RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE NORTHWEST REGION OF ONTARIO, 1994

Forest Districts: Dryden, Fort Frances, Kenora, Nipigon, Red Lake, Sioux Lookout, and Thunder Bay

D.C. Constable, W.D. Biggs, A.J. Keizer, and P.M. Bolan

Natural Resources Canada
Canadian Forest Service – Ontario
Great Lakes Forestry Centre

1995

Information Report O–X–445

Canadian Cataloguing in Publication Data

Main entry under title :

Results of forest insect and disease surveys in
the northwest region of Ontario ...

(Information report, ISSN 0832–7122)
Description based on : 1979.
Vols for 1986- issued by the Great Lakes Forestry Centre.
ISSN 0715–0938 = Results of forest insect and disease
surveys in the northwestern region of Ontario.

1. Trees — Diseases and pests — Ontario.
2. Forest insects — Ontario.
I. Great Lakes Forest Research Centre.
II. Ontario. Ministry of Natural Resources.
III. Great Lakes Forestry Centre.
IV. Series: Information report (Great Lakes Forestry
Centre) ; O–X–445.

SB605.C32 634.9'6'0971311 C82–0715050 rev.

Catalogue No. Fo46–14/445E
ISBN 0–662–22974–6
ISSN 0832–7122

Copies of this publication are available at no charge from:
Publication Services
Canadian Forest Service – Ontario
Great Lakes Forestry Centre
P.O. Box 490
Sault Ste. Marie, Ontario
P6A 5M7

Microfiche copies of this publication may be purchased from:
Micromedia Inc.
Place du Portage
165, Hotel-de-Ville
Hull, Quebec
J8X 3X2

SURVEY HIGHLIGHTS

This report describes the most significant insect and disease conditions that occurred during 1994 in the Northwest Region. The Geraldton District was amalgamated with the Nipigon District and thus slight changes have been made in the Thunder Bay/ Nipigon district boundaries.

Eastern spruce budworm continued to be the most damaging insect detected using aerial and ground checks. However, a decline occurred in five districts, while a slight increase resulted in the Fort Frances and Thunder Bay districts. Other insects that caused varying amounts of damage were the large aspen tortrix, birch leafminer, aspen leafblotch miner, yellowheaded spruce sawfly, northern twig moth, white pine weevil, and eastern pine shoot borer.

Poplar leaf diseases caused moderate to severe discoloration and premature leaf drop on balsam poplar and trembling aspen across most districts in the region. A late season leaf spot, aerially mapped in the southern part of the Nipigon District, affected 74,330 ha of white birch foliage. A needle blight, which affected 200 ha of semimature jack pine stands in 1993 near Nakina in the Nipigon District, increased to 4,821 ha in 1994. Other diseases described in this report caused no major damage and most were reported at endemic levels.

The 11 established Acid Rain National Early Warning System (ARNEWS) plots were revisited, but no significant damage was reported. A total of 116 eastern spruce budworm and 88 jack pine budworm study plots are now established in the region and will be monitored on an annual basis. These plots were funded by a project of the Northern Ontario Development Agreement (NODA) under the Northern Forestry Program (NFP). Gypsy moth pheromone trapping was repeated and all results were negative from 19 trap locations. The forest tree nursery at Dryden was also checked on a regular basis for insect and disease problems. High numbers of squirrels caused widespread damage to jack pine and to a lesser degree to red pine trees in the region. Damage caused by the removal of cones resulted in up to 60% branch-tip mortality in some areas.

Insects and diseases described in this report are categorized as follows:

Major Insects/Diseases

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

Minor Insects/Diseases

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

Other Forest Insects/Diseases (Tables)

These tables provide information on two types of pest:

(1) those that are of minor importance and have not been known to cause serious damage to forest trees, and

(2) those that are capable of causing serious damage but, because of low populations or for other reasons, did not cause serious damage this year.

Cooperation and assistance provided by the Ontario Ministry of Natural Resources (OMNR) and by the forest industry are gratefully acknowledged.

If further information is required about pest conditions in the Northwest Region, please contact one of the report authors or write to: Chief, Forest Insect and Disease Survey Unit, Canadian Forest Service–Ontario, P.O. Box 490, Sault Ste. Marie, Ontario, P6A 5M7.

D.C. Constable
W.D. Biggs
A.J. Keizer
P.M. Bolan

FRONTISPIECE

Figure 1. Damage caused by the white pine weevil (Pissodes strobi *[Peck]).*

Figure 2. Damage caused by the eastern pine shoot borer (Eucosma gloriola *Heinr.).*

Figure 3. Armillaria root rot (Armillaria ostoyae *[Romagn.] Herink).*

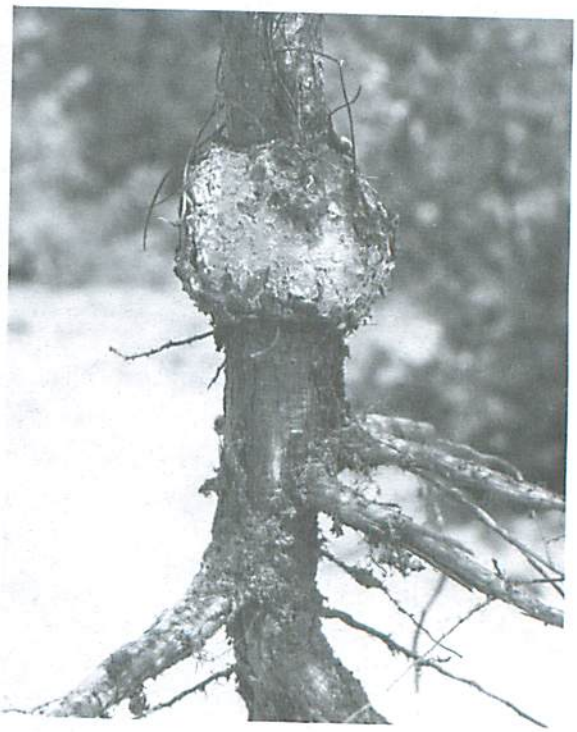

Figure 4. Western gall rust (Endocronartium harknessii *[J.P. Moore] Y. Hirats.).*

Four pests found in the Northwest Region that commonly damage young jack pine (*Pinus banksiana* Lamb.) trees.

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INSECTS

Major Insects

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

This pest of trembling aspen (*Populus tremuloides* Michx.) caused moderate to severe defoliation during 1994 to over 1,905 hectares of forest. The large aspen tortrix infestation was located on the north shore of Lake Superior in the Pays Plat Bay area of the Nipigon District (Fig. 5). Severe defoliation continued north from the Pays Plat area into Yesno Township along the Pays Plat River to Kelly Lake. From Kelly Lake, defoliation continued east to a north–south line running from the Fox River into Lahontan Township. This pest consumes new foliage early in the spring, which usually allows sufficient time for the trees to refoliate. However, this small infestation was not discovered until late August and very little refoliation had commenced. Aerial flights conducted in September also seemed to indicate that the damage had just occurred and very little sign of refoliation was noted. The affected stands of trembling aspen consisted primarily of mature and overmature trees situated along the watershed valleys, mountain tops, and mountain terraces.

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

Provincial Situation

Population levels of eastern spruce budworm declined substantially within Ontario in 1994. The total area of moderate to severe defoliation of balsam fir (*Abies balsamea* [L.] Mill.), white spruce (*Picea glauca* [Moench] Voss), and black spruce (*P. mariana* [Mill.] B.S.P.) mapped this year totaled 4,266,656 ha. Compared with the 8,991,177 ha recorded in 1993, this represents a reduction of 53%. The bulk of the defoliation occurred in the Northwest Region. (Fig. 6, Table 1.)

Aerial surveys disclosed a large increase in the area of visible tree mortality caused by the spruce budworm.

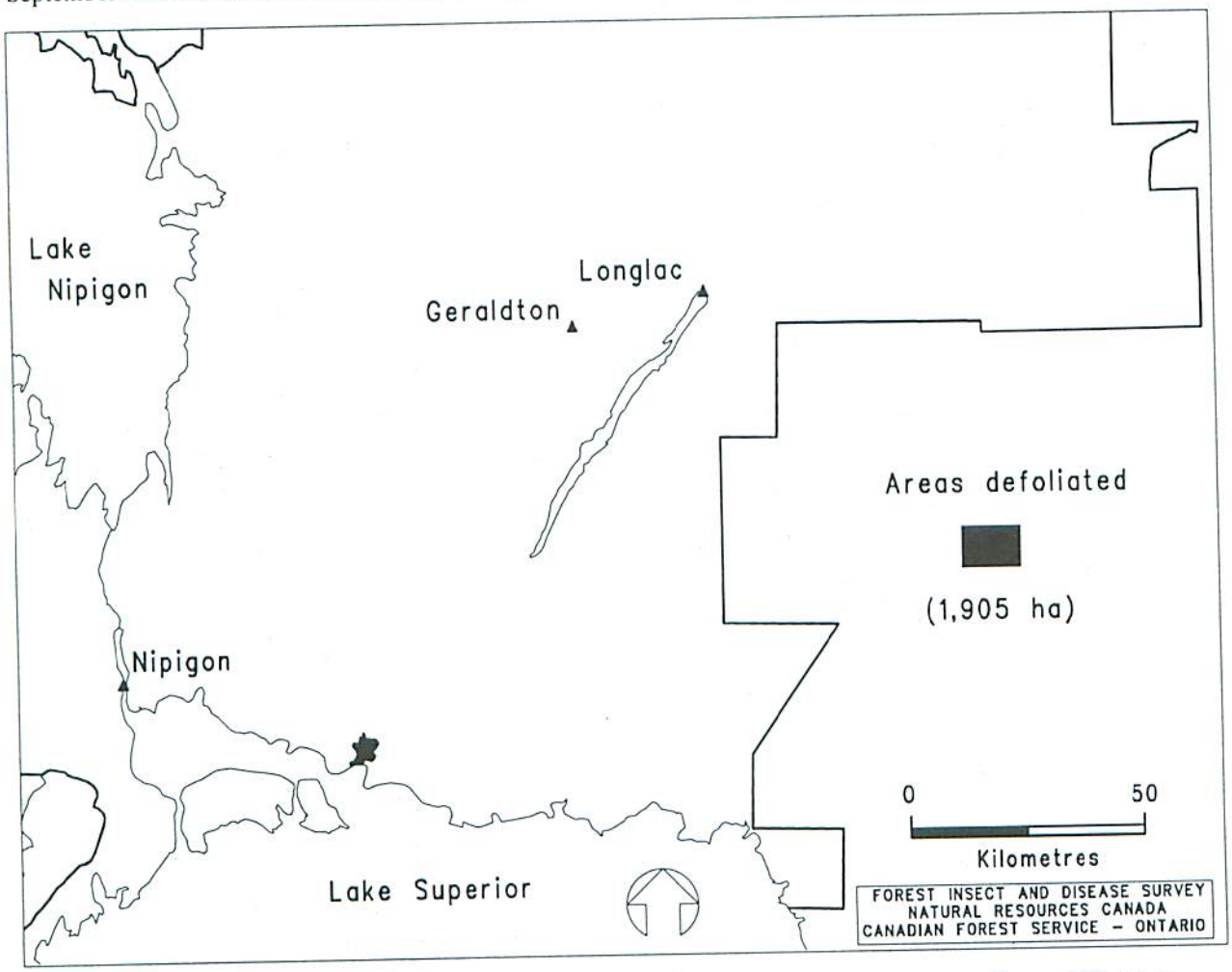

*Figure 5. Areas of moderate to severe defoliation caused by the large aspen tortrix (*Choristoneura conflictana *[Wlk.]) in the Nipigon District, Northwest Region, in 1994.*

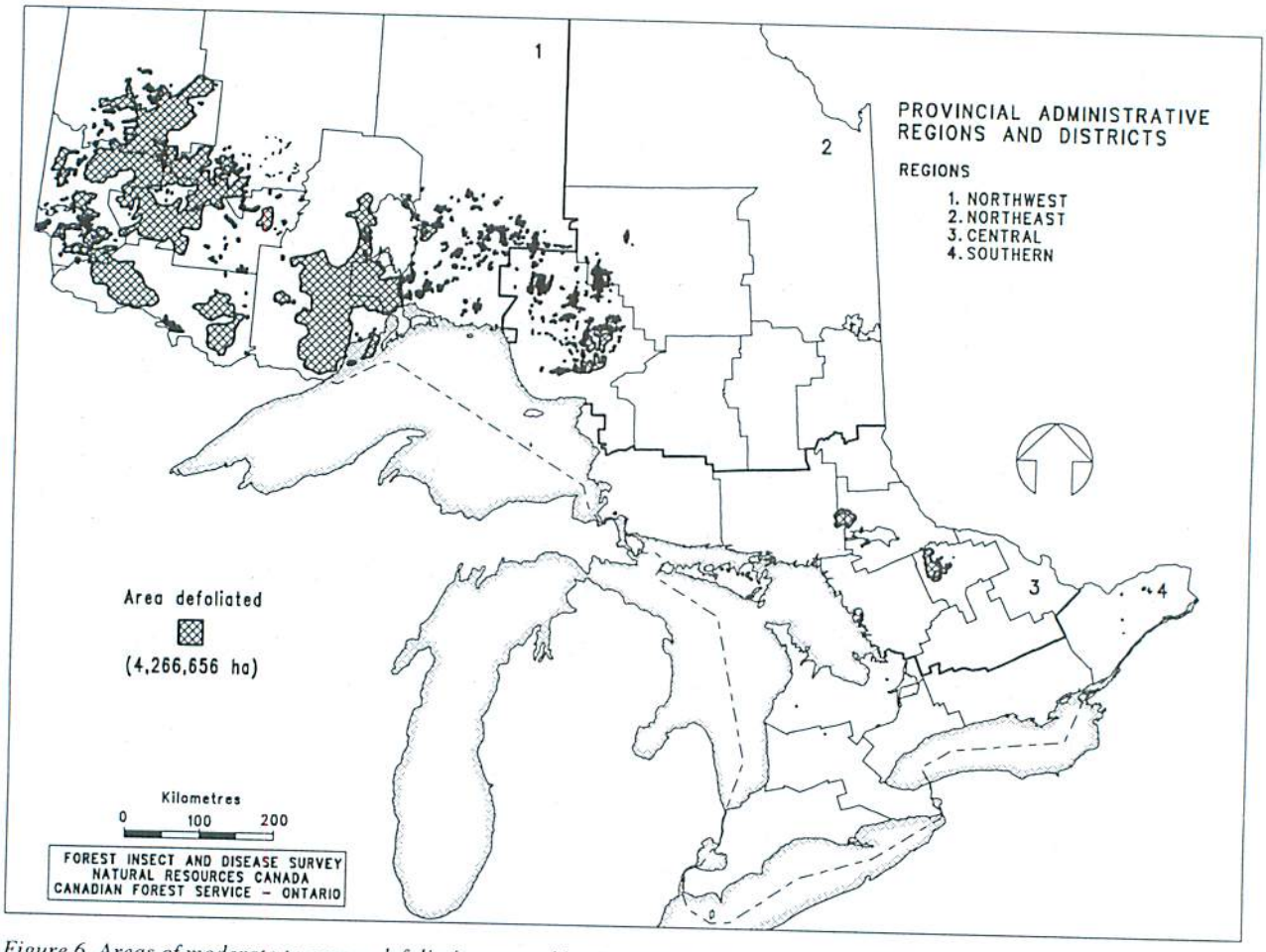

*Figure 6. Areas of moderate to severe defoliation caused by the eastern spruce budworm (*Choristoneura fumiferana *[Clem.]) in 1994.*

Table 1. Total area of moderate to severe defoliation caused by the eastern spruce budworm in Ontario, 1992–1994.

