FOREST HEALTH CONDITIONS IN THE NORTHWEST REGION OF ONTARIO, 1996

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

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Natural Resources Canada
Canadian Forest Service
Great Lakes Forestry Centre

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OVERVIEW

Program reviews and budget reductions announced in February 1995 by the federal government have resulted in changes to the Forest Insect and Disease Survey (FIDS) Program. FIDS has merged with the former Long Range Transport of Airborne Pollutants Program to form a nationally focused Forest Health Network (FHN). This Network has a forest health monitoring component that will assess and report on the condition and changes in the health of Canada's forests. The Forest Health Monitoring Unit will monitor programs such as the Acid Rain National Early Warning System (ARNEWS); North American Maple Project (NAMP); and spruce/fir, jack pine, sugar maple, and oak health plots. Major forest disturbances resulting from insect, disease, or abiotic damage will be mapped and reported on. In addition , quarantine surveys for such pests as the gypsy moth and pine shoot beetle will continue. This 1996 report, a joint effort between the Canadian Forest Service (CFS) and Ontario Ministry of Natural Resources (OMNR), was made possible through assistance from OMNR to expand the field survey from what could be undertaken under the national FHN.

Along with the program changes there were also some staff reductions in the Northwest Region. Mr. David Constable retired from the federal government and was replaced in Thunder Bay by Mr. Simon Melbourne. The vacant position for Fort Frances was not filled, leaving only three individuals responsible for the region. The tradional work area boundaries were no longer adhered to and the field station at Fort Frances was used occasionally by Mr. Melbourne.

The most damaging major forest disturbance in the Northwest Region in 1996 was the spruce budworm, even though there was a significant reduction in populations of this insect. The bulk of the infestation was mapped in the Thunder Bay, Nipigon, and southern Fort Frances districts. Spruce budworm caused increased balsam fir tree mortality across the region, particularly in the Nipigon, Thunder Bay, and Kenora districts. The large aspen tortrix infestation, which increased in size, was predominantly located between Lake Nipigon and Lake Superior. Damage caused by a leaf spot disease on white birch was mapped over a large area in the southern end of the Nipigon District. The long-standing ARNEWS plots were retallied again in 1996. Plots established in 1993 to study the jack pine budworm and spruce budworm were converted to jack pine health and spruce/fir health biomonitoring plots. Pheromone trapping for the gypsy moth was carried out again in 1996. One male moth was caught at Lake Nipigon Provincial Park, Nipigon District.

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

If further information is required about data collected in the Northwest Region, please contact one of the report authors or write to: Leader, Forest Health Monitoring Unit, Canadian Forest Service, Great Lakes Forestry Centre, P.O. Box 490, Sault Ste. Marie, Ontario, P6A 5M7.

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MAJOR FOREST DISTURBANCES

Insects

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

A considerable increase in the area of moderate to severe defoliation of trembling aspen (*Populus tremuloides* Michx.) by the large aspen tortrix occurred along the northern Lake Superior shoreline. Areas totaling 50 461 ha were aerially mapped in the Nipigon and Thunder Bay districts in 1996 (Fig. 1). In 1994, 1 905 ha of host stands were severely defoliated along the Pays Plat River watershed in the Nipigon District; the damaged area declined to 600 ha in Yesno and Lahontan townships in 1995.

Pockets of moderate to severe damage were present along a wide band that extended west from the town of Schreiber in the Nipigon District, into the Thunder Bay District as far as the Pass Lake area. This included parts of the Black Bay Peninsula, and St. Ignace and Simpson islands. Single pockets of damage were also detected in the central Nipigon District east of the village of Jellicoe near Partridge Lake and northeast of the town of Beardmore near Tyrol Lake. Other damaged stands were located along the Nipigon River, south from Purdom and Ledger townships to the town of Red Rock in the Nipigon District. The largest pocket extended from the Red Rock area in the Nipigon District southwest to the village of Pearl in the Thunder Bay District. Large aspen tortrix damage was not detected at any other locations in the region.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

There was a virtual collapse in the area infested by the spruce budworm in the Northwest Region in 1996. A significant decrease in the severity of the foliar damage also occurred within the infested areas (Fig. 2). As evidenced in Table 1, 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.) decreased by 92 percent. The districts of Sioux Lookout, Red Lake, Kenora, and Dryden all reported decreases in the high 90 percentile. The lowest recorded decrease of infested area was 37 percent, in the Nipigon District. A number of causal factors were probably involved in this population decline. Among them was the increasing lack of available balsam fir host due to budworm induced mortality. Figure 3 shows the trend of infestation sizes over a 5-year period in the Northwest Region.

The Thunder Bay District had the largest area infested. However, compared with 1995 figures the defoliated area still declined by 77 percent to 117 971 ha in 1996. This was generally mapped as scattered pockets of moderate defoliation, with only three areas having severe (>75 percent) foliar damage. Two of the large areas of severe damage occurred south and southwest of the town of Armstrong. The first extended from Armstrong Lake south to Waweig Lake on the east side of Highway 527. The other area was located just west of Lake Nipigon in the Wabinosh Bay and Morgan Lake areas. There were a few smaller pockets of severe defoliation in the Little Moraine Lake area on the eastern edge of the district boundary, northeast of the city of Thunder Bay. The main areas of moderate (26–75 percent) damage occurred to the north, west, and

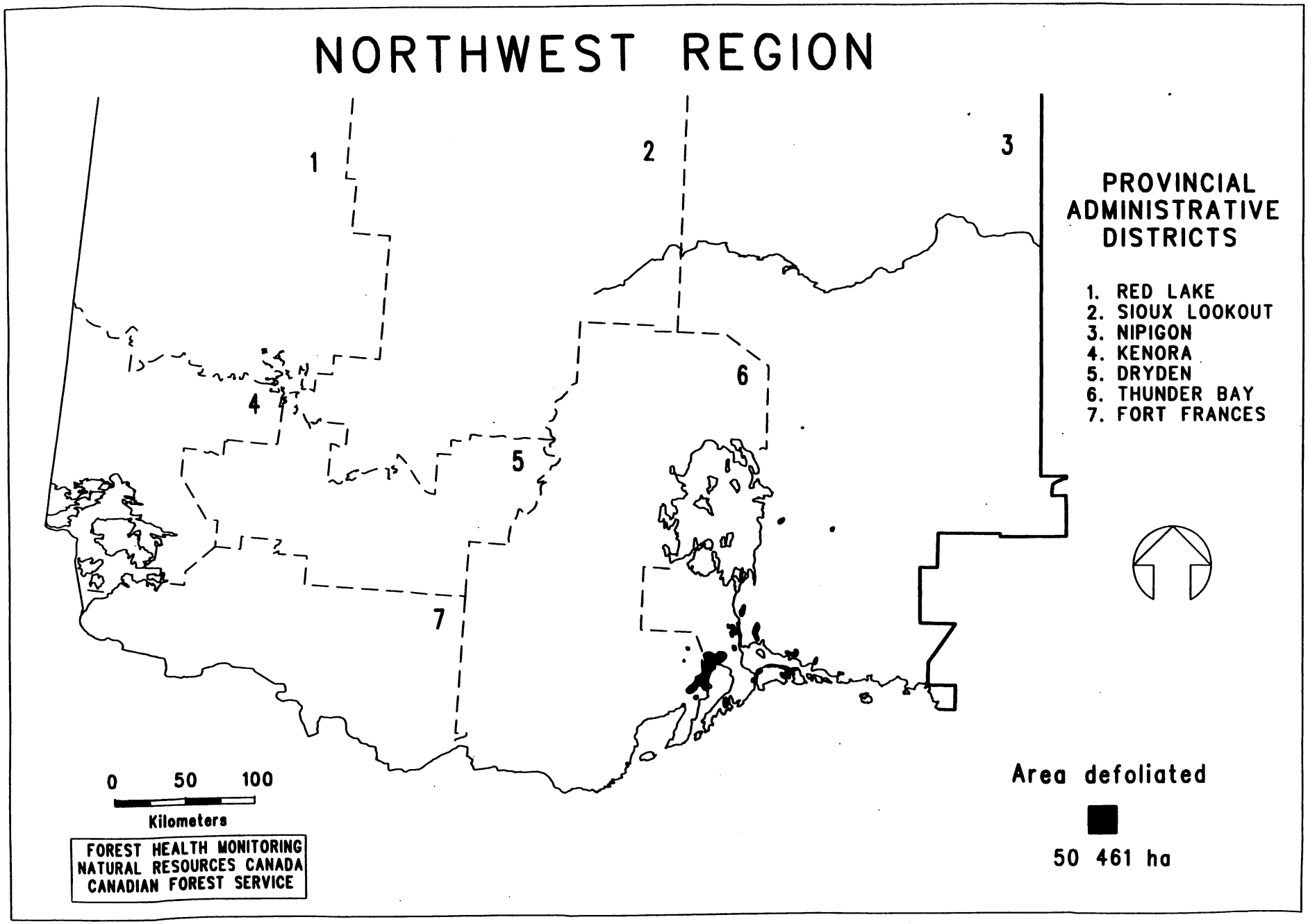

Figure 1. Areas of moderate to severe defoliation caused by the large aspen tortrix (Choristoneura conflictana [Wlk.]) *in 1996.*

southwest of the city of Thunder Bay. Other areas of moderate defoliation were also observed in a wide band starting at the Muskeg Lake area in Wardrope Township extending in a northeastern direction to the western edge of Highway 527. The western half of the district had almost no recorded defoliation.

Table 1. Total area of moderate to severe defoliation caused by the spruce budworm in the Northwest Region of Ontario in 1995 and 1996.

	Area of moderate to severe defoliation (ha)		
District	1995	1996	Change (%)
Dryden	601 490	4 695	-99
Fort Frances	373 401	43 004	-89
Kenora	513 141	12 725	-98
Nipigon	95 569	60 164	-37
Red Lake	392 031	3 964	-99
Sioux Lookout	576 055	6 138	-99
Thunder Bay	521 802	117 971	-77
Totals	3 073 489	248 661	-92

In the Nipigon District, moderate to severe defoliation totaled 60 164 ha; a decline of 37 percent compared with 1995. However, most of the damage observed was categorized as severe when compared with the moderate levels recorded in the other districts. South of Highway 11 there were only a few areas of defoliation. The largest single patch was comprised of severe damage located at the north end of the Black Bay Peninsula. A small pocket of moderate defoliation was also found on Salter Island in Lake Superior. East of Orient Bay, in the Jean Lake area, there was a mixture of moderate and severe levels of foliar damage. Southwest of the town of Jellicoe another discrete stand of severe damage was noted. All other areas of infestation were located north of Highway 11, extending from Lake Nipigon east to the district boundary. The largest of these sites occurred north of the Canadian National (CN) tracks in the Toronto and Hanover lakes area. A few small pockets of moderate damage were mapped as far north as Ogoki Lake.

