchard in Snowdon Township, Minden District, a standard 150-tree evaluation revealed 71% of the 1.5-m trees infested, with an average of three web masses per tree. Employees of the Ontario Ministry of Natural Resources (OMNR), Minden District, hand sprayed the seed orchard on the evenings of 20 and 21 June using the insecticide Sevin at a mixture rate of 5 ml of active ingredient to 1 L of water. Five days later a post-spray survey failed to detect any larvae.

In a 14-ha plantation of red pine (*P. resinosa* Ait.), 2 m high, in Wicklow Township, Bancroft District, a small pocket, less than 0.5 ha, was found to be heavily infested. Virtually every branch tip harbored a web mass resulting in 90% of the old foliage being consumed. Ornamental white pine, widely spaced along the edge of the above-mentioned plantation, were completely denuded of both old and new foliage.

Trace numbers were also detected in a 0.5-ha natural white pine regeneration area west of Norland in Laxton Township, Minden District, and on ornamental Austrian pine (*P. nigra* Arnold) at Mew Lake campground in Algonquin Park, Algonquin Park District. In a 0.5-ha red pine plantation evaluated in Macaulay Township, Bracebridge District, a total of 11 trees out of the 150 examined were infested with an average of only one web mass per tree.

Eastern Blackheaded Budworm, *Acleris variana* (Fern.)

There was a marked decrease in the population level and severity of defoliation caused by this pest in the western portion of the Region in 1984. Extensive ground surveys throughout the Muskoka Lake area of the Bracebridge District, where some 19,720 ha of eastern hemlock (*Tsuga canadensis* [L.] Carr.) were severely defoliated in 1983, revealed only trace numbers of larvae.

Along Highway 169 through Muskoka, Wood and Medora townships, an average of six 45-cm branch tips were removed from the mid- to upper crowns of eastern hemlock before a single larva was encountered. Similarly, along County Road 118 through Watt Township, 12 branches were examined to recover a single larva. In Ridout Township, to the east of the Muskoka Lake area, 10 branches were sampled to find a single larva. Random checks made in areas of concentration of eastern hemlock in Perry and Bethune townships produced similar trace numbers.

Very low numbers causing trace defoliation were encountered along County Road 12 throughout Freeman Township and at Killbear Provincial Park in Carling Township, in the Parry Sound District.

Saratoga Spittlebug, *Aphrophora saratogensis* (Fitch)

Population numbers have varied for the past 10 years, but have been increasing over the last two years, in the central portion of Pembroke District.

Mortality in young red pine has doubled from 1 to 2 ha in a 15-ha plantation with the remainder showing feeding damage ranging from light to severe in Hagarty Township (Fig. 1). New mortality was detected in a 1/4-ha area within a 4-ha red pine plantation in Fraser Township. A standard 150-tree evaluation was carried out and 53% of the remaining trees had 18% branch mortality or foliage discoloration attributed to feeding punctures by the adult Saratoga spittlebugs. In both areas mentioned there was an abundance of the alternate host sweetfern (*Comptonia peregrina* (L.) Coult.).

Nymph counts in May and June revealed between one and five insects in spittle masses at the base of each sweetfern plant, in pockets throughout the damaged areas.

Birch Skeletonizer, *Bucculatrix canadensisella* Cham.

A marked decline in population levels from a peak in 1983, and an easterly movement of damage to white birch (*Betula papyrifera* Marsh.) have taken place in the northwestern portion of the Algonquin Region.

In 1982, moderate-to-severe defoliation was recorded on 40,884 ha in the northern portions of Parry Sound and Bracebridge districts. In 1983, 481,000 ha were aerially mapped in the Bracebridge District, with small pockets on the west side of Minden and Algonquin Park districts.

This year only 1,827 ha were aerially mapped in scattered pockets in Osler, Bishop, McLaughlin, Bower, Anglin and Deacon townships in the central portion of Algonquin Park District (Fig. 2). Throughout the areas of previous defoliation only trace numbers could be found.

The areas in which this late-feeding insect was aerially mapped were in relatively pure stands of mature white birch on lakeshores and adjacent ridge tops.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

Results of damage surveys, population sampling and egg-mass counts of this perennial pest will be published with those of 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.

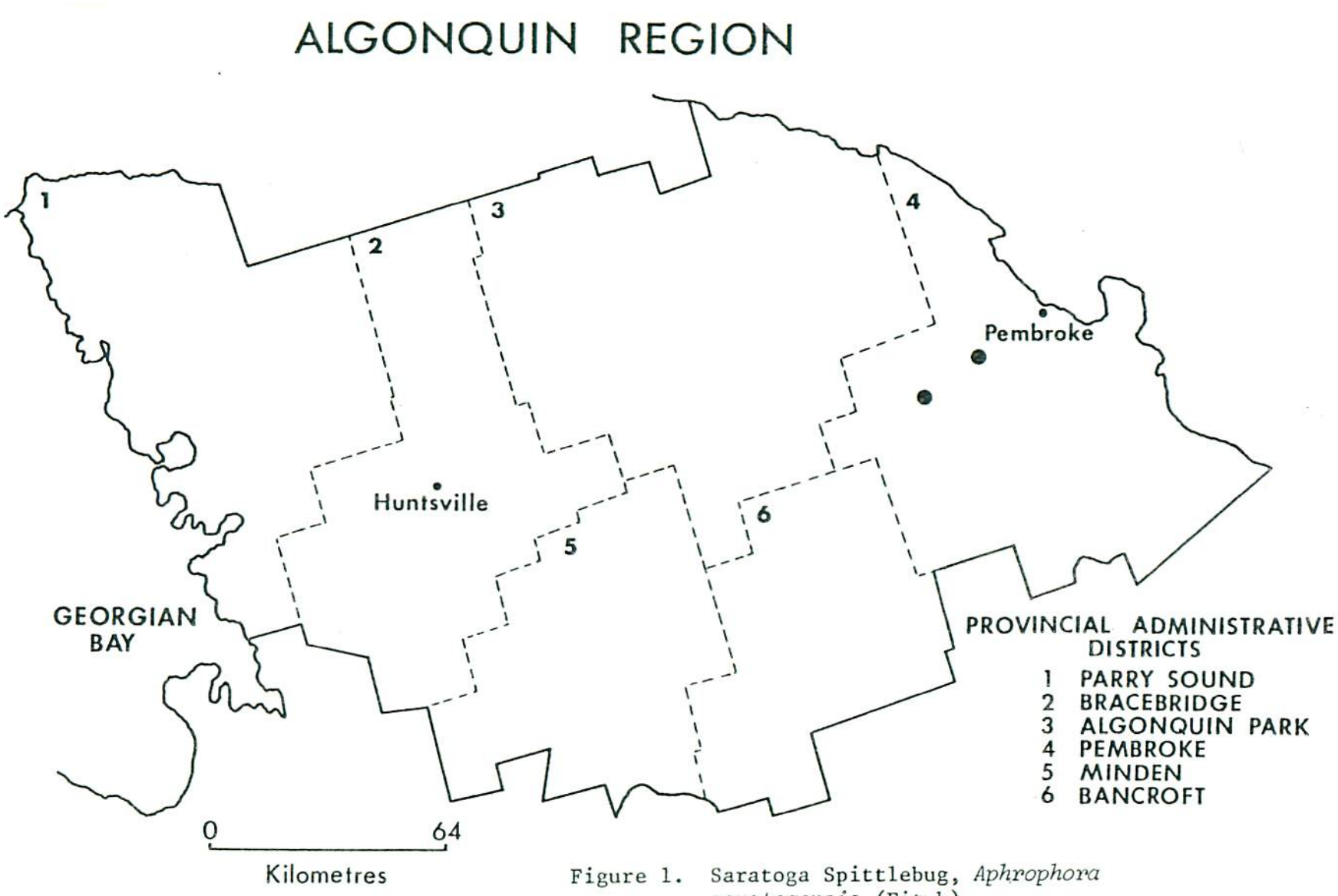

Figure 1. Saratoga Spittlebug, *Aphrophora saratogensis* (Fitch)

Locations of red pine (*Pinus resinosa* Ait.) plantations with mortality caused by this spittlebug . . . . . ●

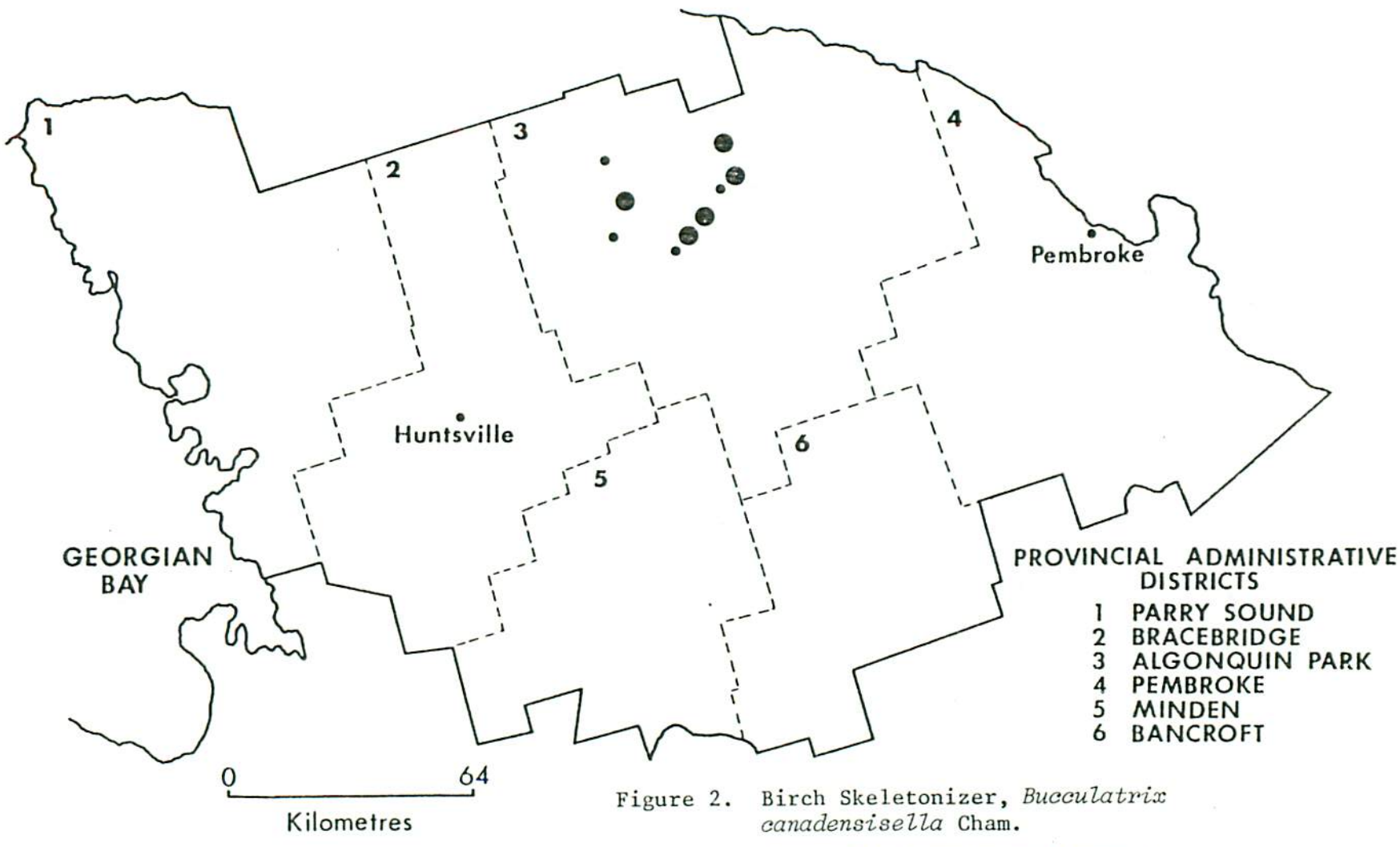

Figure 2. Birch Skeletonizer, *Bucculatrix canadensisella* Cham.

Areas within which moderate-to severe defoliation occurred in 1984 . . . . . ● or •

Jack Pine Budworm, *Choristoneura pinus pinus* Free.

There was a slight decrease in the total area within which moderate-to-severe jack pine budworm defoliation occurred in the Parry Sound District in 1984. In 1983 some 30,202 ha were defoliated, whereas in 1984 this figure declined to approximately 25,397 ha, consisting of one large pocket (24,070 ha) extending along the Georgian Bay shoreline from Harrison to Henvey townships, and four smaller pockets totalling some 1,327 ha in Shawanaga and Carling townships (Fig. 3 and photo page).