	Area of moderate to severe defoliation (ha)		
Region	1992	1993	1994
Northwest	7,438,833	7,295,736	3,873,424
Northeast	2,090,080	1,650,677	283,590
Central	30,775	44,662	108,955
Southern	24	102	687
Total	9,595,762	8,991,177	4,266,656

Throughout the province, 7,783,336 ha of dead balsam fir and white spruce were mapped. This is up 35% from the total of 5,032,925 ha recorded in 1993. The bulk of the mortality was encountered in the Northwest Region and in the Wawa District of the Northeast Region.

Northwest Region

There was a net reduction of 3,422,312 ha (47%) in the area of moderate to severe defoliation in the Northwest Region in 1994 (Fig. 7, Table 2). Aerial and ground surveys disclosed a corresponding decrease in populations across most of the region. Consequently, the intensity of damage varied considerably and resulted in distinct areas of moderate and severe defoliation. Reasons for such a substantial decrease in the area infested and the varying levels of defoliation can be attributed to an increase in the amount of dead and moribund host. In addition, higher than normal mortality of overwintering second instar (L_2) larvae occurred due to the record cold temperatures that were encountered throughout the region during the winter of 1993–1994.

The most significant reduction in the area of moderate to severe defoliation occurred in the Nipigon and Dryden districts. The bulk of the decline in the Nipigon District was encountered east of Lake Nipigon. A major fragmentation of the infestation resulted in the mapping of numerous pockets of defoliation throughout the central and southern portions of the district. These smaller areas of damage replaced the large, continuous area of damage that was recorded in 1993. In the Dryden District, areas of decline were encountered in the southeast portion of the district from Basket Lake to Sowden Lake and in the

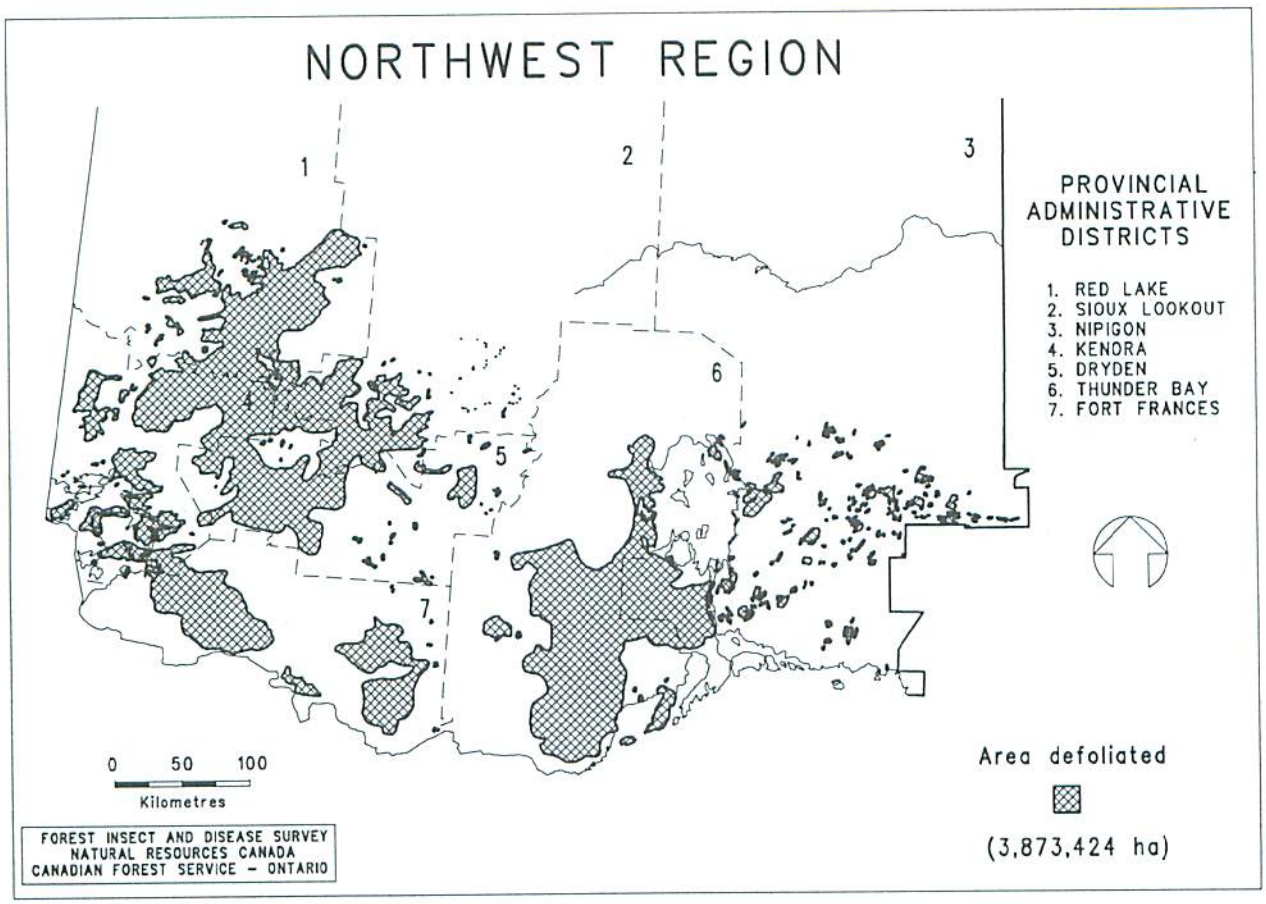

*Figure 7. Areas of moderate to severe defoliation caused by the eastern spruce budworm (*Choristoneura fumiferana *[Clem.]) in 1994.*

Table 2. Total area of moderate to severe defoliation caused by the eastern spruce budworm in the Northwest Region of Ontario in 1993 and 1994.

	Area of moderate to severe defoliation (ha)		
District	1993	1994	Change (ha)
Dryden	997,273	507,450	-489,823
Fort Frances	422,244	506,878	+84,634
Kenora	850,187	571,555	-278,632
Nipigon	2,857,260	355,699	-2,501,561
Red Lake	638,964	559,847	-79,117
Sioux Lookout	556,122	367,437	-188,685
Thunder Bay	973,686	1,004,558	+30,872
Total	7,295,736	3,873,424	-3,422,312

central part of the district from Wauchope Township in the west to McIlraith Township in the east.

The Fort Frances and Thunder Bay districts experienced an increase in the area of moderate to severe defoliation. In the Fort Frances District, damage increased slightly on the northern and southern edges of the 1993 infestation and now occurs from Pipestone and Burditt lakes in the northwest through to the Rainy and Turtle lakes area in the southeast. Infestation in the Thunder Bay District increased due to a realignment of the boundaries of the Nipigon and Thunder Bay districts.

Balsam fir and white spruce mortality associated with eastern spruce budworm continued to increase in all districts of the region (Table 3). In 1994, 2,693,043 ha of additional tree mortality was mapped. This expansion was most noticeable in the Dryden, Kenora, Red Lake, and

Table 3. Total area of whole-tree mortality associated with eastern spruce budworm in the Northwest Region of Ontario in 1993 and 1994.

	Total area of mortality (ha)		Increase
District	1993	1994	(ha)
Dryden	337,936	1,282,939	945,003
Fort Frances	1,251,605	1,376,666	125,061
Kenora	494,522	906,587	412,065
Nipigon	1,608,695	1,704,588	95,893
Red Lake	78,163	631,132	552,969
Sioux Lookout	47,916	440,648	392,732
Thunder Bay	837,608	1,006,928	169,320
Total	4,656,445	7,349,488	2,693,043

Sioux Lookout districts (Fig. 8). To follow the progression of mortality, 34 new monitoring plots were established and 24 existing monitoring plots were retallied (Table 4).

To forecast population levels for 1995, egg-mass collections were carried out at 213 sample points. A total of 51% of the sample points had accumulated damage ratings of 4 or higher (Appendix 1). This is up from 47% in 1993. A 4 rating indicates the stand is moribund or dying, with 80 to 100% total defoliation, or the crowns are grey in appearance with 50–150 cm of the top bare or dead. It now appears that the infestation will persist within the current boundaries or decline slightly.

Jack Pine Budworm, *Choristoneura pinus* Free.

No major infestations of jack pine budworm were detected from ground and aerial surveys conducted in the region. Only trace levels of damage were reported on individual trees in Rowell Township in the Dryden District. The infestation on scattered jack pine (*Pinus banksiana* Lamb.) and Scots pine (*Pinus sylvestris* L.) reported at the Sioux Lookout golf course in 1993 collapsed in the summer of 1994.

Egg-mass sampling was conducted in five districts of the region, and 88 locations were visited. Light defoliation is forecasted at 15 locations for 1995 (Appendix 2); endemic populations are likely elsewhere.

Eastern Pine Shoot Borer, *Eucosma gloriola* Heinr.

The eastern pine shoot borer was generally not a problem in jack pine plantations in 1994. In total, 19 sites were checked for the presence of this insect and the heaviest damage was encountered at the Morson Seed Orchard and the Kenozhe Family Test in the Fort Frances District. At these sites 11 and 7%, respectively, of the trees had damaged leaders (Fig. 2). Very low damage levels were evaluated at many of the other stands. In fact, ten of the sites examined had no leader mortality. Results of the areas surveyed are summarized in Table 5.

Birch Leafminer, *Fenusa pusilla* (Lep.)

During 1994, fewer observations of foliar damage caused by the birch leafminer were reported than were noted in previous years in the Northwest Region. Generally

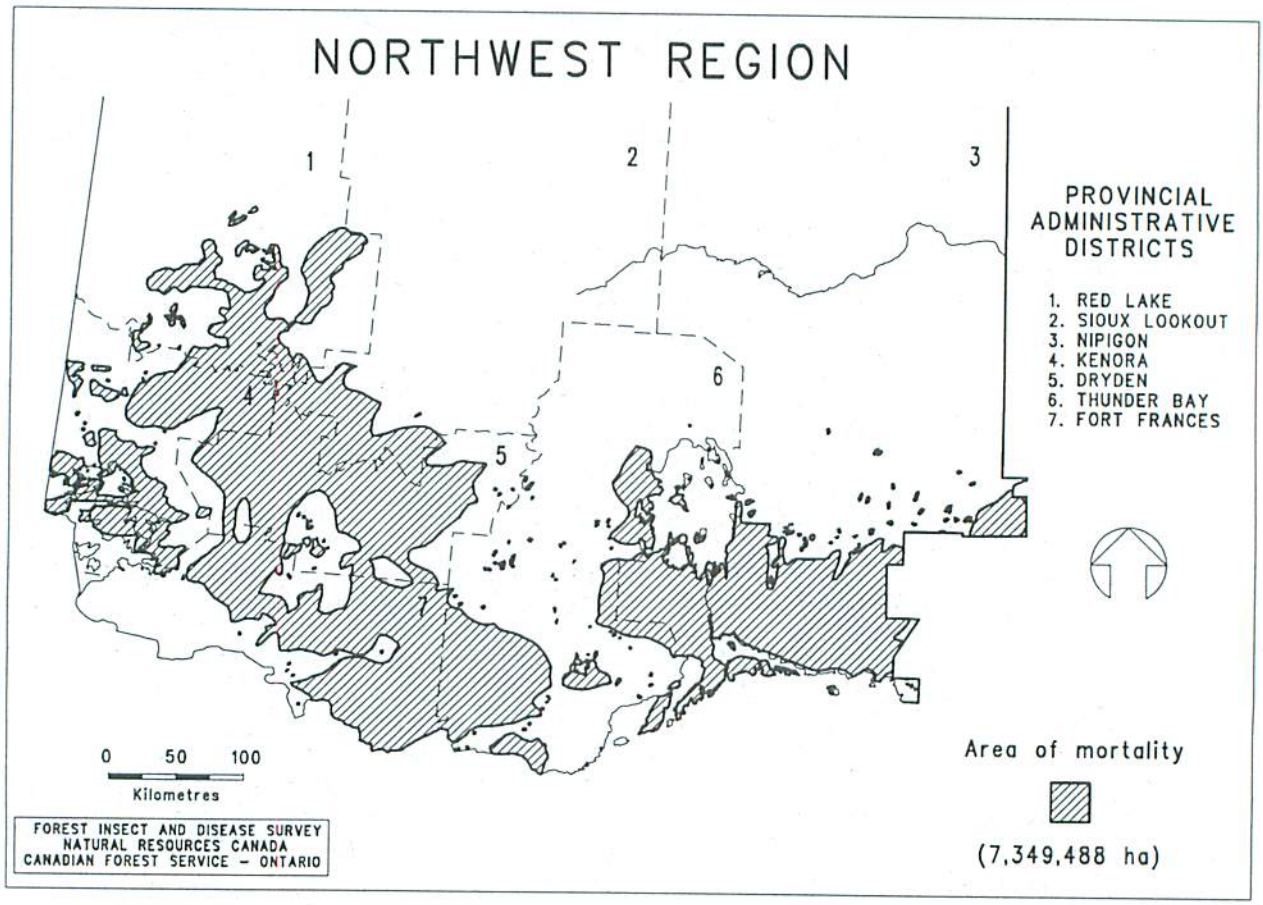

Figure 8. Areas within which cumulative balsam fir whole-tree and top mortality was caused by the eastern spruce budworm (Choristoneura fumiferana *[Clem.]) in 1994.*

Table 4. Summary of tree mortality associated with eastern spruce budworm in the Northwest Region of Ontario. Results are based on ground checks for five districts for 1993 and 1994.