In the Fort Frances District, the area infested declined by 89 percent; from 373 401 ha in 1995 to 43 004 ha in 1996. The infestation consisted of only moderate defoliation, and the majority of damage was located along the Highway 11 corridor. The number of infested stands decreased eastward towards the town of Atikokan. Defoliation was observed in only one small area in the northeast corner of Quetico Provincial Park. The two largest adjoining areas of moderate damage were mapped just west of Quetico Provincial Park and north of Namakan Lake, adjacent to the United States border; and northwest of the town of Fort Frances north along

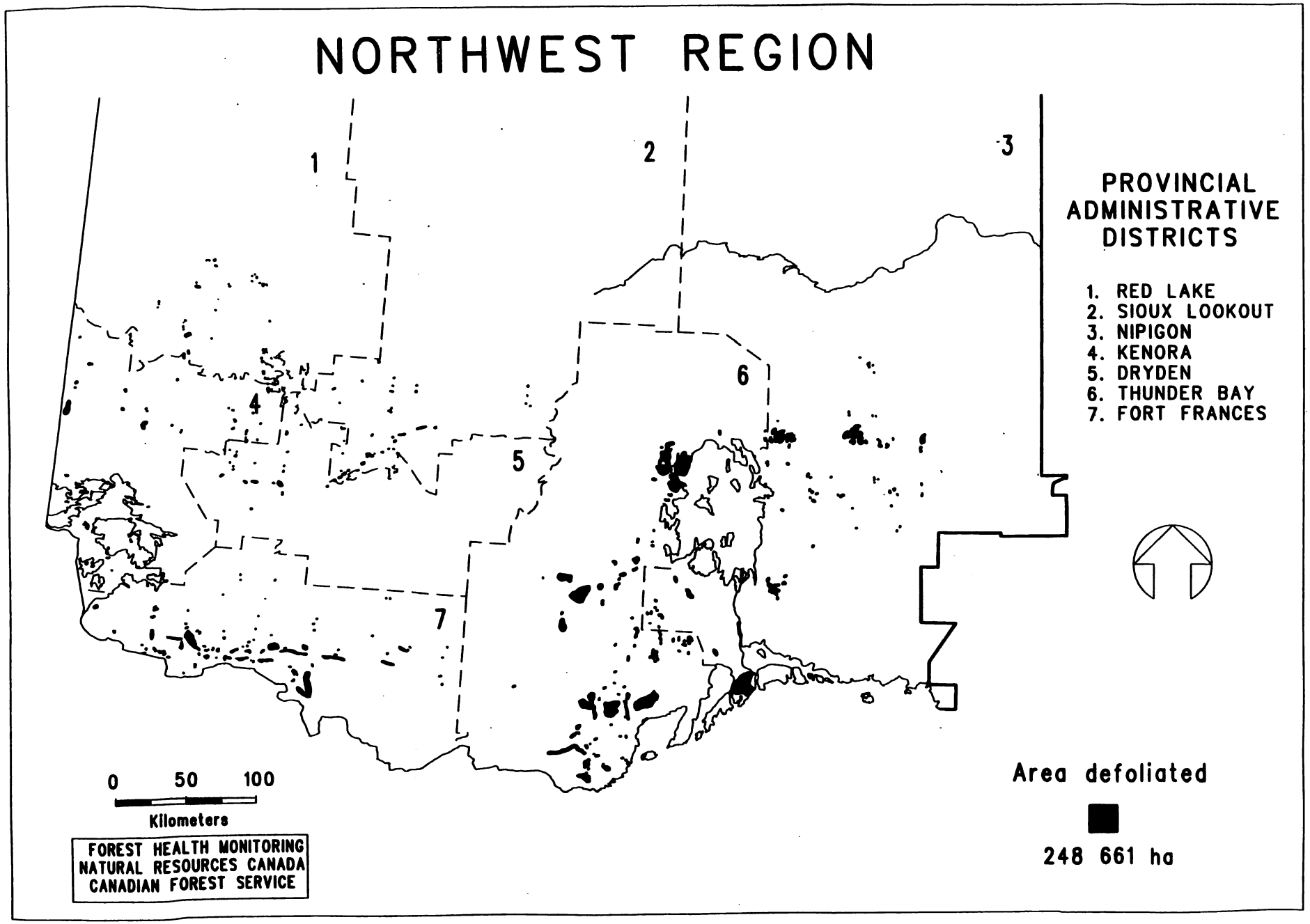

Figure 2. Areas of moderate to severe defoliation caused by the spruce budworm (Choristoneura fumiferana [Clem.]) *in 1996.*

the power line to Highway 613.

The area infested in the Kenora District declined by 98 percent; from 513 141 ha in 1995 to 12 750 ha in 1996. Again, this was primarily made up of pockets of moderate defoliation scattered throughout the district. Pockets of defoliation were again evident on the islands in Lake of the Woods. The largest of these was detected at the north end of Falcon Island. The biggest single area of defoliation in this district was mapped north of the CN tracks between Tetu Lake and the Ontario–Manitoba border.

The total area of defoliation in the Sioux Lookout, Dryden and Red Lake districts declined by 99 percent compared to 1995 figures. In the Sioux Lookout District, this area totaled 6 138 ha in 1996, compared to 576 055 ha in 1995. Most of the moderate defoliation was mapped along the Highway 72 corridor southwest of the town of Sioux Lookout and extending to Sandy Beach Lake. Smaller, scattered pockets of damage were also observed north of the CN tracks to Maskara Lake.

The area infested in the Dryden District decreased from 601 490 ha in 1995 to 4 695 ha in 1996. This defoliation was mainly confined to the northwest portion of the district, along Highway 17 west of the town of Dryden, and north of Highway 17 along Highway 105 to the village of Red Lake Road.

The Red Lake District had the smallest area defoliated, 3 964 ha in 1996 compared to 329 031 ha defoliated in 1995. Some of this defoliation occurred along the Highway 105 corridor from the town of Ear Falls south to the district boundary. Other infested areas included scattered pockets located near the south end of Trout Lake west to the Red Lake and Little Vermilion Lake areas, and south of the town of Red Lake around Longlegged Lake.

Table 2. Total area of whole-tree mortality associated with spruce budworm in the Northwest Region of Ontario in 1995 and 1996.

	Total area of mortality (ha)		Increase
District	1995	1996	(ha)
Dryden	1 289 550	1 289 893	343
Fort Frances	1 376 666	1 406 510	29 844
Kenora	906 587	974 915	68 328
Nipigon	1 750 261	1 843 306	93 045
Red Lake	631 132	651 000	19 868
Sioux Lookout	441 512	466 016	24 504
Thunder Bay	1 067 332	1 144 281	76 949
Totals	7 463 040	7 775 921	312 881

Throughout the Northwest Region light defoliation (>25 percent) was commonly observed in numerous stands, as was light and moderate foliar damage to individual trees.

There was a significant increase in the amount of budworm caused mortality of balsam fir in 1996. The cumulative area of mortality now totals 7 775 921 ha (Fig. 4). This represents an increase of 312 881 ha compared to the 113 552 ha mapped in 1995 (Table 2). The largest area increases in mortality occurred in the Nipigon (93 045 ha) , Thunder Bay (76 949 ha), and Kenora (68 328 ha) districts.

In the Thunder Bay District, the bulk of the new mortality was recorded north and northwest of the city of Thunder Bay, extending north to the town of Armstrong and west to the town of Graham. New mortality was also mapped on Pie Island in Lake Superior. Significant increases in mortality in the Nipigon District were recorded primarily around the town of Longlac, in the Onaman Lake, and Ombabika Bay (Lake Nipigon) areas. Small scattered pockets were also detected as far north as Ogoki Lake.

The northwestern portion of the Kenora District was most heavily affected. In particular, a large area of new mortality was present east of Umfreville Lake. Sizeable pockets of mortality were found along the district boundary from the Roger Lake area west to the Ontario–Manitoba border. A large north–south band of mortality also extended from the east end of Dryberry Lake at the Dryden District boundary south to Rowan Lake near the Fort Frances District boundary (Fig. 4).

In the Red Lake District, the largest single area of new mortality was mapped south of Gullrock Lake and west of Pakwash Lake. Another sizeable pocket straddled the Kenora District boundary west of Sydney Lake.

The largest area of new mortality in the Sioux Lookout District was located along the shore at the east end of Lac Seul, from Gynane Bay south to Scaler Lake. Smaller patches of mortality were found east of this location near Tully, Holger, and Stanzhikimi lakes.

The largest stretch of mortality in the Fort Frances District was adjacent to the Kenora District boundary, extending from the eastern edge of Kagaki Lake southwest towards Highway 71. There was another fairly large area of damage west of Quetico Provincial Park between Highway 11 and the United States border. A total of 62 monitoring plots was examined to give more detailed stand information on the progression of tree mortality in the region (Table 3).

Table 3. Summary of tree mortality associate with spruce budworm in the Northwest Region of Ontario. Results are based on ground checks for seven districts for 1995 and 1996.

