

**RESULTS OF FOREST INSECT
AND DISEASE SURVEYS IN THE
NORTHEAST REGION OF ONTARIO,
1993**

*Forest Districts: Hearst, Cochrane,
Wawa, Chapleau, Timmins, and Kirkland Lake*

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SURVEY HIGHLIGHTS

This report documents the insects, diseases, and abiotic conditions that existed across the Northeast Region of Ontario in 1993. Extended spring conditions of cooler than normal overnight temperatures delayed foliar flush by nearly two weeks. However, by the end of June, host development and insect and disease activity were close to normal.

Much of the forest tent caterpillar infestation collapsed in the western portion of the region reducing the infestation to 532,907 ha, primarily in the Hearst to Smooth Rock Falls portion of the Hearst and Cochrane districts. The overall area of moderate-to-severe defoliation in 1992 was 5,479,481 ha. Egg-mass samples indicate a further reduction in population levels throughout most of the area of the old infestation; however, high populations could persist in the southwestern portion of Cochrane District.

Spruce budworm populations continue to spread, primarily in the Hearst and Wawa districts. The area of moderate-to-severe defoliation was reduced to 1,650,677 ha from 2,091,080 ha reported in 1992. Egg-mass samples collected in both Wawa and Hearst districts reflect continued areas of heavy defoliation for 1994.

Trembling aspen stands across the region sustained heavy populations of aspen leafrollers. Early aspen leafcurler damage, primarily in the Cochrane and Timmins districts, continued but to a lesser degree, with 837,105 ha of moderate-to-severe defoliation compared with 1,750,335 ha in 1992. An additional 41,085 ha of damage, caused by the large aspen tortrix, was mapped on trembling aspen, primarily in the Wawa and Chapleau districts.

Birch skeletonizer was recorded across the region but at a lower level of damage, down from 7,131,439 ha in 1992 to 2,924,469 ha in 1993. Aerial mapping was incomplete in 1993 but ground observations confirmed the overall decrease in damage.

Forest health monitoring through the Acid Rain National Early Warning System (ARNEWS) plots was increased in 1993 with the addition of four new plots. The region now has three jack pine, two black spruce, two white birch, and one trembling aspen acid rain monitoring plots.

With the assistance of the Northern Ontario Development Agreement (NODA), additional time was allotted outside the normal field season for the installation of plots to aid in the development of management techniques for spruce budworm, jack pine budworm, and Scleroderris canker.

The same format was followed in categorizing forest pests as in the 1992 Northeast Region report:

Major Insects / Diseases

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

Minor Insects / Diseases

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

Other Forest Insects / Diseases (Tables)

These tables provide information on two types of pest:

- (1) those that are of minor importance and that have not been known to cause serious damage to forest trees, and
- (2) those that are capable of causing serious damage but, because of low population levels or for other reasons, did not cause serious damage in 1993.

The cooperation and assistance provided by personnel of the Ontario Ministry of Natural Resources (OMNR), wood-using industries and other agencies, and by many individuals, are gratefully acknowledged.

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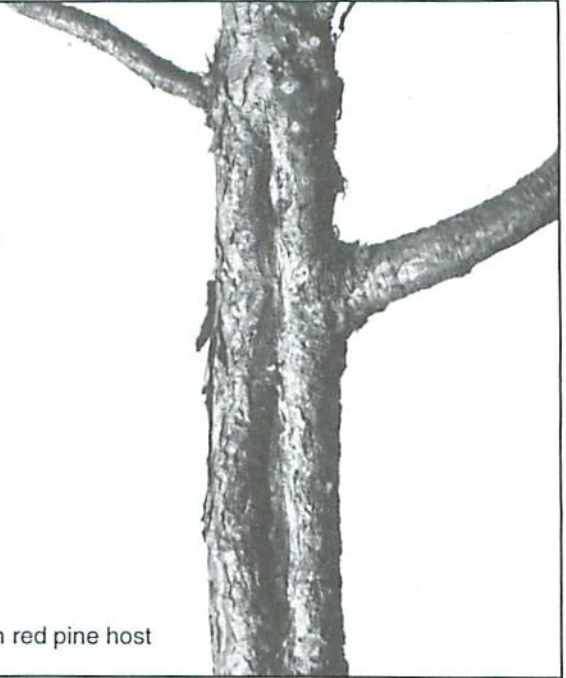
FRONTISPIECE



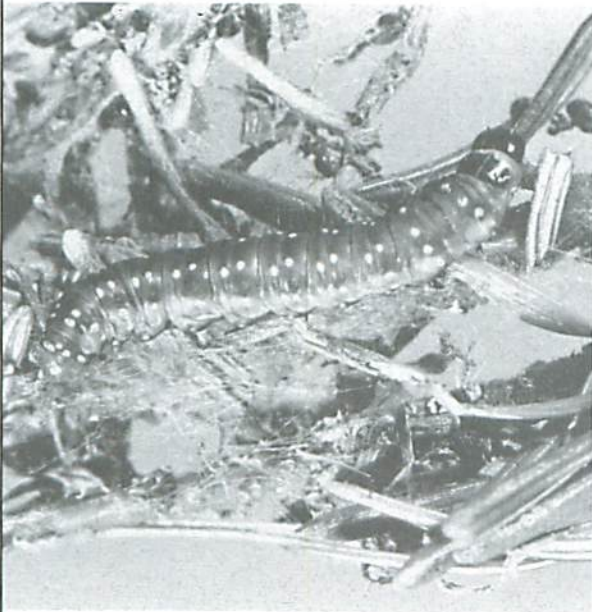
Dead and dying jack pine host.

Scleroderris canker (*Gremeniella abietina*)

stem canker on red pine host



Spruce Budworm (*Choristoneura fumiferana* Clem.)



larval feeding



budworm damaged stand

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INSECTS

Major Insects

Birch Skeletonizer, *Bucculatrix canadensisella* Cham.

Infestations of the birch skeletonizer that have been building for the past 3 years started to decline in 1993. The infestation was reduced to 2,924,469 ha from 7,131,430 ha reported in 1992 (Fig. 1). Although aerial mapping was incomplete in 1993, due to time and aircraft restrictions, ground checks confirmed the patchy nature of the present infestation.

Once again, the infestation was mostly confined to the larger stands of white birch (*Betula papyrifera* Marsh.) in old cutover or fire areas. The northern and eastern portions of the infestation received heavier leaf damage and early leaf fall was more dramatic. It appears that the extreme western portion of the infestation is dying out and leaf color in this area was less pronounced.

Many stands escaped damage by this insect in 1993 and it is believed the damage will further decline in the western and southern portions of the region in 1994.

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

This leafroller was responsible for a total of 41,085 ha of moderate-to-severe defoliation to trembling aspen (*Populus tremuloides* Michx.) and balsam poplar (*P. balsamifera* L.) stands in the Wawa and Chapleau districts in 1993. The degree of defoliation ranged greatly (30-90%) but, in most instances, was near complete (Fig. 2).

The main body of the infestation was located in the extreme east-central portion of the Wawa District; primarily in Riggs and Meath townships, northeast of the town of Wawa. The adjacent townships of Leguerrier, Glasgow, Jacobson, West Acton, Winget, Amik, Leeson, and Rennie all contained pockets of heavy defoliation ranging in size from 65 to 1,500 ha.

Two additional pockets totaling 1,450 ha were reported in the

Chapleau District near Renabie, in an area south of the main body of the infestation.

Elsewhere in the region, this insect was occasionally found feeding in the forest tent caterpillar and early aspen leafcurler infestations.

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

Provincial Situation

For the first time in 5 years a decline has taken place in the area defoliated by spruce budworm. In 1993, 8,991,177 ha of defoliation were aerially sketch-mapped, compared with 9,595,762 ha recorded in 1992 (Fig. 3).

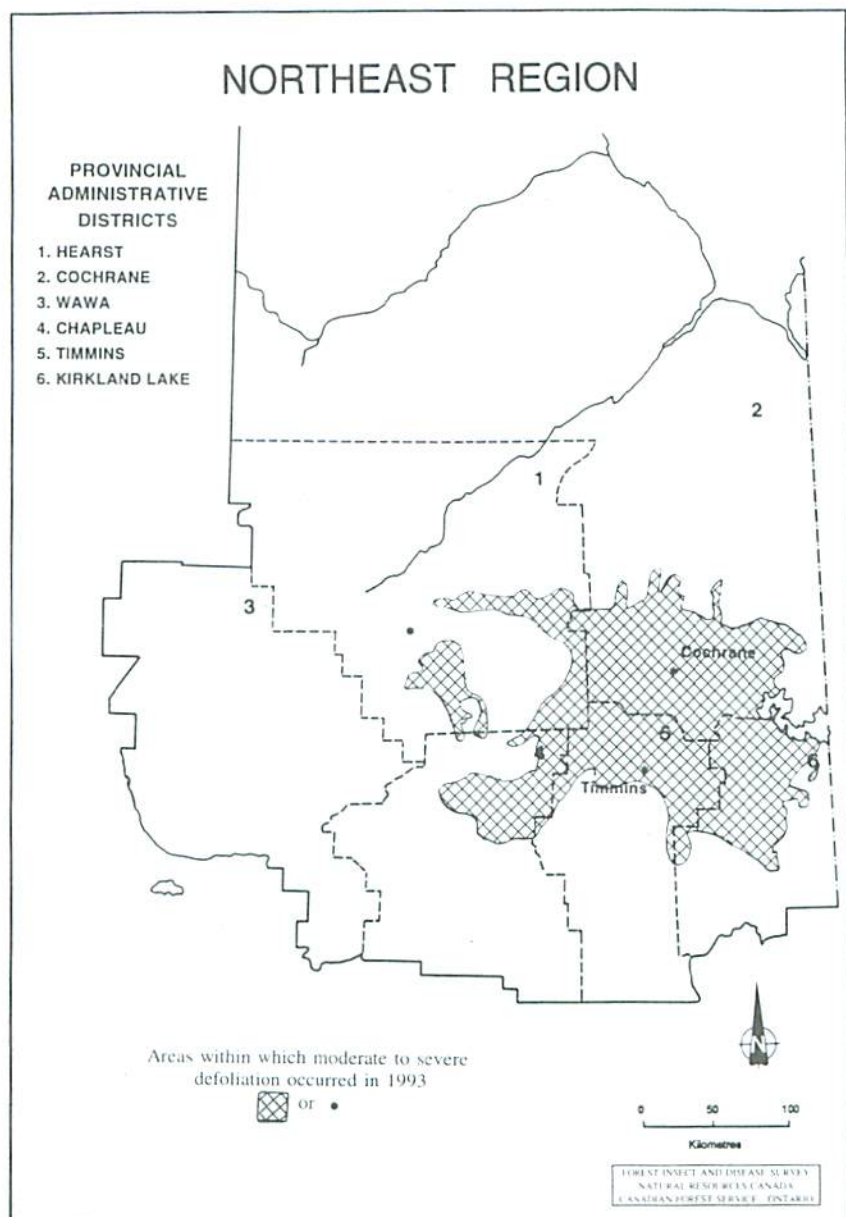


Figure 1. Birch skeletonizer *Bucculatrix canadensisella* (Cham.).

The infestation stretches from the Manitoba border east to Hearst in much of the same area affected in 1992. As well, small pockets occur near Sault Ste. Marie, Lake Nipissing, Algonquin Park, and Ottawa.

Increased defoliation occurred in the Dryden, Sioux Lookout, Nipigon, Geraldton, Moosonee, Sault Ste. Marie, Sudbury, and North Bay districts.

Decreased defoliation occurred in the Red Lake, Kenora, Fort Frances, Thunder Bay, and Algonquin Park districts.

Northeast Region

A decrease in the area of defoliation which was aerially sketch-mapped was noted in the region this year, with 1,650,677 ha of moderate-to-severe defoliation compared with 2,091,080 ha recorded in 1992 (Fig. 4).

Severe defoliation extended from the Geraldton and Nipigon districts near Heron Bay easterly through the Wawa District into the Hearst District as far as the railroad junction at Oba and the town of Hearst. Many scattered pockets were found north and east of the main infestation and along the larger northern rivers, such as the Albany and Moose Rivers, northward as far as James Bay.

The expanded pheromone trapping program of 1992 was continued in the 1993 field season; 198 traps were established at 66 locations across the region. All traps caught less moths this year with the exception of two locations; Arnott Township in the Hearst District and Breckenridge Township in the Wawa District. Twelve of the trap sites have been trapped for a number of years and a comparison of population levels for the past 3 years is presented in Table 1.

Light traps were operated at Chapleau Nursery in the Chapleau District and at Remi Lake near Kapuskasing in the Hearst District. Low numbers of moths were recorded for the third consecutive year at both locations (Table 2).