A total of 13 egg-mass samples were taken, 10 from the Parry Sound District, two from the Algonquin Park District, and one from the Pembroke District, in an effort to forecast population levels for 1985. An analysis of these samples can be found in Table 1. This egg-mass survey indicates that high populations and moderate-to-severe defoliation can be

Table 1. Summary of jack pine budworm egg-mass counts and defoliation in 1984 and infestation forecasts for 1985 in the Algonquin Region (counts based on the examination of six 61-cm jack pine branch tips at each location).

Location	1984 defoliation (%)	Total no. of egg masses 1983	Total no. of egg masses 1984	Infestation forecast for 1985[a]
Parry Sound District				
Carling Twp - Sand Bay	24	1	2	L
- Snug Harbour	72	0	7	H
Harrison Twp - Hwy 529A	76	22	24	H
- Point au Baril	0	0	1	L
Henvey Twp - Still River	0	-	0	N
McConkey Twp - Hwy 522	0	-	0	N
Shawanaga Twp - I.R. 17B	54	1	4	M
Wallbridge Twp - Harris River	46	1	8	H
- N. of Magnetawan R.	94	0	14	H
- S. of Magnetawan R.	66	8	13	H
Algonquin Park District				
Edgar Twp	0	-	0	N
White Twp	0	-	0	N
Pembroke District				
Buchanan Twp	0	-	0	N

[a] N = nil, L = light, M = moderate, H = heavy.

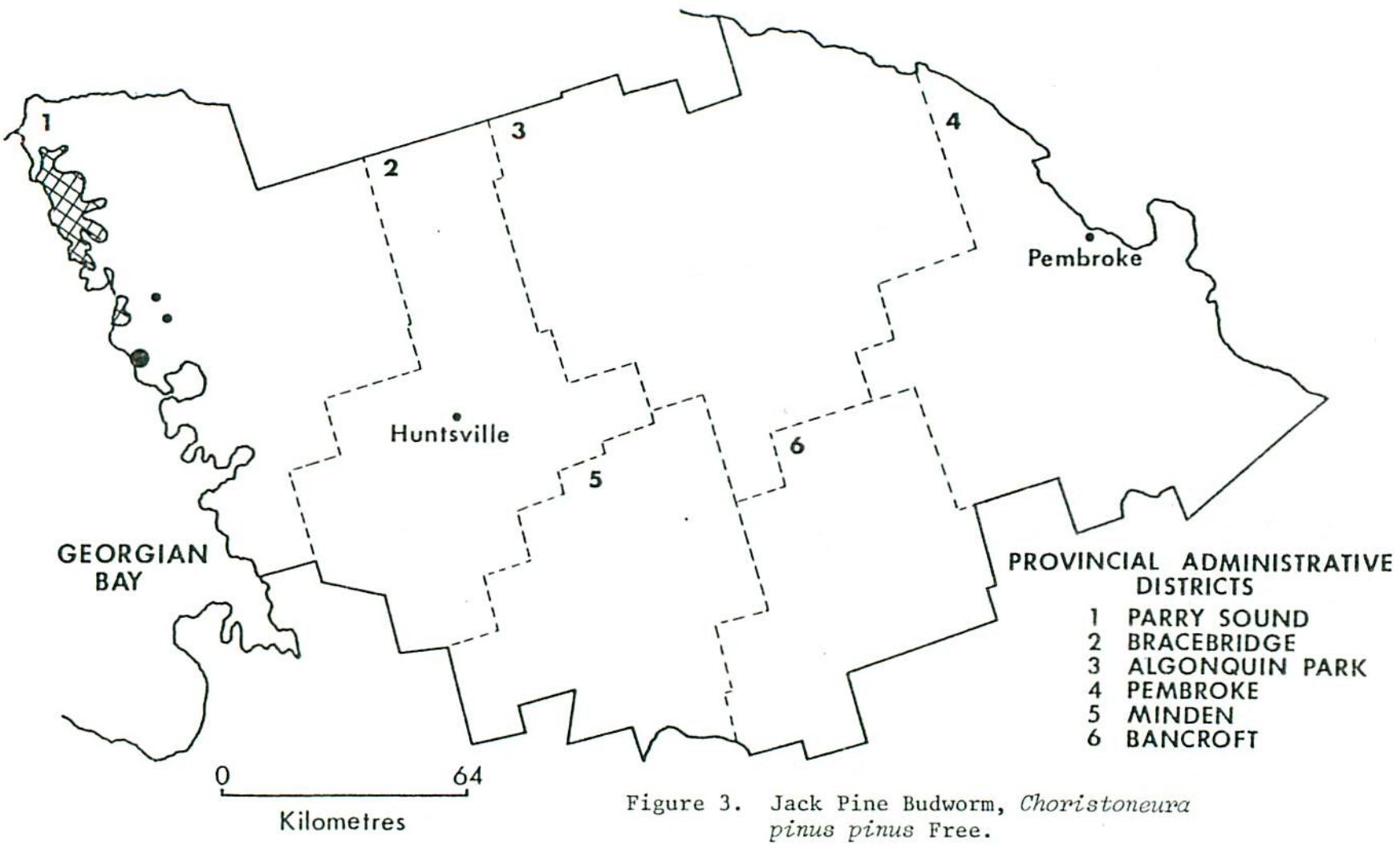

Figure 3. Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Areas within which jack pine (*Pinus banksiana* Lamb.) sustained moderate-to-severe defoliation in 1984

or ● or •

expected throughout the infested area again in 1985. However, in the past, infestations of this pest have unexpectedly collapsed despite forecasts of even higher infestations than the one for this particular area.

Larch Casebearer, *Coleophora laricella* (Hbn.)

There was a slight increase in the amount of defoliation on tamarack (*Larix laricina* [Du Roi] K. Koch) across the Region this year, after severe damage from the larch casebearer in 1980, followed by almost complete collapse of the infestation in 1981.

High population levels caused noticeable discoloration in 5 ha of tamarack growing in a low, wet site in Carling Township, Parry Sound District. Moderate-to-severe defoliation occurred in 1- to 5-ha pockets along Highway 62 and county roads leading to St. Ola and Gunter in Limerick and Cashel townships, and along Highways 620 and 504 in Chandos Township, Bancroft District.

Throughout the remainder of the Region trace-to-low numbers could be found wherever the host species occurred.

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

There was a noticeable decrease in moderate-to-severe defoliation of sugar maple (*Acer saccharum* Marsh.) caused by this skeletonizer across the northern portion of the Region. In addition, the area within which defoliation occurred changed significantly from one solid block along the northern regional boundary, to numerous, widely scattered pockets stretching from Machar Township in the north end of Bracebridge District to the southern portion of Bruton Township in the Algonquin Park District (Fig. 4 and photo page).

A total area of about 23,496 ha was aerially sketch-mapped and considered moderately to severely defoliated. The largest pocket occurred in Chapman Township in Parry Sound District, with an extension into Strong and Armour townships in the Bracebridge District. A second large pocket occurred north of Strong Township in Machar Township.

Elsewhere across the entire Region trace numbers could be detected in stands with a high maple component.

Fall Webworm, *Hyphantria cunea* (Dru.)

This annual pest of hardwoods was prevalent across the Region this season, and again black ash (*Fraxinus nigra* Marsh.) was the favored host. Approximately 1/4 ha of black ash growing on a very low, wet site along

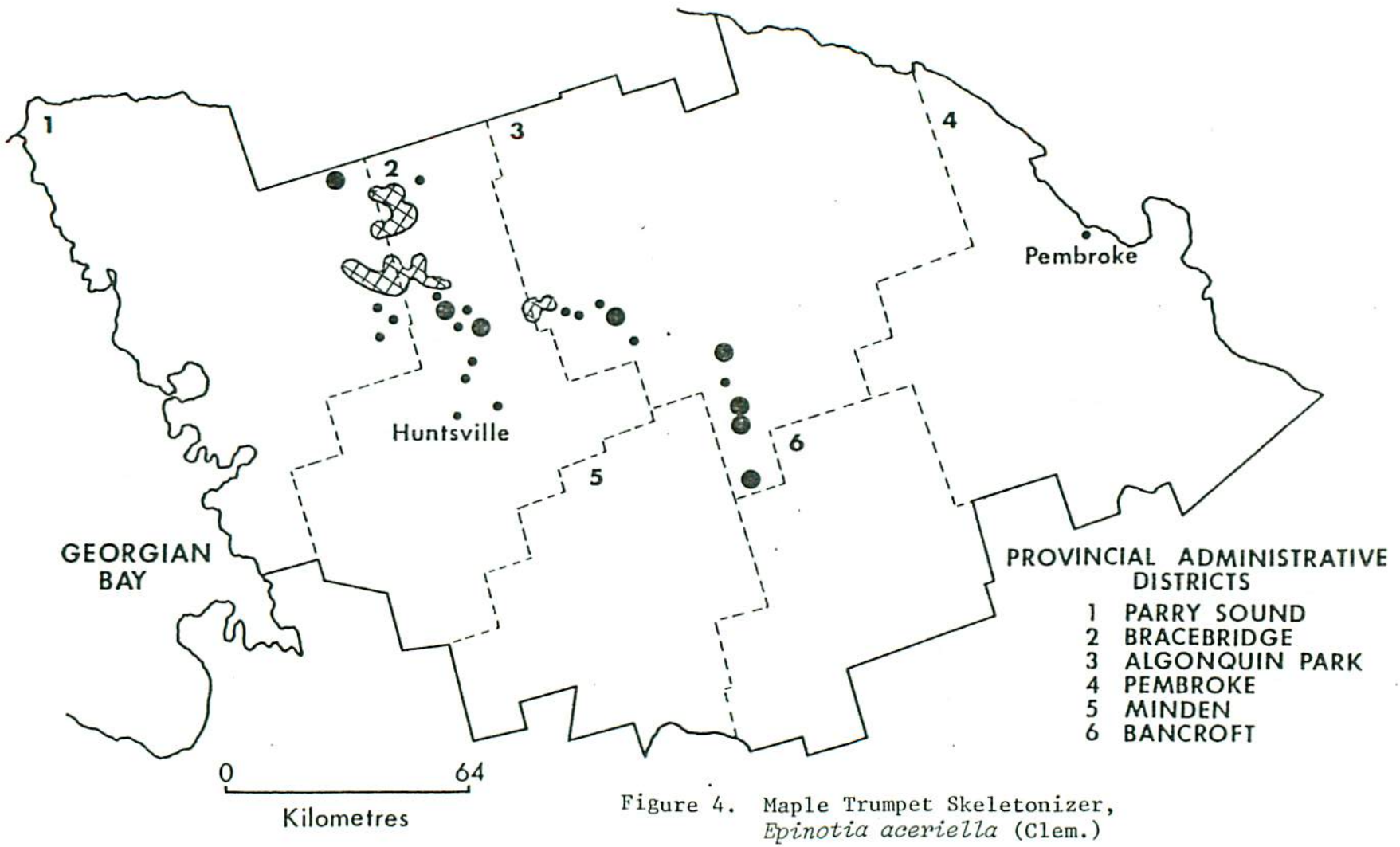

Figure 4. Maple Trumpet Skeletonizer, *Epinotia aceriella* (Clem.)

Areas within which moderate-to-severe defoliation occurred in 1984 . . ▨ or ● or •

Highway 69 in Gibson Township, Parry Sound District, was completely covered with web masses resulting in 100% defoliation (Fig. 5).

Moderate population levels were detected on black ash growing in low-lying areas along Highway 28 in Burleigh Township, Bancroft District, and along Highway 35 in Lutterworth and Minden townships in Minden District. Similar population levels were detected along Renfrew County Road 3 in Horton and McNab townships, Pembroke District.

Elsewhere aross the Region single web masses were detected at numerous locations on a wide variety of host trees.

Gypsy Moth, *Lymantria dispar* (L.)

Various ground, aerial, and trapping surveys conducted across the Region this season have indicated a slight increase in the very low population level of this particular pest (see Frontispiece).

Extensive ground surveys were conducted during early May for evidence of gypsy moth egg masses across the southern portions of the Pembroke and Bancroft districts. Trace numbers of egg masses were detected on open-grown roadside bur oak *(Quercus macrocarpa* Michx.) on the south side of the town of Renfrew and at the town of Braeside, in the Pembroke District. Subsequent ground checks in these areas recovered several larvae from the Renfrew location, and none from Braeside.