Location	Host[a]	Tree mortality (%)	
		1995	1996
Dryden District			
Bridges Township	bF	75	84
Coronary Lake	bF	67	69
Dore Lake	bF	64	72

Table 3. Summary of tree mortality associated with spruce budworm in the Northwest Region of Ontario. Results are based on ground checks for seven districts for 1995 and 1996. (cont'd)

Location	Host[a]	Tree mortality (%)	
		1995	1996
Dryden District (concl.)			
Forest Lake	bF	55	67
North Road	bF	64	73
Rugby Township	bF	65	74
Sandy Point Road	bF	38	51
Satterly Township	bF	67	74
Southworth Township	bF	69	78
Fort Frances District			
Big Sawbill lake	bF	62	62
Claxton Township	bF	21	61
Lake Hope	bF	9	22
Menary Township	bF	20	25
Preacher Lake	bF	63	63
Watten Township	bF	29	33
Kenora District			
April Lake	bF	39	61
Cliff Lake	bF	76	91
Ewart Township	bF	74	78
Willingdon Township	bF	42	71

Table 3. Summary of tree mortality associated with spruce budworm in the Northwest Region of Ontario. Results are based on ground checks for seven districts for 1995 and 1996. (cont'd)

Location	Host[a]	Tree mortality (%)	
		1995	1996
Nipigon District			
Adamson Township	bF	54	62
	wS	22	23
Ashmore Township	bF	25	54
	wS	19	25
Bikerace Township	bF	47	77
Booth Township	bF	85	92
	wS	100	100
Burrows Lake South	bF	23	43
	wS	0	0
Camp 15 - Caramat	bF	86	92
	wS	20	20
Errington Township	bF	32	79
Grain Township	bF	80	86
Legault Township East	bF	19	73
McIvor Township	wS	44	56
Nakina Township	bF	3	63
Nibs Lake	bF	86	90
Parent Township	bF	27	27
Purdom Township	bF	64	77
	wS	88	100
Raynar Township	bF	20	37

Table 3. Summary of tree mortality associated with spruce budworm in the Northwest Region of Ontario. Results are based on ground checks for seven districts for 1995 and 1996. (cont'd)

Location	Host[a]	Tree mortality (%)	
		1995	1996
Nipigon District (concl.)			
Suicide Lake	bF	85	98
Windigokan Lake Road	bF	69	90
Red Lake District			
Baird Township	bF	25	81
Detector Lake	bF	63	93
Goldpine Road	bF	21	53
Snake Falls Road	bF	24	60
Wenasaga Lake	bF	9	27
Sioux Lookout District			
Burma Lake Road	bF	39	61
Deception Lake	bF	16	30
Drayton Township	bF	20	20
Foley Lake	bF	7	7
Lomond Township	bF	52	62
Pape Lake	bF	53	71
Pickerel Township	bF	75	80
Thunder Bay District			
Cheeseman Lake	bF	77	97

Table 3. Summary of tree mortality associated with spruce budworm in the Northwest Region of Ontario. Results are based on ground checks for seven districts for 1995 and 1996. (concl.)

Location	Host[a]	Tree mortality (%)	
		1995	1996
Thunder Bay District (concl.)			
Crombie Lake	bF	83	97
Decourcey Lake	bF	10	24
Dog River	bF	63	79
Fallscamp Lake Road	bF	58	73
	wS	15	15
Forbes Township	bF	19	29
Jacques Township	bF	88	96
Joeboy Lake	bF	80	98
Kabitotikwia Lake	wS	54	72
Mountain Lake Road	bF	52	62
Open Bay - Lac des Milles Lac	bF	64	66
Sandstone Lake	bF	8	10
Waweig Lake	bF	64	100
	wS	4	24

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

An essential part of the spruce budworm survey is the egg-mass sampling used to forecast population levels for the next season. In total, 56 locations were sampled in 1996 by the Survey Division of BioForest Technologies (Appendix 1). A further population decline is forecast in the Thunder Bay and Nipigon districts for 1997, particularly in the eastern half of the region. In the other districts the forecasts are more irregular, but a higher number of severe and moderate to severe population levels are predicted for 1997 in the western half of the region. A comparison of the common locations sampled in both 1995 and 1996 are presented in Table 4. Pockets of

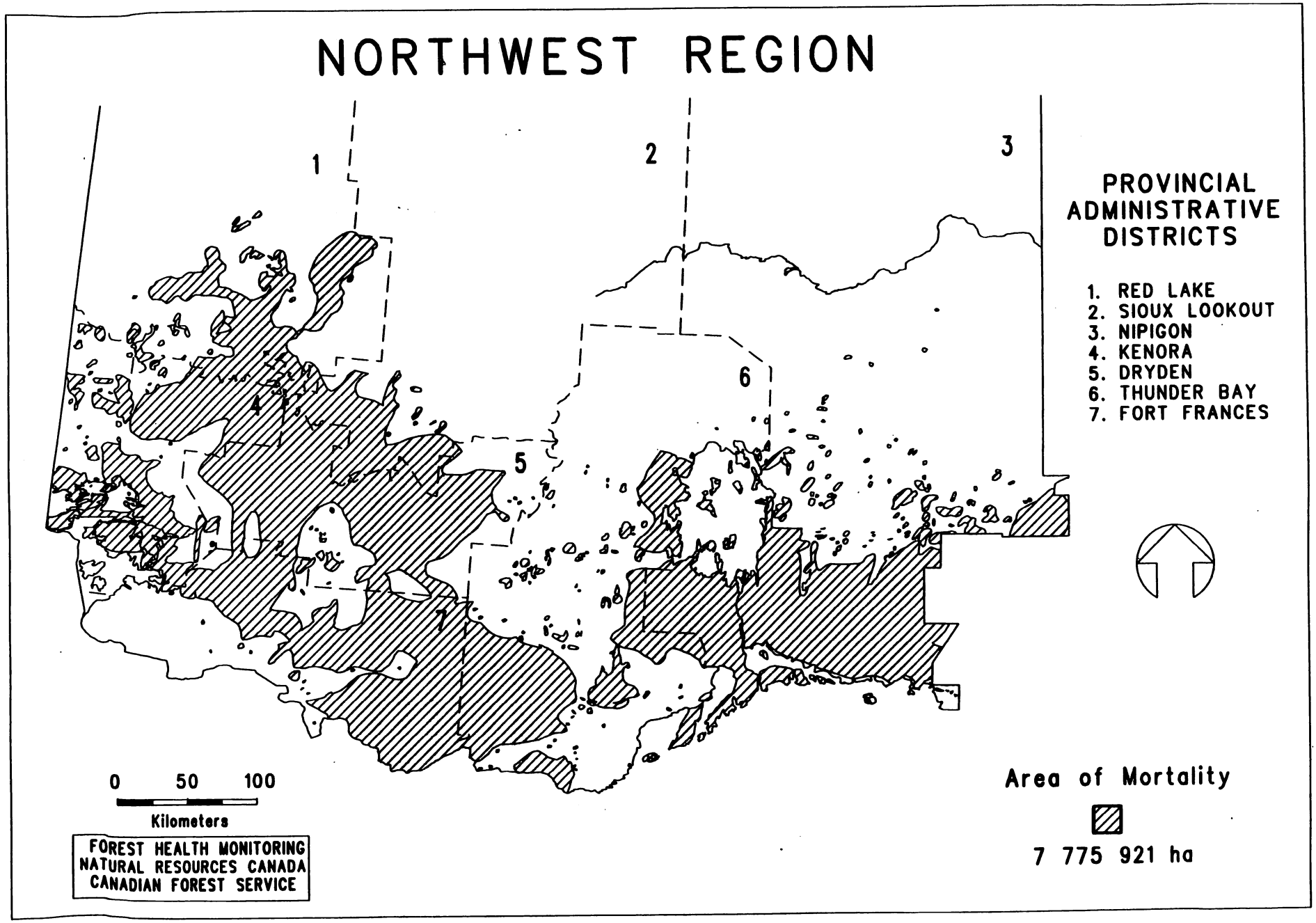

Figure 4. Areas within which cumulative balsam fir* (Abies balsamea [L.] Mill.)*mortality was caused by the spruce budworm* (Choristoneura fumiferana [Clem.])*in 1996.

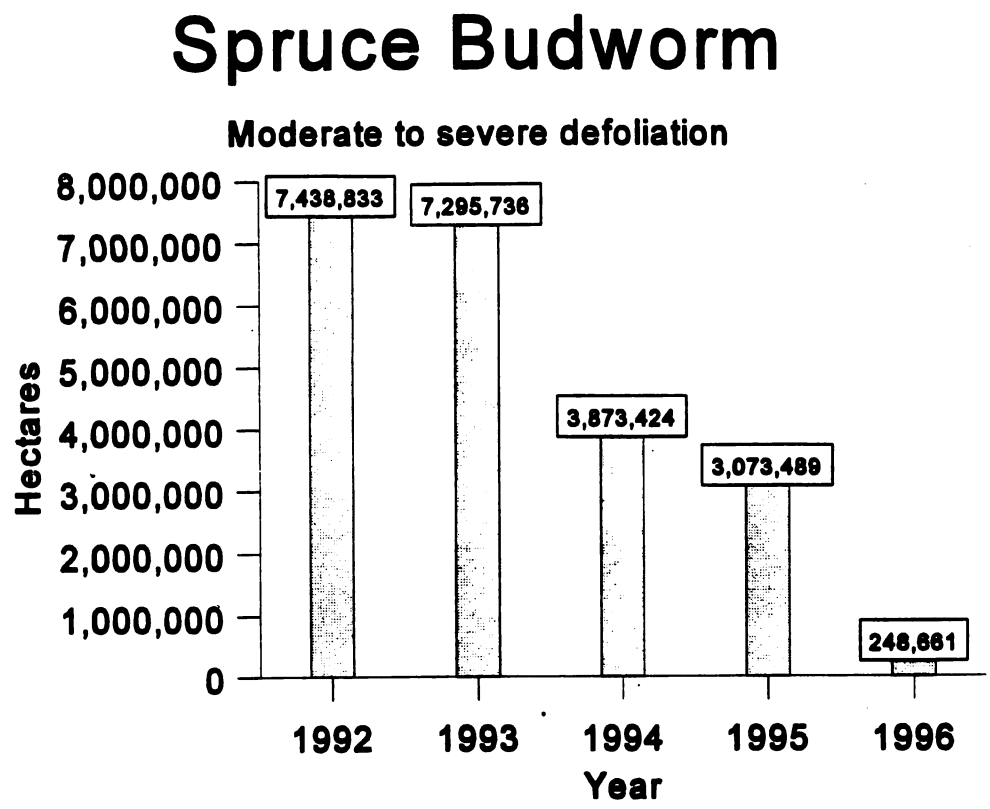

Figure 3. Comparison of the spruce budworm (Choristoneura fumiferana *[Clem.]) infestation over a 5- year period in the Northwest Region.*

moderate to severe defoliation will persist in some areas of the Dryden, Fort Frances, Kenora, Red Lake, and Sioux Lookout districts.

Pheromone trapping of male spruce budworm moths has been carried out in the Northwest Region for a number of years. Because there was a major change in the locations trapped in 1995, only the last 2 years are summarized in Table 5. In conjunction with the infestation reductions most of the trap results showed reductions in the numbers of moths captured.

Table 4. Comparison of spruce budworm egg-mass densities in the Northwest Region of Ontario between 1995 and 1996.