Location	Host[a]	Tree mortality (%) 1993	1994
Dryden District			
*Dore Lake	bF	–	59
*Satterly Township	bF	–	55
Nipigon District			
Adamson Township	bF	54	54
	wS	18	22
*Ashmore Township	bF	–	58
Black Sturgeon Lake	bF	68	9
Booth Township	bF	37	78
	wS	85	100
	bS	–	5
*Burrows Lake	bF	–	8
Camp 15–Caramat	bF	29	39
	wS	–	15
*Daley Township	bF	–	24
*Errington Township	bF	–	7
Fen Lake	bF	–	45
*Grehan Lake	bF	–	12
*Highway 11/625	bF	–	19
John Ahl Road	bF	–	98
Kagiano Lake Road	bF	–	92
*Legault Township	bF	–	6
*Legault North	bF	–	12
*Ledger Township	bF	–	100
Lyon Township	bF	70	81
McIver Township	bF	92	100
	wS	18	34
*Nakina Township	bF	–	1
Nibs Lake	bF	–	77
Nipigon Township	bF	92	92
	wS	30	48
Oly Lake	bF	–	91
Purdom Township	bF	25	46
	wS	84	88
*Raynor Township	bF	–	11
Squawk Lake Road	bF	81	90
Squawk Lake Road North	bF	56	99
South Beatty Lake	bF	–	84
Summers Township	bF	–	88
Red Lake District			
*Baird Township	bF	–	37
Highway 105 north of Ear Falls	bF	–	26
*Snake Falls Road	bF	–	8
Windfall Road	bF	–	94
Sioux Lookout District			
Burma Lake Road	bF	–	53
*Deception Lake	bF	–	11
*Drayton Township	bF	–	29
*Factor Township	bF	–	18
*Foley Lake	bF	–	7
*Pape Lake	bF	–	46
*Pickerel Township	bF	–	60
Thunder Bay District			
Kabitotikwia Lake	bF	82	92
	wS	24	52
Mountain Lake Road	bF	–	46
Open Bay–Lac des MilleLacs	bF	48	60
	wS	7	7
Sibley Township	bF	59	87
	wS	12	71
Sibley Township	bF	43	63
Waweig Lake	bF	38	61
	wS	0	4

(cont'd)

* SBW NODA IMPACT PLOT.

[a] bF = balsam fir, wS = white spruce.

light defoliation levels, averaging 10%, were recorded on roadside trees along Highways 71, 502, and 105 in the Fort Frances, Kenora, and Red Lake districts, respectively. Similar observations were made along Highway 502 near Godson Lake in the Dryden District and near Vermilion Bay along Highway 17; however, defoliation levels here were slightly higher and averaged 30%. A 2-ha cutover containing 1-m-tall white birch (*Betula papyrifera* Marsh.) regeneration in the Basket Lake area of the Dryden District averaged 10% defoliation. Elsewhere throughout the region single trees with light levels of foliar browning were occasionally observed.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

The most recent infestation of forest tent caterpillar in the Northwest Region peaked in 1991 and severely defoliated 14,330,643 hectares of what was primarily trembling aspen forest. This infestation began in 1986 and recurred annually until 1992. During 1993, signs of host mortality and decline were evident throughout the eastern Nipigon District. In 1994 this host damage was aerially mapped at over 44,825 ha (Fig. 9). Most of the damage in the Nipigon District was the result of only 3 years of successive, severe defoliation.

Impact plots based on an examination of 50 host trees were established during 1994 in Ashmore Township, Nipigon District and White Lake Provincial Park, Wawa

Table 5. Damage to jack pine caused by the eastern pine shoot borer in the Northwest Region of Ontario in 1994. (Counts are based on an examination of a minimum of 150 trees at each location within the seven districts.)

Location	Area affected (ha)	Estimated number of trees/ha	Average height of trees (m)	Leaders attacked (%) 1994
Dryden District				
Osaquan Township	4	2,500	1.0	0
Sunstrum Seed Orchard	5	2,000	1.1	0
Fort Frances District				
Kenozhe Family Test	3	1,800	2.0	7
Morson Seed Orchard	10	2,000	1.2	11
Kenora District				
Fifth Creek Seed Orchard	8	2,000	0.9	3
Nipigon District				
Ledger Township	2	1,500	1.8	1
Red Lake District				
Acme Seed Orchard	8	2,000	0.9	1
Sioux Lookout District				
Block 10 Stain Lake	50	4,000	2.1	2
Goodie Lake	5	2,000	2.2	1
Vermilion River Family Test	2	2,500	1.6	1
Vermilion River Seed Orchard	8	2,400	0.8	1
Vermilion River Road km 48	20	4,000	1.8	0
Thunder Bay District				
Fallscamp Lake Family Test	5	2,500	2.3	0
Hardwick Township	5	2,500	2.6	0
Kakabeka Seed Orchard	15	3,700	1.8	0
McIntyre Township	4	1,667	1.2	0
Obonga Lake Road	50	3,000	1.8	0
Robson Family Test	5	2,500	2.9	0
Waweig Lake	5	2,500	2.0	0

District in the Northeast Region.[1] The Ashmore Township plot indicated a 10% mortality rate, with 97% of the trees containing crown dieback. This dieback averaged 26% overall, but ranged from 5–90%. Secondary agents, such as Armillaria root rot (*Armillaria ostoyae* [Romagn.] Herink) and bark beetles (*Scolytidae* spp.), also affected dead trees.

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

The Northwest Region was subject to high populations of aspen leafblotch miner and accompanying moderate to severe foliar damage during 1994 (Fig. 10). Surveys disclosed that regenerating cutovers, roadside, and open-grown trees were commonly affected. Although this pest prefers immature trembling aspen, usually 1–5 m tall, older age classes are affected where insect populations are very high. Host trees up to 15 m tall sustained severe foliar damage. Areas of extensive damage, reported from all districts, usually occurred in pockets ranging from 0.25 to 3.0 hectares in size. Estimated defoliation levels ranged from 20 to 100% throughout the region.

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

The yellowheaded spruce sawfly was found throughout the region. Damage to individual and small clumps of white spruce, black spruce, and ornamental plantings of blue spruce (*Picea pungens* Engelm.) ranged from trace levels to total defoliation. Damage was most noticeable on roadside trees ranging from 1 to 4 m in height.

In the Dryden District, defoliation levels ranged from 50 to 80% on scattered 2- 3-m white spruce or black spruce trees in Smellie Township and along Highway 605 in Eton Township. Along Highway 72 in the Sioux Lookout District, similar damage occurred on the same host species. Varying degrees of defoliation were present along the Highway 17 corridor from the town of Ignace west to the junction with Highway 71 in the Dryden and Kenora districts, respectively. It was not uncommon to see scattered black spruce, 2 to 4 m in height, that were 100% defoliated.

[1] Jones, C.G.; Broderson, H.; Smith, B.E.; Evans, H.J.; Keizer, A.J. 1995. Results of forest insect and disease surveys in the Northeast Region of Ontario, 1994. Nat. Resour. Can., Canadian Forest Service–Ontario, Sault Ste. Marie, ON. Inf. Rep. 0–X–447. 27 p.

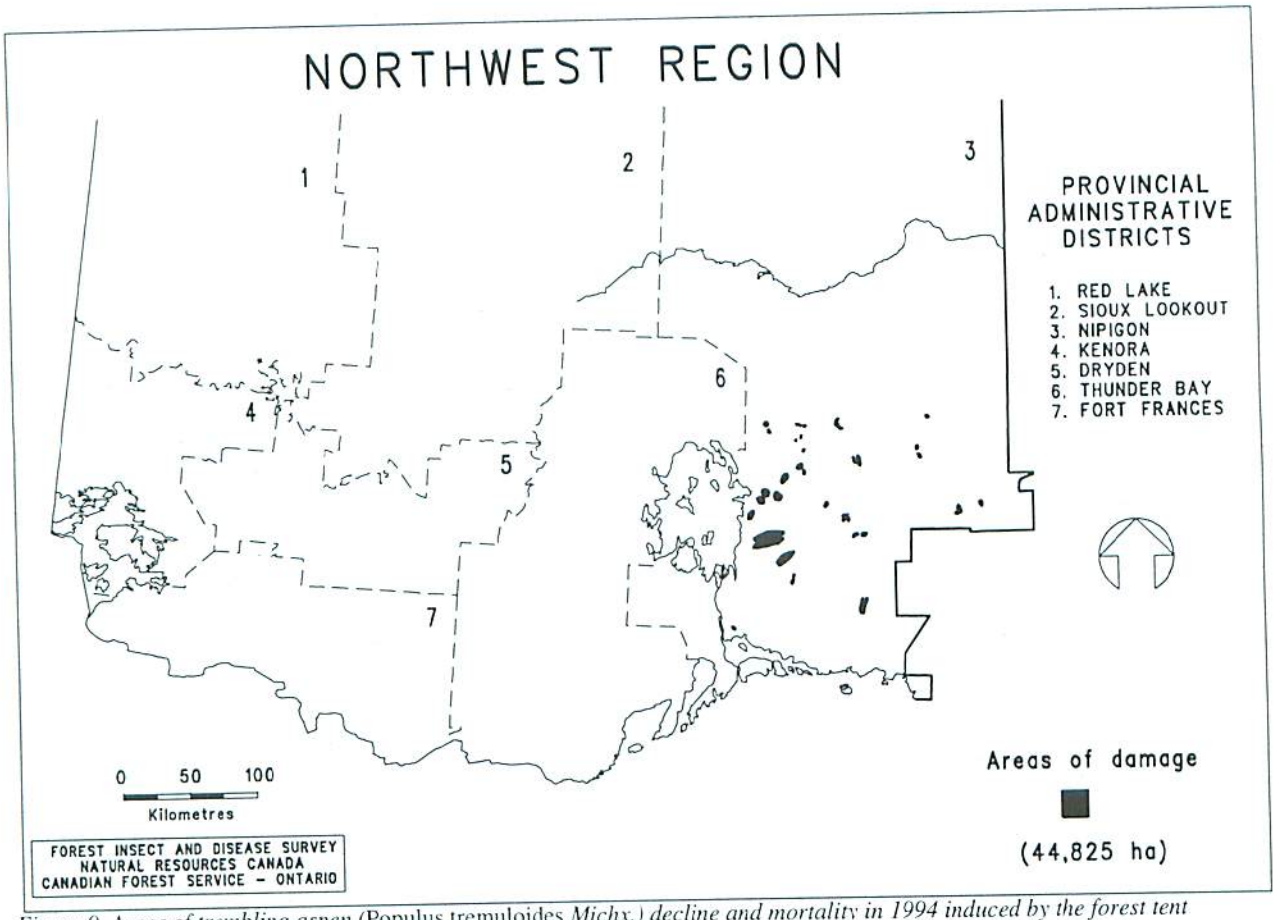

Figure 9. Areas of trembling aspen (Populus tremuloides *Michx.) decline and mortality in 1994 induced by the forest tent caterpillar* (Malacosoma disstria *Hbn.).*

Figure 10. Damage to trembling aspen (Populus tremuloides *Michx.) leaves caused by the aspen leafblotch miner* (Phyllonorycter ontario *Free.).*

In the Kakabeka Falls area, and westward to Shebandown in the Thunder Bay District, foliar damage of 25 to 100% occurred, mainly on black spruce and to a lesser extent on white spruce. Many ornamental plantings of blue spruce in the city of Thunder Bay also displayed varying amounts of defoliation. Average defoliation on 0.5-m-tall black spruce in the Neys Provincial Park in the Nipigon District averaged 60%. Ornamental plantings of black spruce and white spruce were defoliated in many towns across the region. Defoliation levels ranging from 10 to 85% were observed at Emo, Fort Frances, and Nestor Falls in the Fort Frances District; at Sioux Narrows, Kenora, and Keewatin in the Kenora District; at Ear Falls and Red Lake in the Red Lake District; at Sioux Lookout in the Sioux Lookout District; and at Geraldton and Longlac in the Nipigon District.

Several plantations were also surveyed for the presence of this pest; however, evaluations revealed that damage was less than 10% (Table 6).

Table 6. Damage to spruce caused by the yellowheaded spruce sawfly in the Northwest Region of Ontario in 1994.(Counts based on an examination of a minimum of 150 trees at each location within the five districts.)

Location	Host[a]	Area affected (ha)	Estimated number of trees/ha	Average height of trees (m)	Trees affected (%)	Foliar damage (%)
Fort Frances District						
Manion Lake Seed Orchard	bS	5	3,000	3.0	1	1
Morson Seed Orchard	bS	5	3,000	3.0	1	1
Kenora District						
Minnesabik Seed Orchard	bS	8	3,000	3.0	29	6
Ulster Lake Seed Orchard	bS	5	3,200	3.0	10	5
Nipigon District						
Cockerham Township	bS	100	2,500	1.4	0	0
Margo Lake	wS	1	500	8.0	0	0
Margo Lake	bS	1	500	7.0	0	0
Pagwachuan	wS	2	500	8.0	0	0
Thunder Bay District						
Devon Seed Orchard	bS	5	2,500	1.4	0	0
Hardwick Township	bS	10	2,500	2.2	3	1
Robson Family Test	bS	5	2,500	1.7	0	0
Red Lake District						
Bawlb Lake Seed Orchard	bS	6	3,000	0.6	1	1
Beauregard Seed Orchard	bS	5	3,000	2.8	1	1

[a] bS = black spruce, wS = white spruce.

White Pine Weevil, *Pissodes strobi* (Peck)

Surveys for the white pine weevil (Fig. 1) were conducted at 47 locations in the Northwest Region (Table 7). Damage levels were low for most of the plantations surveyed. The heaviest damage occurred at the Robson Family Test in the Thunder Bay District. At this site, 13% of the leaders were destroyed in a 5-ha jack pine plantation, which had an average tree height of 1.8 m. A total of 33 jack pine, 12 black spruce, and 2 white spruce plantations were visited at widely scattered locations across the region.