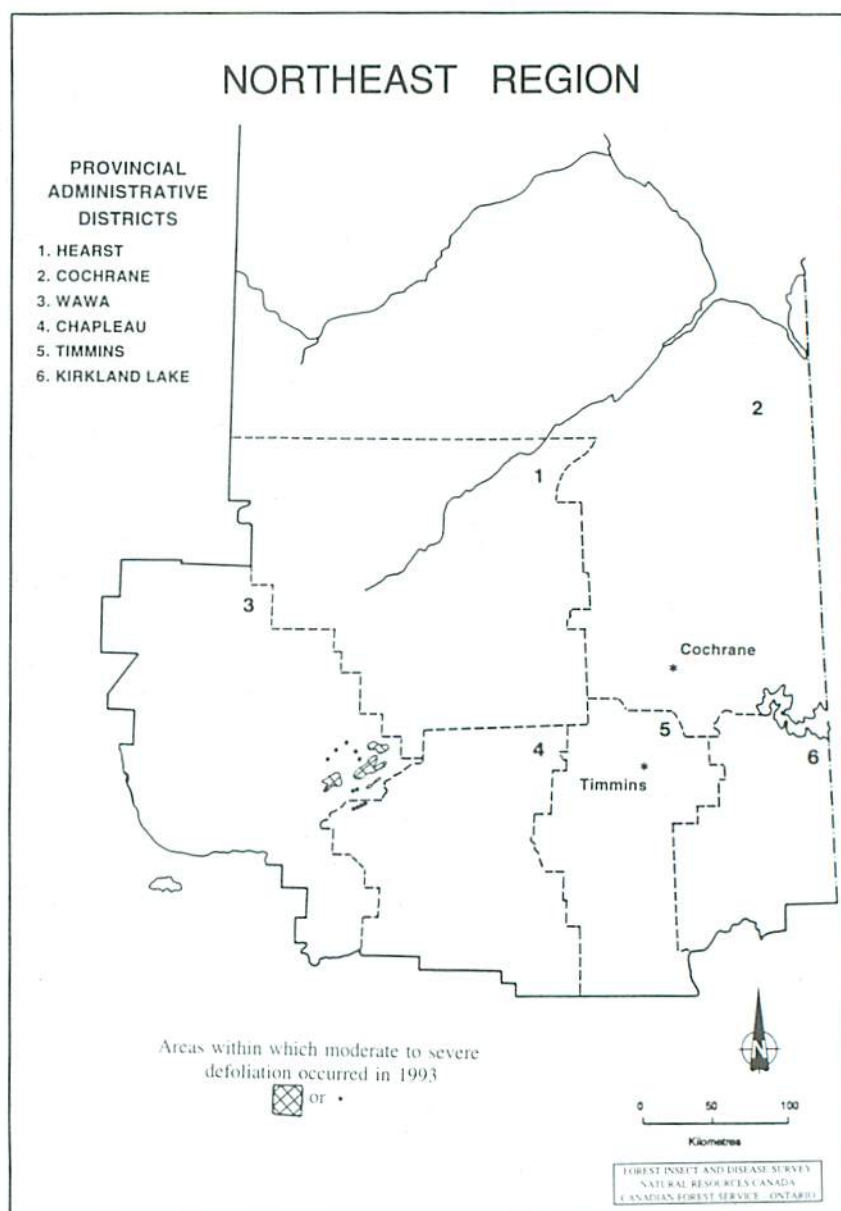


Figure 2. Large aspen tortrix *Choristoneura conflictana* (Wlk.).

Egg-mass sampling was carried out at 129 locations across the region (Appendix 1) indicating that there should be an increase in population levels in 1994 in the western and central portion of the Hearst District. Defoliation levels similar to 1993 should occur throughout the remainder of the infested areas in the region in 1994.

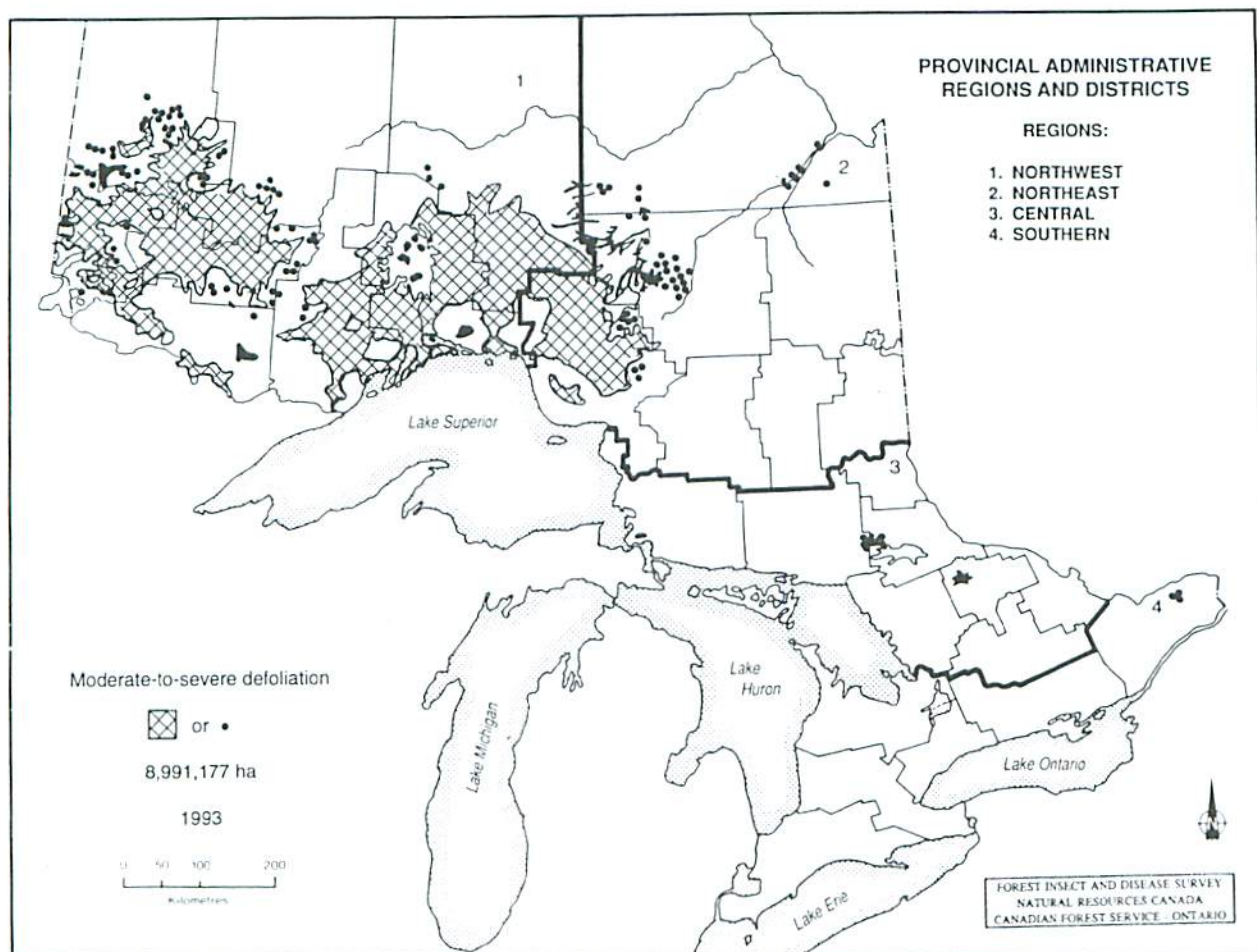


Figure 3. Eastern spruce budworm *Choristoneura fumiferana* (Clem.).

Table 1. Captures of male eastern spruce budworm moths in pheromone traps in eight districts of the Northeast Region of Ontario, 1991–1993 (three traps at each location).

Location (Township)	Total moths captured		
	1991	1992	1993
<i>Chapleau District</i>			
Abney	— ^a	—	780
Barclay	—	581 ^b	332
Borden	—	685	193
Fawn	—	—	419
Genier	—	271 ^b	106
Ivanhoe	—	709	847
Lloyd	—	469	40
Neelands	—	1,069	85
Peters	109	704 ^b	279
Racine	—	330	0
Reaney	—	458 ^b	85
Sandy	—	—	34
<i>Cochrane District</i>			
Fournier	—	1,084	206
Haggart	—	—	91
Laughton	—	1,021	112
Marathon	—	285	45
Nesbitt	—	1,533	165
St. John	288	518	39 ^b

(cont'd)

Table 1. Captures of male eastern spruce budworm moths in pheromone traps in eight districts of the Northeast Region of Ontario, 1991-1993 (three traps at each location) (concl.) .

Location (Township)	Total moths captured		
	1991	1992	1993
<i>Hearst District</i>			
Abbot	-	2,510	257
Arnott	-	961 ^b	1,088
Cumming	-	833 ^b	538
Fauquier	709	154 ^b	176
Fenton	-	596	249
Frost	2,906	2,999	2,555
Guilfoyle ⁸⁹⁰	883	115	
Kohler	-	4,486	959
Lisgar	-	1,539	211
Landry	-	1,322 ^b	395
Shannon	-	1,237	82
Staunton	-	1,867	187
Stoddart	-	3,534	827
Walls	-	2,298	485
<i>Kirkland Lake District</i>			
Bannockburn	-	79	22
Dack	-	334	208
Lamplugh	-	321	55
Maisonville	301	229	60
Mickle	-	345	147
Pacaud	247	260	101
Tyrrell	-	502	190
<i>Timmins District</i>			
Dublin	44	361	34
Edinburgh	-	637	24 ^b
Eldorado	-	370	93
Enid	-	712	146
Garibaldi	-	518	74
Hassard	-	734	129
Kelvin	-	-	174
Sewell	-	702	89
Silk	-	-	130
St. Louis	-	425 ^b	145
Thomas	-	580	105
<i>Wawa District</i>			
Barbara Lake	-	6,140	3,275
Breckenridge	-	1,728	2,912
Cecile	-	4,467	2,893
Dahl	-	4,738	2,291
Dambrossio	2,414	8,529	4,002
Esquega	-	544	208
Lalibert	781	3,260	1,470
Larkin	1,699 ^b	3,239	507 ^c
Lipton	-	1,474 ^b	585
Maness	-	326	307
Mikano	-	7,210	1,656 ^b
Nickle	-	3,903	910
Pearkes	-	5,880	1,495
Stevens	-	3,551 ^b	1,162
Tedder - Stand 360	-	3,959	650

^a Data unavailable.

^b One trap destroyed by a bear.

^c Two traps destroyed.

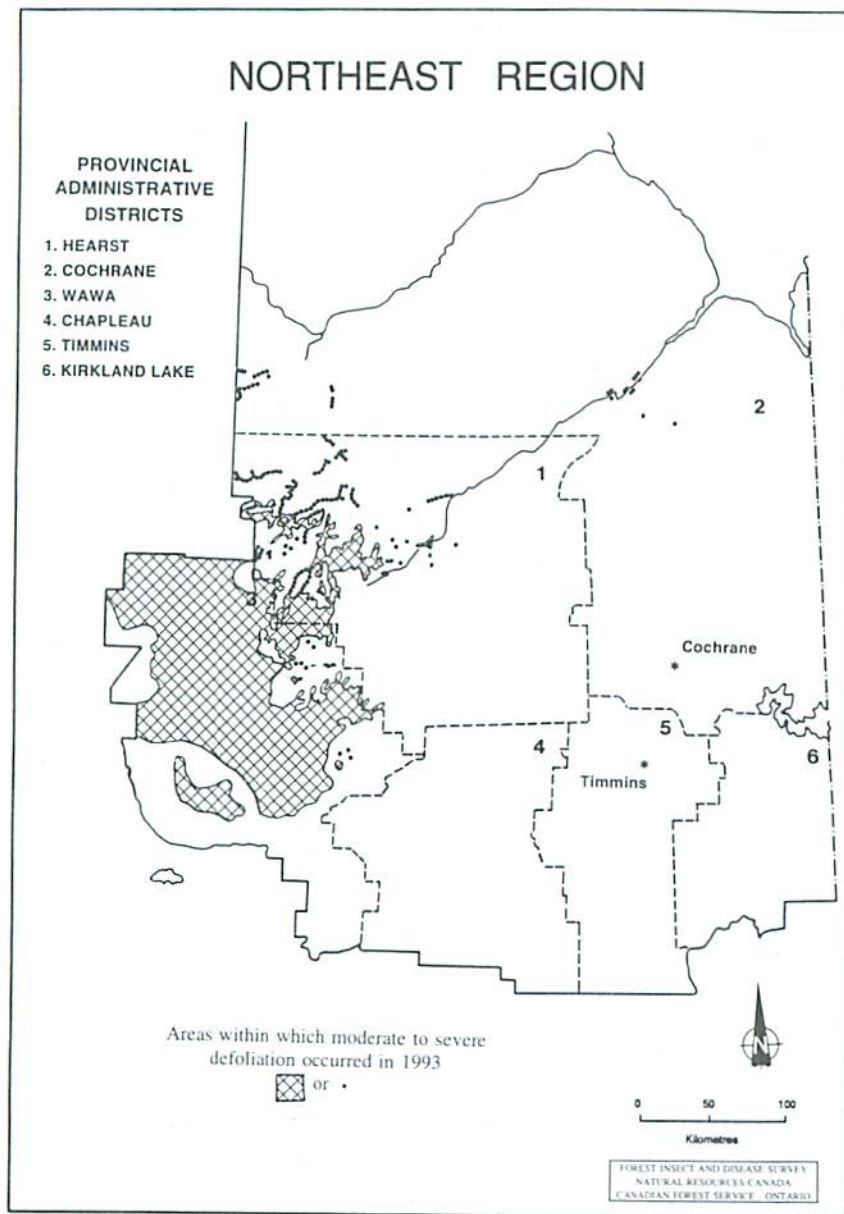


Figure 4. Eastern spruce budworm *Choristoneura fumiferana* (Clem.).

Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Provincial Situation

In 1993, the area of moderate-to-severe defoliation attributed to this insect totaled 282,247 hectares. This constitutes an increase of 56% over last year's total of 158,704 ha.

A complete collapse was recorded in northwestern Ontario and the entire infestation mapped this year occurred in the Central Region. Defoliation was generally confined to the Sudbury, Parry Sound, North Bay, Pembroke, Sault Ste. Marie, Algonquin Park, and Temagami districts (Fig. 5).

Northeast Region

Light defoliation was recorded on approximately 2% of the trees in young 2-m jack pine stands in Nickle Township, Wawa District, and Denton Township, Timmins District. Throughout the remainder of the region budworm populations were found at trace levels and insignificant levels of foliar damage resulted.

Egg-mass samples collected at 43 locations across the region indicate that light defoliation can be expected in two areas in the Chapleau District, at three locations in the Timmins District, and at a single location in the Hearst District (Appendix 2).

Table 2. Captures of eastern spruce budworm moths in light traps at two locations in the Northeast Region of Ontario from 1989 to 1993.

Location	Total number of moths captured				
	1989	1990	1991	1992	1993
<i>Chapleau District</i>					
Chapleau Nursery	182	159	8	13	47
<i>Hearst District</i>					
Remi Lake	75	352	7	0	2

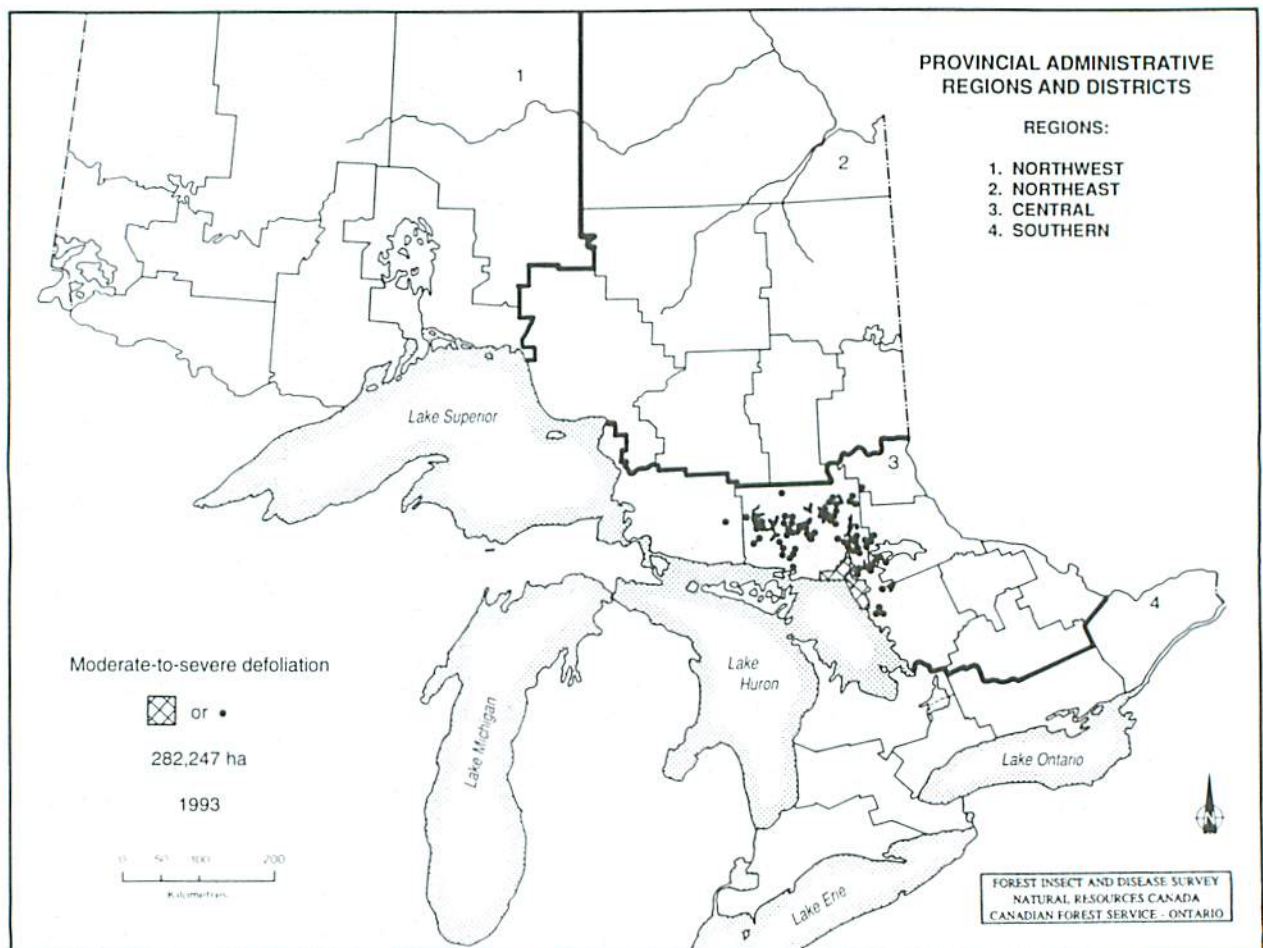


Figure 5. Jack pine budworm, *Choristoneura pinus pinus* Free.

Red Pine Cone Beetle, *Conophthorus resinosae* Hopk.

Decreased population levels of this tip beetle were recorded across the region in 1993. Tip damage due to this insect was found in seven of the 30 plantations examined.

The heaviest levels of tip damage (2-3%) occurred on 16% of the trees in a 5-ha plantation in Stoddart Township, Hearst District, and on 7.3% of the trees in a 25-ha plantation in Hunt Township, Wawa District. Trees throughout these two areas ranged from 2-3 metres in height.

At one location in Macklem Township, Timmins District, roadside open-grown 6-m trees had up to 24 shoots attacked per tree over a 0.5-ha area.

Eastern Pine Shoot Borer, *Eucosma gloriola* Heinr.

Surveys conducted at 13 plantations across the region revealed that seven had received damage to approximately 6% of the trees examined (Table 3). The highest level of recorded damage occurred on 2-m jack pine over a 5-ha site in Invergarry Township, Timmins District. Here 10% of all trees examined sustained shoot damage.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Provincial Situation

In 1993, forest tent caterpillar population levels declined drastically in Ontario, with the total area of moderate-to-severe defoliation reduced to 655,256 ha compared with 16,051,424 ha recorded in 1992. Most of the reduction was accounted for by a total collapse of the insect population in the Northwestern Region and a large reduction in the Northeast Region. In both the Central and Southern regions, slight increases in population levels were recorded (Fig. 6).

Northeast Region

The total area of moderate-to-severe defoliation recorded across the region in 1993 totalled 532,907 ha (Fig. 7). This constitutes a 90.3% reduction from the area reported in 1992 (Table 4).

The main body of the infestation was located along the Hwy. 11 corridor; from the Brunswick Lake area in the south central portion of the Hearst District, northeast into the Remi Lake area, and further southeast to the village of Hunta in the Cochrane District.

Table 3. Damage caused by the eastern pine shoot borer in jack pine plantations in the Northeast Region of Ontario in 1992. (Counts are based on the examination of 150 randomly selected trees at each location.)

Location (Township)	Average height of trees (m)	Estimated number of trees per ha	Estimated area affected (ha)	Trees affected (%)	Leaders attacked (%)
<i>Chapleau</i>					
Dalhous	1.9	2,200	33	1.6	0.0
Hurcheon	4.4	2,222	14	4.0	0.0
McNaught	1.8	2,600	35	9.4	2.7
<i>Kirkland Lake</i>					
Playfair	2.2	2,500	20	8.7	3.3
<i>Timmins</i>					
Battersby	2.3	2,475	24	3.3	0.0
Invergarry	2.2	2,400	5	10.0	0.0
Macklem	4.3	2,500	12	2.0	0.7
Zavitz	2.0	4,000	20	8.7	3.3

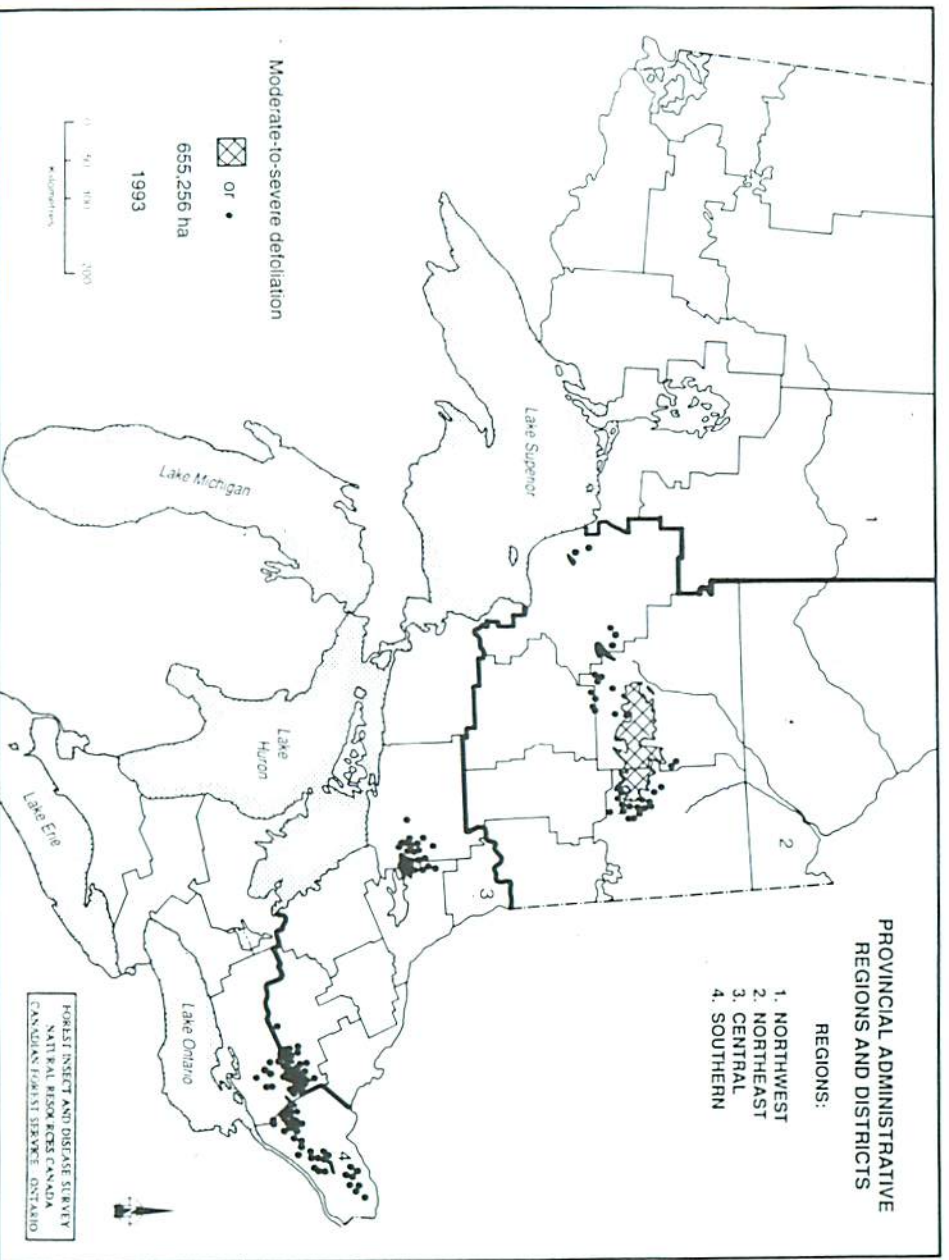


Figure 6. *Forest tent caterpillar*, *Malacosoma disstria* Hbn.

A second, smaller area of infection was recorded in the southeast portion of Irving Township, Wawa District, and in the south central portion of Walls Township, Hearst District. Similar small areas of defoliation were recorded in Martin and Mildred townships, both in the northern end of the Wawa District.

Numerous small areas of defoliation were recorded adjacent to the main infestations and a few small pockets were mapped in the northeastern portion of Pukaskwa Provincial Park, south of White Lake in the Wawa District.

Egg-band counts taken at several areas across the region indicate further declines in population levels for 1994. Areas where heavy forecasts are predicted will not be as severely defoliated as they were in 1993 (Table 5).