District	Number of locations common to 1995 and 1996	Average egg-mass density per 9.29 m^2 of branch		Change (%)
		1995	1996	
Dryden	13	211	258	+22
Fort Frances	7	133	306	+130
Kenora	6	252	296	+17
Nipigon	15	108	19	-82
Red Lake	4	162	244	+51
Sioux Lookout	7	164	153	-6
Thunder Bay	17	253	56	-78

Table 5. Results of spruce budworm pheromone trapping in 26 locations in the Northwest Region of Ontario from 1995 to 1996. (Three traps were used at each location.)

Location	Plot number	Total number of moths captured	
		1995	1996
Dryden District			
Ilsley Township	119	209	226
Southworth Township	128	205	249
Fort Frances District			
Big Sawbill Lake	131	751	239[a]
Calm Lake	132	559	80
Claxton Township	133	611	332
French Lake	134	178	55

Table 5. Results of spruce budworm pheromone trapping in 26 locations in the Northwest Region of Ontario from 1995 to 1996. (Three traps were used at each location.)

Location	Plot number	Total number of moths captured	
		1995	1996
Kenora District			
Cliff Lake	142	276	563
Ewart Township	143	338	247
Willingdon Township	153	1 967	292
Haycock Township	146	808	681
Nipigon District			
Burrows Lake South	159	458[a]	29
Catlonite Road	161	273	78[a]
Booth Township	157	214	27
Nakina Township	173	193[a]	208[a]
Nibs Lake	174	46	13
Parent Township	176	124	125
Windigokan Lake	183	90	29
Red Lake District			
Baird Township	184	255	257
Sioux Lookout District			
Foley Lake	195	843	457
Thunder Bay District			
Buzzer Lake Road	201	70	137[a]

Table 5. Results of spruce budworm pheromone trapping in 26 locations in the Northwest Region of Ontario from 1995 to 1996. (Three traps were used at each location.) (concl.)

Location	Plot number	Total number of moths captured	
		1995	1996
Thunder Bay District (concl.)			
Dog Lake	206	216	23
Fallis Township	207	152	17
Milkshake Lake	218	279	35[a]
Sandstone Lake	221	143	16
Waweig Lake	224	74	58
Wolf River Road	225	79	58

[a] Total from 2 traps.

Jack Pine Budworm, *Choristoneura p. pinus* Free.

The jack pine budworm has not been a significant problem in the Northwest Region since 1991, when more than 70 000 ha of jack pine (*Pinus banksiana* Lamb.) were infested in the Red Lake, Dryden, and Sioux Lookout districts. There has been a steady decline in population levels and only scattered individual trees were damaged in 1995. Aerial and ground surveys conducted across the region in 1996 detected no damage resulting from this jack pine pest.

As part of the forest health plot system 86 jack pine stands, varying in size from 3 m to 25 m in height, were examined. No significant jack pine budworm defoliation levels were observed in any of these stands. In each of the 50-tree plots at Straw Lake, Fort Frances District; Work Township, Kenora District; and on the Nungesser Road in the Red Lake District, 10 percent current defoliation was found on only one tree. Also, assessments were made at each plot as to the level of male flowers present in the crowns. Of the 4 202 trees examined 15 percent had a heavy crop of flowers (>20/ branch), 14 percent had moderate levels (10–20/branch), 33 percent had a light level (1–9/branch), and 37 percent had no flowers. Of the 86 plots surveyed, five had heavy flower crops in more than 50 percent of the trees. These plots were present in stands ≥16 m in height.

In an effort to monitor insect populations egg-mass sampling was carried out by the Survey Division of BioForest Technologies Incorporated at 20 locations across the western part of the region. No jack pine budworm egg-masses were found in any of the samples taken (Appendix 2). Therefore, no defoliation is forecast for these areas of the Northwest Region for 1997. All of the sample sites were jack pine health plots. Refer to the forest health monitoring section of this report for additional information collected in these plots.

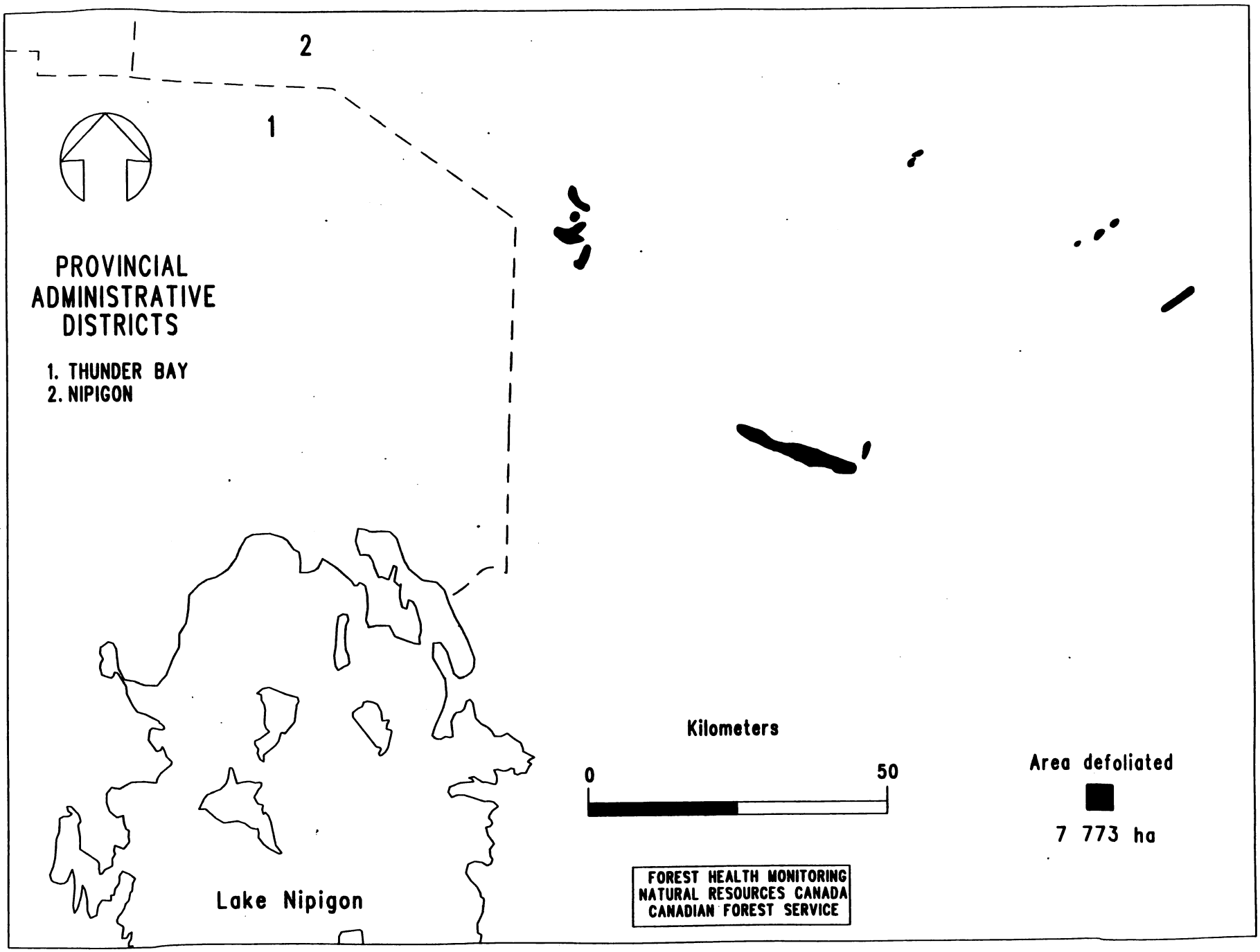

Figure 5. Areas of severe leafmining caused by the aspen serpentine leafminer **(Phyllocnistis populiella Cham.)** *in the Nipigon District, Northwest Region, in 1996.*

Aspen Serpentine Leafminer, *Phyllocnistis populiella* Cham.

Damage by this leafminer, which causes a "silvery" foliar appearance to trembling aspen, was again aerially mapped in the central Nipigon District in 1996 (Fig. 5). In total, 5 970 ha of host stands were severely mined during 1996. This compared to 88 440 ha recorded in 1995, a decrease of 93 percent. Once again the affected stands were located primarily along the Ogoki Road, between O'Sullivan Lake and Ara Lake (2 750 ha); on the east end of the Ogoki Reservoir (2 040 ha), and in a few scattered locations in the Percy Lake area (1 040 ha). Leaf mining was severe in these areas with over 90 percent estimated foliar damage to trembling aspen ranging in size from small regeneration (2 m tall) to mature trees (20 m tall).

The aspen serpentine leafminer has one generation per year and overwinters as an adult. The tiny moths lay their eggs in the spring on both sides of the leaves, and upon hatching the young larvae enter the leaf and feed between the layers of leaf tissue. The tiny larvae then meander back and forth in the leaf while feeding. From time to time very high populations result in the type of damage noted above.

Ambermarked Birch Leafminer, *Profenusa thomsoni* (Konow)

Foliar browning of white birch (*Betula papyrifera* Marsh.) caused by the ambermarked birch leafminer occurred at six locations in the Nipigon District during 1996 (Fig. 6). These were aerially mapped along the Catlonite road south of Long Lake, and in Wiggins and Yesno townships west of the town of Schreiber. Damaged areas totaled 1 630 ha and pockets ranged in size from 65 to 1 070 ha. The largest single pocket was located along the north shore of Lake Superior adjacent to the Gravel River in Wiggins and Yesno townships. Ground observations made at two sites along the Catlonite Road indicated that average damage levels ranged from 70 to 80 percent.

Diseases

Leaf Spot, *Septoria betulae* Pass.

This late season leaf spot disease of white birch caused premature leaf drop and discoloration again in 1996. The brown foliage was widespread and easily visible on hilltops and ridges during aerial surveys conducted in late August and early September along the northern Lake Superior shoreline in the Nipigon District (Fig. 7).

Approximately 138 710 ha of host trees were affected in an area stretching from the town of Schreiber west to Kama Bay and north to Greenhedge Lake. This was a considerable increase in the area of moderate to severe defoliation as compared with the previous 2 years. In 1994 this disease infected 74 000 ha throughout the same general area; in 1995 the damaged area declined to 3 700 ha. An average foliar infection level of 60 percent was assessed along the Highway 17 corridor in Lahontan Township.