Table 7. Damage caused by the white pine weevil in the Northwest Region of Ontario in 1994. (Counts are based on an examination of 150 randomly selected trees at each location within the seven districts.)

Location	Host[a]	Average height of trees (m)	Estimated number of trees/ha	Estimated area of stand (ha)	Leaders attacked (%)
Dryden District					
Bark Lake	jP	2.1	4,500	10	2
Basket Lake	jP	1.0	3,000	5	1
Osaquan Township	jP	3.0	3,000	10	4
Osaquan Progeny Test	jP	1.0	2,500	4	1
Sandbar Lake	jP	2.0	3,000	10	2
Smoke Lake Road	jP	2.8	3,500	20	2
Snake Bay Road	jP	0.8	3,000	10	2
Stokes Township	jP	1.8	2,500	10	1
Sunstrum Seed Orchard	jP	1.1	2,000	5	2
Williams Bay	jP	1.8	2,000	10	2

(cont'd)

Table 7. Damage caused by the white pine weevil in the Northwest Region of Ontario in 1994. (Counts are based on an examination of 150 randomly selected trees at each location within the seven districts (concl.).

Location	Host[a]	Average height of trees (m)	Estimated number of trees/ha	Estimated area of stand (ha)	Leaders attacked (%)
Fort Frances District					
Kenozhe Family Test	jP	2.0	1,800	5	5
Manion Lake Seed Orchard	bS	2.6	3,000	5	0
Morson Seed Orchard	jP	1.2	2,000	10	2
Morson Seed Orchard	bS	2.9	3,000	5	0
Kenora District					
Fifth Creek Seed Orchard	jP	0.9	2,000	8	1
Minnesabik Seed Orchard	bS	3.0	2,500	8	1
Ulster Lake Seed Orchard	bS	3.0	2,700	5	0
Nipigon District					
Jean Lake Seed Orchard	bS	5.0	1,100	2	0
Ledger Township	jP	4.0	1,000	2	9
Margo Lake	wS	8.0	500	1	0
Margo Lake	bS	7.0	500	1	0
Pagwachuan	wS	8.0	500	2	0
Red Lake District					
Acme Seed Orchard	jP	0.9	2,000	8	1
Beauregard Seed Orchard	bS	2.8	2,700	5	1
Bawlb Lake Seed Orchard	bS	0.6	2,800	6	0
Sioux Lookout District					
Block 9–Highway 642	jP	2.2	4,000	20	2
Burma Lake–km 8	jP	2.8	3,500	20	2
Burma Lake–km 9	bS	2.2	2,500	5	1
Burma Lake–km 21	jP	0.8	4,500	40	1
Goodie Lake	jP	2.2	2,000	5	2
Moose Lake Road	jP	3.8	2,400	8	1
Smock Lake Road	jP	2.8	4,500	100	1
Stain Lake	jP	2.1	4,000	50	3
Stanzhikimi Lake Road	jP	3.4	4,500	5	1
Vermilion River Family Test	jP	1.0	2,500	2	1
Vermilion River Road–km 48	jP	1.8	4,000	20	2
Vermilion River Seed Orchard	jP	0.8	2,400	8	1
Thunder Bay District					
Devon Seed Orchard	bS	1.4	2,500	5	1
Fallscamp Lake Family Test	jP	2.3	2,500	5	8
Hardwick Township	jP	2.6	2,500	5	7
Hardwick Township	bS	2.2	3,000	10	4
Kakabeka Seed Orchard	jP	1.8	3,700	15	4
McIntyre Township	jP	1.2	1,667	4	1
Obonga Lake Road	jP	1.8	3,000	50	10
Robson Family Test	jP	2.9	2,500	5	13
Robson Family Test	bS	1.7	2,500	10	0
Waweig Lake	jP	2.0	2,500	5	7

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

Minor Insects

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

High populations of jack pine resin midge were recorded in the Dryden and Sioux Lookout districts. Feeding by this tiny insect causes damage in the form of shoot mortality. Young larvae burrow into the stem of the new shoots and feed on resin, but it is not known how injury to the cambial tissue occurs. Feeding kills about 75% of the affected shoots and height growth on young trees may be adversely affected.

In 1994, damage was confined to small jack pine growing along fringes of stands or roadways and in open areas or cutovers. High levels of shoot mortality (100%) on 3- to 5-m trees were present along Highway 17 between Dryden and the English River in the Dryden District. Similar damage levels were observed along Highway 599 for approximately 35 kilometres north of the town of Ignace in the Dryden District. Branch-tip mortality averaging 75% was common in the Stanzhikimi area and along Highway 642 in the Sioux Lookout District. Moderate insect populations caused flagging at the Tree Nursery Jack Pine Seed Orchard in the Dryden District. Lower damage levels were recorded at numerous other locations in the Dryden and Sioux Lookout districts.

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

The northern pitch twig moth was observed at moderate levels at two locations in the Thunder Bay District. The highest level of attack occurred in a small plantation in McIntyre Township. A total of 48.6% of the jack pine trees, averaging 1.2 m in height, were attacked over a 2-ha site. The second area of infestation occurred at the Kakabeka Seed Orchard in Paipoonge Township. At this site, 46% of the jack pine trees, averaging 3 m in height, were attacked over a 15-ha area. At both of these sites first year nodules were present.

Low numbers of the insects were also found in young stands at the Rugby–Glatz Seed Orchard, Osaquan Township Progeny Test; and at km 44, Snake Bay Road, Dryden District. Similar population levels occurred in Block 10, north of Stain Lake in the Sioux Lookout District.

Young jack pine trees approximately 0.3 to 3 m in height are most subject to attack. Larvae feed singly under masses of pitch, generally at an internode or fork. As they develop, their feeding may be extended almost to the pith. Winter is spent in the larval stage and 2 years are required to complete the life cycle.

When an attack occurs at the base of a growing terminal shoot, the shoot may be girdled and killed or survive as a weakened, crooked trunk. Damage in young plantations may be severe.

White Pine Needle Mite, *Trisetacus alborum* Keif.

During the month of August, damage by white pine needle mite became quite evident on the current years' foliage of mature and overmature eastern white pine (*Pinus strobus* L.). Moderate to severe foliar damage was encountered north of Shoal Lake Narrows, Rainy Lake, in the Fort Frances District, where surveys disclosed that 80% of the trees were affected and up to 50% of the current years' growth was dead. An evaluation of scattered host in the vicinity of Lennan Lake, Kenora District, revealed that 75% of the mature trees had sustained up to 60% foliar damage.

Light foliar damage was observed on eastern white pine in the Vickers Lake area and along the Cedar Narrows Road, Fort Frances District. Similar levels of damage were encountered on host along Highway 71 in the Kenora District.

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.

TREE DISEASES

Major Diseases

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

Surveys for Armillaria root rot (Fig. 3) were conducted at 38 locations. It was identified in 21 (55%) of these and mortality levels ranged from 1.0 to 10%. The highest level of damage was encountered in a 2.0-ha stand of 10-m-tall trembling aspen in Ashmore Township, Nipigon District (Table 9).

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

Western gall rust causes the annual appearance of conspicuous round swellings on the branches and stems of host trees (Fig. 4). Infected trees are considered severely damaged if the main stem and/or 25% of the branches are galled. The most severe infection in 1994 was observed at the Vermilion River Seed Orchard in the Sioux Lookout District. Here, 15% of the 0.8-m-tall jack pine trees were severely damaged. Overall, at 23 locations evaluated for this disease in the Northwest Region, levels of infected trees ranged from 1 to 35%; severely infected trees ranged from 1 to 15% (Table 10).

Table 8. Other forest insects.

Insect	Host(s)[a]	Remarks
Acantholyda erythrocephala (L.) Pine false webworm	rP	This insect was detected at two locations in Paipoonge Township in the Thunder Bay District. In a private plantation, 39% of the 3-m-tall trees had defoliation of 5 to 70% and similar damage occurred on 2-m-tall trees along Highway 130.
Agrotis ipsilon (Hufn.) Black cutworm and *Pseudalentia unipuncta* (Haw.) Armyworm	grass	These cutworms, commonly found in the towns of Geraldton and Longlac in the Nipigon District, prompted numerous calls.
Alsophila pometaria (Harr.) Fall cankerworm	gAs, Ba, mM	Defoliation levels of 50 to 70% on all hosts occurred in the city of Thunder Bay, Thunder Bay District. Up to 100% defoliation occurred on Manitoba maple in the towns of Sioux Lookout and Hudson, Sioux Lookout District and in Dryden, Dryden District.
Archips negundana (Dyar) Larger boxelder leafroller	mM	High population levels, with defoliation ranging from 5 to 100%, occurred at several locations in the Dryden, Fort Frances, Kenora, and Sioux Lookout districts.
Chionaspis pinifoliae (Fitch) Pine needle scale	wS	High populations of pine needle scale were present on the lower branches of 2-m-tall trees in Ilsley Township in the Dryden District.
Dimorphopteryx melanognathus Roh. Fringed birch sawfly	wB	At the Geraldton Fire Base in the Nipigon District, 60% defoliation occurred on a small clump of trees.
Dioryctria abietivorella (Grt.) Fir coneworm	jP	Numerous western gall rust galls were infested in a plantation at km 44 on the Snake Bay Road. Lower population levels were present at the Sunstrum Seed Orchard in the Dryden District.
Diprion similis (Htg.) Introduced pine sawfly	ewP	Moderate insect levels were observed on a small clump of trees at Old Fort William in the Thunder Bay District. Defoliation was less than 20%.
Eriocampa ovata (L.) Woolly alder sawfly	Al	For approximately 0.5 km along Highway 527, 2-m-tall trees were completely defoliated in MacGregor Township, in the Thunder Bay District.
Gonioctena americana (Schaeff.) American aspen beetle	tA	This insect was commonly observed on regeneration throughout the Nipigon District.
Hemichroa crocea (Geoff.) Striped alder sawfly	Al	Approximately one dozen shrubs were 100% defoliated in Mutrie Township and low sawfly populations were found in McAree Township in the Dryden District.
Hyphantria cunea (Drury) Fall webworm	deciduous	Low numbers of this insect were observed in the southern portion of the Thunder Bay District, and in Sanford Township and on the Snake Bay Road in the Dryden District. Defoliation occurred on a wide variety of hosts.

(cont'd)

Table 8. Other forest insects (concl.).

Insect	Host(s)[a]	Remarks
Messa nana (Klug) Early birch leaf edgeminer	wB	This insect was found at trace levels at the ARNEWS plot near Schreiber in the Nipigon District. This is also a new distribution record.
Monochamus s. scutellatus (Say) Whitespotted sawyer beetle	jP	Severe damage was recorded in a 10-year-old stand of 2.5-m-tall trees in Rowell Township, Dryden District.
Nematus salicisodoratus Dyar Willow sawfly	W	High populations of sawfly resulted in 100% defoliation of a clump of 6-m shrubs along Highway 516 south of Deception Lake in the Sioux Lookout District.
Neodiprion n. nanulus Schedl Red pine sawfly	jP, rP	Trace damage levels occurred on regeneration at Nym Lake in the Fort Frances District.
Neodiprion pratti banksianae Roh. Jack pine sawfly	jP	This sawfly caused 5% defoliation on trees varying from 5 to 8 m in height at French Lake, and 10% defoliation at points in Farrington and Halkirk townships in the Fort Frances District.
Neodiprion virginiana complex Redheaded jack pine sawfly	jP	This sawfly was commonly observed on regeneration throughout Quetico Provincial Park in the Fort Frances District and along the Goldfield and Catlonite roads in the Nipigon District. Defoliation in both districts averaged 5%.
Phratora p. purpurea Brown Aspen skeletonizer	bPo	This pest was commonly observed on roadside regeneration along the Goldfield Road in the Nipigon District.
Phyllonorycter nipigon (Free.) Balsam poplar leafblotch miner	bPo	Low levels of damage occurred on 2-m-tall trees in Sanford Township in the Dryden District.
Pineus strobi (Htg.) Pine bark adelgid`	ewP	High numbers of this pest were present on 2-m-tall trees at Orient Bay, Nipigon District.
Pristiphora cadma W. & R. Birch sawfly	wB	Low insect numbers were present on ornamental plantings along Marina Park Drive in the Thunder Bay District.
Pristiphora geniculata (Htg.) Mountain-ash sawfly	aMo	This sawfly was widespread throughout the Northwest Region and damage varied from trace to total defoliation of scattered host trees.
Vasates quadripedes (Shimer) Maple bladdergall mite	siM	High mite populations were observed at scattered points in the city of Thunder Bay, Thunder Bay District and in Atikokan, Fort Frances District.

[a] Al = alder, aMo = American mountain-ash, Ba = basswood, bPo = balsam poplar, ewP = eastern white pine, gAs = green ash, jP = jack pine, mM = Manitoba maple, rP = red pine, siM = silver maple, tA = trembling aspen, wB = white birch, W = willow, wS = white spruce.

Table 9. Summary of damage caused by Armillaria root rot in the Northwest Region of Ontario in 1994. (Counts are based on an examination of 150 randomly selected trees at each location within the seven districts.)