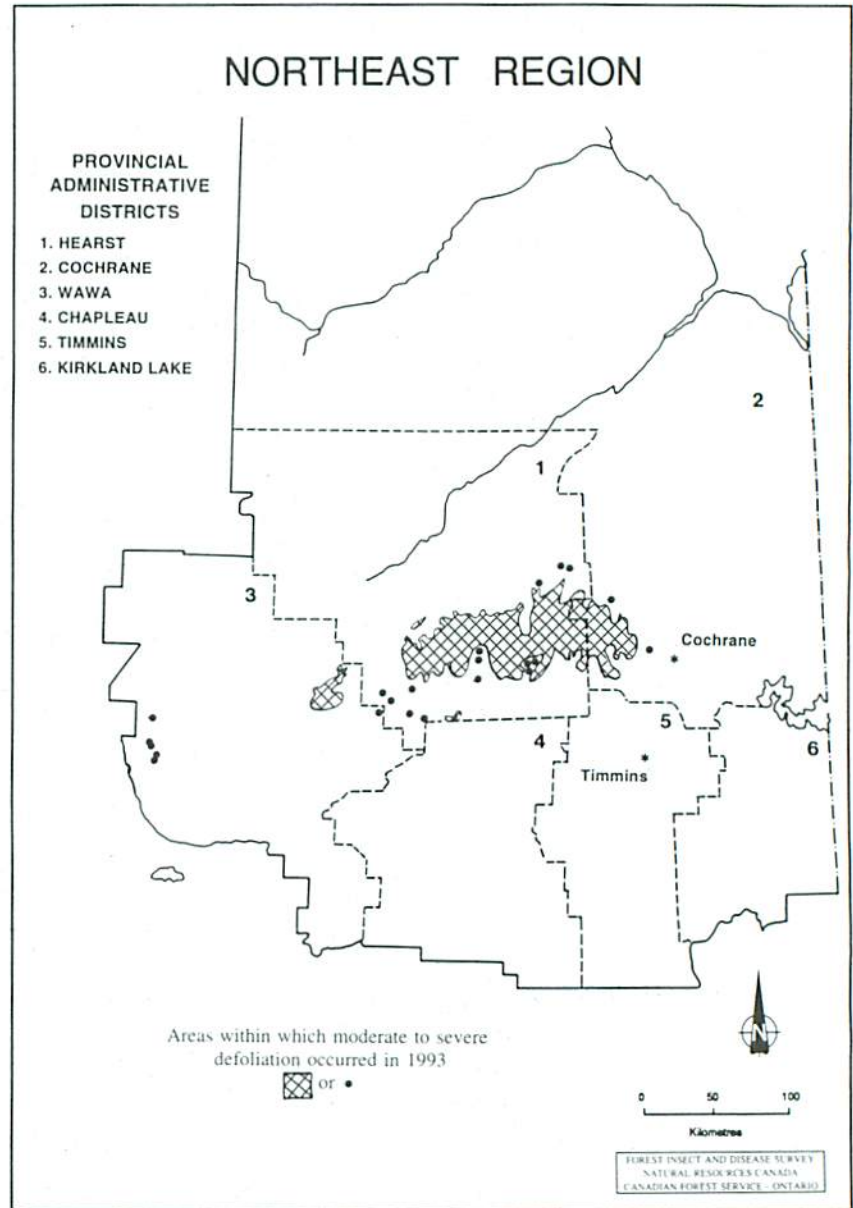


Figure 7. Forest tent caterpillar *Malacosoma disstria* (Hbn.).

Table 4. Comparison of areas of defoliation by the forest tent caterpillar in the Northeast Region of Ontario from 1991 to 1993.

District	Defoliation (ha)		
	1991	1992	1993
Chapleau	0	0	1,520
Cochrane	0	541,507	141,38
Hearst	1,902,728	3,103,653	358,541
Moosonee	90,015	92,092	0
Timmins	495	0	0
Wawa	1,428,888	1,742,229	31,457
Total	3,422,076	5,479,481	532,907

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

Increased population levels of this sawfly were observed in the western half of the Wawa District. The heaviest damage occurred in a 5-ha plantation of young white spruce (*Picea glauca* [Moench] Voss) trees in Cecil Township. Current defoliation averaged 32% and 3% current mortality occurred.

Across the remainder of the work area low insect numbers were observed at widely scattered locations causing up to 5% defoliation on open-grown and ornamental trees. Similarly, low levels of defoliation were recorded in several of the family tests and seed orchards examined across the region.

Table 5. Results of forest tent caterpillar egg-band counts on trembling aspen in the Northeast Region of Ontario in 1993 and infestation forecasts for 1994.

Location (Township)	Average DBH of trees (cm)	Average number of egg bands per tree	Infes- tation forecast for 1994
<i>Chapleau District</i>			
Brackin Township	15	0	nil
Copenace Township	20	0	nil
Echum Township	13	0	nil
<i>Cochrane District</i>			
Heighington Township		0	nil
Kendrey Township	9	8	severe
Nesbitt Township	12	16	severe
St. John Township	8	1	light
<i>Hearst District</i>			
Fauquier Township	9	3	light
Pearce Township		0	nil

White Pine Weevil, *Pissodes strobi* (Peck)

There was a significant drop in population levels of this pest on jack pine and both black and white spruce (*Picea* spp.) across the region. Evaluations at 36 sites revealed an average incidence of 2.8% damaged leaders, down from the 5.1% level reported last year.

A total of 86% of all locations surveyed were positive (see Table 6). Generally, damage levels were low with incidence rates averaging <5%.

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

For the first time in the past 5 years, an overall reduction in infestation size can be reported in the region. The total area of moderate-to-severe defoliation of trembling aspen was reduced to 837,105 ha, down from 1,750,335 ha recorded in 1992.

The main body of the infestation now extends from the Swartman–Inglis townships area of the Cochrane District south into the Fallon–Fasken township areas, through Ross and Turnbull townships of the Timmins District, and east into the Warden–Guilford townships area of the Kirkland Lake District. North of the main body of infestation, a number of small pockets occurred as far north as Abitibi and Kesagami lakes. Another large pocket occurred in Sangster and Hoblitzell townships, east of the main infestation. South of the main body of the infestation, large areas of damage were mapped in the Robillard, Dack, and Evanturel townships in the Kirkland Lake District. To the west of the main body, pockets of heavy defoliation were recorded as far west as the Chapleau–Hearst District boundaries (Fig. 8).

Defoliation within the infestation varied from 60–100% but was generally less conspicuous than in previous years. Populations of large aspen tortrix and forest tent caterpillar were recorded sporadically in the infestation this year and could, in fact, override portions of the leafcurler infestation in 1994.

Pine Tip Moths, *Rhyacionia adana* Heinr. and *R. granti* Miller

Population numbers for this insect were down at sample points across the region in 1993. Forty percent of the jack pine plantations evaluated were affected at the relatively low level of 4.2% (Table 7). The heaviest damage occurred in a 10-ha family test area of 1.7-m trees in Evelyn Township, Timmins District. Damage in the family test area was heavy with up to six branches damaged per affected tree. However, all damage was restricted to side branches and as such tree form was not compromised.

The two species of insects cause similar damage early in needle mining and later in new shoot tunneling. However, *R. adana* generally occurs on a wide range of pine hosts when they are under 1 m in height while *R. granti* occurs only on jack pine and on trees taller than 1 m.

Table 6. Damage caused by the white pine weevil in the Northeast Region of Ontario in 1992. (Counts are based on an examination of 150 randomly selected trees at each location.)

Location (Township)	Tree species ^a	Average height of trees (m)	Estimated number of trees/ha	Estimated area affected (ha)	Tree affected (%)
<i>Chapleau District</i>					
Dalmas	jP	1.9	2,200	3	3.3
Hutcheon	jP	4.4	2,222	14	1.3
Nimitz	jP	3.9	600	1	8.0
McNaught	jP	1.8	2,600	35	6.7
Triquet	jP	2.5	2,500	10	4.6
<i>Cochrane District</i>					
Kennedy	bS	1.2	2,500	10	2.0
<i>Kirkland Lake District</i>					
Bennevis	wS	2.1	2,500	10	0.7
Cane	jP	2.4	3,000	25	3.3
Catherine	jP	2.2	2,500	25	1.3
Egan	bS	1.0	2,500	10	3.0
Ossian	jP	2.0	2,500	15	1.3
Playfair	bS	0.7	2,500	15	1.3
Playfair	jP	2.2	2,500	20	2.0
Pontiac	jP	1.3	2,500	50	0.7
<i>Timmins District</i>					
Battersby	jP	2.3	2,475	24	3.3
English	jP	1.3	2,500	50	2.0
Evelyn	jP	1.4	2,500	10	0.7
Invergarry	jP	2.2	2,400	5	3.3
Londonderry	jP	3.7	2,350	11	3.3
McMurchy	jP	1.2	2,400	16	7.3
Zavitz	wS	1.5	2,500	40	2.0
Zavitz	jP	2.0	2,500	10	2.7
<i>Wawa District</i>					
Cecile	jP	3.5	3,500	10	0.7
Cecile	wS	2.0	1,000	20	1.3
Chenard	jP	3.5	2,500	4	3.3
Esquega	jP	3.4	2,500	10	4.0
Finan	jP	3.5	2,500	8	4.0
Flanders	wS	1.9	300	10	0.7
Hunt	jP	2.7	2,500	25	4.7
Lastheels Road	jP	0.9	2,500	4	4.0
Magone	jP	3.1	3,000	15	0.7

^a jP = jack pine, bS = black spruce, wS = white spruce.

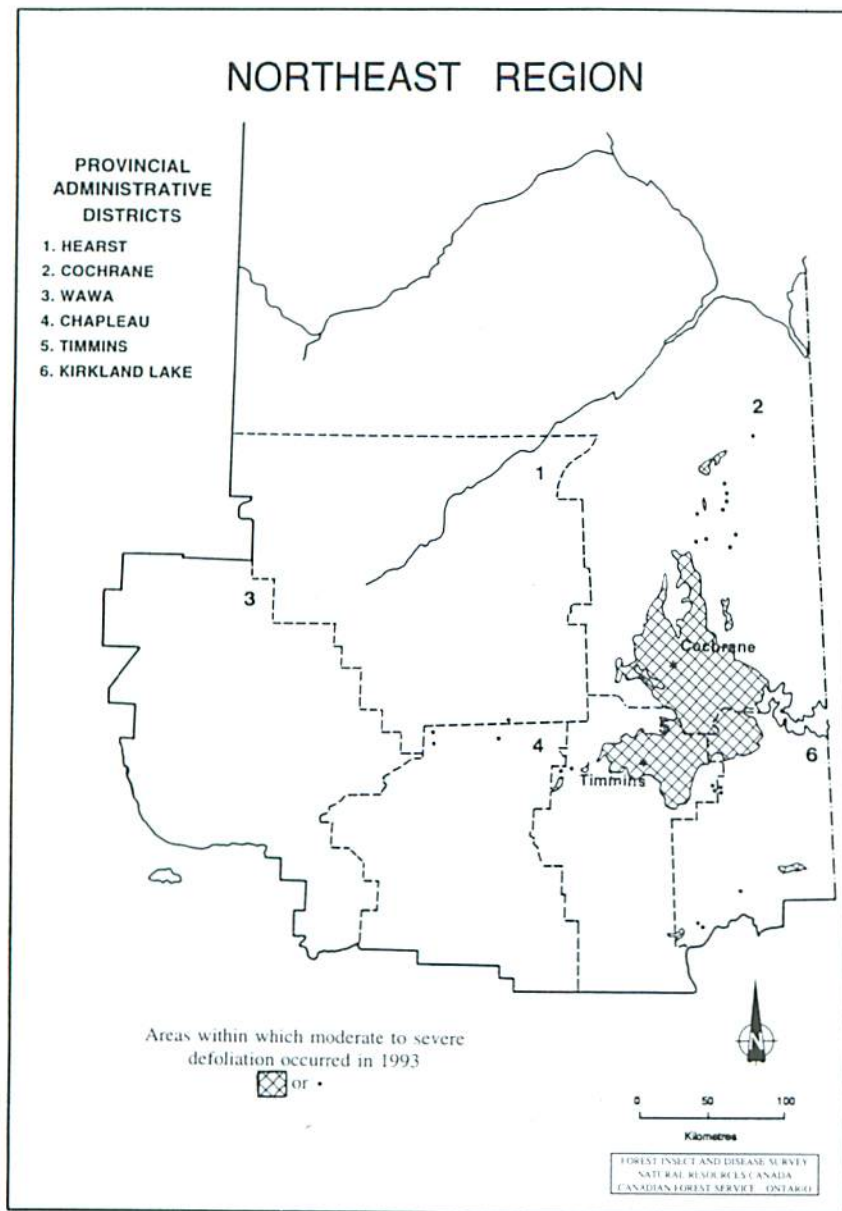


Figure 8. Early aspen leafcurler *Pseudexentera oregonana* (Wlshn.).

Table 7. Damage caused by pine shoot borers in jack pine plantations in the Northeast Region of Ontario in 1993. (Counts are based on an examination of 150 randomly selected trees at each location.)

Location (Township)	Average height of trees (m)	Estimated number of trees per ha	Estimated area affected (ha)	Trees affected (%)	Leaders attacked (%)
<i>Chapleau District</i>					
McNaught	1.8	2,600	35	5.0	0
Strachan	0.7	4,678	25	0.7	0
<i>Timmins District</i>					
Evelyn	1.7	2,500	10	12.0	0
Macklem	4.3	2,500	12	0.7	0
Denton	1.7	2,500	5	6.7	0
<i>Kirkland Lake District</i>					
Pontaic	1.3	2,500	50	0.7	0
<i>Wawa District</i>					
Hambleton	1.0	2,500	13	0.7	0
Hunt	2.7	2,500	25	7.3	0

Minor Insects

Aspen Leafblotch Miner, *Phyllonorycter ontario* (Free.)