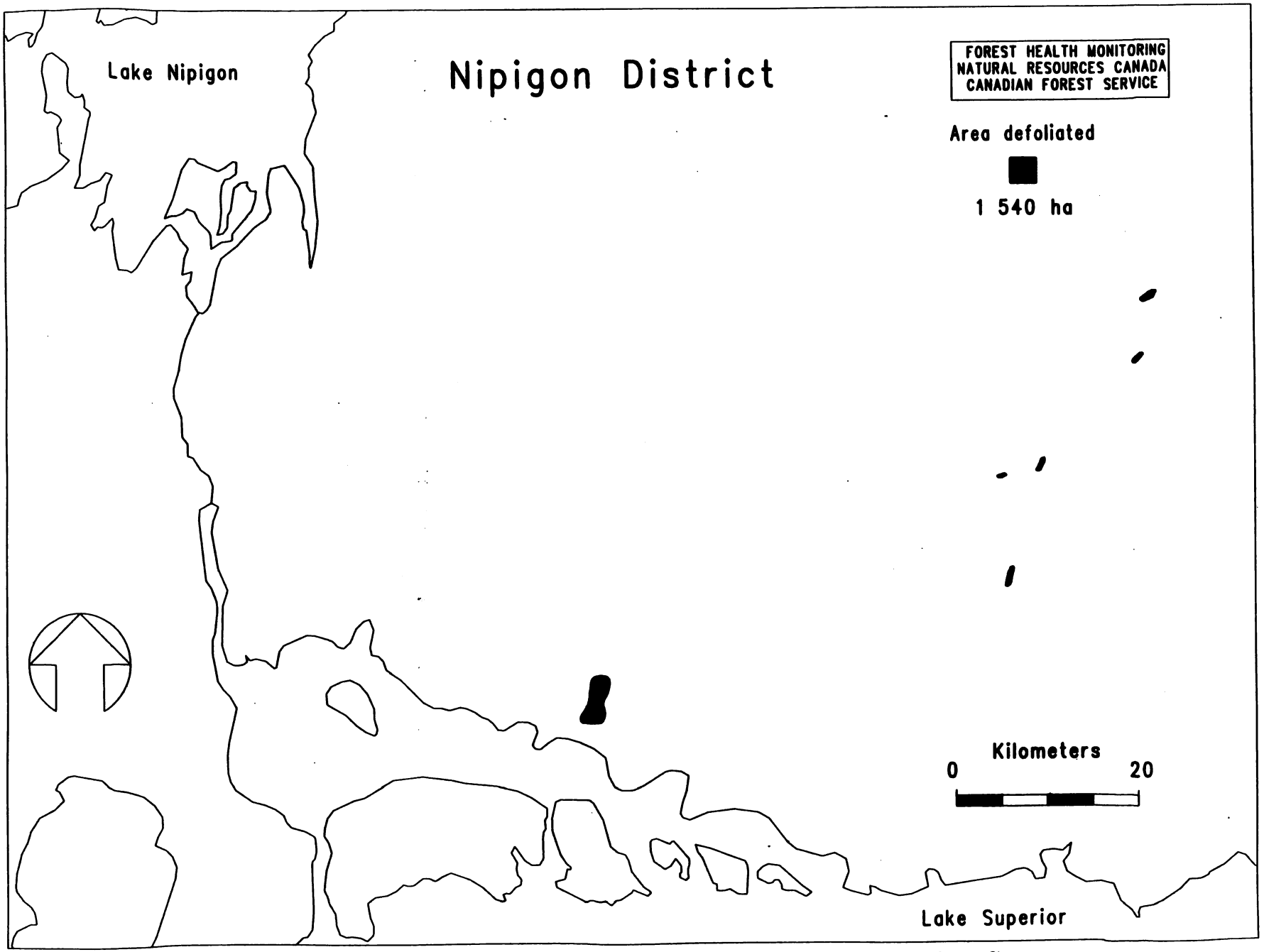

Figure 6. Areas of severe leafmining caused by the ambermarked birch leafminer (Profenusa thomsoni [Konow]) *in the Nipigon District, Northwest Region, in 1996.*

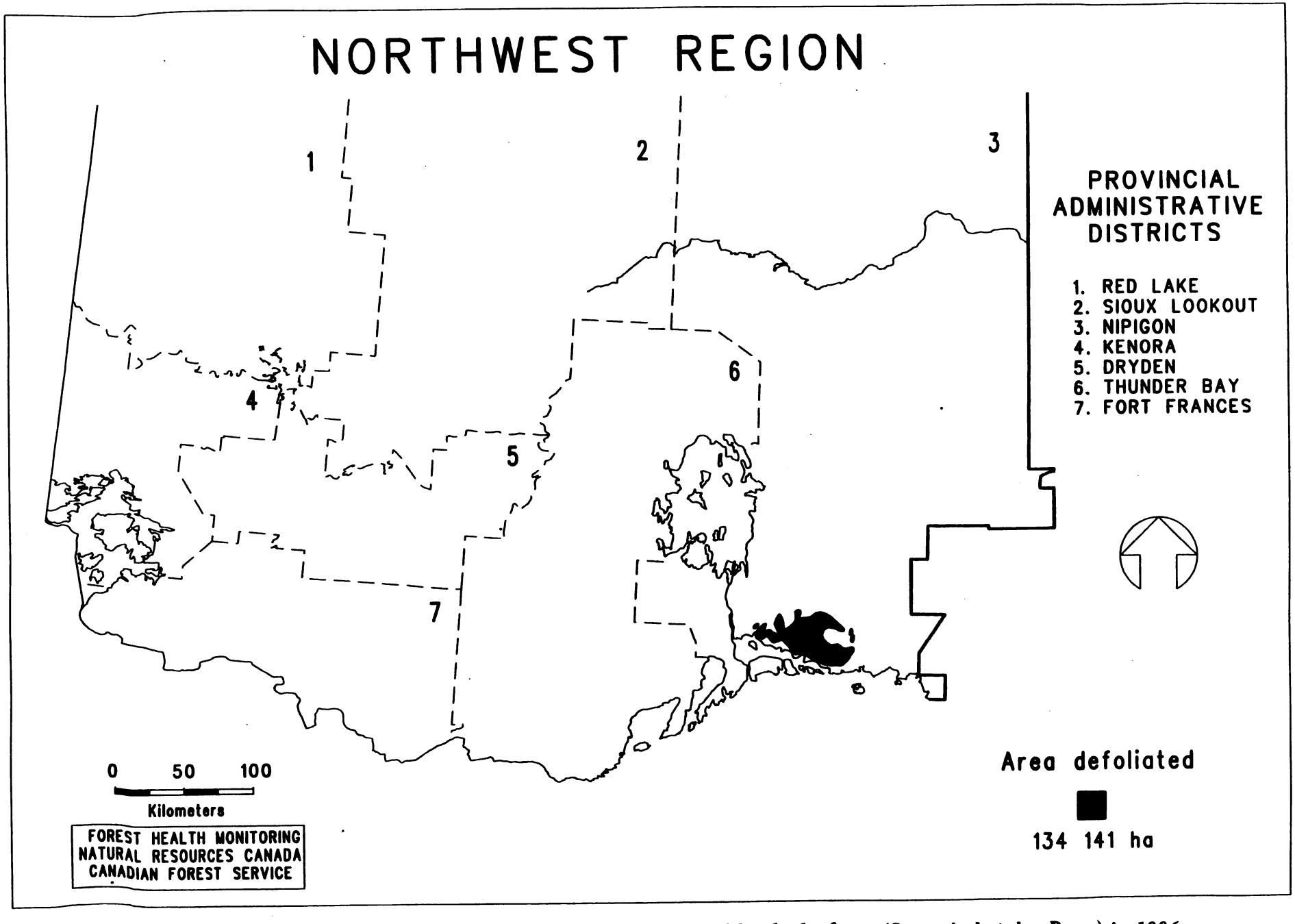

Figure 7. Areas of moderate to severe discolouration and defoliation caused by the leaf spot (Septoria betulae Pass.) *in 1996.*

Abiotic Damage

Blowdown

In 1996, high winds resulted in an area of blowdown totaling approximately 390 ha in the southeast corner of Quetico Provincial Park in the Fort Frances District (Fig. 8). Damage was evident in a narrow band from Lilypad Lake extending in a northeastern direction over Cache Bay on Saganaga Lake to the Thunder Bay District boundary. The primary host affected was trembling aspen and most of the damage consisted of broken stems.

Single Tree Mortality of Balsam Fir (Stillwell's Syndrome)

"..... Balsam fir trees, usually with a fair complement of foliage and after exposure to varying amounts of defoliation by the spruce budworm for several years, sometimes turn bright red and die. This phenomenon has been known in stands where considerable damage or mortality has already occurred. The sudden demise of surviving trees in spruce budworm damaged stands during the apparent recovery stage, even years after the collapse of the outbreak, was noted by the late M.A. Stillwell during his pathological studies in the Green River Watershed of New Brunswick. We proposed that this phenomenon be known as Stillwell's Syndrome in the researchers honour in 1982, when the Forest Insect and Disease Survey Unit first drew attention to this condition. Balsam fir trees stressed by repeated spruce budworm defoliation are susceptible to attack by numerous organisms that are normally considered to be of secondary importance. Investigations in 1982 into the possible cause of Stillwell's syndrome found that all red trees sampled were affected by Armillaria root rot and at least one species of beetle...."[1]

This sudden death of balsam fir was particularly evident in the Nipigon District, east of Lake Nipigon, during 1996 (Fig. 9). High numbers of red balsam fir trees were aerially detected in Meader, Irwin, and Walters townships.

Above-average numbers of dead balsam trees were also reported from many other areas visited throughout the remainder of the Northwest Region. During routine plot surveys it was noted that many of the dead trees encountered with the above symptoms contained one or a combination of the following organisms: Armillaria root rot (*Armillaria ostoyae* [Romagn.] Herink), bark beetles, and sawyer beetles.

Wind And Snow Damage

Heavy snow combined with high winds during November 1995 caused severe damage to jack pine and black spruce at several locations in the Nipigon District and at one location in the Thunder Bay District (Fig. 10). This tree crown breakage was amplified in June 1996 by high winds that further damaged stands in the same general areas.

Snapped stems, broken branches, and blowdown were aerially mapped over 66 892 ha,

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[1] Moody et al. 1988. Forest Insect and Disease Conditions in Canada, 1987. Forestry Canada, Canadian Forestry Service, Ottawa, ON. Cat. No. Fo21-1/1987E. 92 p.