In the town of Calabogie, in Bagot Township, Bancroft District, more than 100 larvae were collected on a single roadside red oak *(Quercus rubra* L.). A single larva was also collected at the Tea Lake Campground in Algonquin Park, Algonquin Park District.

In cooperation with the Parks Branch of OMNR, burlap and pheromone traps were set out at 21 provincial campgrounds throughout the Region (Fig. 6). Ten burlap traps were set out at each campground in late May and left in place until early July. These traps were examined daily by park staff, but no larvae were trapped. At the time the burlap traps were removed, two pheromone traps were set out at each campground, and remained in place until early September. Due to vandalism a number of traps could not be recovered. Positive counts were registered at several locations and these data are summarized in Table 2.

Extensive aerial surveys, conducted in early July, across the southern portion of the Region did not detect any noticeable defoliation caused by gypsy moth.

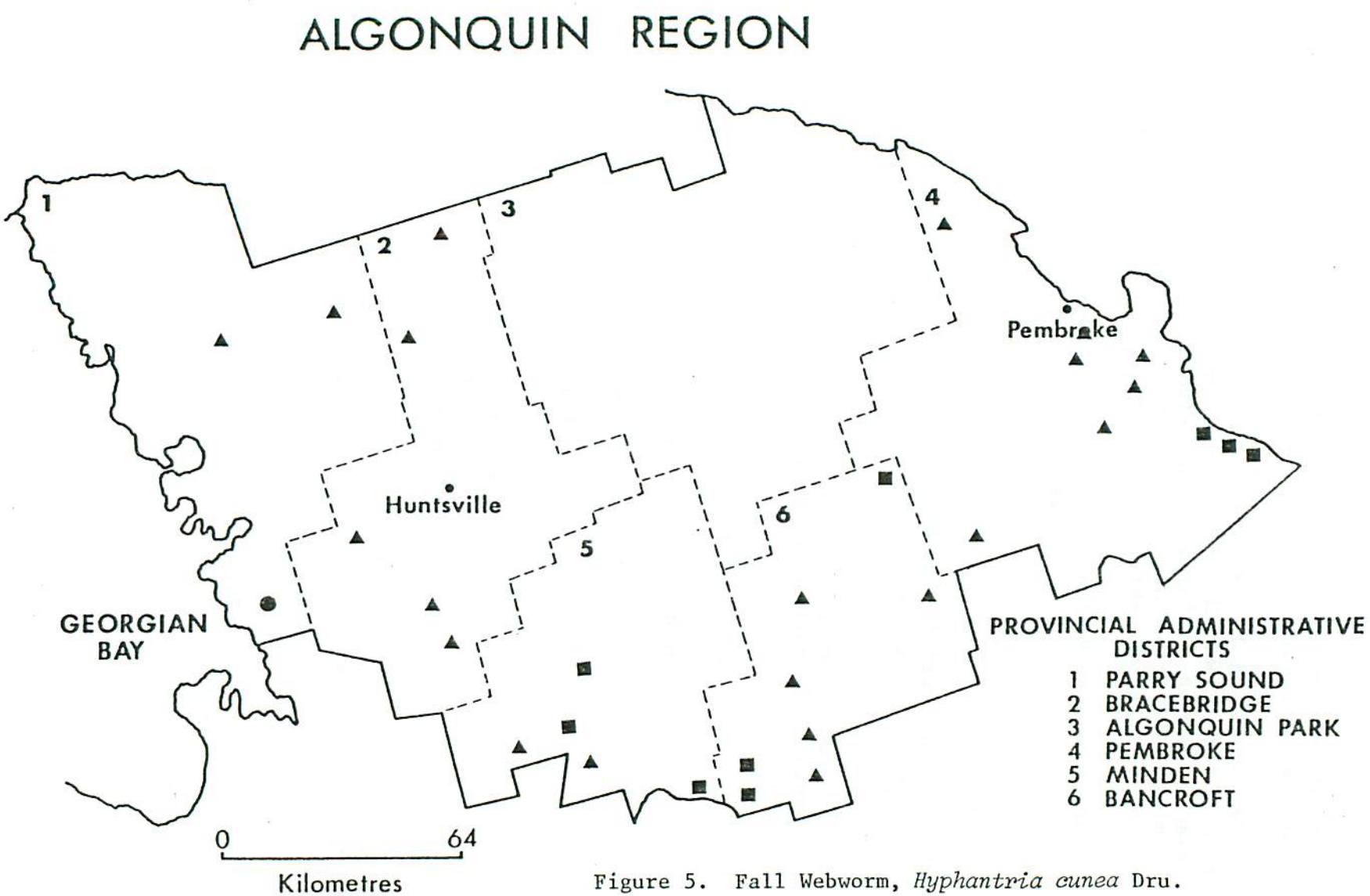

Figure 5. Fall Webworm, *Hyphantria cunea* Dru.

Areas within which defoliation of hardwoods occurred in 1984

Light . . . . . ▲
Moderate . . . . . ■
Heavy . . . . . ●

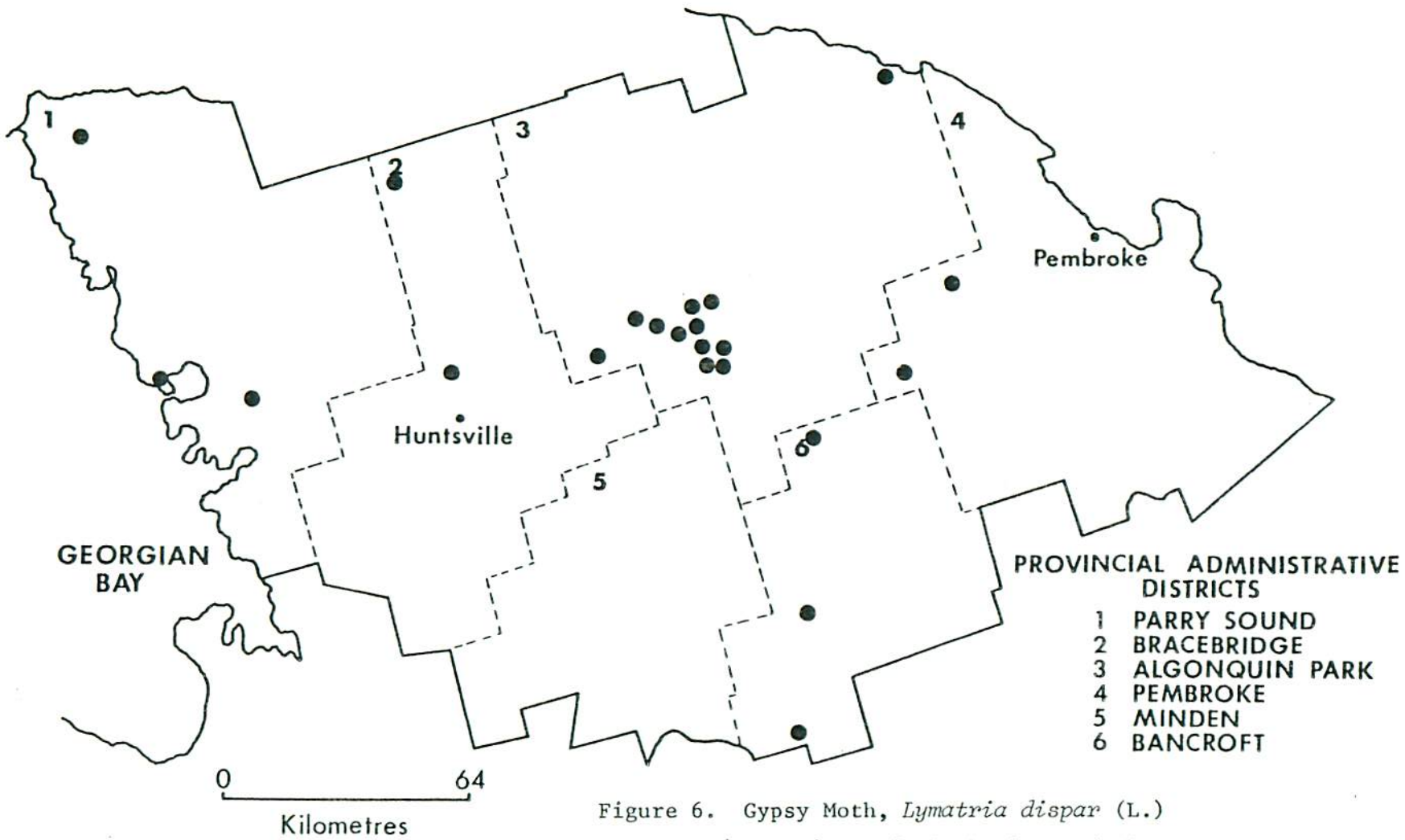

Figure 6. Gypsy Moth, *Lymatria dispar* (L.)

Locations of the burlap and pheromone trapping completed in 1984 . . . . . ●

Table 2. Summary of the number of adult male moths trapped in pheromone traps at provincial campgrounds across the Algonquin Region in 1984.

Location	No. of pheromone traps	No. of male moths trapped
Algonquin Park District		
Driftwood	1	0
Algonquin Park		
Kearny Lake	1	0
Pog Lake	1	0
Lake of Two Rivers	1	1
Mew Lake	2	1
Tea Lake	1	0
Coon Lake	1	2
Rock Lake	1	1
Whitefish Lake	1	0
Opeongo	1	0
Canisby	1	0
Bancroft District		
Lake St. Peter	1	8
Petroglyphs	2	13
Silent Lake	2	7
Bracebridge District		
Arrowhead	2	0
Mikisew	2	0
Parry Sound District		
Grundy Lake	2	1
Killbear	2	1
Oastler Lake	2	0
Pembroke District		
Bonnechere	2	2
Carson Lake	1	4

Balsam Fir Sawfly, *Neodiprion abietis* complex

The districts of Algonquin Park and Pembroke experienced a marked increase in population levels of this sawfly from the previous low numbers observed in 1981 and 1982.

Moderate-to-severe damage was aerially mapped in a total of 300 ha in Finlayson and McCraney townships, Algonquin Park District.

A number of scattered areas on the east side of Pembroke District had damage ranging from 50% defoliation in a total of 400 ha in Alice, Stafford and Westmeath townships to 10% in a total of 200 ha in Admaston and McNab townships and 100 ha in Rolph Township (Fig. 7).

Redheaded Pine Sawfly, *Neodiprion lecontei* (Fitch)

Low population levels were detected in young red pine plantations across the southern portion of Bancroft and Pembroke districts again this year. However, a high population occurred for the second year in a small roadside planting (<1 ha) on the west side of Algonquin Park, Algonquin Park District.

The most damage occurred on the east side of Pembroke District where a total of 10 colonies, averaging only one colony per tree, were detected in a pocket less than 1 ha in size in a 15-ha red pine plantation in Ross Township. In adjacent Horton Township a total of 21 colonies, averaging two to three colonies per tree, were scattered throughout a similar 5-ha red pine plantation.

Jack Pine Sawfly, *Neodiprion pratti banksianae* Roh.

This sawfly caused various levels of defoliation to jack pine (*Pinus banksiana* Lamb.) across the central and northern portion of the Pembroke District (Fig. 8).

The heaviest defoliation, which resulted in 100% of the old foliage being consumed, was encountered on the fringe trees of a 12-ha plantation of 10-m trees in North Algona Township. Moderate-to-severe defoliation occurred throughout the remainder of this plantation. Similar levels of defoliation were detected in 3- to 4-m jack pine in a 6-ha planting in Wilberforce Township, and a 1-ha plantation in Hagarty Township.

Light defoliation was detected in a 2-ha plantation of 10-m-high trees in Radcliffe Township, and in a 1-ha natural stand of trees 9 m high in Alice Township.

Trace numbers could be found wherever jack pine occurred, extending from the Eganville area of Wilberforce Township in the south to Deep River in Rolph Township in the north.