Heavy damage was recorded in the Kirkland Lake District from Larder Lake west to the area of Kenogami Lake and south to the area of Kap-Kig-Iwan Provincial Park in the Englehart area. Heavy foliar damage resulted in leaf discoloration and early leaf fall throughout much of the area. As many as 10–15 insect mines were recorded per leaf on the semi-mature trembling aspen host. Similar heavy damage was recorded on regeneration along the Mikano Township Road, Mikano Township in the Wawa District.

Less severe damage of 3–5 mines per leaf was recorded across the northern portion of the Kirkland Lake and Timmins districts and the southern portion of the Hearst and Cochrane districts.

Other Forest Insects

A number of other pests were encountered during the course of regular surveys. Information on these pests is provided in Table 8.

Table 8. Other forest insects.

Insect	Host(s) ^a	Remarks
<i>Cecidomyia resinicola</i> (O.S.) Jack pine resin midge	jP	Light defoliation was recorded on approximately 4–5% of the 1.8- to 4.4-m trees in McNaught and Hutcheon townships, Chapleau District.
<i>Datana ministra</i> (Drury) Yellownecked caterpillar	wE	Light defoliation was recorded on two 13-m trees in Aspen Grove Campground in Kap-Kig-Iwan Provincial Park, Kirkland Lake District.
<i>Fenusa dohrnii</i> (Tisch.) European alder leafminer	Al	Light defoliation of 10–15% was recorded over small clumps of 5–10, 2-m stems in a small roadside park in Barker Township, Kirkland Lake District.
<i>Hyphantria cunea</i> (Drury) Fall webworm	Al W Ch	Individual shrubs received up to 80% defoliation across the southern portion of the Kirkland Lake District from New Liskeard to Earleton and into the Englehart area.
<i>Phyllonorycter nipigon</i> (Free.) Balsam poplar leafblotch miner	bPo	Moderate foliar damage of 40–60% was recorded over a 2-ha area of mature trees in Barber Township, Kirkland Lake District.
<i>Pristiphora geniculata</i> (Htg.) Mountain-ash sawfly	aMo	Defoliation averaging 30% was commonly observed on ornamental shrubs throughout the towns of New Liskeard and Kirkland Lake and the two provincial parks in the Kirkland Lake District.
<i>Rhabdophaga swainei</i> Felt Spruce bud midge	wS bS	Light damage was recorded over a 30-ha plantation of 1.4-m trees in Lamplugh Township, Kirkland Lake District.

^a Al = alder, aMo = American mountain-ash, bPo = balsam poplar, bS = black spruce, Ch = cherry, jP = jack pine, W = willow, wE = white elm, wS = white spruce.

TREE DISEASES

Major Diseases

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

A total of 26 plantations were surveyed throughout the region for the presence of Armillaria root rot. Mortality was noted at 17 locations on jack pine, red pine, eastern white pine (*Pinus strobus* L.), white spruce, and black spruce (Table 9).

The average number of damaged trees at affected sites was not significantly different (1.6%) from levels encountered in 1992 (1.4%).

Spruce Needle Rusts, *Chrysomyxa ledi* (Alb. & Schwein.) de Bary var. *ledi*, *Chrysomyxa ledicola* (Peck) Lagerh.

The incidence of these disease-causing organisms remained high across the region but levels of infection were quite low (2–3% defoliation). The host trees generally ranged from 1 to 3 m and were infected at a 1–23% level in the eight plantations that showed damage. The heaviest area of defoliation was recorded near Wawa in Lendrum Township on a 20-ha area of mixed black

spruce–white spruce host that ranged in height up to 10 m. At this location most of the damage was confined to the white spruce host and damage levels ranged from 60–80%. A plantation in Kennedy Township, Cochrane District, that has had all the 1-m trees affected for the past three years, received average damage levels of 14.5%; down from 56% over the 15-ha area noted in 1992.

The rust parasite *Fusarium avenaceum* can be found at various infection levels in most areas of the region where the needle rust occurs. The impact of this parasite on the control of the needle rust appears significant; however, to date no hard data has been collected to verify this.

Ink Spot of Aspen, *Ciborinia whetzellii* (Seaver) Seaver

Heavy foliar damage (26–75%) resulting from this disease was commonly noted in small pockets (0.5 to 2.0 ha) of young regeneration throughout the Kirkland Lake and Timmins districts.

Elsewhere, a single pocket (13 ha) of trace defoliation (5%) was noted on 2- to 4-metre-tall understory regeneration in the Reeves Township Seed Orchard, Chapleau District.

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

This needle rust of jack pine was frequently observed throughout most of the work area. Incidence varied

considerably; however, foliar damage was trace-to-low at all locations surveyed. Approximately 50% of the plantations checked were positive (7 of 13). Results of the positive checks are detailed in Table 10.

Table 9. Mortality caused by Armillaria root rot in the Northeast Region of Ontario in 1993. (Counts are based on an examination of 150 randomly selected trees at each location.)

Location (Township)	Host ^a	Average height of trees (m)	Estimated number of trees per ha	Estimated area affected (ha)	Current mortality (%)
<i>Chapleau District</i>					
Nimitz	jP	1.9	600	1	0.6
McNaught	jP	1.8	2,600	35	0.6
<i>Kirkland Lake District</i>					
Bennevis	wS	2.1	2,500	10	0.6
Chamberlain	rP	1.7	2,000	4	0.6
Chamberlain	bS	1.6	2,500	10	1.3
Egan	bS	1.0	2,500	10	0.6
Ossian	jP	2.0	2,500	10	2.0
Playfair	bS	0.7	2,500	15	0.6
Playfair	jP	2.2	2,500	20	0.6
Truax	jP	1.7	2,450	50	2.0
<i>Timmins District</i>					
Battersby	jP	2.3	2,475	24	0.6
Evelyn	jP	1.4	2,500	10	2.0
Londonderry	jP	3.7	2,350	11	0.6
McMurchy	jP	1.2	2,400	16	1.3
Sheraton	jP	1.2	2,500	5	0.6
Turnbull	wP	1.3	4,000	10	0.6
<i>Wawa District</i>					
Esquea	jP	3.4	2,500	10	0.6

^a bS = black spruce, jP = jack pine, rP = red pine, wP = white pine, wS = white spruce.

Table 10. Damage caused by the pine needle rust to jack pine in the Northeast Region of Ontario in 1993. (Counts are based on an examination of 150 randomly selected trees at each location.)

Location (Township)	Average height of trees (m)	Estimated number of trees per ha	Estimated area affected (ha)	Trees affected (%)	Foliar damage (%)
<i>Chapleau District</i>					
Invergarry	2.2	2,400	5	16	8
<i>Hearst District</i>					
Stoddart	2.7	2,500	5	93	1
<i>Kirkland Lake District</i>					
Truax	1.7	2,450	50	45	2
Warden	0.6	2,375	10	7	1
<i>Timmins District</i>					
Battersby	2.3	2,475	24	6	2
McMurchy	1.2	2,500	16	47	1

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

The cool, wet weather experienced across the region in 1992 greatly enhanced the damage caused by this needle cast organism in stands evaluated in 1993. Sixty percent of the 21 plantations surveyed were infected. An average of 16.5% of the trees sampled had an average of 14.6% of the old foliage affected (Table 11). The heaviest damage occurred in Vasiloff Township in the Wawa District where 38% of the 2.2-m trees in a 60-ha plantation averaged 38.5% foliage loss.

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

This organism was present in 54% of the jack pine plantations examined across the region in 1993. Plantations inspected in the Wawa District exhibited a much heavier incidence of the disease; 16.3% compared with 3.2% for the remainder of the region. Similarly, the (main stem) severely affected trees were double the numbers experienced elsewhere in the region (Table 12). By far, the heaviest damage occurred on 2.2-m trees over a 60-ha plantation in Vasiloff Township, Wawa District. At this location 42% of the trees examined had galled branches but only four trees had main stem infections.

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

A total of 21 plantations were surveyed specifically for the presence of this fungus in the region. Among the red pine (*Pinus resinosa* Ait.) and jack pine plantations surveyed a total of six (three red pine and three jack pine) tested positive for the North American race of this fungus. The results of the infected plantation assessments are presented in Table 13.

Minor Diseases

**Linosporea Leaf Blight, *Linosporea tetraspora*
G.E. Thompson, Septoria Leaf Spot,
Mycosphaerella populicola G.E. Thompson**

Within the region, large areas of mature balsam poplar sustained heavy foliar damage across much of the hosts range. The heaviest damage (up to 100%) occurred in two major areas and resulted in premature leaf discoloration and early leaf fall. The first area extended across much of the central portion of the Timmins District; the second across the western portion of the Kirkland Lake District. Defoliation in the Hearst and Wawa districts ranged from 5 to 75% over areas 0.5 to 5 hectares in size.

Other Forest Insects

Various other diseases were encountered during the course of regular surveys. Information on these is provided in Table 14.

Table 11. Damage caused by tar spot needle cast in jack pine plantations in the Northeast Region of Ontario in 1993. (Counts are based on an examination of 150 randomly selected trees at each location.)

Location (Township)	Average height of trees (m)	Estimated number of trees per ha	Estimated area affected (ha)	Trees affected (%)	Foliar damage (%)
<i>Chapleau District</i>					
Invergarry	2.2	2,400	5	16.0	1.0
Nimitz	3.9	600	1	6.7	5.0
Triquet	2.5	2,500	10	1.0	2.0
<i>Cochrane District</i>					
Sheldon	4.9	200	25	15.0	1.0
<i>Kirkland Lake District</i>					
Cane	2.4	3,000	25	64.7	20.0
Skead	3.7	2,000	6	10.0	18.3
Truax	1.7	2,450	50	21.3	6.0
<i>Timmins District</i>					
Sheraton	1.2	2,500	5	12.0	3.4
<i>Wawa District</i>					
Atkinson				8.0	30.0
Nickle	2.5	2,500	2	1.0	25.0
Odlum	3.5	3,500	10	4.4	25.0
Vasiloff	2.2	4,500	60	38.0	38.5

Table 12. Damage caused by western gall rust in jack pine plantations in the Northeast Region of Ontario in 1993. (Counts are based on an examination of 150 randomly selected trees at each location.)

Location (Township)	Average height of trees (m)	Estimated number of trees per ha	Estimated area affected (ha)	Trees affected (%)	Trees severely affected (%)
<i>Chapleau District</i>					
Hutcheon	4.4	2,222	14	6.7	2.0
Invergarry	2.2	2,400	5	1.6	1.6
McNaughton	1.8	2,600	35	6.7	4.0
Nimitz	3.9	600	1	4.0	0.0
<i>Kirkland Lake District</i>					
Pontiac	1.3	2,500	50	0.7	0.7
Cane	2.4	2,500	25	2.0	0.0
<i>Timmins District</i>					
English	1.3	2,500	50	2.7	0.0
Evelyn	1.7	2,500	10	0.7	0.0
Londonderry	3.7	2,350	11	0.7	0.0
Macklem	4.3	2,500	12	4.0	0.7
Sheraton	1.2	2,500	5	5.3	0.7
<i>Wawa District</i>					
Atkinson	3.0	4,000	12	16.0	3.0
Cecile	2.7	3,500	10	9.0	0.7
Dahl	2.0	500	3	32.0	3.3
Hambleton	1.0	2,000	10	0.7	0.7
Mikano	10.0	3,000	5	35.0	3.3
Nickle	2.5	2,500	2	0.7	0.0
Nogawash	0.7	3,500	10	1.3	1.3
Odlum	3.5	3,500	10	10.0	1.3
Vasiloff	2.2	4,500	60	42.0	4.0

Table 13. Damage caused by the North American race of *Gremmeniella abietina* at six locations in the Northeast Region of Ontario in 1993. (Counts are based on an examination of 150 randomly selected trees at each location.)

Location (Township)	Species affected ^a	Average height of trees (m)	Estimated number of trees per ha	Estimated area affected (ha)	Trees affected (%)	Tree severely affected (%)
<i>Cochrane District</i>						
Sheldon	jP	4.9	2,000	25	32.7	0
<i>Kirkland Lake District</i>						
Chamberlain	rP	1.7	2,000	4	2.7	0
Skead	rP	2.8	2,000	6	2.0	0
Pontiac	rP	0.5	1,500	50	2.7	100
Playfair	jP	2.2	2,500	20	0.7	0
<i>Wawa District</i>						
Odlum	jP	3.5	3,500	10	0.7	0

^a jP = jack pine, rP = red pine.

Table 14. Other forest diseases.

Disease	Host(s) ^a	Remarks
<i>Botryosphaeria obtusa</i> (Schwein.) Shoemaker Tip blight	juniper	Heavy fruiting was recorded at the base of dead shoots on 2% of the branches on an ornamental shrub at the Swastika Tree Nursery, Kirkland Lake District.
<i>Ciborinia whetzellii</i> (Seaver) Seaver Ink spot of aspen	tA	Pockets of heavy foliar damage (60–80%) were recorded over areas of 0.5 to 2 ha of mature aspen in the southern portions of the Timmins and Kirkland Lake districts.
<i>Sphaeropsis sapinea</i> (Fr.) Dyko & B. Sutton Tip blight	scP rP jP	This pine tip blight organism occurred at low damage levels (1–10%) on 2- to 3-m trees at two locations in the region. Infection levels ranged from a high of 30.7% on red pine in Skead Township, Kirkland Lake District, to 1.6% on jack pine in Dalmas Township, Chapleau District. The heaviest infection occurred on 70% of the tips of a 3.4-m Scots pine tree in Marter Township, Kirkland Lake District.