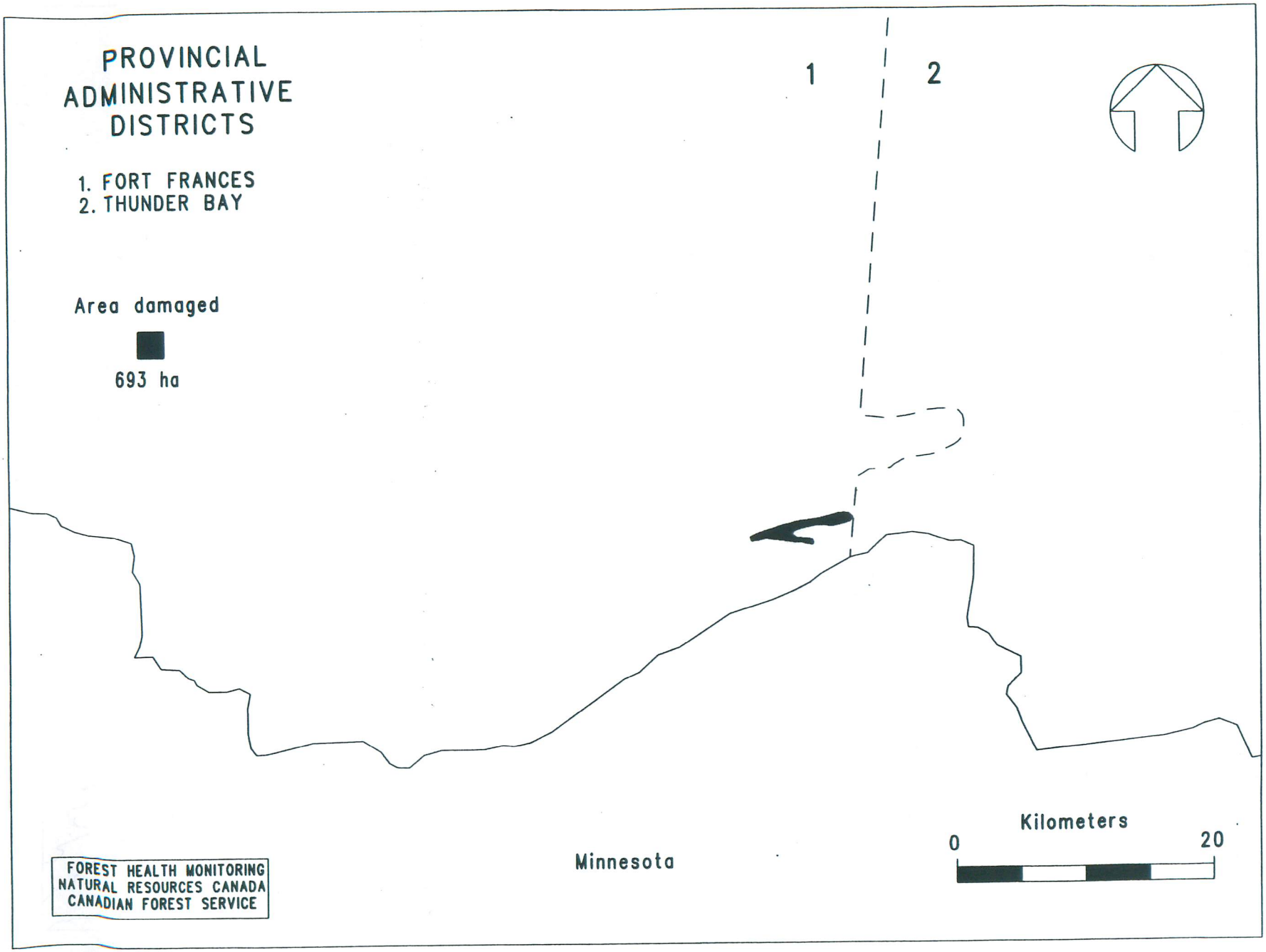

Figure 8. Area of damage caused by blowdown in the Fort Frances District, Northwestern Region, in 1996.

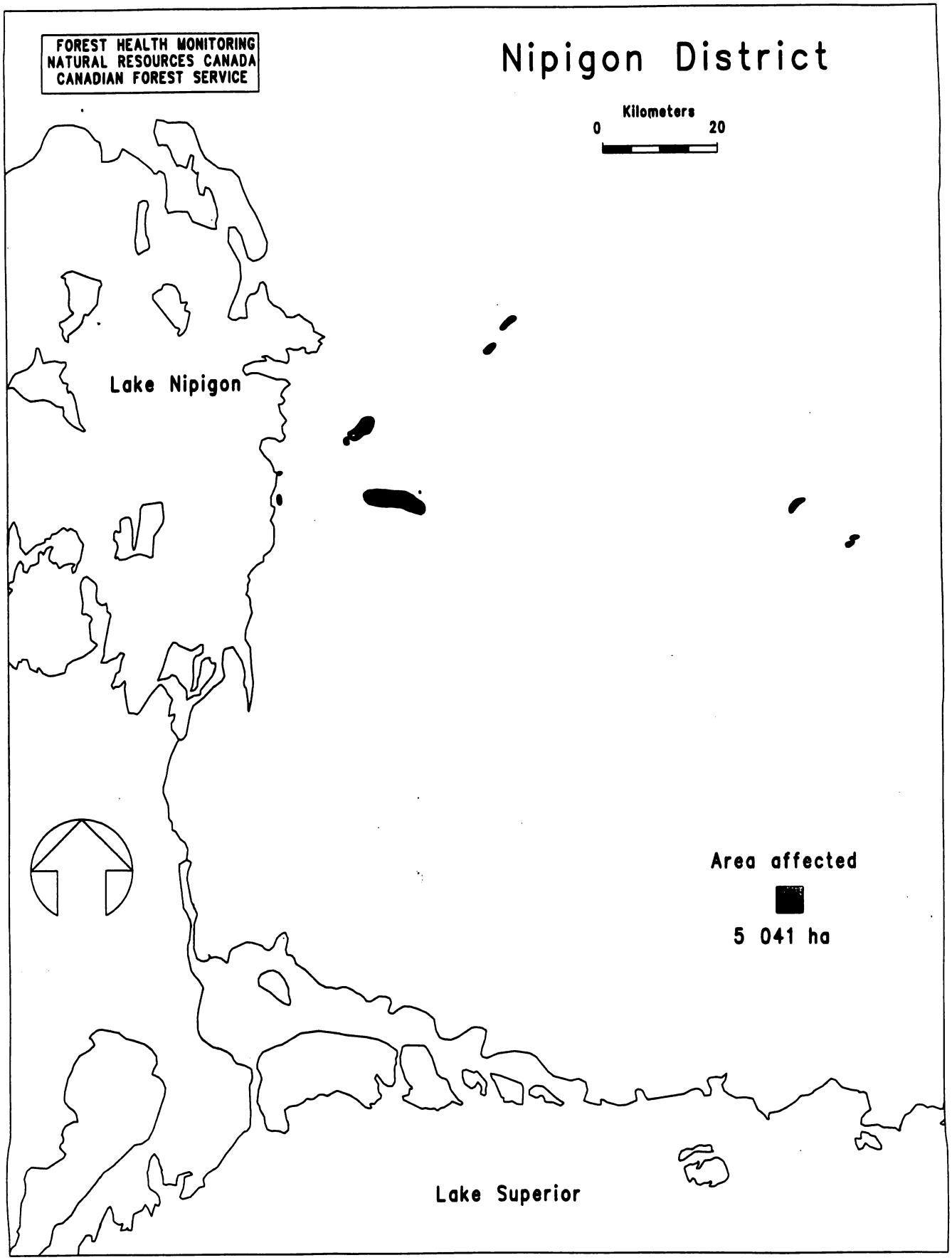

Figure 9. Areas of heavy concentrations of single-tree mortality of balsam fir* (Abies balsamea [L.] Mill.) *in the Nipigon District, Northwest Region, in 1996.

primarily in the Nakina area. Smaller affected areas were also located in Gzowski, Kowkash, and Esnagami townships in the Nipigon District. An additional area of damage was detected in the northeast corner of the Thunder Bay District near North Lamaune Lake, north of Lake Nipigon. Salvage operations are ongoing in the Nakina area.

FOREST HEALTH

Acid Rain National Early Warning System

The Acid Rain National Early Warning System (ARNEWS) is a Canada-wide forest health monitoring program. Its original purpose was to monitor the condition and changes in the forest in order to detect the early signs of acid rain damage. In addition to checking for damage from airborne pollutants, data has also been collected on all biotic or abiotic agents.

There are a total of 11 ARNEWS plots located across the Northwest Region (Fig. 11). These biomonitoring plots represent all of the commercial tree species found in this part of Ontario. Six of the plots have been in place for over 10 years; the other five plots were established in 1993.

No symptoms attributed to airbourne pollutants were found in 1996, but a wide range of insect and disease damage was present in most of the plots (Appendix 3. Table 6). The highest level of damage was caused by spruce budworm in the Fowler Township plot in the Thunder Bay District. Here, an average of 15 percent defoliation was found on the balsam fir. Spruce budworm was also present on 100 percent of the black spruce at Sandel Lake, Sioux Lookout District, but damage levels were low. Low levels of damage caused by the blackheaded jack pine sawfly (*Neodiprion pratti banksianae* Roh.) and western gall rust (*Endocronartium harknessii* [J.P. Moore] Y. Hirats.) affected the jack pine on three plots in the Dryden and Sioux Lookout districts. One balsam fir was killed by Armillaria root rot in the Wiggins Township plot in the Nipigon District.

As part of the monitoring procedure the overall condition of the tree crowns was assessed using the classification system found in Table 7. Information on the crown conditions is summarized in Tables 8 and 9 in Appendix 3. Even though many of the plots are much older, a base year of 1993 was used because the method of assessment was revised that year. Crown condition categories are different for conifer hosts compared to deciduous hosts—thus the need for two tables. Only data on the principal host species (consisted of 10 percent or more of the plot) is presented in these tables. Because of its species composition, the Wiggins Township plot in Nipigon District can be found in both tables. For the most part coniferous trees are healthy throughout the ARNEWS plots in the Northwest Region (Appendix 3. Table 8). The majority of the trees were assessed no higher than a crown condition three, which indicates an overall foliar damage level of less than 25 percent. The only exceptions to this were in Wiggins Township, Nipigon District, where a high number of white spruce trees have been affected by blowdown and in Fowler Township, Thunder Bay District, where the spruce budworm has had an impact over the years on balsam fir (Fig. 12).