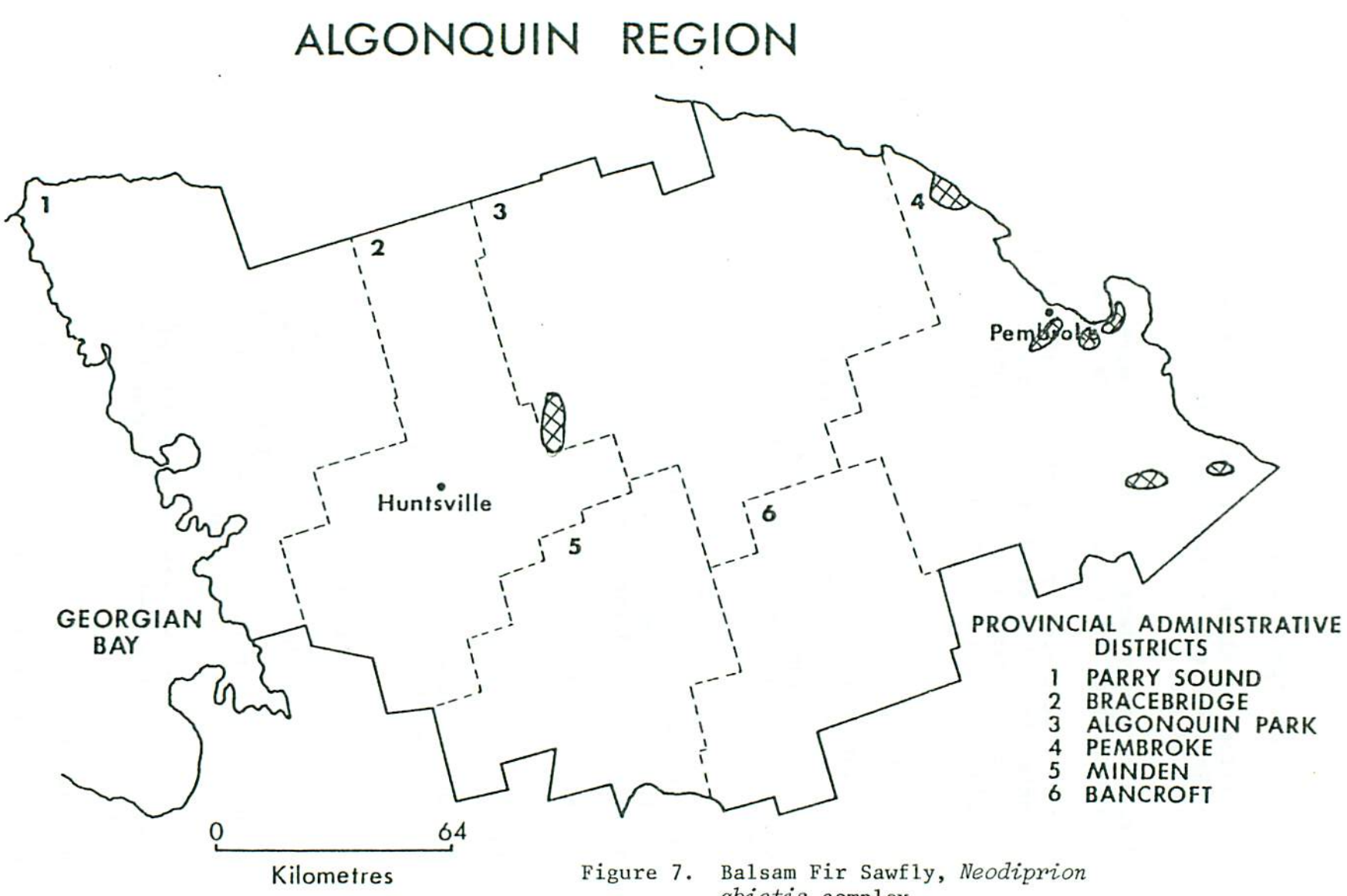

Figure 7. Balsam Fir Sawfly, *Neodiprion abietis* complex

Areas within which defoliation occurred in 1984 . . . . . .

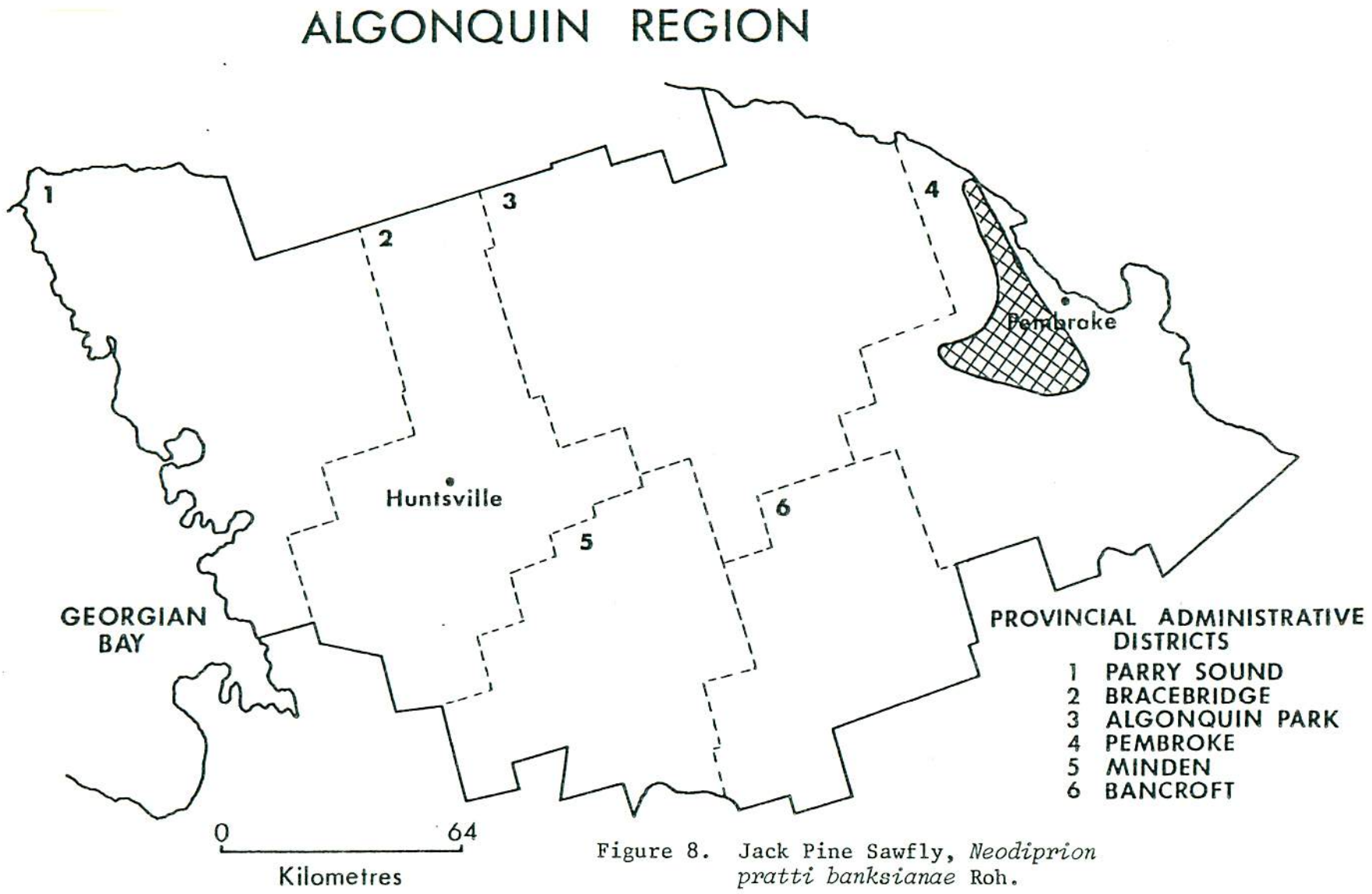

Figure 8. Jack Pine Sawfly, *Neodiprion pratti banksianae* Roh.

Area within which various levels of defoliation occurred in 1984 . . .

Maple Leafcutter, *Paraclemensia acerifoliella* (Fitch)

There was a marked increase in the distribution and level of defoliation caused by the maple leafcutter in 1984. Aerial surveys detected a pocket of approximately 126 ha of heavily defoliated sugar maple in the southeastern portion of Limerick Township, Bancroft Township, and an additional 126 ha west of Eganville in Wilberforce Township, Pembroke District (Fig. 9).

Moderate defoliation was detected throughout a 20-ha mixed hardwood stand in Harvey Township, and in a 15-ha maple stand in Dysart Township in the Minden District.

Trace numbers were often encountered in hardwood areas in Burleigh and Anstruther townships, Bancroft District; Ridout Township, Bracebridge District; Lutterworth and Havelock townships, Minden District and at Killbear Provincial Park in the Parry Sound District. In the above-mentioned areas this pest was encountered only on the understory trees.

White Pine Weevil, *Pissodes strobi* (Peck)

Surveys conducted across the Region revealed extremely high population levels of this weevil in the eastern portion of the Pembroke District. In white pine plantations in Ross and Wilberforce townships, 43 and 38% of the leaders were attacked, respectively (Table 3). Elsewhere in the Region the number of leaders damaged averaged only 3%, which is more typical of the long-term yearly average for the Region.

Additional information on this pest may be found later in this report under Special Surveys, White Spruce Plantation Survey.

Table 3. Summary of damage caused by the white pine weevil at six locations in the Algonquin Region (counts based on the examination of 150 trees at each location).

Location (Twp)	Host	Area (ha)	Total trees per ha	Avg ht of sampled trees (m)	Trees weeviled (%)
Algonquin Park District					
Edgar	jP	120	2200	2	2
Bancroft District					
Dungannon	wP	4	2000	3	5
Bracebridge District					
Medora	wP	1	1800	3	4
Pembroke District					
Ross	wP	4	1600	4	43
Wilberforce	wP	1	2800	5	38
Rolph	jP	4	2000	2	3

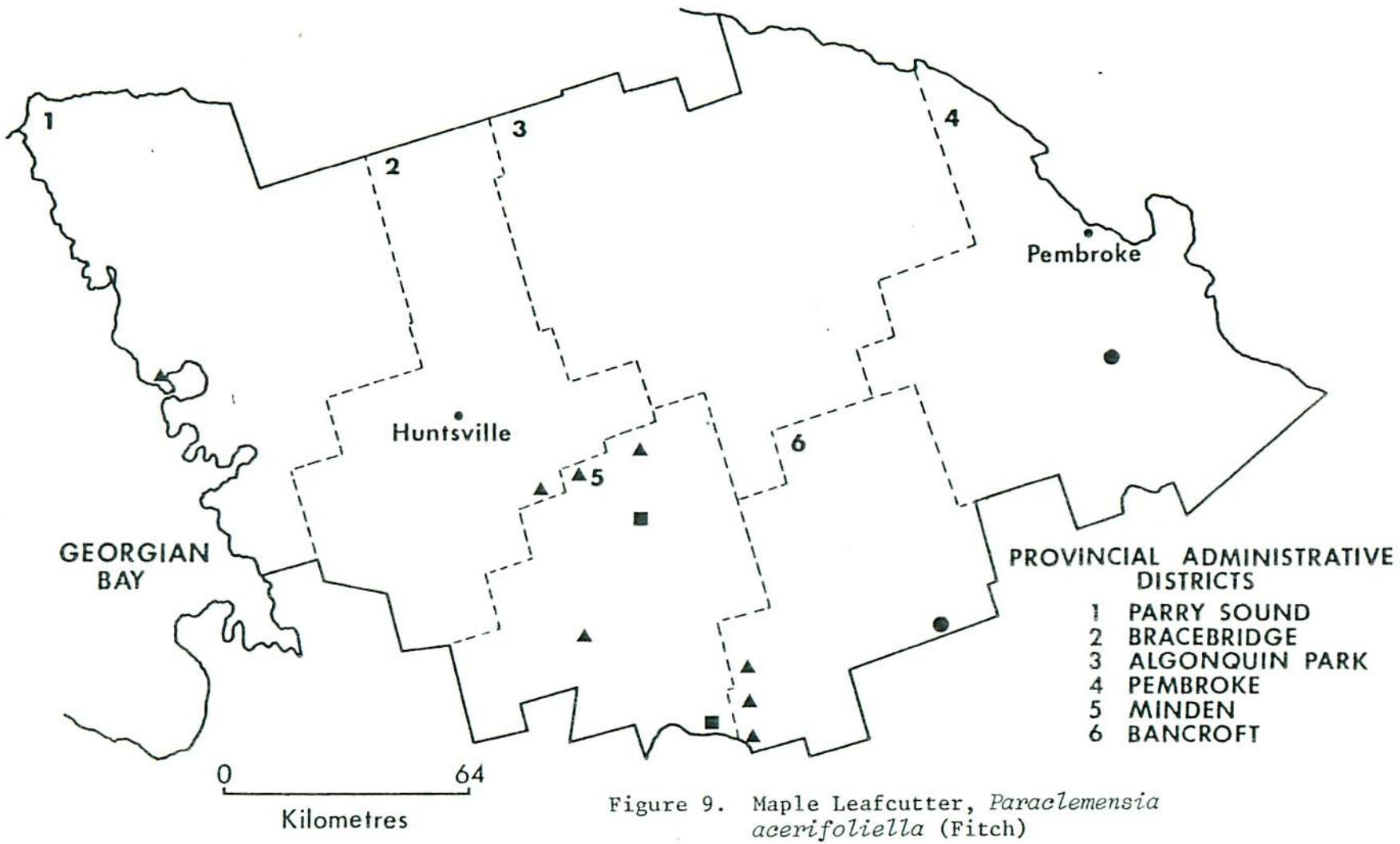

Figure 9. Maple Leafcutter, *Paraclemensia acerifoliella* (Fitch)

Area within which defoliation of sugar maple (*Acer saccharum* Marsh.) occurred in 1984

Light . . . . . ▲
Moderate . . . . . ■
Heavy . . . . . ●

Minor Insects

Flat Leaftier, *Psilocorsis reflexella* Clem.