Location	Host[a]	Estimated height of trees (m)	Density (trees/ha)	Average area affected (ha)	Current mortality (%)
Dryden District					
Bark Lake	jP	2.1	4,500	10	0
Basket Lake	jP	0.8	3,500	20	1
Breithaupt Township	jP	1.9	2,500	5	3
Osaquan Township Progeny Test	jP	1.0	2,500	4	1
Smock Lake	jP	2.8	4,500	100	1
Snake Bay Road–km 44	jP	0.8	3,000	10	1
Stokes Township	jP	0.9	2,500	10	1
Sunstrum Seed Orchard	jP	1.0	2,000	5	2
Fort Frances District					
Kenozhe Family Test	jP	2.0	1,800	3	1
Manion Lake Seed Orchard	bS	2.6	3,000	5	0
Morson Seed Orchard	bS	2.9	3,000	5	0
Morson Seed Orchard	jP	1.9	2,000	10	1
Kenora District					
Fifth Creek Seed Orchard	jP	0.9	2,000	8	0
Ulster Lake Seed Orchard	bS	3.0	2,700	5	0
Minnesabic Seed Orchard	bS	3.0	2,500	8	1
Nipigon District					
Ashmore Township	tA	10.0	750	2	10
Ledger Township	jP	1.8	1,000	5	6
Cockerham Township	bS	1.4	2,500	5	0
Red Lake District					
Acme Seed Orchard	jP	0.9	2,000	8	1
Beauregard Seed Orchard	bS	2.8	2,700	5	0
Bawlb Lake Seed Orchard	bS	0.6	2,800	6	0
Sioux Lookout					
Block 9–Highway 642	jP	2.2	3,500	10	0
Block 10–North of Stain Lake	jP	2.1	4,000	50	2
Burma Lake Road–km 21	jP	0.8	4,500	40	1
Goodie Lake	jP	2.2	2,000	5	0
Goodie Lake Seed Orchard	bS	3.3	3,000	5	1
Vermilion River Family Test	jP	1.6	2,500	2	0
Vermilion River Seed Orchard	jP	0.8	2,400	8	0
Thunder Bay District					
Devon Seed Orchard	bS	1.4	2,500	50	0
Fallscamp Lake Family Test	jP	2.3	2,500	5	0
Hardwick Township	jP	2.6	2,500	5	1
Hardwick Township	bS	2.2	2,500	10	0
Kakabeka Seed Orchard	jP	1.8	3,700	15	1
McIntyre Township	jP	1.2	1,667	4	0
Obonga Lake	jP	1.8	3,000	50	0
Robson Family Test	jP	2.9	2,500	5	1
Robson Family Test	bS	1.7	2,500	10	1
Waweig Lake–Highway 527	jP	2.0	2,500	5	0

[a] bS = black spruce, jP = jack pine, tA = trembling aspen.

Table 10. Damage caused by the western gall rust in jack pine stands in the Northwest Region of Ontario in 1994.

Location	Average height of trees (m)	Number of trees per ha	Area affected (ha)	Trees affected (m)	Trees severely affected (%)
Dryden District					
Breithaupt Township	1.9	2,500	5	10	3
MacFie Township	4.0	2,500	15	15	3
Osaquan Township Progeny Test	1.0	2,500	4	1	1
Rugby–Glatz Orchard	0.9	1,500	2	4	4
Stokes Township	0.9	2,500	10	2	2
Sunstrum Seed Orchard	1.0	2,000	5	3	3
Fort Frances District					
Kemuel Lake	2.5	2,500	50	9	2
Kenozhe Family Test	2.0	2,800	2	0	0
Morson Seed Orchard	1.9	2,000	10	1	1
Kenora District					
Fifth Creek Seed Orchard	0.9	2,000	8	0	0
Red Lake District					
Acme Seed Orchard	0.9	2,000	8	0	0
Sioux Lookout District					
Block 10–North of Stain Lake	2.1	4,000	50	4	3
Boucher Township	6.8	1,000	25	15	5
Echo Township	3.5	2,500	10	15	5
Goodie Lake	3.5	2,500	30	20	5
Moose Lake Road	3.8	2,000	15	30	5
Stanzhikimi Lake Road	2.5	2,500	10	35	8
Vermilion River Seed Orchard	0.8	2,400	8	16	15
Thunder Bay District					
Ames Township	3.0	5,000	100	5	1
Obanga Lake–Highway 527	1.4	1,700	10	3	0
Obanga Lake Road	1.7	2,500	200	9	0
Kakabeka Seed Orchard	3.0	3,730	15	7	0
Raith Family Test	1.6	2,500	5	12	3

Minor Diseases

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

Pine needle rust attacks the older foliage of pine during the latter part of the spring. Severe defoliation may kill small trees and possibly cause a reduction of growth in trees of sapling size.

The most notable area of damage in the Northwest Region was encountered in a 100-ha jack pine plantation in Ames Township, Thunder Bay District. A survey of the 3-m-tall host disclosed that 100% of the trees sustained an average of 23% foliar damage.

An evaluation in Rowell Township, Dryden District, of a 5-ha plantation revealed that 100% of the 3-m jack pine were affected. Defoliation averaged 5%, but occasional trees were up to 40% infected.

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

Surveys in the region during 1994 disclosed varying levels of tar spot needle cast. The highest levels of damage were encountered on jack pine in the vicinity of Goodie Lake and Kathlyn Lake, Sioux Lookout District. Moderate to severe defoliation (70–90%) of the old foliage was commonly encountered on the 3.5- to 4-m-tall host. Additional jack pine stands containing severely defoliated trees, but in lesser numbers, were observed in the Moose and Stanzhikimi lakes area in the Sioux Lookout District.

Light defoliation of old foliage was recorded on immature jack pine host in Breithaupt and MacFie townships, Dryden District; in the Kemuel Lake area of the Fort Frances District; and in the Raith Family Test and the Obonga Lake area, Thunder Bay District.

A Needle Blight of Jack Pine, *Hendersonia pinicola* Whem.

During 1993, approximately 200 hectares of jack pine stands in the Nakina area of the Nipigon District were affected by this pathogen.[2] In 1994, this area expanded to include approximately 4,821 hectares of primarily semi-mature jack pine stands located along Highways 643 and 584 in Exton and Nakina townships (Fig. 11). Also affected were two small plantations of 2-m-tall trees located in Exton Township. Foliar damage averaged 45 and 30% on 60 and 25% of the trees, respectively. A small area of natural regeneration (0.25 ha) near Longjohn Road, off the Catlonite Road and east of Long Lake, also contained this fungus. At this location approximately 20% of the 4-m-tall trees averaged 40% foliar browning (Fig. 11).

Hendersonia pinicola is most commonly associated with *Lophodermium* sp. acting primarily as a parasite of this fungus. At this location *Hendersonia pinicola* was the primary pathogen of jack pine and *Lophodermium* sp. was not detected.

Linospora Leaf Blight, *Linospora tetraspora* G.E. Thomps. and Septoria Leaf Spot, *Mycosphaerella populicola* G.E. Thomps.

High levels of damage caused by linospora leaf blight and/or septoria leaf spot were evident in 1994. Both of these foliage diseases attack balsam poplar (*Populus balsamifera* L.) and damage is apparent in late summer. Disease symptoms are similar and inoculation results in the formation of dark areas on leaf surfaces. Heavy infections cause premature shedding of leaves.

[2] Biggs, W.D.; Constable, D.C.; Keizer, A.J.; Bolan, P.M. 1994. Results of forest insect and disease surveys in the Northwest Region of Ontario, 1993. Nat. Resour. Can., Canadian Forest Service–Ontario, Sault Ste. Marie, ON. Inf. Rep. 0–X–435. 21 p.

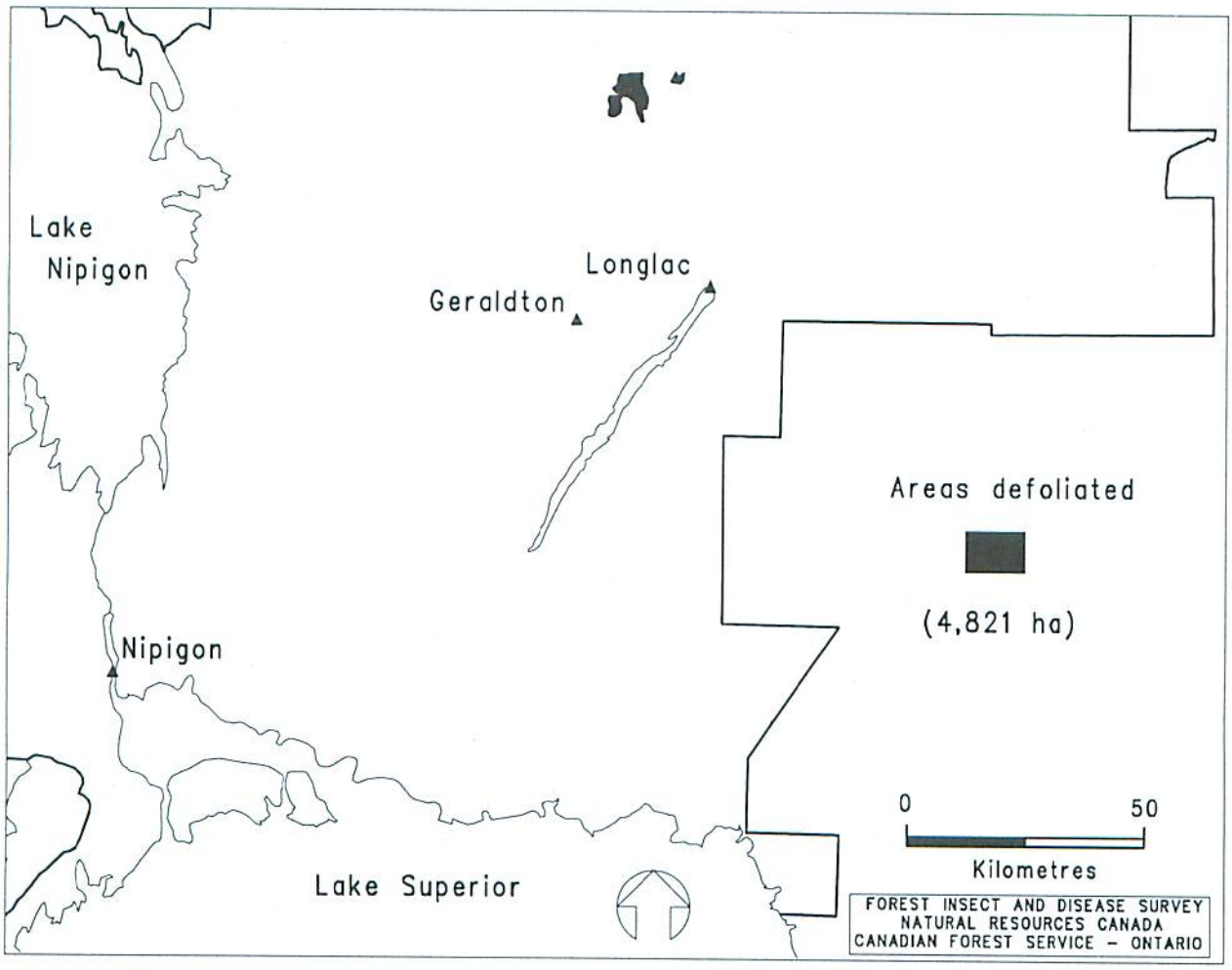

Figure 11. Areas of moderate to severe damage caused by a needle blight of jack pine (Hendersonia pinicola *Wehm.) in the Nipigon District, Northwest Region, in 1994.*

Foliar browning levels were often in the 50 to 100% range on all age classes at many points in the region. This level of incidence was observed in the areas east of Lake Nipigon and the Nipigon River, and south of Longlac along the Catlonite Road in the Nipigon District. Infection levels averaging 80% were present along the Highway 17 corridor west of Dryden and down the Snake Bay Road in the Dryden District. In these areas, 100% leaf infection on the affected host was common. Slightly lower damage levels were found at various points along the Vermilion River Road in the Sioux Lookout District. Varying levels of leaf infection and premature leaf drop were detected at many other locations in the Dryden, Fort Frances, Kenora, Nipigon, Sioux Lookout, and Thunder Bay districts.

Leaf Spot, *Septoria betulae* Pass.

This late season leaf spot disease of white birch was aerially mapped in the southern part of the Nipigon District. An area of severe browning, which totaled 74,330 ha in size, was located from the Highway 17 corridor in Wiggins, McAllister, and Yesno townships north to the Upper Roslyn Lake area (Fig. 12). The infestation consisted of one large 67,667-ha tract and five smaller pockets, ranging from 760 to 1,980 ha in size, located east of the main infestation and extending as far as Ruffle Lake. Foliar damage levels averaging 75% were observed on 50 to 80% of the 2- to 4-m roadside trees in areas around Foley Lake and the Burma Lake Road in the Sioux Lookout District. Similar damage was also encountered on scattered trees at Ojibway Provincial Park, Sioux Lookout District. Low to moderate (20–50%) damage levels were present along Highway 17 from the town of Dryden west to Tustin Township in the Dryden District.

Shoot Blight, *Venturia macularis* (Fr.:Fr.) E. Müll. & Arx

This shoot blight disease was common in many areas of the Dryden and Sioux Lookout districts where trembling

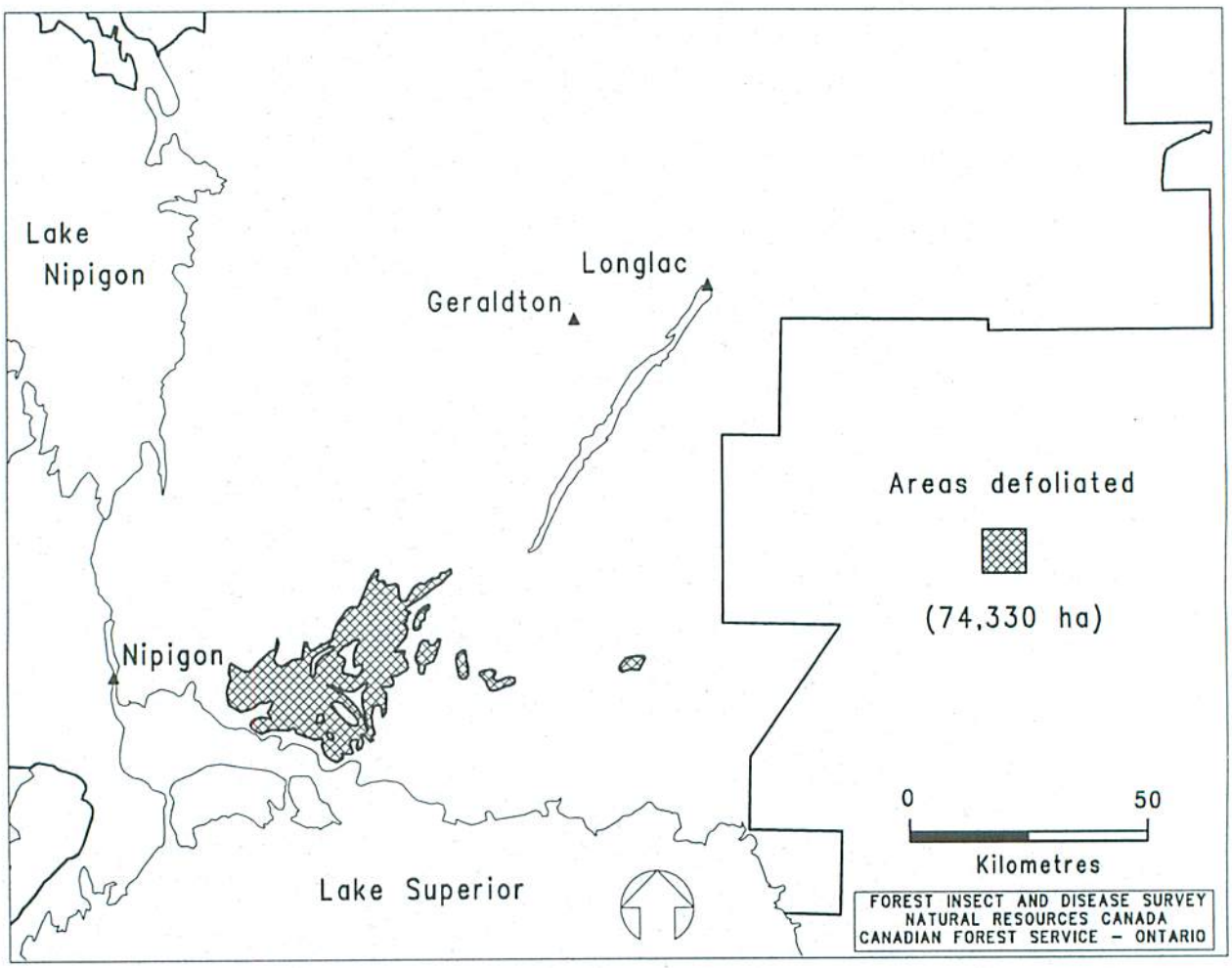

*Figure 12. Areas of moderate to severe leaf damage caused by the birch leaf spot (*Septoria betulae *Pass.) in the Nipigon District, Northwest Region, in 1994.*