^a jP = jack pine, rP = red pine, scP = Scots pine, tA = trembling aspen.

ABIOTIC CONDITIONS

Frost Damage

Compared to the cool, erratic weather experienced during early 1992, spring weather in 1993 was more moderate. Consequently, far less frost damage was recorded than last year.

The heaviest damage occurred in a 10-ha plantation of 1-m black spruce in Egan Township in the Kirkland Lake District. At this site 8.3% of the trees exhibited an average of 4.2% foliage damage. In a similar plantation in Kennedy Township, Cochrane District, 2.2% foliar damage was recorded on 98% of the trees.

Snow Damage

A heavy, wet snowfall in late October of 1992 accounted for bent and broken saplings of numerous species (5–10 cm dbh on average) across large portions of the Chapleau, Timmins, and Kirkland Lake districts. The most conspicuous damage occurred on exposed, open-grown, and fringe trembling aspen. These were bent close to the ground in small pockets of <0.5 ha. A smaller percentage (<1%) of saplings ranging from 2 to 7 m in height were frequently snapped off on the bole.

Damage in the Chapleau District was most noticeable along Hwy 101 between Sloan Creek and the Nat River. Widespread damage was noted throughout the entire Timmins District and across all but the southern third of the Kirkland Lake District. Throughout all these areas conifer plantations also suffered varying degrees of broken stems and branches. A typical survey, at the Island Lake Tree Improvement area in Dalmas Township, Chapleau District, revealed 5% branch mortality on 5% of all 2.4-m jack pine throughout a 33-ha site.

Winter Drying

This unusual winter phenomenon occurs primarily on coniferous hosts growing adjacent to open areas where rapid air movement desiccates the foliage. Frozen root systems are unable to replace the moisture before cell collapse takes place. More succulent new shoots are most often damaged but, in severe situations, older foliage is also affected.

Climatic conditions in 1993 did not appear favorable for damage by winter drying. The only area of recorded damage involved 5-m ornamental trees at Ivanhoe Provincial Park in Ivanhoe Township, Chapleau District. At this location 6.7% of the jack pine host received damage to approximately 5% of the current foliage.

Jack Pine Mortality

Dead and dying jack pine was aerially mapped over an area of 31,260 ha in 1993. Most of the damage occurred in one large area covering portions of Gourlay, Bayfield, Beaton, and Larkin townships. Smaller adjacent pockets were scattered across the northeastern half of the Wawa District. Isolated pockets occurred in the Hearst District around Oba and along the Missinaibi River and Friday Creek, both north of the village of Opasatika. Another small area of damage occurred near Foxville Station on the Ontario Northland Railway, Cochrane District (Fig. 9).

Trees in the above areas have been severely stressed by drought, insects, and adverse weather conditions for many years. The combined effect of this stress is now becoming evident on both balsam fir and jack pine.

There has been a long history of jack pine problems in the Wawa–Hearst area. In 1986, a tornado in Marjorie Township in the Hearst District damaged many trees.

This, in turn, provided brood material resulting in a build-up of bark beetles and wood borers which spread out and killed individual trees in many of the surrounding townships in 1989.

In 1990, drought-killed balsam fir (the first species to show drought damage) was recorded across the entire work area. Dead trees were especially prevalent around the Granitehill Lake area in Drew Township in the northeastern portion of the Wawa District.

As well a major snow storm in May 1990 caused heavy damage, especially to jack pine, which were often snapped off 10 to 15 m above the ground. Again, bark beetle and wood borer populations increased dramatically.

Unusually dry conditions during the summer of 1991 had a dramatic affect on the health of the forest. Some areas which were defoliated earlier that spring by forest tent caterpillar were in such poor condition that many hilltop stands of aspen, especially in the northeastern portion of the Wawa District, never refoliated.

Additional drought damage was aerially mapped over 125,877 ha in the northeastern half of the Wawa District. This is the same area which now contains the dead jack pine.

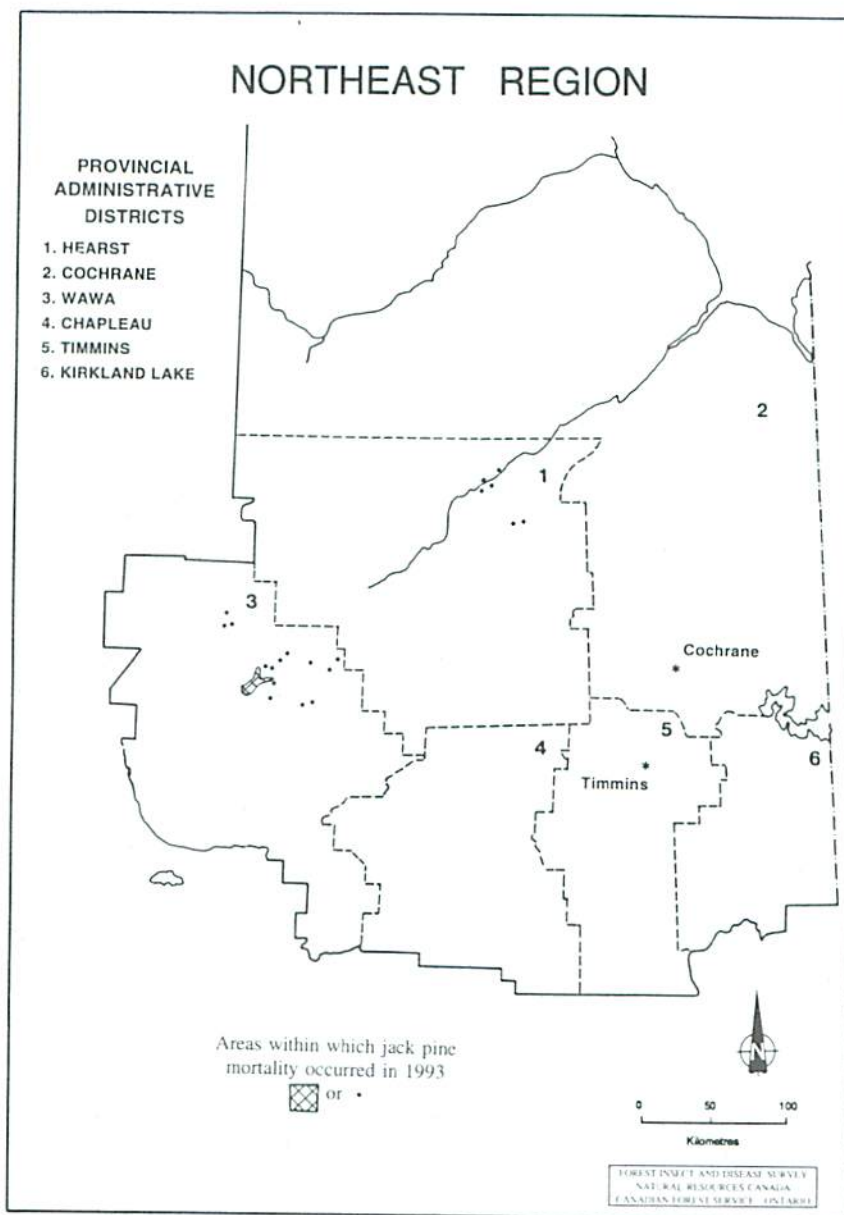


Figure 9. Jack pine mortality.

FOREST HEALTH

Acid Rain National Early Warning System (ARNEWS)

Four additional acid rain monitoring plots were established across the region in 1993, bringing the total number to eight (Fig. 10).

The plots are monitored annually for insect and disease activity, for any tree abnormality, or for changes in crown configuration. Ground vegetation and regeneration plots are also monitored each year within the plot boundaries.

To date, no symptoms attributable to acid rain deposition have been recorded in any of the monitored plots; but, insect and disease activity and stress from abiotic conditions have been identified.

In the black spruce plot in Sweetman Township, Cochrane District, light needle rust (*Chrysomyxa ledi*) was recorded on off-plot trees during foliar sampling.

In Cane Township, Kirkland Lake District, trees both in and outside of a jack pine plot continued to show signs of stress due to the well drained soil conditions.

In the newly established plot in Evelyn Township, Timmins District, the early aspen leafcurler *Pseudexentera oregonana* was responsible for an average defoliation of 50% over the plot area. Low levels of aspen leafblotch miner (*Phyllonorycter ontario*) and ink spot disease (*Ciborinia whetzellii*) were also recorded on off-plot trees during foliar sampling.

All new plots established this year had base year data collected, i.e., soil sampling and foliar samples of the

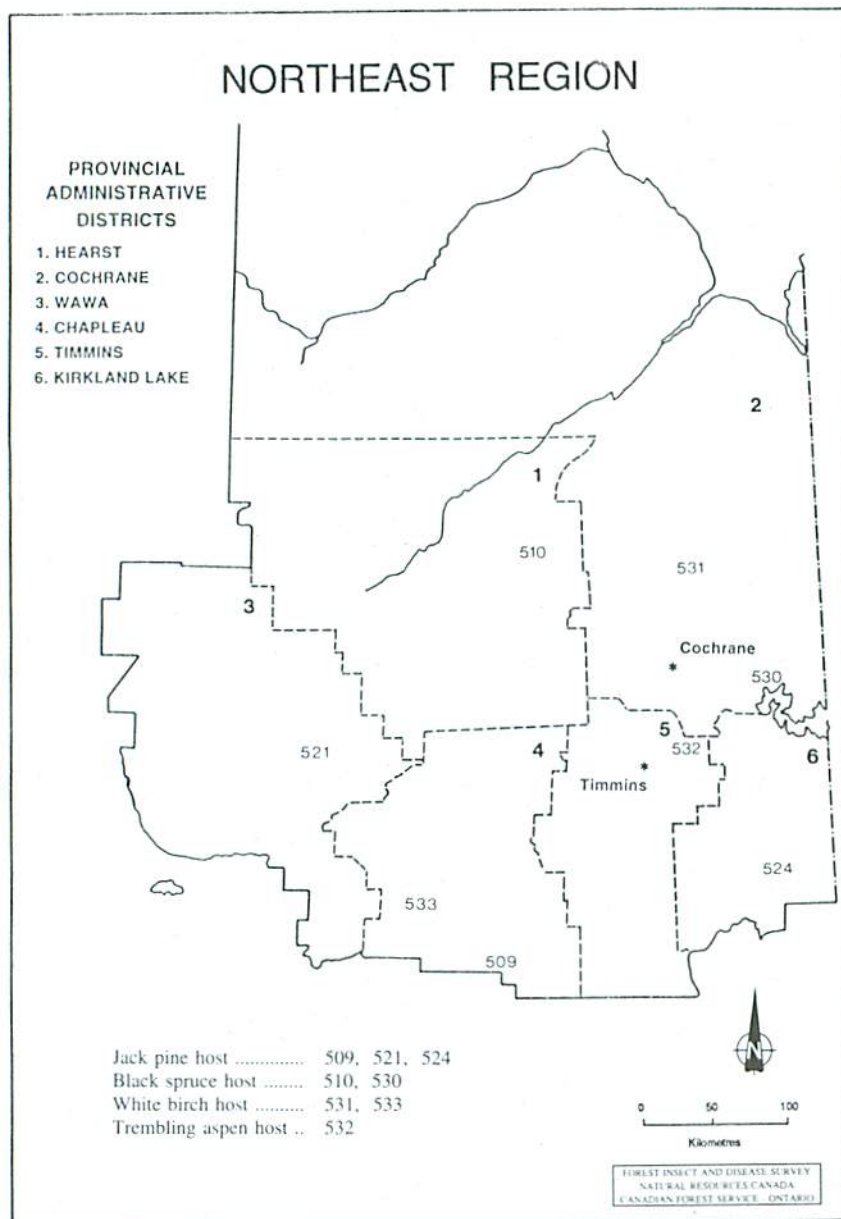


Figure 10. Arnefs plot locations.

off-plot trees. All mensurational measurements were taken and tree health and vigor observations were obtained.

SPECIAL SURVEYS

Forest Tree Nursery Report

The spring of 1993 marked the first removal of seedlings from the Chapleau and Gogama nurseries; however, seedling production has now been terminated at these locations. This leaves only the Swastika Nursery in operation in the region.

At the Swastika Nursery, nursery compartments and clonal archive materials were checked at three week intervals. During each visit contact was made with nursery personnel and areas of interest were discussed prior to and upon completion of the inspection.

The most common problem in the nursery continues to be the root rot within compartments D12, H7, and H9. In most instances, seedling mortality was less than 1% but in compartment H7 approximately 10% of the trees showed signs of root damage. In all instances the only organism isolated from the dead root area was *Fusarium*.

Annually, low levels of both spruce budworm and yellowheaded spruce sawfly persist on the large spruce hedgerows between the seedbeds, particularly in the south-eastern section of the nursery.