The flat leaftier caused severe browning of foliage to oaks and trembling aspen *(Populus tremuloides* Michx.) this season at numerous locations. In the area between Magnetawan in the Parry Sound District and Sundridge in the Bracebridge District, small pockets of trembling aspen, ranging from several trees to half a hectare, were heavily infested, with virtually every leaf damaged. Red and bur oaks throughout Muskoka and Woods townships, from Gravenhurst to Bala in the Bracebridge District were found to have 50 to 75% of the foliage damaged by this pest. Damage within this area was heaviest on fringe trees. Similar damage was encountered on the same tree species throughout Minden, Dysart and Guilford townships, and on a small cluster of approximately 20 trembling aspen trees west of Head Lake in Digby Township, Minden District. Fringe red and bur oak growing along County Road 12 across Freeman Township, Parry Sound District, were also heavily infested.

Light-to-moderate defoliation was commonly detected along Highway 28, extending from Paudash in Cardiff Township to the town of Bancroft in Faraday Township, and in the vicinity of Oak Lake in Methuen Township, Bancroft District. Low numbers were detected throughout Griffith and Raglan townships in the Pembroke District, Airy and Canisbay townships in the southern portion of Algonquin Park District, Harvey and Laxton townships in the Minden District and in Conger Township in the Parry Sound District.

Elsewhere in the Region trace numbers were routinely encountered at numerous widely scattered locations.

Pine Needle Sheathminer, *Zelleria haimbachi* Busck

Ground surveys conducted throughout the western portion of the Parry Sound District detected a high incidence of this needle miner. However, due to the jack pine budworm infestation that occurred in the same area, total population levels and degree of defoliation could not be determined. Larvae and damage were detected in an area extending from the town of Parry Sound northward to the French River. The highest numbers were found through Carling, Shawanaga, Harrison and Wallbridge townships.

Table 4. Other forest insects.

Insect	Host(s)	Remarks
Acrobasis betulella Hlst. Birch tubemaker	wB	low population levels collected on roadside fringe, semimature trees in Alice Twp, Pembroke District, and in Airy Twp, Algonquin Park District
Adelges abietis (L.) Eastern spruce gall aphid	wS	5% of trees infested in a 2-ha plantation in Bagot Twp, and 1% in a 10-ha plantation in Hagarty Twp, Pembroke District
Altica populi Brown Poplar flea beetle	bPo	marked reduction in population and distribution across area infested in 1983; only low numbers at widely scattered points detected this season in Pembroke and Bancroft districts
Aphrophora cribrata (Walker) Pine spittlebug	wP	very common across the Region at trace levels; an average of 12 spittle masses on 8 trees sampled in Mayo Twp, Bancroft District, and an average of 10 masses on 2-m trees in Alice Twp, Pembroke District
Archips cerasivorana (Fitch) Uglynest caterpillar	pCh	very common on single roadside shrubs throughout the Region
Argyresthia thuiella (Pack.) and *Pulicalvaria thujaella* (Kft.) Cedar leafminer complex	Ce	complete collapse of the infestation reported in 1983 in the southern portion of the Minden District; trace numbers found in 1-ha and 1.5-ha areas in Faraday Twp, Bancroft District, and Airy Twp, Algonquin Park District
Cameraria aceriella (Clem.) Maple leafblotch miner	sM	high populations detected throughout a 25-ha woodlot at Miners Bay, Lutterworth Twp, Minden District

(continued)

Table 4. Other forest insects (continued).

Insect	Host(s)	Remarks
Camerarai hamadryadella (Clem.) Solitary oak leafminer	wO	trace populations found across a 0.5-ha stand in Harvey Twp, Minden District
Cephalica marginata Midd. Red pine webspinning sawfly	rP	2% of trees infested with an average of one web mass per 1.5-m tree in a 0.5-ha plantation in Macaulay Twp, Bracebridge District
Croesia semipurpurana (Kft.) Oak leaf shredder	rO, wO	small numbers collected on ornamentals in Admaston Twp, and on roadside trees along Hwy 62 in Alice Twp, Pembroke District
Datana ministra (Dru.) Yellownecked caterpillar	Ba, rO	a few larvae found on single roadside trees at two locations in Faraday Twp, Bancroft District
Dendroctonus valens Lec. Red turpentine beetle	rP	small numbers detected in a 5-ha plantation in Mayo Twp, Bancroft District
Diprion similis (Htg.) Introduced pine sawfly	wP	trace population detected on semimature trees on a 3-ha island in Georgian Bay, Conger Twp, Parry Sound District
Epinotia solandriana L. Birch-aspen leafroller	wB	low numbers detected on roadside trees along Hwy 550 in Carling Twp, Parry Sound District; along secondary roads throughout Alice Twp, Pembroke District and Airy Twp, Algonquin Park District; on fringe roadside trees scattered from the town of South River to Beautiful Lake in Laurier Twp; and trace numbers throughout Perry Twp, Bracebridge District

(continued)

Table 4. Other forest insects (continued).

Insect	Host(s)	Remarks
Epinotia timidella Clem. Oak trumpet skeletonizer	rO	high numbers found along Hwy 69 from Hwy 169 to the Moon River, in Freeman Twp, and along Hwy 128 in Croft Twp, Parry Sound District
Eucosma gloriola Heinr. Eastern pine shoot borer	rP	trace populations found on 1% of the trees in a 15-ha plantation in Westmeath Twp, Pembroke District
Fenusa pusilla (Lep.) Birch leafminer	wB	very common at high infestation levels on ornamentals throughout the entire Region; heavy along Hwy 60 throughout Algonquin Park, Algonquin Park District
Gonioctena americana (Schaef.) American aspen beetle	tA	moderate population levels at widely scattered locations throughout Buchanan Twp, Pembroke District, and trace damage throughout Burleigh Twp, Bancroft District
Hylobius congener D.T. Bark weevil	rP	trace populations detected in a 6-ha plantation in Alice Twp, Pembroke District
Hylobius radicis Buch. Pine root collar weevil	rP	trace populations found in a 4-ha plantation in Richards Twp, Pembroke District, and in a 15-ha plantation in McMurrich Twp, Parry Sound District
Ips pini (Say) Pine engraver	rP	small numbers associated with several dead trees in a 5-ha plantation in Mayo Twp, Bancroft District
Malacosoma americanum F. Eastern tent caterpillar	cCh	very common on widely scattered, single roadside shrubs throughout the Region

(continued)

Table 4. Other forest insects (continued).

Insect	Host(s)	Remarks
Malacosoma disstria Hbn. Forest tent caterpillar	sM, rO, tA	trace populations found on single trees in Minden Twp, Minden District, Blithfield Twp, Pembroke District, and in Sabine Twp, Algonquin Park District
Orthotomicus caelatus (Eich.) Bark beetle	rP	high numbers associated with dead and dying trees in a 10-ha plantation in McMurrich Twp, Parry Sound District
Pandemis limitata (Rob.) Threelined leafroller	rO, wO	small numbers collected in semimature trees in 3- and 7-ha stands in Alice and Wylie twps, Pembroke District, and in a 0.5-ha area of open-growing trees in Harvey Twp, Minden District
Pissodes approximatus Hopk. Northern pine weevil	rP	high numbers found in dead and dying trees in a 10-ha plantation in McMurrich Twp, Parry Sound District
Pristiphora erichsonii (Htg.) Larch sawfly	eL	trace populations for second consecutive year on ornamental trees at Mew Lake Campground, Algonquin Park, Algonquin Park District
Pseudexentera cressoniana Clem. Oak olethreutid leafroller	rO, wO	low-to-moderate numbers collected on single roadside trees throughout much of Wylie, Alice and Admaston twps, Pembroke District and in Mayo Twp, Bancroft District
Pseudexentera oregonana Wlshm. Aspen leafroller	tA	small numbers detected on fringe and single trees throughout Alice Twp, Pembroke District
Pulicalvaria piceaella (Kft.) Orange spruce needleminer	wS	small numbers detected on exposed edge of 0.5-ha pocket of trees in Christie Twp, Parry Sound District

(continued)

Table 4. Other forest insects (concluded).

Insect	Host(s)	Remarks
Symmerista canicosta Francl. Redhumped oakworm	rO	a complete collapse of the infestation that has occurred for the past few years on the islands in Georgian Bay, Parry Sound District; only a few larvae found on island in Georgian Bay and on a single tree in Watt Twp, Bracebridge District
Tetralopha asperatella (Clem.) Maple webworm	sM	very common with trace-to-light populations in virtually all areas within which sugar maples occurred across the Region
Tetralopha expandens (Wlk.) Striped oak webworm	rO	very common at low levels on fringe trees along Muskoka Lake shoreline, Bracebridge District, and along District Road 12 in Freeman Twp, Parry Sound District

TREE DISEASES

Major Diseases

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

In a 15-ha red pine plantation in McMurrich Township, Parry Sound District, 10% of the 1.7-m trees were found to be dead or dying as a result of this root rotting fungi. At this particular site the native race of Scleroderris canker, *Gremmeniella abietina* (Lagerb.) Morelet, has had a significant impact on the planting effort, reducing the stocking to less than 1,000 trees per hectare. Many of the trees that were initially weakened by Scleroderris are now dying as a result of the Armillaria root rot.

A pocket of mortality, consisting of 23 dead trees, was detected in a 2-ha red pine plantation of 7-m high trees in Stanhope Township, Minden District. Examination of the butts of each dead tree showed the characteristic resin flow and white mycelial fans under the bark caused by Armillaria root rot.

This disease organism also caused 1% mortality in a 1981 white pine planting that followed a selective cut in a 20-ha mature hardwood stand in Ballantyne Township in the Bracebridge District. In a mixed red and jack pine plantation, 10 ha in size and 2 m in height, in White Township, Algonquin Park District, a mortality rate of 2% in the red pine and 3% in the jack pine was attributed to this disease.

Additional information concerning this disease may be found later in this report under Special Surveys, White Spruce Plantation Survey.

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

White pine blister rust was commonly encountered across the Region, causing trace levels of branch and whole tree mortality. A standard 150-tree evaluation conducted in a 4-ha white pine plantation, 2 m high in Dungannon Township, Bancroft District, however, revealed a higher than normal incidence rate. This evaluation revealed a 1% current mortality rate with 16% of the trees diseased, 83% of which had main stem cankers. A similar evaluation completed in a 0.5-ha white pine plantation in Wilberforce Township, Pembroke District, revealed 7% of the 4.9-m trees affected with main stem infections, and a 1% current mortality rate. In Ross Township, Pembroke District, infection levels were considerably lower with only 3% of the main stems cankered, causing 1% current mortality in a 4-ha white pine plantation, with 3.5-m high trees.

A Needle Cast, *Davisomycella ampla* (Davis) Darker

The incidence of this needle cast on jack pine increased from low levels last year to high levels this year on the eastern side of the Pembroke District. In Westmeath Township, Pembroke District, in a 1/4-ha pocket in a 16-ha mixed red and jack pine plantation 12 m in height, 75% of the old foliage was affected. Moderate damage occurred on 20% of the 2- and 3-yr-old needles on the lower branches of 30% of the trees in an 3-ha jack pine plantation of 2-m high trees in Buchanan Township, Pembroke District.

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

An extensive aerial and ground survey conducted during late May and early June across the Region detected no evidence of the European race of this pathogen.