aspen regeneration occurred. The following are results of detailed observations made at some of these sites and typify damage levels present across the two districts. The heaviest incidence was seen in Osaquan Township in the Dryden District. Here, 80 to 100% of the 3-m trees were affected and average shoot infection levels were 50%. Similar numbers of affected trees were encountered in Sanford and Hartman townships, Dryden District, but on average, 30% shoot mortality was found on the 2-m trees throughout the 10-ha and 20-ha cutovers, respectively. Lower levels (20–50%) of affected 2- to 3-m regeneration, with shoot damage averaging 50%, were observed near Coronary Lake in the Williams Bay area; near Sandbar Lake in the Dryden District; and in Block 10, north of Stain Lake in the Sioux Lookout District. In the Thunder Bay District, 50% shoot infection levels were recorded in the upper one-third of the 15-m trees over a 5-ha area in Crockerham Township. Varying levels of shoot mortality were seen at other points across the remainder of the region (Fig. 13).

*Figure 13. Damage to a trembling aspen (*Populus tremuloides *Michx.) terminal shoot caused by shoot blight (*Venturia macularis *[Fr.:Fr.] E. Müll. & Arx).*

Other Forest Diseases

Various other diseaes were encountered during the course of regular surveys. Information on these is provided in Table 11.

Table 11. Other forest diseases.

Disease	Host(s)[a]	Remarks
Apiosporina morbosa (Schwein.:Fr.) Arx Black knot	pCH	Branch infection levels of 20% were found on shrubs growing in a cutover on the west side of Basket Lake in the Dryden District.
Chrysomyxa arctostaphyli Dietel Spruce broom rust	bs	This rust was commonly encountered on host trees northeast of Ignace, along Highway 599, in the Dryden District.
Chrysomyxa ledicola Lagerh. Large-spored spruce needle rust *Chrysomyxa ledi* (Alb.& Schwein.) de Bary Spruce needle rust	bs	Heavy rust infections caused an average of 60% foliar damage in Neys Provincial Park, Nipigon District. Trace levels of damage were found near the Revell River and Suzanne Lake in the Dryden District. The rust parasite, *Fusarium avenaceum* (Fr.:Fr.) Sacc., was found on samples from Revell River in the Dryden District and Neys Provincial Park in the Nipigon District.
Ciborinia whetezelii (Seaver) Seaver Ink spot of aspen	tA	Foliar infection levels of 10% were present on scattered, 3-m trees in a 10-ha cutover in Sanford Township, Dryden District and in the Eskwanonwatin and Mound Lake areas, Nipigon District.
Cronartium ribicola J.C. Fisch White pine blister rust	ewP	Trees of various sizes at the Ontario Ranger Camp in the Sioux Lookout District were found to have low levels of branch mortality.

(cont'd)

Table 11. Other forest diseases (cont'd).

Disease	Host(s)[a]	Remarks
Erwinia amylovora (Burrill) Winslow et al. Fire blight	aMo	This condition was commonly observed on ornamental plantings at Marina Park in the Thunder Bay District. Trees averaging 2.5 m in height sustained foliar damage ranging from 20 to 75%.
Glomerella cingulata (Stoneman) Spauld. & H. Schrenk Black canker of willow	W	Moderate to high infection levels were encountered on scattered ornamental willow trees in the town of Fort Frances. Damage varied but was often severe, with up to 80% of the foliage affected.
Gremmeniella abietina (Lagerb.) M. Morlet Scleroderris canker	rP	Open-growing host, averaging 3 m in height, in Neys Provincial Park, Nipigon District, were found to have varying degrees of lower branch infection.
Isthmiella faullii (Darker) Darker Needle cast	bF	Scattered host along the Milkshake Road, Sibley Peninsula, Thunder Bay District, sustained foliar damage ranging from 30 to 50%.
Lophodermium spp. Needle cast	jP	Roadside trees, averaging 3 m in height, in Ledger Township and along the Sturgeon River Road in the Nipigon District sustained infection levels of 50%.
Ophiostoma ulmi (Buisman) Nannf. Dutch elm disease	wE	Mature to overmature white elm in the town of Fort Frances sustained 16% current mortality.
Phellinus tremulae (Bondartsev) Bondartsev & Borissov Poplar false tinder fungus	tA	Evaluation of Acid Rain National Early Warning System plot #538, Caribou Falls, Kenora District, disclosed that 29% of the plot trees had fruiting bodies on the main stem.
Rhytisma acerinum (Pers.:Fr.) Fr. Tar spot	mM	This foliage disease was present at low levels on many understory shrubs across the region.
Sirococcus conigenus (D.C.) P.F. Cannon & Minter Shoot blight	rP	Numerous dead branch tips were observed on understory host at the entrance to Blue Lake Provincial Park, Dryden District.
Sphaeropsis sapinea (Fr.) Dyko & B. Sutton Diplodia tip blight	rP	A survey in the vicinty of Reef Point and Windy Point, Rainy Lake, Fort Frances District, disclosed foliar damage ranging from 20 to 90% on 3% of the host. Low levels of branch-tip mortality were encountered on numerous 1.2-m red pine growing along the road to Sandbar Ontario Ranger Camp in the Dryden District.
Uncinula adunca (Wall.:Fr.) Lev Powdery milldew	bPO W	Leaf infection levels of 100% were found on balsam poplar regeneration at Ojibway Provincial Park, Sioux Lookout District and on willow at kilometre 3 on the Snake Bay Road, Dryden District.

(cont'd)

Table 11. Other forest diseases (concl.).

Disease	Host(s)[a]	Remarks
Venturia populina (Vuill.) Fabric. Shoot blight	bPo	Low levels of infection were present on scattered 2-m host in a 10-ha cutover in Sanford Township, Dryden District.
Venturia saliciperda J. Nuesch. Willow scab	W	Leaf infection levels of 50% were observed on clumps of shrubs in Block 10, north of Stain Lake in the Sioux Lookout District.

[a] aMo = American mountain ash, bF = balsam fir, bPo = balsam poplar, bS = black spruce, ewP = eastern white pine, jP = jack pine, mM = Manitoba maple, pCH = pin cherry, rP = red pine, tA = trembling aspen, W = willow, wE = white elm.

ABIOTIC DAMAGE

Browning of Eastern White Pine

Damage to eastern white pine was observed during late July and early August. Affected trees of all age classes were encountered in the Dryden, Fort Frances, Kenora, and Sioux Lookout districts. Damage consisted of one-half to three-quarters of the individual needles of the current years' growth turning brown and dying. The cause has not yet been determined for this damage. Two secondary fungi, *Lophodermium pinastri* (Schrad.:Fr.) Chevall., a needle cast and *Meloderma desmazieresii* (Duby) Darker, a needle blight, have been identified from some of the damaged foliage, but are not thought to be the main cause of the problem.

Frost Damage

A few low-lying areas of black spruce sustained light levels of bud damage due to frost in the Thunder Bay and Dryden districts during 1994. In the Thunder Bay District, the Raith Black Spruce Family Test sustained damage on 11% of the 1.6-m-tall trees with an average of 3% bud damage per tree. In Paipoonge Township, 15% of the 2-m-tall trees averaged 2% bud damage and on the Sibley Peninsula, from Pass Lake to the Ponesford Lake area, scattered black spruce trees of all sizes averaged 15% bud damage. In the Dryden District, 80% of the 3.3-m-tall trees at the Aubrey Clonal Orchard were affected; at the Melgund Orchard 75% of the 3.8-m-tall trees were affected. At each of these sites bud damage was observed at only trace levels (<1%).

Squirrel Damage

Considerable flagging was observed on jack pine, and to a lesser extent on red pine, throughout the entire Northwest Region. Most of the damage was observed on trees ranging from 4 to 9 m in height, although it was not uncommon to see affected trees up to 20 m tall. This damage was caused by squirrels as they removed cones from branches for their winter food supply. Often the branch tissue is killed during this exercise, thereby resulting in flagging and branch-tip mortality.

The most noticeable damage was reported in the Pace and Detour lakes area in the Thunder Bay District. Branch mortality of 60% occurred on jack pine trees in the 6- to 9-m height range. Similar damage was reported in parts of the Fort Frances, Kenora, and Red Lake districts. Widespread but less severe damage (20–40%) was apparent at numerous locations in the Dryden, Sioux Lookout, and Nipigon districts.

Winter Browning

Winter browning, which occurs in midwinter or early spring, is caused by the loss of moisture from needles during periods of low temperatures and high winds. Tree roots are unable to replace this water loss, either because of low soil temperatures or because the stem and roots are frozen. Thus water is unable to pass up the tree and this results in a form of drought or desiccation. Under severe conditions, buds are generally killed and branch or whole-tree mortality may occur.

During 1994, this abiotic condition was observed in three districts within the region. In the Dryden District, at the south end of the Snake Bay Road, 300 ha of 4-m-tall jack pine trees received 60 to 100% foliar damage. In the Sioux Lookout District, similar damage was reported on 3-m-tall jack pine trees over a 3-ha site along the Vermilion River Road.

In the Thunder Bay District, severe damage occurred to ornamental plantings at the Terry Fox Lookout, MacGregor Township. Here, approximately 30 Douglas fir (*Pseudotsuga menziesii* [Mirb.] Franco) had foliar browning of 50 to 80% and extensive bud and branch mortality resulted. In the city of Thunder Bay, ornamental eastern white cedar (*Thuja occidentalis* L.) and juniper (*Juniperus* spp.) were also severely damaged. At many locations whole-tree mortality was noted.

FOREST HEALTH

Acid Rain National Early Warning System (ARNEWS)

A total of 11 ARNEWS plots were evaluated across the Northwest Region so as to monitor the possible effects of airborne pollutants on the forest. Five main tree species were targeted: jack pine, black spruce, white spruce, trembling aspen, and white birch. Jack pine were monitored in Mafeking Township and on the Pine Road in the Dryden District, and in Dance Township in the Fort Frances District. A mixed jack pine–black spruce stand was monitored at Margo Lake in the Nipigon District. Black spruce were checked in Fowler Township, Thunder Bay District and near Sandel Lake, Sioux Lookout District. White spruce were monitored in Wiggins Township, Nipigon District. Trembling aspen was examined on the Caribou Falls Road, Kenora District and in Hutchinson Township, Fort Frances District. Two white birch stands were surveyed, one near Schreiber in Priske Township, Nipigon District and the other at Ear Falls in the Red Lake District.

No visible damage due to airborne pollutants was observed on any of the plot trees. However, varying levels of damage caused by a range of insect and disease pests were found in all plots. Eastern spruce budworm was observed in each of the spruce plots. The heaviest damage, with current defoliation averaging 30%, was encountered on all of the white spruce in the Wiggins Township plot, Nipigon District. Black spruce were affected by the eastern spruce budworm in plots at Sandel Lake, Sioux Lookout District; in Fowler Township, Thunder Bay District; and at Margo Lake, Nipigon District. However, defoliation levels of current foliage averaged only 5%. Damage due to feeding by the birch leaf beetle (*Phratora hudsonia* Brown) averaged 5% and was present on 100% of the white birch in Priske Township, Nipigon District. Aspen leafblotch miner was present on all trembling aspen at trace levels in Hutchinson Township, Fort Frances District. The most common forest disease found was western gall rust. At Margo Lake, Nipigon District, 44% of the jack pine had low levels of branch galls; so also did 18% of the trees in Dance Township, Fort Frances District. Branch infection levels of 10 and 8% were present in Mafeking Township and Pine Road, respectively, in the Dryden District. Since the last assessment in 1993, Armillaria root rot killed one of the trembling aspen in Hutchinson Township, Fort Frances District. Poplar false tinder fungus (*Phellinus tremulae* [Bondartsev] Bondartsev & Borissov) fruiting (Fig. 14) was present on a few trees in each of the trembling aspen plots in Hutchinson Township, Fort Frances District and on Caribou Falls Road, Kenora District. One tree in the latter of the two trembling aspen plots had a main stem infection of Hypoxylon canker (*Hypoxylon mammatum* [Wahlenb.] P. Karst.). Septoria leaf spot caused an average of 10% foliar damage on 35% of the white birch in the Priske Township plot in the Nipigon District. As part of the forest monitoring program for airborne pollution damage, these plots will be checked again in 1995.