A combination of winter drying and the disease organism *Kabatina juniperianus* severely damaged young white cedar seedbed material being held for hedgerow planting. Resulting tip mortality and general host condition necessitated a removal of the entire section of the cedar nursery bed.

Archival jack pine plantations and breeding orchard materials sustained low foliar damage levels (1-5%) by *Davisiomyella ampla* and *C. asterum*. Light (1-2%) shoot damage was also recorded, mainly on side branches, and attributed to a combination of eastern pine shoot borer and jack pine tip beetle. White pine weevil caused light leader damage to the same trees.

Ornamental trees and shrubs adjacent to the office area received light damage due to needle rusts and insect damage. Blue spruce (*Picea pungens* Engelm.) received 20% damage by *C. ledi* (needle rust) and mugho pine (*Pinus mugo* Turra) received 5% damage by a yet undetermined needle cast organism. Leafroller damage was apparent on approximately 2-5% of the deciduous ornamental hosts (i.e., ashes and maples).

Gypsy Moth Pheromone Trapping

Pheromone trap catches of gypsy moth (*Lymantria dispar* [L.]) were down significantly from those reported in 1992. A total of three moths were trapped at 16 locations across the region (Table 15), significantly less than the 57 moths trapped in 1992. Shoals Provincial Park in Peters Township, Chapleau District was the single new catch location recorded this year. Catches have not revealed any trends throughout the region.

Northern Ontario Development Agreement (NODA)

With the signing of the Northern Ontario Development Agreement (NODA) in November of 1991, the Northern Forestry Program (NFP) was provided with \$50 million over a 4-year period for economic development in forestry in northern Ontario.

The NFP is a joint venture between the Ontario Ministry of Natural Resources (OMNR) and the Canadian Forest Service. Emphasis will focus on obtaining information to develop better tools and ultimately result in better decisions in the management of Ontario forests for economic, social, and environmental prosperity.

Under the NFP, the Forest Insect and Disease Survey (FIDS) Unit is coordinating stand data (from both OMNR and forest product companies) and insect historical data into a pattern of plots that would cover the diverse stand conditions encountered across the province.

Work on NFP plots was funded separately from annual FIDS pest monitoring work. To strengthen the value of plot work, careful attention was taken to locate plots in stands that met the designated criteria and were presently monitored as egg-mass sample locations, impact plots, or pheromone sample sites for Dr. C.J. Sanders.

Management Guidelines for Jack Pine Budworm NFP Project No. 4033

Project objectives are to develop jack pine budworm impact estimates and to provide accurate predictions of growth loss, top kill, decay and defect development, and whole-tree mortality. In turn, this will allow for the development of guidelines for the management of jack pine budworm in northern Ontario.

Table 15. Results of gypsy moth pheromone trapping in the Northeast Region of Ontario from 1990 to 1993.

District (Location)	Number of moths trapped			
	1990	1991	1992	1993
<i>Chapleau District</i>				
Ivanhoe Lake Provincial Park	0	3	6	0
Missinabi Lake Provincial Park	0	0	1	0
Missinabi Wild River Provincial Park	1	0	0	1
Shoals Provincial Park	0	0	0	1
Wakami Lake Provincial Park	0	0	9	0
<i>Cochrane District</i>				
Greenwater Provincial Park	0	0	4	0
<i>Hearst District</i>				
Cecil Trailer Park	0	0	0	0
Fushimi Lake Provincial Park	0	1	0	0
Nagagamisis Provincial Park	0	0	0	0
Remi Lake Provincial Park	1	2	1	0
<i>Kirkland Lake District</i>				
Esker Lakes Provincial Park	13	3	4	0
Kap-Kig-Iwan Provincial Park	14	1	27	0
<i>Timmins District</i>				
Dublin Township, Muldrew Lake	-	4	1	1
Kettle Lake Provincial Park	2	0	4	0
<i>Wawa District</i>				
Obatanga Provincial Park	0	0	2	0
White Lake Provincial Park	0	0	0	0

Because of the uniform nature of jack pine stands the basic criterion used for plot selection was age class; immature (1–40 yrs), mature (41–80 yrs), and over-mature (80+ years). Within these age classes, all site classes from X to 3 were sampled. To cover this criterion, a complete set would constitute nine individual plots. When possible, stands that had been previously infested with jack pine budworm were used.

Plots located across the work area now total 27 (three sets) and generally cover the range of large jack pine stands in the region (Fig. 11).

Development of an Eastern Spruce Budworm Hazard Rating System for the Forests of Northern Ontario NFP Project No. 4210

The objective of this project was to develop a system for rating the vulnerability of forest stands to spruce budworm attacks. Classification on species content was based on the percentage of the spruce–fir component in the stand and divided into 10 to 30, 31 to 60, and over 60% categories. Within the above division, stands examined were further broken down into age groups of 20 to 40, 41 to 60, and over 60 years old. Plot locations were divided into areas across the site classes from X to the poorer site class 4. To work across this range of variables a complete unit would constitute a series of 27 individual plots.

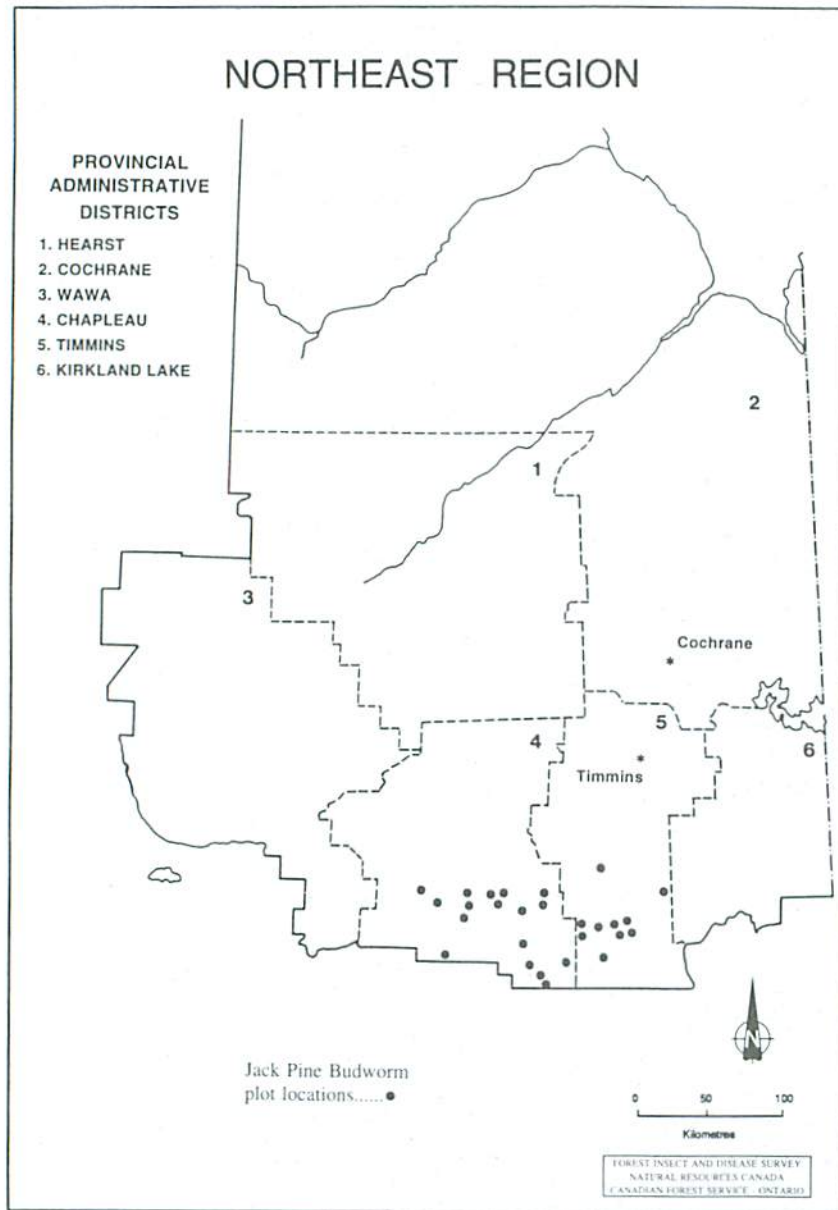


Figure 11. Locations of jack pine budworm NFP plots.

Distribution across the susceptible stands in the region is important (Fig. 12) and further work in 1994 will complete the plot network.

As mentioned for jack pine budworm, an attempt was made to locate the plots within areas where previous budworm work has been carried out if the stands met the above criteria. It was felt that information from the L_2 and pheromone sites, as well as old impact plots or egg-mass sample locations, would further enhance the new data to be collected.

The objective of this project was to develop a framework to study the impact of this fungus and to provide a definitive statement on the losses (economic and otherwise) that it causes on susceptible pine hosts.

Scleroderris canker has been a problem for over 25 years in Ontario, primarily infecting red pine. Throughout the Northeast Region, however, only the North American race of the organism is found, primarily on the more available jack pine host.

An attempt was made in 1993 to visit all red pine plantations, and a cross section of jack pine plantations, to obtain information on the distribution of the organism across the region and the current impact it is having on the affected hosts.

Climatic Data

Temperature and precipitation have a great deal of influence on the presence and development of insect and disease organisms, and can facilitate or hinder their expansion greatly from year-to-year. Adverse weather conditions can also cause abiotic damage (hail, wind, snow, drought) to the host trees that would predispose them to insect or disease attack.

Therefore, current weather data (temperature and precipitation) of a representative sample of weather stations across the work area have been included. For ease of comparison, 30-year normals in the table and the current deviation from normal figures (Table 16) are also listed.

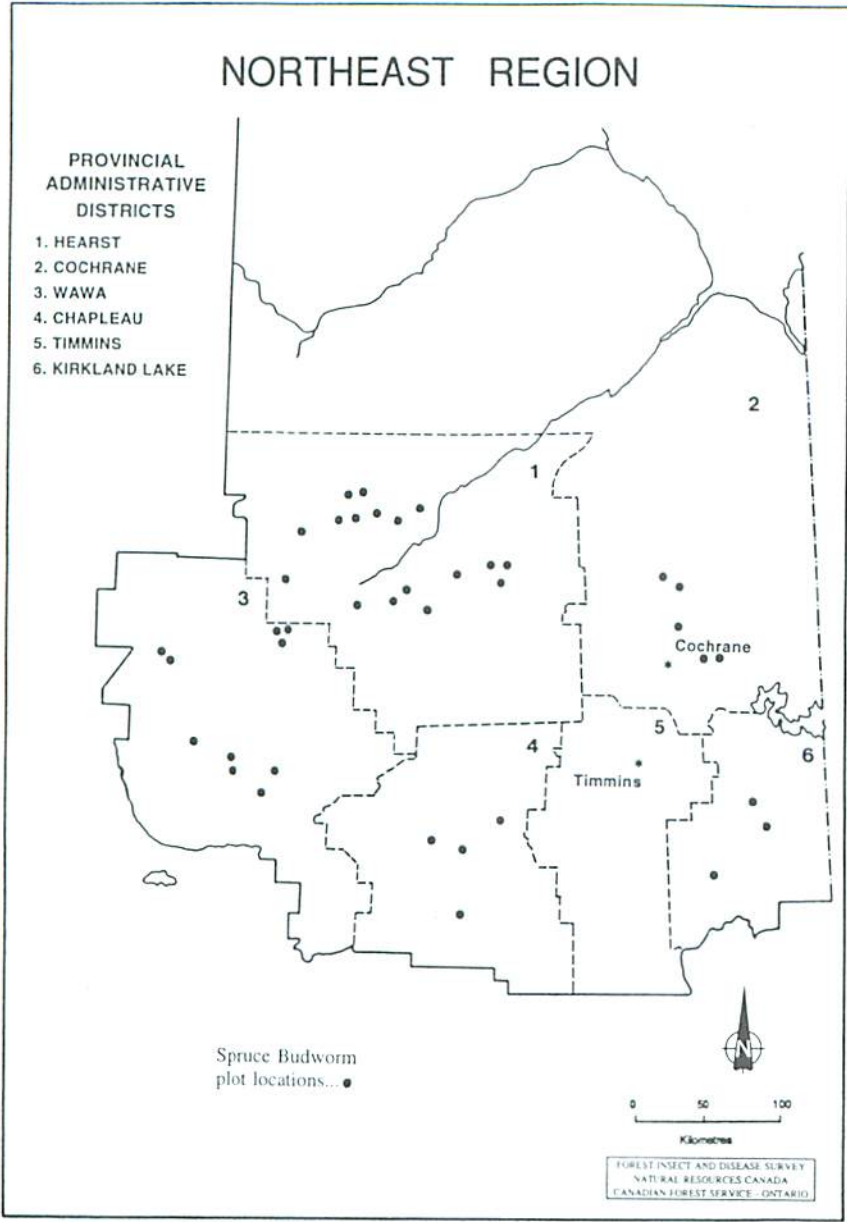


Figure 12. Locations of eastern spruce budworm NFP plots.

Table 16. Mean temperatures and total precipitation at three locations in the Northeast Region of Ontario in 1993.