A minimum of 500 red pine trees were visually examined for any evidence of infection at 15 semipermanent plots (Fig. 10). An additional 15 locations, the majority of which were plantations within which dead or dying trees were aerially detected, were also inspected. At all of these locations the cause of the damage was later attributed to various other causes, such as Armillaria root rot, needle cast fungi, drought, or animal damage.

Routine surveys of red pine plantations detected very high incidence rates of the native race of this pathogen in previously unaffected plantations in Macaulay Township, Bracebridge District, and in McMurrich Township, Parry Sound District. Table 5 summarizes the data collected from standard 150-tree disease evaluations conducted in the affected areas. In both of these townships the OMNR conducted a sanitation program that included the removal of all dead trees and the removal of the lower branches on the remaining trees. Similar sanitation programs have been carried out in the past in other affected plantations in the above mentioned townships.

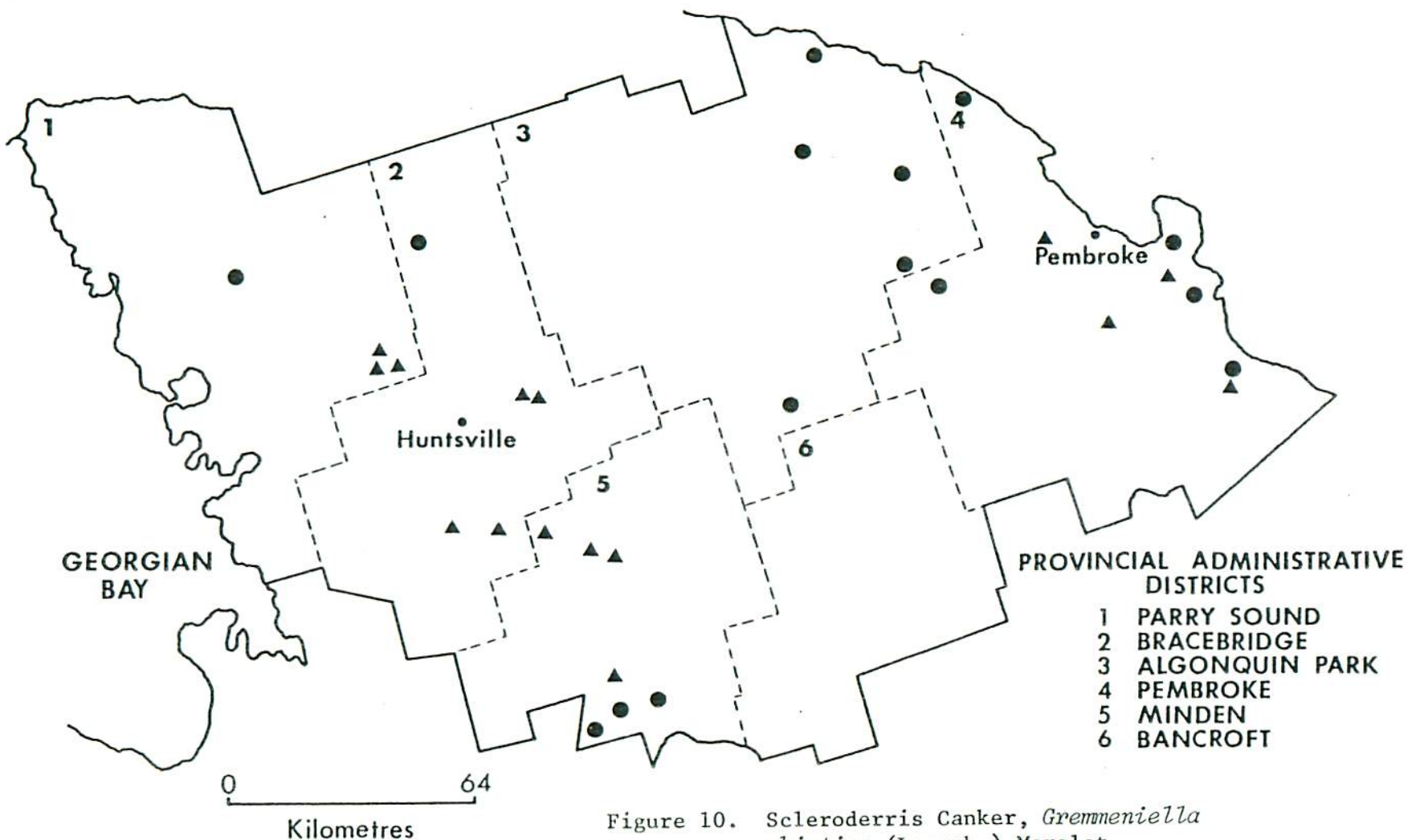

Figure 10. Scleroderris Canker, *Gremmeniella abietina* (Lagerb.) Morelet

Locations of semipermanent monitoring plots and additional pine plantings examined in 1984

Semipermanent plots . . . . . ●
Additional areas checked . . . . ▲

Table 5. Summary of the results of a Scleroderris canker survey, native race, conducted at four locations in the Algonquin Region in 1984 (data based on the examination of 150 red pine trees at each location).

Location (Twp)	Ht of trees (m)	Area affected (ha)	Host trees per ha	Trees affected (%)	Current mortality (%)
Bracebridge District					
MacCaulay	1.5	1	1,800	61	13
Parry Sound District					
McMurrich	1.9	12	2,500	33	3
	2.1	3	3,000	24	1
	1.5	8	2,700	17	0

Minor Diseases

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

An increase in the incidence of this leaf blight occurred in the south central and eastern portion of the Algonquin Region. Damage levels were high in roadside stands of balsam poplar *(Populus balsamifera* L.), usually less than 0.5 ha in size, along Highway 503 between Norland and Head Lake in Laxton township, Minden District. Two similar-size pockets of 13-m trees sustained 60% premature leaf drop in Westmeath township, Pembroke District.

Elsewhere throughout the Region only trace infections on widely scattered individual trees were observed.

Table 6. Other forest diseases.

Organism	Host(s)	Remarks
Ceratocystis ulmi (Buism.) C. Moreau Dutch elm disease	wE	still very active throughout the Region; high incidence found in open-grown, semi-mature trees in Ross Twp, Pembroke District
Chrysomyxa ledi (Alb. & Schw.) d By. var. *ledi* Spruce needle rust	wS	trace amounts of needle damage in 2 ha of young naturally regenerated trees in Westmeath Twp, Pembroke District

(continued)

Table 6. Other forest diseases (continued).

Organism	Host(s)	Remarks
Chrysomyxa pirolata Wint. Spruce cone rust	wS	high levels of cone damage along Hwy 11 near Scotia, Perry Twp, Bracebridge District
Ciborinia whetzelii (Seav.) Seav. Ink spot of aspen	tA	heavy foliage damage with up to 80% of the leaves affected along a 0.5-km section of road in Fitzgerald Twp, Algonquin Park District
Endocronartium harknesii (J.P. Moore) Y. Hirat. Western gall rust	scP jP	trace incidence in a 1-ha plantation of Scots pine in Dudley Twp, Minden District; trace levels were observed in a 0.5-ha experimental plantation in Buchanan Twp, Pembroke District
Hypoxylon mammatum (Wahl.) J.H. Miller Hypoxylon canker	tA	a high incidence of damage in a 0.5-ha natural stand with 30% mortality in Sherwood Twp, Pembroke District
Isthmiella faullii (Darker) Darker Needle cast	bF	moderate amounts of this most destructive needle cast observed in 5 ha of mature forest in Buchanan Twp, Pembroke District
Kabatiella apocrypta (Ell. & Ev.) Arx Anthracnose	mAs, rM	high incidence of leaf damage on three ornamental ash trees within the town of Minden, Minden District; moderate damage levels observed on an ornamental in the town of Deep River, Pembroke District
Linospora tetraspora G.E. Thomps. Leaf blight	bF	moderate-to-severe damage observed in 1- to 2-ha semi-mature stands scattered across the southern half of the Region
Lophodermium sp. Needle cast	jP, rP	high damage levels affecting 75% of the old foliage in a 5-ha jack pine stand in Harrison Twp, Parry Sound District; high incidence found on 2-m trees in a 2-ha plantation in Wicklow Twp, Bancroft District

(continued)

Table 6. Other forest diseases (concluded).

Organism	Host(s)	Remarks
Marssonina brunnea (Ell. & Ev.) Magn. Leaf spot	lA, tA hybrid poplar	high incidence of damage with up to 100% of the leaves affected observed in a 0.5-ha largetooth aspen (*Populus grandidentata* Michx.) stand in Sherwood Twp, Pembroke District; 90% defoliation noted in a 0.3-ha stand in Hinden Twp, Minden District; low levels observed in a 20-ha plantation of hybrid poplar in Ross Twp, Pembroke District
Rhytisma acerinum (Pers.) Fr. Tar spot	rM	trace amounts of leaf damage sampled or observed on semi-mature trees in Wylie and Radcliffe twps, Pembroke District
Sphaeropsis sapinea (Fr.) Dyko & Sutt. Tip blight	scP	low levels of continuing mortality occurring on a shelterbelt along old Hwy 17, just north of the town of Pembroke in Alice Twp, Pembroke District
Taphrina caerulescens (Mont. & Desm.) Tul. Leaf-blister rust	rO	cool, damp weather this summer probably a contributing factor in high incidence (95%) of leaf-blisters on mature trees in Westmeath Twp, Pembroke District
Venturia macularis (Fr.) Müller & Arx Shoot blight	tA	moderate tip damage evident on young fringe trees in Alice Twp, Pembroke District; common elsewhere at trace levels throughout the work area

DIEBACKS AND DECLINES

Maple Dieback and Canker Survey

A special survey was conducted at eight randomly located sugar maple stands across the Algonquin Region in 1984. Each stand selected had at least 40% sugar maple content (Fig. 11).

At each location a minimum of 100 sugar maple trees were evaluated for the current and accumulative level of crown dieback and for the presence of Eutypella stem cankers, *Eutypella parastitica* Davidson and Lorenz (see photo page). The average height to the base of the Eutypella cankers was found to be 1.46 m, with an average canker length of 86 cm. The evaluation of the crowns of the 847 trees tallied revealed only 6% had more than 20% of the crown currently dying whereas the accummulative amount of dieback increased to 22% of the trees having greater than 20% of the crown dead.

The complete results of this survey are summarized in Table 7.

Oak Decline

In 1977, semipermanent sample plots were established at three locations in the Algonquin Region to determine the amount of deterioration that has occurred in red oak trees in southern Ontario. At each location 100 red oak trees were numbered and have been annually evaluated to determine the total amount of yearly crown deterioration. In 1984, the dieback was classified and recorded as either current or accumulative. Current refers to mortality that occurred during the past year, whereas accumulative refers to the total mortality that has occurred on the tree, including the current dieback.

Since the establishment of the plots in 1977 a slow but steady decline in tree vigor has occurred and some trees have died. Of the 100 healthy trees that were originally numbered in the Macaulay Township plot, Bracebridge District, 6% are now dead, and 3% mortality has been recorded in both the Alice and Wylie township plots in Pembroke District.

Table 8 summarizes the data collected in 1984.