The crown condition of the deciduous hosts is generally considered healthy up to and including category 35 (Table 7 and Appendix 3. Table 9). Most of the trees were found within

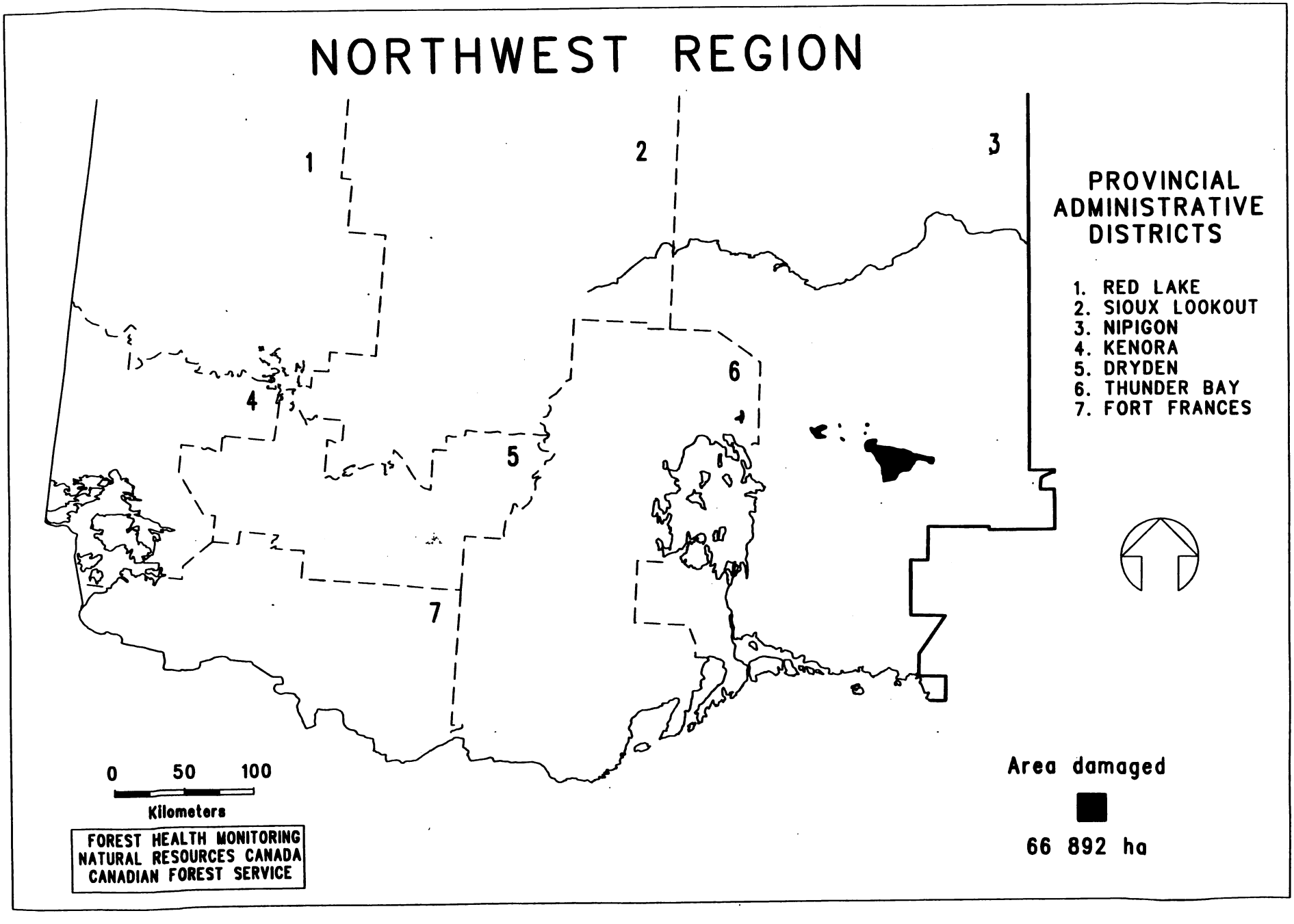

Figure 10. Areas of damage caused by wind and snow in 1996.

this category (Fig. 13). Crown dieback was present in some of the white birch in Schreiber Township, Nipigon District and was probably caused by old clinker conk (*Inonotus obliquus* [Pers.:Fr.] Pilát) infections. There was no apparent cause for the dieback in the 13 trembling aspen in the plots at Sapawe in Fort Frances District and Caribou Falls Road in the Kenora District. Some of the dieback may have resulted from four years of forest tent caterpillar (*Malacosoma disstria* Hbn.) infestations that ended in the early 1990s.

A summary of the annual mortality for all the on plot and off plot trees (a couple of miscellaneous species are not included) in the ARNEWS system in the Northwest Region is presented in two tables. Table 10 in Appendix 3 lists the original plots, some of which were established in 1984 and the remainder the following year; therefore, the table starts in 1985. The most common cause of tree mortality over the years has been blowdown. Initial damage was first observed in 1989 in Plots 511 and 513 on black spruce and white spruce. There was some further related mortality the following 2 to 3 years. Most of the other tree species have died as a result of Armillaria root rot infections. The impact of spruce budworm feeding caused the decline and death of the balsam fir. Annual mortality rates for the tree species in the five newer ARNEWS plots are summarized in Table 11.

Table 7. Crown condition classification system used for the ARNEWS plots.

Class	Code	Description
		Coniferous species
Healthy	01	No defoliation
	02	Only current defoliation, total defoliation less than 25 percent
	03	Current and/or some older defoliation, total less than 25 percent
Weak	04	25–50 percent total defoliation
Poor	05	51–75 percent total defoliation
	06	76–90 percent total defoliation
Dying	07	More than 90 percent total defoliation
Dead	08	Tree died since last assessment
		Deciduous species
Healthy	10	Full complement of foliage. Tree exhibits no visible crown damage
	20	Foliage thin, off-color. No dead branches present or bare twigs visible
	30	No dead branches present. Bare twigs present in up to 5 percent of the crown

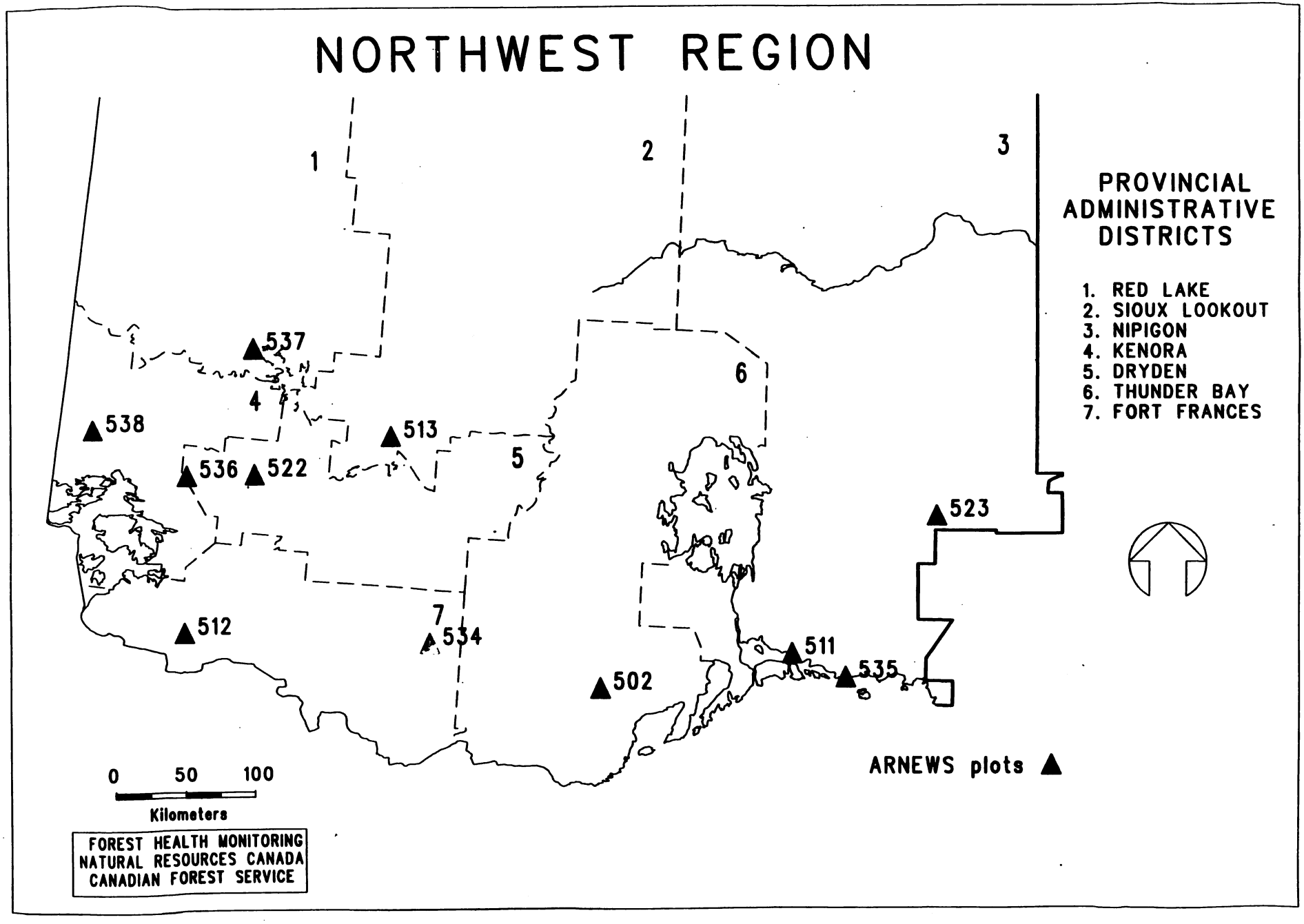

Figure 11. Locations of ARNEWS plots in 1996.

Table 7. Crown condition classification system used for the ARNEWS plots (cont'd).