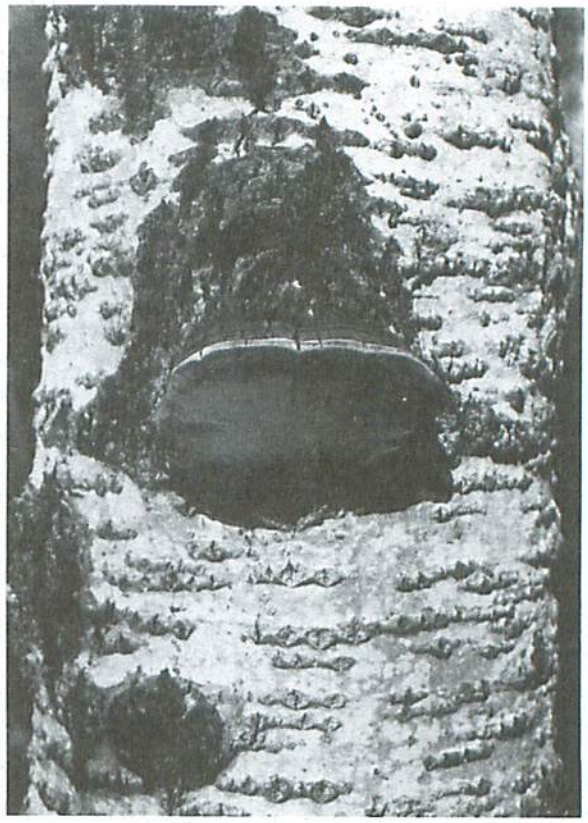

*Figure 14. A fruiting body of the poplar false tinder fungus (*Phellinus tremulae *[Bondartsev] Bondartsev & Borissov) found on trembling aspen (*Populus tremuloides *Michx.) at two ARNEWS plots.*

SPECIAL SURVEYS

Gypsy moth, *Lymantria dispar* (L.)

A pheromone trapping program was carried out again in 1994 to monitor the presence of gypsy moth in the Northwest Region. Natural movement of the European strain of this insect is limited since female moths cannot fly. Dispersal of this insect is aided by human activities, which provide a possible mode of transportation for the egg masses and to a lesser extent for larvae, pupae, or adult females. Each year a large number of vehicles travel into the region, particularly from parts of the United States where this insect is well established.

In 1994, two pheromone traps were deployed at each of 19 locations across the region. All 15 of the OMNR-operated provincial parks in the Northwest Region were

trapped. Sioux Narrows and Aaron provincial parks in the Kenora and Dryden districts, respectively, were closed for the 1994 season. The trap sites also included two municipally operated parks, Inwood Park at Upsala in the Thunder Bay District and MacLeod Park near Geraldton in the Nipigon District. Pheromone traps were also set out at Minaki Lodge in the Kenora District and at Kyros Fly-In Service in the Nipigon District. No male moths were captured in any of the traps in 1994.

Forest Tree Nursery Report

In total, four visits were made to the OMNR Dryden Forest Tree Nursery in the Dryden District during the 1994 field season. No one insect or disease caused appreciable damage in either the container or bare root stock at the nursery.

Fusarium (*Fusarium* sp.) was the most common organism found in samples taken from the nursery; however, damage levels never exceeded 2%. In most cases fusarium was not the primary cause of the problem but was secondary in nature. In all of the samples collected the species of fusarium was not known. Various species of the disease can affect different parts of a seedling: the roots (fusarium root rot), the stem (damping-off), and the foliage (fusarium tip blight). Secondary infections of fusarium root rot to bare root stock were found on a few dead patches of 3+0 red pine from Compartment C7 and on 1+0 red pine in Compartment E18. Secondary root infections were found in Coldframe No. 2 on jack pine container stock grown at Whitedog. Such infection was the primary cause of dead roots on 1% of the 13-week-old black spruce from Greenhouse No. 3. Fusarium tip blight was present on dead seedling tops from the Whitedog jack pine container stock in Coldframe No.2.

Gray mold (*Botrytis cinerea* Pers.:Fr.) was cultured from the dead tops of the Whitedog jack pine stock from Coldframe No. 2, but it was probably a secondary infection. Fruiting structures from a weak parasite, *Cylindrocarpon* spp., were found on the roots of the 1+0 red pine in Compartment E18.

Minor damage, in the form of twisted terminal needles, was observed in Compartment C3 on the 2+0 jack pine. It was typical of that caused by the lygus bug (*Lygus* spp.). The white triangle leafroller, *Clepsis persicana* Fitch, was found in a couple of black spruce seedlings in Greenhouse No. 5. A dagger moth (*Autographa biloba* [Steph.]) was collected by nursery staff from Coldframe No. 2. Their larva are occasionally injurious to garden crops, but no damage was found that could be attributed to this insect.

Northern Ontario Development Agreement Northern Forestry Program

In 1991 a 4-year allotment of funding was provided by the Northern Forestry Program (NFP)—a joint venture between the Ontario Ministry of Natural Resources (OMNR) and the Canadian Forest Service (CFS)—for the development of better tools to manage Ontario's forests. Three projects were developed using this funding. In 1994 the field stage was successfully completed for each project and all plots were reevaluated.[3] Tree condition assessments in the Northwest Region were made at 116 eastern spruce budworm plots and 88 jack pine budworm plots. Variables such as defoliation, mortality, and tree vigor were recorded. Egg-mass and L_2 samples were also taken to assist in determining future budworm populations (Appendices 1 and 2). Data retrieved to date is presently being organized and should be available for report in 1995.

Climatic Data

Seasonal variations in normal weather patterns have a direct effect on both biotic and abiotic conditions. The monitoring of daily weather conditions also permits an accurate prediction of emergence of overwintering larvae of some of the major forest pests.

Table 12 summarizes the 1994 weather data provided by five weather offices in the Northwest Region of Ontario. The "normals" quoted were taken directly from the Canadian Climatic Normals for Ontario from 1951 to 1980.

[3] Biggs, W.D.; Constable, D.C.; Keizer, A.J.; Bolan, P.M. 1994. Results of forest insect and disease surveys in the Northwest Region of Ontario, 1993. Nat. Resour. Can., Canadian Forest Service–Ontario, Sault Ste. Marie, ON. Inf. Rep. 0–X–435. 21 p.

Table 12. Climatic data from five weather stations in the Northwest Region of Ontario in 1994.

Location	Month	Mean temperature (C°) Normal	Mean temperature (C°) Actual	Deviation from normal (C°)	Total precipitation (mm) Normal	Total precipitation (mm) Actual	Deviation from normal (mm)
Fort Frances Airport	January	-16.9	-22.2	-5.3	30.6	19.0	-11.6
	February	-13.1	-15.6	-2.5	22.7	9.0	-13.7
	March	-5.7	-1.9	+3.8	31.6	15.0	-16.6
	April	3.8	3.0	+0.8	48.5	46.4	-2.1
	May	11.0	12.1	+1.1	71.2	41.2	-30.0
	June	16.4	17.4	+1.0	101.7	100.8	-0.9
	July	19.2	18.0	-1.2	103.7	107.4	+3.7
	August	17.7	16.2	-1.5	82.6	90.7	+8.1
	September	12.2	13.8	+1.6	83.8	98.9	+15.1
	October	6.6	8.1	+1.5	50.9	58.3	+7.4
	November	-3.2	-3.2	+2.3	36.8	80.9	+44.1
	December	-12.4	-7.5	+4.9	31.8	28.0	-3.8
Geraldton Airport	January	-20.0	-27.4	-7.4	38.2	21.4	-16.8
	February	-17.9	-20.1	-2.2	33.3	9.0	-24.3
	March	-11.0	-6.3	+4.7	38.2	14.3	-23.9
	April	-0.5	-1.6	-1.1	43.3	82.8	+39.5
	May	7.7	7.8	+0.1	63.2	64.4	+1.2
	June	13.5	15.7	+2.2	91.1	107.0	+15.1
	July	16.3	16.4	+0.1	81.6	172.6	+91.0
	August	14.6	13.5	-1.1	66.8	130.8	+64.0
	September	9.3	11.4	+2.1	75.6	74.4	-1.2
	October	3.9	6.5	+2.6	64.6	36.8	-27.8
	November	-5.5	-2.6	+2.9	61.5	44.6	-16.9
	December	-15.4	-8.2	+7.2	38.8	29.0	-9.8
Kenora Airport	January	-18.5	-23.6	-5.1	28.2	14.8	-13.4
	February	-14.4	-16.6	-2.2	23.0	5.7	-17.3
	March	-7.1	-3.2	+3.9	30.1	14.8	-15.3
	April	2.7	2.7	0.0	41.9	24.1	-17.8
	May	10.5	12.0	+1.5	57.3	53.8	-3.5
	June	16.1	18.1	+2.0	83.4	73.8	-9.6
	July	19.2	18.1	-1.1	91.8	147.9	+56.1
	August	17.6	16.3	-1.3	85.9	66.6	-19.3
	September	11.6	14.1	+3.5	69.2	76.2	+7.0
	October	5.6	7.6	+2.0	40.7	66.4	+25.7
	November	-4.6	-1.0	+3.6	40.4	63.7	+23.3
	December	-14.1	-8.6	+5.5	31.2	27.3	-3.9
Sioux Lookout Airport	January	-19.4	-25.5	-6.1	36.0	19.5	-16.5
	February	-15.7	-18.5	-2.8	27.6	10.6	-17.0
	March	-8.3	-5.1	+3.2	35.0	22.6	-12.4
	April	1.4	1.2	-0.2	45.2	23.3	-21.9
	May	9.2	10.7	+1.5	65.8	62.0	-3.8
	June	15.2	17.3	+2.1	91.7	66.3	-25.4
	July	18.3	17.6	-0.7	93.7	136.0	+42.3
	August	16.6	15.2	-1.4	88.3	155.1	+66.8
	September	10.7	12.9	+2.2	81.6	69.1	-12.5
	October	4.7	6.9	+2.2	64.9	89.3	+24.4
	November	-5.3	-1.8	+3.5	49.9	101.4	+51.5
	December	-15.1	-9.7	+5.4	33.7	38.8	+5.1

(cont'd)

Table 12. Climatic data from five weather stations in the Northwest Region of Ontario in 1994 (concl.).

Location	Month	Mean temperature (C°) Normal	Mean temperature (C°) Actual	Deviation from normal (C°)	Total precipitation (mm) Normal	Total precipitation (mm) Actual	Deviation from normal (mm)
Thunder Bay	January	-15.4	-22.0	-6.6	40.9	16.4	-24.5
Airport	February	-13.0	-16.1	-3.1	28.3	7.6	-20.7
	March	6.3	-3.1	-9.4	45.0	33.6	-11.4
	April	2.5	1.6	-0.9	50.7	92.6	+41.9
	May	8.8	8.8	0.0	73.3	64.2	-9.1
	June	14.0	15.4	+1.4	76.6	87.1	+10.5
	July	17.6	16.2	-1.4	75.4	72.2	-3.2
	August	16.4	15.3	-1.1	83.1	75.0	-8.1
	September	11.1	13.5	+2.4	89.1	54.6	-34.5
	October	5.7	7.6	+1.9	54.8	27.1	-27.7
	November	-2.6	-0.6	+2.0	52.9	42.5	-10.4
	December	-11.1	-6.5	+4.6	41.7	19.3	-22.4

Appendix 1. Northwest Region – Eastern Spruce Budworm. (Summary of defoliation estimates and egg-mass counts in 1994 and infestation forecasts for 1995.)

Location	Host[a]	Estimated defoliation in 1994 (%)	Number of egg masses per 9.29 m² of foliage	Infestation forecasts for 1995[b]	Accumulated damage[c]
Dryden District (32 locations)					
Beaverhouse Lake	bF	29	365	S	8
*Bridges Township–stand 83	bF	36	205	S	5
*Coronary Lake	bF	45	458	S	3
*Docker Township–stand 110	bF	31	164	M–S	1
	bS	10	26	L–M	0
*Dore Lake–stand 483	bF	18	218	S	4
*Emmons Lake	bF	33	147	M–S	3
	wS	25	433	S	1
*Forest Lake–stand 22	bF	47	110	M–S	3
*Isley Township	bF	6	37	L–M	1
Kukukus Lake	bF	3	0	N	8
*Langton Township	bF	11	26	L–M	3
*Langton Township	wS	18	1,111	S	2
*Little Indian Lake	bF	4	0	N	7
*Mafeking Township	bF	18	35	L–M	7
*McIlraith Township–stand 10	bF	12	397	S	3
	bS	5	246	S	1
*North Road	bF	18	129	M–S	4
*North Road	bS	34	197	S	1
*Rugby Township	bF	14	148	M–S	4
	wS	22	1,058	S	3
*Sandy Point Road	bF	28	78	M–S	5
*Satterly Township	bF	90	634	S	4
	bS	33	488	S	1
Shikag Lake	bF	9	212	S	2
*Southworth Township	bF	9	85	M–S	6
Sturgeon Lake–Granite Bay	bF	14	268	S	2
–North Arm	bF	6	113	M–S	2
*Temple Township	bF	19	0	N	7
	wS	18	801	S	6
*Vaughn Lake	bF	39	147	M–S	2
	bS	13	139	M–S	2
Fort Frances District (19 locations)					
Agnes Lake	bF	54	255	S	8
Basswood Lake–Prairie Portage	bF	71	361	S	5
*Big Sawbill Lake	bF	93	248	S	6
Boffin Lake	bF	78	472	S	3
*Calm Lake	bF	90	430	S	6
	bS	28	0	N	6
*Claxton Township	bF	90	739	S	3
*French Lake	bF	72	197	M–S	0
Irene Lake	bF	7	46	L–M	5
*Lake Hope	bF	98	418	S	2
*Menary Township–stand 84	bF	78	671	S	2
*Perch Lake	bF	90	138	M–S	6
	bS	33	354	S	6

(cont'd)

Appendix 1. Northwest Region – Eastern Spruce Budworm. (Summary of defoliation estimates and egg-mass counts in 1994 and infestation forecasts for 1995.) (cont'd)