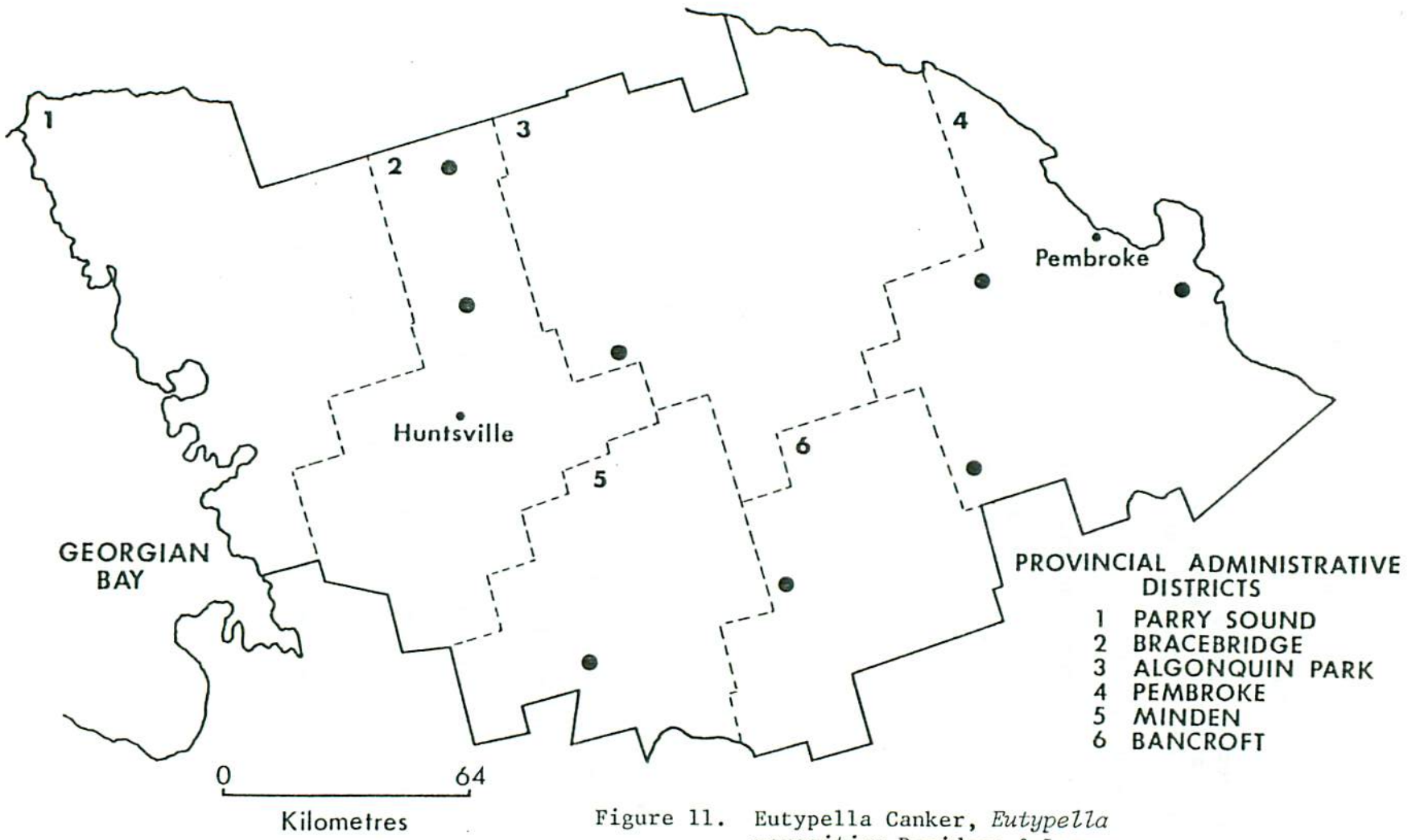

Figure 11. Eutypella Canker, *Eutypella parasitica* Davidson & Lorenz

Locations of sugar maple (*Acer saccharum* Marsh.) stands examined in 1984 . . . . . ●

Table 7. Summary of the results of a sugar maple stand survey conducted at eight locations across the Algonquin 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)	Total host trees per ha	Total trees cankered	Avg ht to canker (m)	Avg length of canker (cm)	Crown dieback[a]											
								Current						Accumulative					
								0	1	2	3	4	5	0	1	2	3	4	5
								(No. of trees)						(No. of trees)					
Algonquin Park District																			
Peck	28	21.0	100	180	2	1.4	95	28	66	7	0	0	6	7	40	42	12	0	6
Bancroft District																			
Cardiff	28	19.5	10	220	1	1.3	50	52	59	3	0	0	2	10	51	46	6	0	2
Bracebridge District																			
Proudfoot	18	17.0	20	110	5	1.4	68	84	18	1	0	2	3	65	36	2	0	2	3
Laurier	26	19.0	50	125	0	–	–	82	18	1	0	0	2	61	33	7	0	0	2
Minden District																			
Lutterworth	30	18.0	26	100	5	1.4	106	78	22	0	0	1	1	48	45	5	2	1	1
Pembroke District																			
Richards	26	18.8	12	150	2	1.2	95	55	40	9	0	0	0	43	44	17	0	0	0
Raglan	31	25.4	12	80	1	2.8	120	78	15	6	0	0	3	53	33	12	3	0	3
Ross	41	21.4	8	180	1	0.7	70	44	60	0	0	0	1	47	45	10	2	0	1

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

Table 8. Summary of the results for three permanent monitoring plots established in 1977 for red oak decline in the Algonquin Region in 1984 (data based on the examination of a minimum of 100 host trees at each location).

Location (Twp)	Avg DBH of sample trees (cm)		Stand size (ha)	Dieback classes[a]											
				Current						Accumulative					
	1977	1984		0	1	2	3	4	5	0	1	2	3	4	5
Bracebridge District				(No. of trees)						(No. of trees)					
Macaulay Twp	20	35	4	69	21	4	0	0	6	2	44	34	11	3	6
Pembroke District															
Alice Twp	16	18	4	51	46	0	0	0	3	0	0	41	54	2	3
Wylie Twp	16	25	3	72	25	0	0	0	3	0	0	27	66	4	3

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

ABIOTIC DAMAGE

Drought

A wide variety of tree species across the Region showed various levels of damage as a result of the 1983 drought, ranging from smaller than normal foliage to entire tree mortality. Last season experienced a rainfall deficit of 52% and 64% for the months of June and July, respectively.

The majority of damage was confined to the rocky ridge tops or shallow soil sites across the southern portion of the Region. An aerial survey revealed some 1,637 ha of red oak mortality along ridge tops in Anstruther, Burleigh and Methuen townships in the southern portion of the Bancroft District. To the immediate west of this area, in Harvey and Cavendish townships, Minden District, several pockets of red oak, 3- to 5 ha in size, sustained an estimated 75% mortality. The occasional white pine, 6 to 7 m high, growing in the same open rocky areas also died from the drought. Another area comprising some 3 ha of dead red oak was detected along the southwest side of Gull Lake in Lutterworth Township, Minden District.

Top dieback and very sparse foliage was commonly seen on yellow birch *(Betula alleghaniensis* Britton) and white birch growing along Highway 35 from Minden Township, in the Minden District, to Highway 60 in Franklin Township in the Bracebridge District, and along Haliburton County Road 1 in Hindon Township, Minden District, and Oakley Township, Bracebridge District. At numerous locations throughout these areas, trembling aspen, growing on the rockier sites, produced very sparse and smaller than normal foliage in 1984. At a few of these locations the trees dropped this sparse foliage by late August. A mixed red and Scots pine *(Pinus sylvestris* L.) plantation, 3 ha in size, growing on very shallow soil over limestone, north of Buckhorn in Harvey Township, Minden District, sustained a mortality rate of 30%, the majority of which was concentrated in one small area of the planting (see photo page).

As a possible effect of the 1983 drought, an extremely heavy seed crop occurred on almost every tree species that occurs across the Region. In most areas the white spruce *(Picea glauca* [Moench] Voss) produced such a quantity of seed that branches were bent downward from the weight of the cones, and yellow birch did not produce any leaves, only seed, in the extreme upper portion of the crowns. Sugar maples appeared to produce as prolific a seed crop but with no significant reduction in the size or amount of foliage.

Late Spring Leaf Scorch

Trace foliage damage occurred in a 10-ha sugar maple stand in Cardiff Township, Bancroft District.

Wind Damage

On 15 July a tornado totally flattened approximately 60 ha of natural mature mixed forest north of the town of Deep River on the northeast side of Ralph Township, Pembroke District.

A further expansion to the 2,080-ha blowdown which took place in 1983 in Bronson and Stratton townships on the east side of Algonquin District occurred this year, with an additional 630 ha of blowdown. The blowdown area was a mature mixedwood forest, but it was mainly the conifers that were blown down.

Strong winds on 14 August caused scattered damage to individual conifer trees around Burk's Falls in Armour Township in the northern portion of Bracebridge District.

Winter Drying

Discoloration of the foliage of conifers, particularly red pine, caused by winter drying was very common across the central and southern portions of the Region in 1984. Winter drying results when a sudden great increase in temperature, usually accompanied by warm, drying winds, occurs after an extended cold period. This creates an excessive loss of water from the needles which cannot be replaced from the roots because the soil and roots are still frozen, or the stems of the tree are frozen and water cannot be passed along to the needles. The damage is actually a form of drought. If winter drying is very severe, entire tree mortality may occur. In most circumstances, however, upon the return of warmer temperatures in the spring, the foliage browns and later falls off, but the buds flush normally and trees survive.

This season, sudden warm temperatures occurred from 11 to 24 February and caused mainly red pine to discolor in the spring as seen along Highways 35 and 60, from Dorset in the Minden District to Huntsville in the Bracebridge District. The fringes of red pine plantations and natural regeneration spruce and fir along Highway 11 from Bracebridge to Burk's Falls were also damaged. White spruce and red pine were discolored along Highways 511 and 508 in Bagot Township, and along Highway 17 in Petawawa Township, Pembroke District. Natural spruce and pine regeneration and fringes of red pine plantations were discolored along Highway 132, 41 and 28 from the Arnprior area to the town of Bancroft in the Bancroft District. In the Algonquin Park District, natural regenerated white pine along Highway 60, east of Two River Campground in Sproule Township, was heavily affected.

Throughout all the above areas only the foliage of the trees was damaged, averaging 40 to 50% loss; no entire tree mortality from this winter drying phenomenon was observed.

SPECIAL SURVEYS

Acid Rain National Early Warning System (ARNEWS)

In conjunction with a national program, two permanent ARNEWS plots were established in the Region. The first was located north of the Leslie M. Frost Natural Resources Centre at Dorset, along the Plastic Lake Road in Sherborne Township, Minden District, and consisted of sugar maple and white pine. The second was located west of the Frost Centre along the Little Margaret Lake Road in Ridout Township, Bracebridge District and consisted of yellow birch and sugar maple.

At each of these locations a plot measuring 40 m x 10 m was set out and the location of each tree on the plot was mapped. The following data were then recorded for each tree on the plot: species, dominance, height, DBH, length and width of crown, height of crown, length of dead top if present, foliage color and size, the current and old levels of defoliation by forest pests which may be present, and the magnitude of the seed crop. For each tree species that comprised more than 10% of the plot trees, 10 additional trees in the immediate vicinity, but off the actual plot, were similarly evaluated.

Ten regeneration subplots, each 1 m^2, were offset 3 m perpendicular to the long axis of the main plot. On these subplots all ground vegetation, including tree seedlings, were identified and counted. These data were recorded in four vertical strata, 0-0.1, 0.1-0.5, 0.5-2.0, and over 2.0 cm.

In 1985 both soil and foliage samples will be taken and analyzed to determine the current levels of micronutrients present on each site, and the overall crown and foliage evaluations will be repeated.

White Spruce Flower, Cone and Seed Survey

A special survey was conducted at four locations in the Region to determine the various pests affecting white spruce flowers and mature cones. In Peck Township, Algonquin Park Dstrict and in Perry Township, Bracebridge District, 200 female flowers were collected in late May. At each of these two locations and in Alice Township, Pembroke District and Ballantyne Township, Bracebridge District, 100 mature cones were collected in late August.

To determine the total impact of the feeding of spruce budworm larvae, which are capable of destroying a large proportion of the seed crop, the four areas selected were all within the area of high budworm population in 1983.

In Peck Township, 8% of the female flowers were damaged by insect feeding and in Perry Township, 5% were damaged. If the flowers are heavily damaged by feeding insects, they are often aborted, resulting in no cone and seed development.

The cone sample revealed 50% of the sample from Alice Township damaged, resulting in a 64% seed loss within the affected cones. In Peck Township, 31% of the cones were damaged with a seed loss of 7% within the damaged cones; in Ballantyne Township, 59% were damaged with 24% seed loss; and in the Perry Township sample 41% were damaged with 28% seed loss. These data are summarized in Tables 9a and 9b.

Table 9a. Summary of the data of the white spruce female flower survey conducted at two locations in the Algonquin Region in 1984 (counts based on the examination of 200 female flowers).

Location (Twp)	Total no. of flowers damaged	Causal agent of damage	No. of agents
Algonquin Park District			
Peck	38	Spruce budworm	13
		Spruce coneworm, *Dioryctria reniculelloides*	2
		Orange spruce needle miner, *Pulicalvaria piceaella*	3
		Unknown insect damage	21
Bracebridge District			
Perry	13	Spruce budworm	2
		Lesser yellow spruce shootworm, *Zeiraphera fortunana*	3
		Orange spruce needle miner,	2
		Eastern blackheaded budworm	1
		Spruce micro moth, *Eucordylea atrupictella*	1
		Unknown insect damage	4

Note: The total number of causal agents may not match the number of flowers damaged due to the fact that more than one pest may occur on the same flower.