Location	Month	Mean temperature (C°)		Deviation from normal (°C)	Total precipitation (mm)		Deviation from normal (mm)
		Normal	Actual		Normal	Actual	
Chapleau Airport	January	-16.9	-13.9	+3.0	46.9	65.8	+18.9
	February	-15.8	-16.7	-0.9	34.5	15.8	18.7
	March	-8.3	-6.7	+1.6	56.2	25.2	31.0
	April	0.6	0.0	-0.6	59.3	85.4	+26.1
	May	8.6	9.2	+0.6	73.8	125.0	+51.2
	June	14.3	13.7	-0.6	100.4	86.0	-14.4
	July	16.8	17.2	+0.4	81.8	106.0	+24.2
	August	15.4	17.1	+1.7	86.2	54.8	-31.4
	September	10.4	8.4	-2.0	101.5	137.8	+36.3
	October	4.9	1.4	-3.5	75.7	70.0	-5.7
	November	-3.5			64.2		
	December	-12.8			53.5		
Earlton Airport	January	-16.3	-15.7	+0.6	56.4	32.1	-24.3
	February	-14.1	-18.2	-4.1	47.2	7.4	-39.
	March	-7.6	-7.0	+0.6	58.0	17.6	-40.4
	April	1.9	2.1	+0.2	50.0	59.2	+9.2
	May	9.8	9.9	+0.1	61.3	112.8	+51.5
	June	15.2	14.6	-0.6	89.2	47.2	-42.0
	July	17.7	19.0	+1.3	80.8	69.0	-11.8
	August	16.2	18.5	+2.3	83.4	121.8	+38.
	September	11.1	9.5	-1.6	99.1	68.6	-30.5
	October	5.4	2.8	-2.6	70.0	103.8	+33.8
	November	-2.5	-6.2	-3.7	70.6	62.6	-8.0
	December	-12.6	-11.0	+1.6	65.3	36.8	-28.5
Kapusking Airport	January	-18.6	-16.4	+2.2	53.6	29.6	-24.0
	February	-16.2	-19.1	-2.9	43.0	10.6	-32.4
	March	-9.4	-8.0	+1.4	55.4	14.7	-40.7
	April	0.5	0.2	-0.3	53.2	69.2	+16.0
	May	8.3	8.7	+0.4	74.3	75.8	+1.5
	June	14.1	13.9	-0.2	84.7	54.8	-29.9
	July	16.8	17.9	+1.1	96.3	188.1	+91.8
	August	15.3	17.3	+2.0	92.5	45.9	-46.6
	September	10.0	7.9	-2.1	94.4	114.8	+50.4
	October	4.4	1.2	-3.2	77.4	74.6	-2.8
	November	-2.4	-7.6	-5.2	80.1	46.8	-33.3
	December	-16.4	-13.4	+3.0	53.3	44.0	-9.3

Appendix 1. Northeast Region – Eastern Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1993 and infestation forecasts for 1994.

Location	Host ^a	Estimated defoliation in 1993 (%)	Number of egg masses per 9.29 m ² of foliage	Infestation forecasts for 1994 ^b	Accumulated damage ^c
<i>Chapleau District</i>					
(14 locations)					
Barclay Township	bF	5	0	N	0
Borden Township	bF	5	0	N	0
Fawn Township	bF	5	0	N	0
Genier Township	bF	5	0	N	0
Hall Township	bF	10	22	L-M	0
*Ivanhoe Township	bF	3	0	N	0
Lloyd Township	wS	5	0	N	0
*Neelands Township	bF	5	0	N	0
	wS	5	0	N	0
Peters Township					
– Shoals Provincial Park	bF	5	0	N	0
*Racine Township	bF	5	0	N	0
-Reaney Township					
– Five Mile Provincial Park	bF	5	0	N	0
*Sandy Township	bF	5	0	N	0
	wS	5	0	N	0
<i>Cochrane District</i>					
(12 locations)					
Clute Township – OMNR SPA ^d	wS	0	0	N	0
*Dempsey Township	bF	10	0	N	0
Fournier Township – OMNR SPA ^d	wS	0	0	N	0
*Freele Township	bF	6	0	N	0
*Laughton Township	bF	10	0	N	0
	wS	5	0	N	0
Laughton Township	bF	0	0	N	0
Marathon Township	bF	0	0	N	0
*Potter Township – stand 2365	bF	5	0	N	0
*Potter Township – stand 9186	bF	5	0	N	0
	wS	5	0	N	0
St. John Township – stand 177	bF	0	0	N	0
<i>Hearst District</i>					
(53 locations)					
Arnott Township	bF	2	0	N	0
Burrell Township	bF	62	274	S	2
Cumming Township	wS	0	0	N	0
Elgie Township	bF	42	271	S	2
Fauquier Township – Park	bF	0	0	N	0
*Franz Township	bF	6	57	M	1
	wS	3	130	M-S	1
*Frost Township	bF	50	189	M-S	2
	wS	82	561	S	3
*Fushimi Township	bF	2	0	N	1
	wS	2	0	N	1
*Fushimi Provincial Park	bF	25	178	M-S	2
*Fushimi Provincial Park	wS	15	125	M-S	1
Guilfoyle Township	bF	0	0	N	0
*Hanlan Township	bF	2	9	L	1
	wS	0	0	N	0
Kohler Township	bF	88	191	M-S	3
*Landry Township	bF	2	5	L	1
	wS	5	0	N	1
McFarlan Township	bF	5	40	L-M	1
*McMillan Township	bF	48	275	S	2
	wS	26	227	M-S	2

(cont'd)

Appendix 1. Northeast Region – Eastern Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1993 and infestation forecasts for 1994 (cont'd).

Location	Host ^a	Estimated defoliation in 1993 (%)	Number of egg masses per 9.29 m ² of foliage	Infestation forecasts for 1994 ^b	Accumulated damage ^c
<i>Hearst District (cont'd)</i>					
Mulloy Township	bF	20	77	M-S	2
Mulvey Township	bF	1	0	N	1
*Neely Township – stand 1156	bF	20	0	N	0
	wS	15	0	N	0
*Orkney Township	bF	0	9	L	1
	wS	1	0	N	1
*Pearce Township – stand 4542	bF	5	0	N	0
	wS	8	0	N	0
*Pearce Township – stand 5161	bF	10	0	N	0
	wS	32	0	N	0
*Ritchie Township	bF	2	15	L-M	1
	wS	2	0	N	1
Rogers Township	wS	33	557	S	2
*Rogers Township – stand 4306	bF	90	391	S	2
	wS	72	231	M-S	2
Shannon Township	bF	1	0	N	1
*Shearer Township – stand 5391	bF	5	11	L	0
	wS	5	0	N	0
Shuel Township	wS	19	128	M-S	1
*Staunton Township – stand 45	bF	25	0	N	1
	wS	38	0	N	1
Stauton Township	bF	1	0	N	1
Studholme Township	wS	2	172	M-S	1
*Teetzel Township – stand 2335	bF	4	0	N	0
	wS	8	0	N	0
*Templeton Township – stand 93	bF	18	12	L	1
	wS	40	0	N	1
*Township 238 – stand 4594	wS	5	0	N	1
*Township 238 – stand 4843	bF	5	51	L-M	1
	wS	4	35	L-M	1
Walls Township	wS	8	50	L-M	1
<i>Kirkland Lake District</i>					
(10 locations)					
Bannockburn Township	bF	5	0	N	0
Dack Township	wS	3	0	N	0
Lamplugh Township	bF	2	0	N	0
*Maisonville Township	bF	1	0	N	0
	bS	0	0	N	0
*Mickle Township	bF	2	0	N	0
	wS	10	0	N	0
	bS	0	0	N	0
*Pacaud Township	bF	0	0	N	0
	wS	2	0	N	0
<i>Timmins District</i>					
(10 locations)					
Dublin Township	bF	5	0	N	0
Edinburgh Township	bS	5	0	N	0
Eldorado Township	bF	1	0	N	0
Enid Township	bF	2	0	N	0
Garibaldi Township	bF	5	0	N	0
Hassard Township	bF	1	0	N	0
Reeves Township – OMNR SPA ^d	wS	5	0	N	0
Sewell Township	bF	1	0	N	0
St. Louis Township	wS	5	0	N	0
Thomas Township	wS	14	0	N	0

(cont'd)

Appendix 1. Northeast Region – Eastern Spruce Budworm: Summary of defoliation estimates and egg-mass counts in 1993 and infestation forecasts for 1994 (concl.).

Location	Host ^a	Estimated defoliation in 1993 (%)	Number of egg masses per 9.29 m ² of foliage	Infestation forecasts for 1994 ^b	Accumulated damage ^c
<i>Wawa District</i>					
(41 locations)					
Barbara Lake – SPA ^d	wS	40	221	M-S	2
Bayfield Township	bF	3	54	M-S	2
Breckenridge Township	wS	13	248	S	1
Dahl Township					
– Obatanga Provincial Park	bF	66	203	M-S	2
Dambrossio Township–Impact Plot	bF	94	433	S	1
Dead Otter Lake	bF	36	0	N	4
Derry Township	bF	11	206	M-S	2
*Dumas Township	bF	92	343	S	1
	wS	95	269	S	1
Esquega Township	bF	0	0	N	0
Foch Township	bF	38	214	M-S	2
Fourbay Lake	bF	78	131	M-S	4
Gowan Lake Road	bF	38	217	M-S	5
Hiawatha Township	bF	32	114	M-S	2
*Hunt Township	wS	20	59	M-S	1
Industrial Road – south of Caramat	bF	95	169	M-S	2
Industrial Road – Camp 15	bF	88	164	M-S	2
*Laberge Township	bF	22	27	L-M	2
*Lalibert Township	bF	8	22	L-M	0
	bS	0	0	N	0
*Leslie Township – stand 266	bF	83	136	M-S	3
	wS	73	228	S	2
*Leslie Township – (south) stand 352	bF	94	446	S	7
Lessard Township	bF	2	0	N	1
Lipton Township	wS	39	245	M-S	2
Maness Township	bF	0	0	N	0
Manitouwadge plantation	wS	5	0	N	0
McCron Township	bF	84	137	M-S	0
Nickle Township	bF	32	227	S	3
Osawin Township	bF	72	223	M-S	3
Otasawian Lake	bF	58	0	N	3
Pearkes Township	bF	65	367	S	0
Pearly Lake	bF	42	84	M-S	3
Recollet Township	bF	0	0	N	0
Stevens – Microwave Tower	bF	94	103	M-S	4
*Wickstead Township – stand 156	bF	48	131	M-S	2
	wS	5	293	S	1
*Wickstead Township – stand 521	bF	65	0	N	2
	wS	65	42	L-M	2
*Wickstead Township – stand 552	bF	18	79	M-S	2
	wS	42	182	M-S	2

* SBW NFP IMPACT PLOT

^a bF = balsam fir, wS = white spruce.

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

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

^d SPA = Seed Production Area.

Appendix 2. Northeast Region – Jack Pine Budworm: Summary of defoliation estimates and egg-mass counts in 1993 and infestation forecasts for 1994 on jack pine.

Location	Estimated % defoliation 1993	Total number egg-masses on six 61-cm branch tips	Infestation forecasts for 1994 ^a
<i>Chapleau District</i> (21 locations)			
*Bazett Township	1	1	L
*Cortez Township – stand 234	0	0	N
*Daoust Township – stand 187	0	0	N
Deans Township	1	0	N
*Deans Township – stand 103	0	0	N
*Edith Township	0	0	N
+*Fawn Township – Dore Road East	0	0	N
* – Dore Road West	0	0	N
+* – Hong Kong Road	0	0	N
*Fingal Township	0	0	N
*Hall Township – stand 340	0	0	N
*Ivy Township – stand 65	0	0	N
*Ivy Township – Metagama Road – stand 314	0	1	L
+*Kaplan Township – west of Sultan	0	0	N
+* – north of Sultan	0	0	N
*Nimitz Township – stand 149	0	0	N
*Osway Township	0	0	N
Peters Township	5	0	N
Strom Township	5	0	N
*Wakami Township – stand 518	0	0	N
Wakami Township	5	0	N
<i>Cochrane District</i> (2 locations)			
Avon Township	0	0	N
Dempsey Township	0	0	N
<i>Hearst District</i> (2 locations)			
Fauquier Township	0	0	N
Gill Township	0	1	L
<i>Kirkland Lake District</i> (3 locations)			
Chamberlain Township	0	0	N
Clifford Township	0	0	N
Mickle Township – stand 95	1	0	N
<i>Timmins District</i> (15 locations)			
Adams Township – stand 130	0	1	L
Evelyn Township – stand 51	0	0	N
*Invergarry Township – stand 90	0	0	N
+* – stand 121	0	0	N
Mattagami Township	1	1	L
*MacMurchy Township – stand 2389	0	0	N
Noble Township	1	0	N
*Paudash Township – stand 298	3	0	N
Robb Township – stand 86	0	0	N
*Stetham Township – stand 211	0	0	N
*Vrooman Township – stand 95	2	0	N
*Westbrook Township – stand 67	3	1	L
+* – stand 72	0	0	N
+* – stand 72	0	0	N
+* – stand 98	0	0	N
<i>Wawa District</i> (3 locations)			
Maness Township	0	0	N
Recollet Township	0	0	N
Vasiloff Township	0	0	N

* JPBW NFP PLOT

+ Immature jack pine stands

^a N = nil, L = light, M = moderate, H = heavy