Location	Host[a]	Estimated defoliation in 1994 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1995[b]	Accumulated damage[c]
Fort Frances District (19 locations) (concl.)					
Poohbah Lake	bF	78	438	S	8
*Preacher Lake	bF	16	126	M–S	6
Shoal Lake	bF	61	785	S	2
Tuck Lake	bF	90	485	S	8
Vickers Lake	bF	7	0	N	1
*Watten Township–stand 158	bF	99	494	S	5
Kenora District (23 locations)					
*Aerobus Lake Road	bF	89	140	M–S	6
	wS	81	250	M–S	6
*April Lake	bF	83	978	S	5
*Cliff Lake	bF	22	94	M–S	6
	wS	49	329	S	6
*Ewart Township–stand 28	bF	8	0	N	8
*Forgie Township–stand 355	bF	10	0	N	8
*Godson Township–stand 451	bF	97	616	S	5
*Haycock Township–stand 384	bF	66	444	S	2
*Kirkup Township–stand 167	wS	82	1,131	S	8
Lennan Lake	bF	42	487	S	7
Maynard Lake–stand 44	bF	94	438	S	6
*McMeekin Township–stand 412	bS	26	168	M–S	6
*Melick Township–stand 205	bF	88	103	M–S	7
	wS	87	372	S	7
Oak Lake–stand 238	bF	55	250	M–S	5
Pelican Township–Pelican Pouch Lake	bF	25	1,025	S	8
*Separation Lake–stand 8	bF	86	212	M–S	7
	wS	70	1,086	S	7
*Trail Lake–stand 127	bF	76	164	M–S	6
Umfreville Lake	bF	57	1,396	S	7
Unexpected Lake–stand 60	bF	86	641	S	6
*Willingdon Township–stand 156	bF	98	398	S	6
Nipigon District (60 locations)					
*Ashmore Township	bF	78	26	L–M	2
	wS	8	0	N	2
Big Duck Lake	bF	45	96	M–S	2
*Bikerace Lake	bF	89	40	L–M	4
*Black Sturgeon Lake–LURS	bF	42	75	M–S	4
*Booth Township	bF	20	22	L–M	3
*Burrows Lake–North	bF	82	29	L–M	3
	wS	65	49	L–M	3
*Burrows Lake–South	bF	81	39	L–M	3
	wS	60	20	L	3
Camp 75 Road	bF	45	71	M–S	4
*Caramat Road–Highway 11	bF	65	169	M–S	4
*Catlonite Road–Spider Lake	bF	59	66	M–S	5
	bS	20	268	S	3

(cont'd)

Appendix 1. Northwest Region – Eastern Spruce Budworm. (Summary of defoliation estimates and egg-mass counts in 1994 and infestation forecasts for 1995.) (cont'd)

Location	Host[a]	Estimated defoliation in 1994 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1995[b]	Accumulated damage[c]
Nipigon District (60 locations) (concl.)					
*Church Township	bF	12	88	M–S	3
*Coldwell Township	wS	12	0	N	0
*Daley Township	bF	89	176	M–S	2
	bS	11	247	S	2
*Errington Township	bF	70	58	M	2
Goldfield Road–Wig Lake	bF	74	37	L–M	3
*Eskanonwatin Lake	bF	11	234	M–S	5
*Grain Township	bF	5	0	N	6
*John Ahl Road	bF	88	46	L–M	4
	bS	12	40	L–M	4
*John Creek	bF	7	61	M	8
Killraine Township–Rainbow Falls Park	bF	2	0	N	1
Klotz Lake Provincial Park	bF	68	78	M	3
*Ledger Township–Polly Lake	bF	50	49	L–M	4
	bS	9	22	L–M	2
*Legault Township–Highway 11	bF	54	17	L–M	3
	wS	25	151	M–S	3
*Legault Township–Kinghorn Road	bF	48	37	L–M	3
	wS	20	194	M–S	3
*Nakina Township	bF	55	18	L–M	2
	wS	65	77	M–S	2
*Nibs Lake	bF	42	0	N	2
	wS	40	0	N	2
*Nonwatin River	bF	25	128	M–S	6
North Lamaune Lake	bF	8	0	N	1
Ogahalla Lake	bF	28	68	M	3
Onaman Lake–south	bF	15	48	L–M	1
Onaman Lake–north	bF	3	13	L	1
Onaman River	bF	3	0	N	1
*Parent Township	bF	38	8	L	4
	wS	4	33	L–M	4
*Pic Township–Black River	bF	1	0	N	0
	bS	2	0	N	0
*Raynar Lake	bF	53	43	L–M	3
	wS	55	502	S	3
*South Beatty Lake	wS	50	169	M–S	6
*Suicide Lake	bF	72	84	M–S	6
	wS	19	432	S	6
*Summers Township	bF	10	10	L	8
	wS	10	0	N	8
Sump Lake	bF	40	53	L–M	7
*Twit Lake	wS	9	514	S	4
Wababimiga Lake	bF	4	0	N	2
Wiggins Township	wS	26	0	N	3
*Windigokan Lake	bF	6	0	N	7
	bS	2	0	N	7

(cont'd)

Appendix 1. Northwest Region – Eastern Spruce Budworm. (Summary of defoliation estimates and egg-mass counts in 1994 and infestation forecasts for 1995.) (cont'd)

Location	Host[a]	Estimated defoliation in 1994 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1995[b]	Accumulated damage[c]
Red Lake District (12 locations)					
Aerofoil Lake	bF	58	529	S	5
*Baird Township–stand 162	bF	95	107	M–S	5
Birch Lake–South Bay	bF	33	389	S	5
*Detector Lake–stand 251	bF	94	94	M–S	8
*Goldpine Road–stand 734	bF	83	196	M–S	3
Goodall Township	bF	74	544	S	5
McDonough Township	bF	62	584	S	3
Pakwash Provincial Park	bF	97	413	S	6
*Sandy Creek–stand 202	wS	52	921	S	5
*Snake Falls Road–stand 38	bF	55	344	S	3
	wS	48	1,407	S	3
*Wenesaaga Lake–stand 252	bF	75	159	M–S	3
Sioux Lookout District (16 locations)					
*Burma Lake Road	bF	22	144	M–S	3
	bS	13	0	N	3
Carling Lake	bF	2	137	M–S	2
*Deception Lake	bF	7	226	S	3
*Drayton Township–stand 234	bF	4	84	M–S	3
*Factor Township–stand 209	bF	20	94	M–S	3
*Foley Lake–stand 287	bF	17	553	S	3
Goodie Lake Seed Orchard	bS	2	0	N	0
Lac Seul–Windigo Point	bF	13	63	M	4
*Lomond Township	bF	47	167	M–S	2
Maskara Lake	bF	36	207	S	4
*Moose Lake Road	bF	17	253	S	3
Pacific Lake Family Test	bS	1	0	N	0
*Pape Lake	bF	16	208	S	3
*Pickerel Township	bF	5	0	N	3
Wapesi Lake–stand 470	bF	33	459	S	3
Thunder Bay District (50 locations)					
Aldina Township–Impact Plot–stand 4	bF	63	785	S	2
*Blackwell Township	bF	32	58	M	6
Burchell Lake–stand 125	bF	0	0	N	–
*Buzzer Lake Road	bF	66	623	S	3
	wS	58	1,001	S	2
*Cheeseman Lake	bF	23	121	M–S	6
	wS	11	285	S	4
*Conacher Township	bF	63	405	S	8
Crayfish Lake	bF	0	0	N	–
*Crombie Lake	bF	12	77	M–S	8
	bS	15	60	M	0
*Decourcey Lake	bF	28	38	L–M	2
*Dog Lake–stand 60	bF	31	122	M–S	4
*Fallis Township	bF	33	0	N	1
*Forbes Township–Flett	bF	79	259	S	3

(cont'd)

Appendix 1. Northwest Region – Eastern Spruce Budworm. (Summary of defoliation estimates and egg-mass counts in 1994 and infestation forecasts for 1995.) (concl.)

Location	Host[a]	Estimated defoliation in 1994 (%)	Number of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1995[b]	Accumulated damage[c]
Thunder Bay District (50 locations) (concl.)					
*Fowler Township	bF	72	121	M–S	2
	bS	8	16	L–M	2
*Glen Township–stand 56	bF	11	47	L–M	1
*Gorham Township–stand 99	bF	34	110	M–S	4
	wS	26	793	S	3
Greenwater Lake–S.E.	bF	1	0	N	–
–Shelter Island	bF	1	0	N	–
Greenwood Lake	bF	0	0	N	–
Grew River	bF	0	0	N	0
Hagey Township–Highway 586	bF	6	12	L	+
Haines Township–Postans	bF	0	0	N	+
Harmon Lake	bF	2	0	N	6
*Hicks Lake	bF	14	19	L–M	1
Hood Lake	bF	0	18	L–M	–
Hoof Lake	bF	1	15	L–M	+
*Joeboy Lake	bF	13	99	M–S	6
*Kabitotikwia Lake	bF	16	463	S	4
Kekekuab Lake	bF	1	44	L–M	–
*Kenna Lake	bF	5	51	L–M	1
*Laverendrye Park	bF	16	0	N	8
McGinnis Lake	bF	1	0	N	–
*Michener Township	bF	96	467	S	3
*Milkshake Lake	bF	25	120	M–S	4
	wS	22	290	S	3
Moss Lake	bF	0	0	N	1
*Mountain Lake Road–stand 205	bF	48	364	S	4
Mug Lake	bF	25	208	M–S	4
*Open Bay	bF	20	18	L–M	6
Plummes Lake	bF	0	0	N	–
*Sandstone Lake	bF	25	71	M–S	2
*Soper Township	bF	92	48	L–M	3
*Walkingshaw Lake	bF	42	170	M–S	1
Wawang Lake	bF	5	37	L–M	3
*Waweig Lake	bF	12	0	N	5
Weaver Lake	bF	2	110	M–S	6
*Wolf River Road–km 28	bF	12	270	S	4

* SBW NODA IMPACT PLOT.

[a] bF = balsam fir, bS = black spruce, 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 70% of stand dead, no significant defoliation for several years.

Appendix 2. Northwest Region – Jack Pine Budworm. (Summary of defoliation estimates and egg mass counts in 1994 and infestation forecasts for 1995 on jack pine. All sampling was done on jack pine budworm NODA plots.)

Location	Estimated % defoliation 1994	Total number of egg masses on six 61 cm branch tips	Infestation forecasts for 1995[a]
Dryden District (17 locations)			
Bailey Lake–stand 208	0	0	N
+Basket Lake–stand 519	0	0	N
Bradshaw Township–stand 200	0	0	N
+Bradshaw Township–stand 212	0	0	N
+Centrefire Lake–stand 23	0	0	N
Hodgson Township–stand 370	0	0	N
+Ilsley Township–stand 333	0	0	N
Lac Seul–Williams Bay–stand 89	0	0	N
+ –Route Bay–stand 128	0	0	N
Mafeking Township–stand 66	0	0	N
McNevin Township–stand 364	0	0	N
Mutrie Township–stand 311	0	0	N
Revell River–stand 398	0	0	N
Suzanne Lake–stand 323	0	0	N
Turtle Lake–stand 19	0	0	N
Wabigoon Township–stand 350	0	0	N
–stand 362	0	1	L
Fort Frances District (16 locations)			
+Caliper Lake–stand 167	0	0	N
+Dance Lake–stand 37	0	0	N
Dawn Road–stand 229	2	1	L
Eltrut Lake–stand 183	0	0	N
–stand 249	2	0	N
Fishhawk Road–stand 43	2	0	N
Gallo Lake–stand 131	0	1	L
+Heathcliffe Lake–stand 232	0	0	N
+Hillyer Creek–stand 224	0	0	N
Lake Despair–stand 24	0	0	N
Prince Road–stand 18	2	1	L
Rawlinson Creek–stand 30	1	0	N
Rawlinson Creek–stand 119	0	0	N
Skull Lake–stand 110	2	0	N
Straw Lake–stand 519	0	0	N
Triple Road–stand 134	3	0	N
Kenora District (13 locations)			
April Lake–stand 134	0	0	N
Blindfold Creek–stand 344	0	1	L
Coyle Township–stand 245	0	0	N
Devonshire Township–stand 503	0	0	N
Graphic Lake–stand 209	0	0	N
Gundy Township–stand 319	0	0	N
+John Lake–stand 119	0	0	N
MacNicol Township–stand 108	0	0	N
+Mark Lake–stand 103	0	0	N
Rabbit Lake	0	0	N
Snook Lake	0	0	N

(cont'd)

Appendix 2. Northwest Region – Jack Pine Budworm. (Summary of defoliation estimates and egg mass counts in 1994 and infestation forecasts for 1995 on jack pine. All sampling was done on jack pine budworm NODA plots.) (concl.)

Location	Estimated % defoliation 1994	Total number of egg masses on six 61 cm branch tips	Infestation forecasts for 1995[a]
Kenora District (13 locations) (concl.)			
Stokes Lake	0	0	N
Wabigoon Lake–stand 32	0	0	N
Red Lake District (24 locations)			
+Bateman Township–stand 31	0	0	N
+ –stand 34	0	0	N
+Coli Lake–stand 224	0	0	N
Conifer Lake	0	0	N
Ear Falls	0	0	N
+Emarton Lake	0	1	L
+Flundra Lake	0	0	N
+Gleave Lake	0	2	L
+Graves Township–stand 514	0	0	N
McDonough Township–stand 401	0	1	L
–stand 402	0	1	L
–stand 403	0	0	N
+McKenzie Bay Road–stand 374	0	0	N
+McKenzie Bay Road–stand 451	0	0	N
North Road–stand 132	0	0	N
Nungesser Road–km 30–stand 27	0	0	N
–km 36–stand 150	0	1	L
–km 75–stand 407	0	0	N
Nungesser River–stand 240	0	0	N
Overnight Road–stand 404	0	0	N
Sidace Lake Road–stand 230	0	0	N
+ –stand 254	0	0	N
Wenesaga Lake	2	1	L
Zimring Road–stand 100	0	0	N
Sioux Lookout District (18 locations)			
+Drayton Township–stand 200	0	0	N
+Elbow Lake Road–stand 251	0	0	N
Goodie Lake–stand 49	0	0	N
Goodie Lake–stand 80	0	0	N
+Goodie Lake–stand 83	0	0	N
+Goodie Lake–stand 108	0	0	N
Goodie Lake–stand 245	0	1	L
+Lomond Township–stand 6	0	0	N
McAree Township–stand 57	0	0	N
McAree Township–stand 65	0	0	N
Moose Lake Road–stand 99	0	0	N
Moose Lake Road–stand 116	0	0	N
–stand 122	0	0	N
Porrett Lake–stand 259	0	0	N
Stanzhikimi Lake Road–stand 26	0	1	L
+ –stand 230	0	0	N
Wrong Road–stand 266	0	1	L
Wyatt Lake Road–stand 195	0	1	L

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

+ Immature jack pine stand.