Table 9b. Summary of the results of a white spruce cone survey conducted at four locations in the Algonquin Region in 1984 (counts based on the examination of 100 mature cones at each location).

Location (Twp)	Total no. of cones damaged	Avg seed count per sound cone	Avg. seed loss per damaged cone	Causal agent	No. of agents
Algonquin Park District					
Peck	31	93	7	Cone moth, *Barbara mappana*	2
				Spruce cone maggot, *(Hylemya anthracina)*	2
				Spruce micro moth, *Paralobesia piceana*	1
				Unknown Lepidoptera	24
Pembroke District					
Alice	50	55	36	Spruce cone maggot	15
				Spruce coneworm	2
				Unknown Lepidoptera	33
Bracebridge District					
Ballantyne	59	87	21	Unknown Lepidoptera	59
Perry	41	78	28	Spruce micro moth	6
				Spruce cone maggot	2
				Spruce seed moth, *Laspeyresia youngana*	2
				Unknown Lepidoptera	

Note: The total number of causal agents may not match the number of cones damaged due to the fact that more than one pest may occur on the same cone.

White Spruce Plantation Survey

A special survey was conducted at nine randomly located white spruce plantations across the Region in 1984 (Fig. 12). Two plots were established in plantations with trees less than 2 m in height, four plots in plantations with trees 2-6 m in height, and three plots in plantations with trees greater than 6 m in height. Each plantation was inspected and evaluated at two specific time periods during the season, 25-26 June and 23-26 July. Table 10 summarizes the data collected.

During the first visit to the plantations, a check for evidence of broom rust, *Chrysomyxa arctostaphyli* Diet. and dwarf mistletoe, *Arceuthobium pusillum* Pk., revealed none. Similar results were recorded during the second visit for spruce needle rust, *Chrysomyxa ledi* (Alb. & Schw.) d. By var. *ledi* and *C. ledicola* Lagerh.

In Bethune Township, Bracebridge District, spruce budworm was found on 19% of the trees, causing 3% defoliation. The spruce coneworm was detected at a high level (67%) in Buchanan Township, Pembroke District. The spruce bud moth, *Zeiraphera* spp., was detected at moderate-to-high numbers at five out of the nine locations, and the yellowheaded spruce sawfly, *Pikonema alaskensis* Rohwer, was found at low levels at only two locations. Trace numbers of the white pine weevil were also found at two locations.

Frost damage was encountered on 66% of the trees, causing 1% damage to foliage in Bethune Township, Bracebridge District; Armillaria root rot caused 1% mortality in Buchanan Township, Pembroke District.

These results are very similar to those recorded during the 1981 white spruce plantation survey. The percentage of trees affected by spruce budworm was significantly higher in 1981 due to the infestation that was occurring across the northern portion of the Region at that time.

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

During the past five years samples for this pest have been taken at several locations throughout the Region. Recently dead or dying trees that have wilted very quickly or exhibited blue stain in cross sections of the main bole are suspected and core samples are taken and submitted for microscopic examination.

To date all samples taken in the Region have produced no evidence of the pinewood nematode.

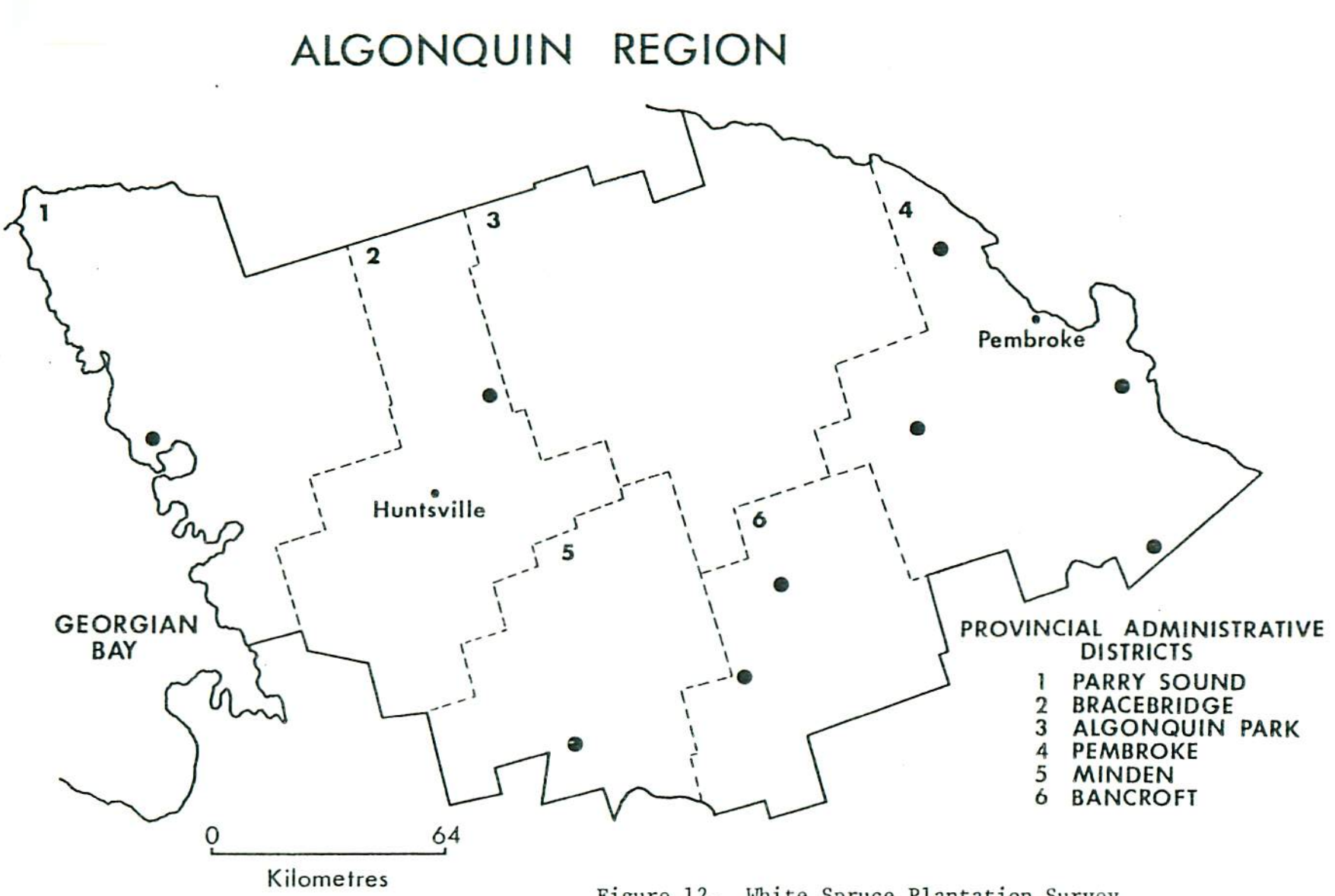

Figure 12. White Spruce Plantation Survey

Locations of plantations evaluated . . . . . ●

Table 10. Summary of the results of a white spruce plantation survey conducted at nine randomly selected locations across the Algonquin 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		Total % defoliation by spruce budworm and spruce coneworm	% trees attacked by *Zeiraphera* spp.	% trees attacked by yellowheaded spruce sawfly	Total % defoliation by yellowheaded spruce sawfly	% leaders attacked by white pine weevil
				Spruce budworm	Spruce coneworm					
Bancroft District										
Cardiff	2	2800	1.2	0	0	0	13	0	0	0
Herschel	4	1600	3.6	0	7	0	31	0	0	1
Bracebridge District										
Bethune	20	2400	5.3	19	0	3	0	0	0	0
Minden District										
Somerville	2	2100	13.6	0	0	0	0	0	0	0
Parry Sound District										
Carling	2	2700	1.7	0	0	0	0	13	2	0
Pembroke District										
Bagot	2	2800	6.2	1	0	0	87	0	0	0
Hagarty	10	2800	2.7	0	5	0	57	0	0	0
Buchanan	5	2100	35.5	0	67	0	0	0	0	0
Ross	8	2200	2.3	0	6	0	49	2	1	1

(cont'd)

Table 10. Summary of the results of a white spruce plantation survey conducted at nine randomly selected locations across the Algonquin 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		% trees affected by Armillaria root rot	Cone rust	
					Faded green (%)	Yellow (%)	% trees affected	% foliage affected		No. of cones examined	% cones affected
Bancroft District											
Cardiff	2	2800	1.2	0	1	0	6	2	0	0	0
Herschel	4	1600	3.6	0	5	0	0	0	0	0	0
Bracebridge District											
Bethune	20	2400	5.3	3	0	0	66	1	0	200	0
Minden District											
Somerville	2	2100	13.6	0	0	0	0	0	0	0	0
Parry Sound District											
Carling	2	2700	1.7	1	0	0	0	0	0	100	0
Pembroke District											
Bagot	2	2800	6.2	0	1	0	0	0	0	0	0
Hagarty	10	2800	2.7	0	4	0	0	0	0	200	1
Buchanan	5	2100	35.5	0	0	1	0	0	1	0	0
Ross	8	2200	2.3	2	2	1	0	0	0	0	0

Light Trap

Again this year the annual operation of a light trap was carried out at the Petawawa National Forest Institute station at Chalk River in the Pembroke District. The primary purpose for operating the light trap is to monitor the flight period of the adult spruce budworm moth.

The area monitored by the light trap is undetermined, and therefore the number of adults trapped cannot be used to forecast populations. However, a light trap can be used to indicate that populations are present in an area, and the total numbers trapped each year indicate changes in the population levels.

The light trap was operated every night from 20 June to 1 August. The first spruce budworm moth was collected on 24 June. The peak of the flight occurred on 4 July. The last night moths were collected on 1 August with a total of 183 moths trapped, compared to 2,360+ moths trapped in 1983.

The light trap also captured 331 forest tent caterpillar moths, compared to 168 trapped in 1983, and 83 jack pine budworm moths (62 of which were collected in one night, 30 July) compared to a total of 12 moths trapped in 1983.

Climatic Data

Seasonal variations in the normal weather patterns have a direct effect on both biotic and abiotic pests and conditions. Sudden and extreme changes in weather have been known to play an important part in controlling insect outbreaks. By monitoring daily weather conditions, predictions such as the emergence of overwintering larvae or the onset of drought conditions may be accurately made. For these reasons, the Forest Insect and Disease Survey Unit keeps daily and monthly averages of weather conditions on file for numerous locations across the province. Table 11 summarizes weather data for the 12-month period of 1984, January to December, from two Atmospheric Weather Offices in the Algonquin Region. The normals quoted were taken directly from the Canadian Climate Normals for Ontario, 1951-1980.

Table 11. Summary of climatic data covering the 12-month period, January to December 1984, from two locations in the Algonquin Region.

Location	Month	Mean temperature		Total precipitation	
		Actual (°C)	Normal (°C)	Actual (mm)	Normal (mm)
Bracebridge District					
Muskoka Airport	Jan.	-12.9	-10.4	56.1	85.9
	Feb.	- 3.6	- 9.6	66.6	62.4
	Mar.	- 6.8	- 3.8	66.7	66.3
	Apr.	+ 6.6	+ 4.5	58.8	73.3
	May	+ 9.2	+10.9	123.1	77.8
	June	+16.1	+15.9	71.1	81.9
	July	+17.9	+18.3	95.1	77.5
	Aug.	+19.0	+17.4	80.1	89.0
	Sept.	+11.6	+13.2	123.5	102.4
	Oct.	+ 9.4	+ 7.5	83.6	93.9
	Nov.	+ 1.3	+ 1.1	119.7	101.0
	Dec.	- 1.9	- 7.1	154.4	97.8
Pembroke District					
Petawawa Weather station	Jan.	-15.6	-12.8	27.5	46.7
	Feb.	- 4.9	-11.2	36.5	51.0
	Mar.	- 4.4	- 4.6	44.8	50.5
	Apr.	+ 6.5	+ 4.2	99.2	59.6
	May	+ 9.5	+11.5	117.8	60.0
	June	+16.7	+16.3	57.8	87.5
	July	+18.8	+18.7	114.7	84.5
	Aug.	+19.0	+17.6	66.0	79.8
	Sept.	+11.9	+12.6	58.4	83.1
	Oct.	+ 8.1	+ 7.1	57.2	66.7
	Nov.	+17.2	- 0.1	66.7	65.8
	Dec.	- 6.4	- 9.7	90.1	64.8