Class	Code	Description
Healthy	35	No dead branches present. Bare twigs present in more than 6 percent of the crown
Weak	40	Dead branches and bare twigs present in up to 15 percent of the crown
	45	Dead branches and bare twigs present in 16 to 25 percent of the crown
Poor	50	Dead branches and bare twigs present in 26 to 37 percent of the crown
	55	Dead branches and bare twigs present in 38 to 50 percent of the crown
	60	Dead branches and bare twigs present in 51 to 75 percent of the crown
	65	Dead branches and bare twigs present in 76 percent or more of the crown
Dying	70	More than 50 percent of the crown dead. Only small adventitious branches present
Dead	08	Tree died since last assessment

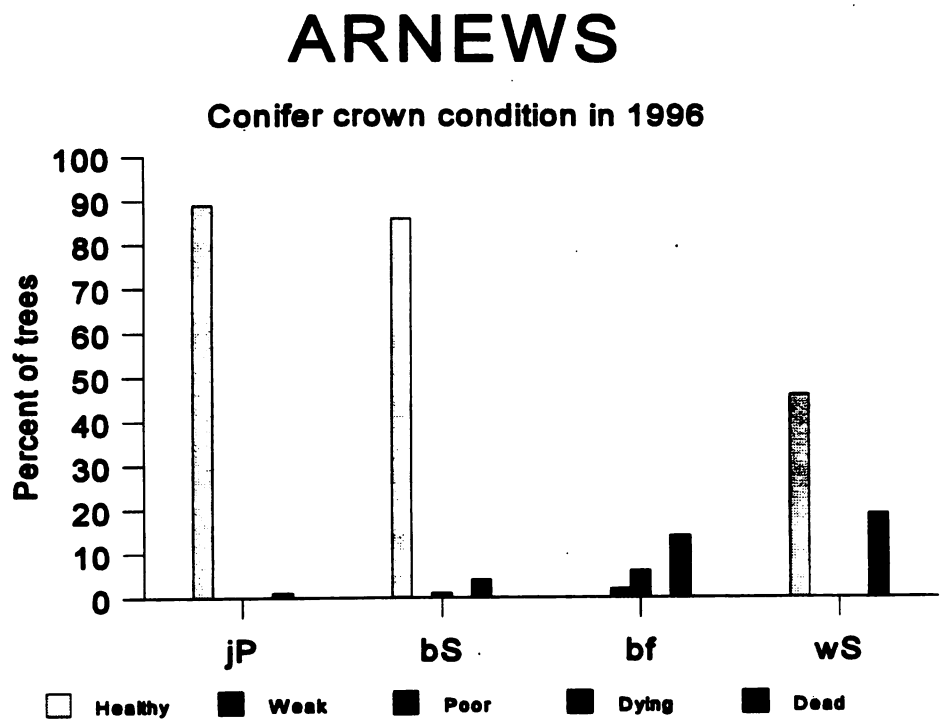

Figure 12. Comparison of crown condition (see Table 7) *among the four major conifer species in the ARNEWS plots in the Northwest Region in 1996.*

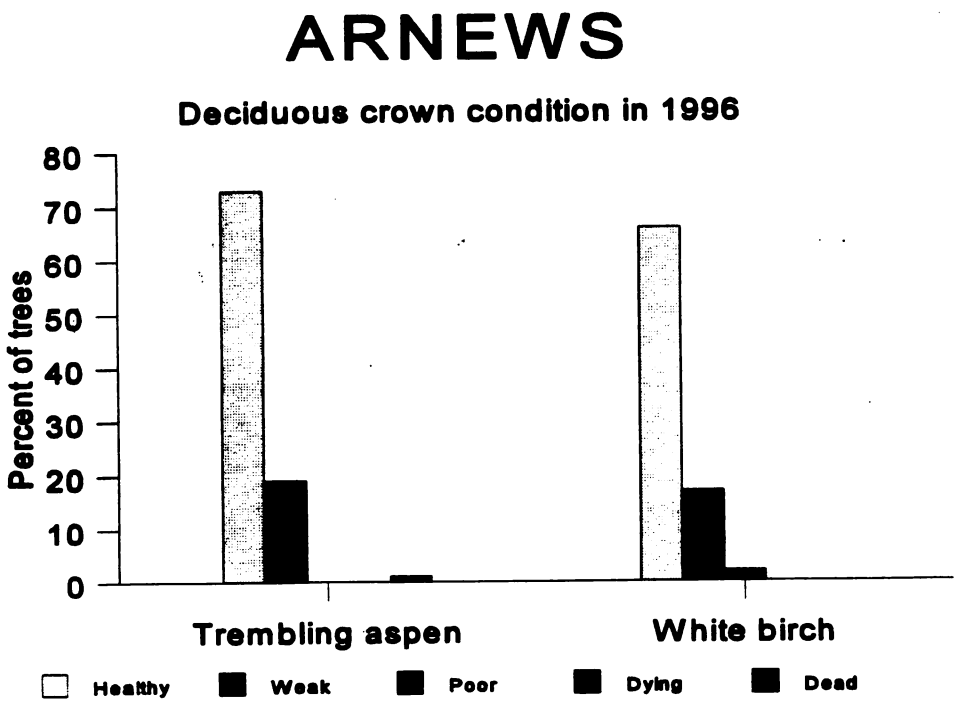

Figure 13. Comparison of crown condition (see Table 7) *among the two major deciduous species in the ARNEWS plots in the Northwest Region in 1996.*

Table 11. Summary of annual mortality for on and off plot tree species found in five ARNEWS plots from 1993 to 1996 in the Northwest Region of Ontario.

Host (Plots with host)	Dominance[a]	Number of trees examined	Annual mortality 1993	1994	1995	1996	Total (%)
			Number of trees				
Jack pine	1	40	0	0	0	0	0
(536)	2	8	0	0	0	0	0
Balsam fir	1	2	0	0	0	1	1 (50)
(535 536 537)	2	5	0	0	0	0	0
Black spruce	1	0	0	0	0	0	0
(536)	2	2	0	0	0	0	0
Trembling aspen	1	88	1	0	1	1	3 (3)
(534 535 538)	2	3	1	0	0	0	1 (33)
White birch	1	63	.0	0	0	0	0
(534 535 537 538)	2	6	0	1	0	0	1 (17)

[a] 1 = dominant and codominant trees and 2 = intermediate and suppressed trees.

Jack Pine Health

A program to study jack pine began in 1993 with funding from the Northern Forestry Program, a part of the Northern Ontario Development Agreement. The project was initiated to develop management guidelines for the jack pine budworm. With the change from the Forest Insect and Disease Survey Unit to the Forest Health Monitoring Unit this jack pine budworm study was changed to a jack pine biomonitoring program. Information on the jack pine budworm can be found in the major forest disturbance section of this report. The methodology used to monitor jack pine crowns was borrowed from the ARNEWS program. The plots are located in the Dryden, Fort Frances, Kenora, Red Lake, and Sioux Lookout districts (Fig. 14).

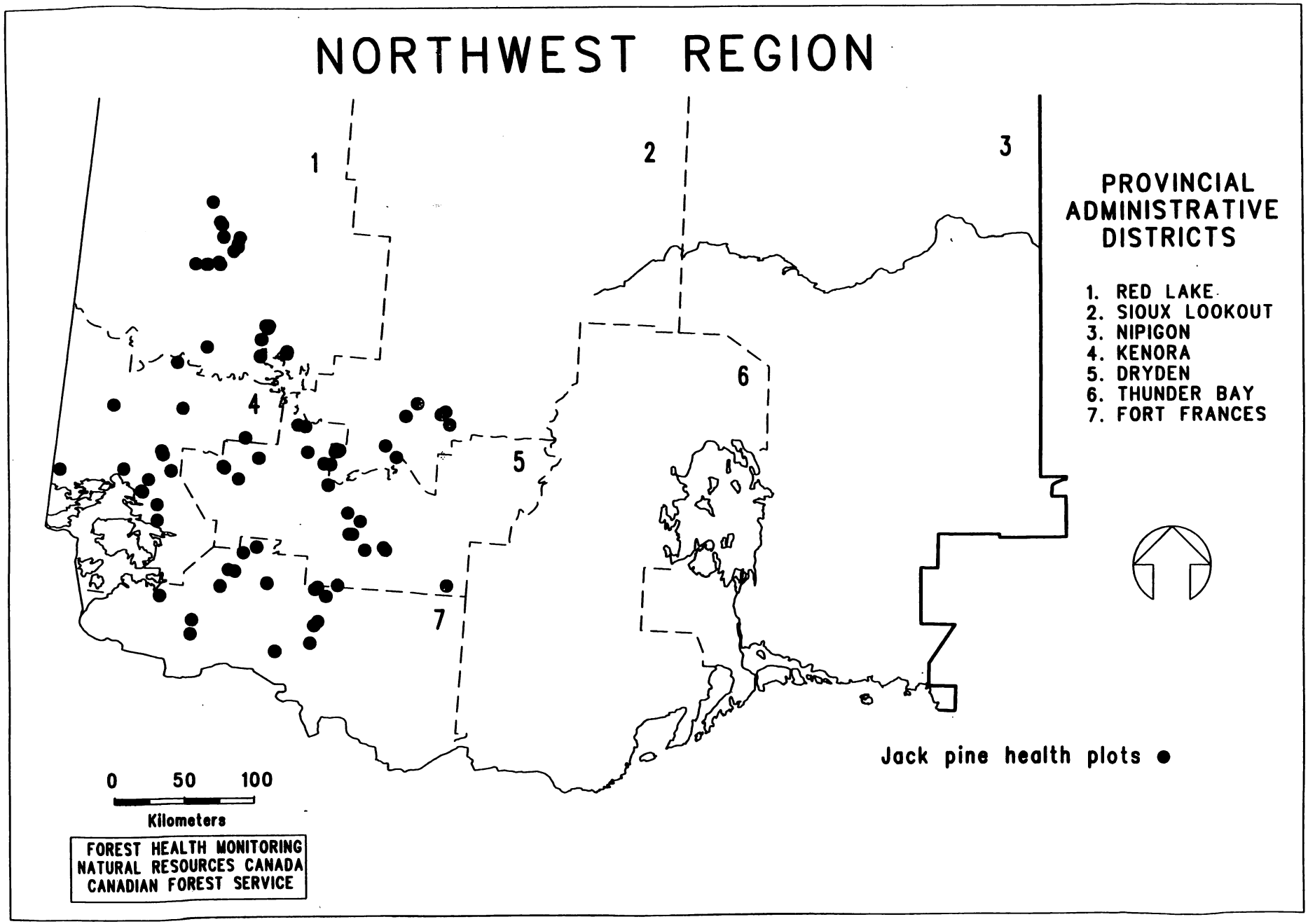

Figure 14. Locations of the jack pine health plots in 1996

Some of the data collected prior to 1996 has been used in the new monitoring system. Appendix 4 summarizes the top condition, tree mortality, and trees cut from 1993 to 1996. Surveys reveal that for the most part tops have been healthy with the exception of some older age class plots in the Red Lake District (Fig. 15). In particular, dead and bare tops were more common in plots located in McDonough Township, and in plots along the North, Nungesser, and

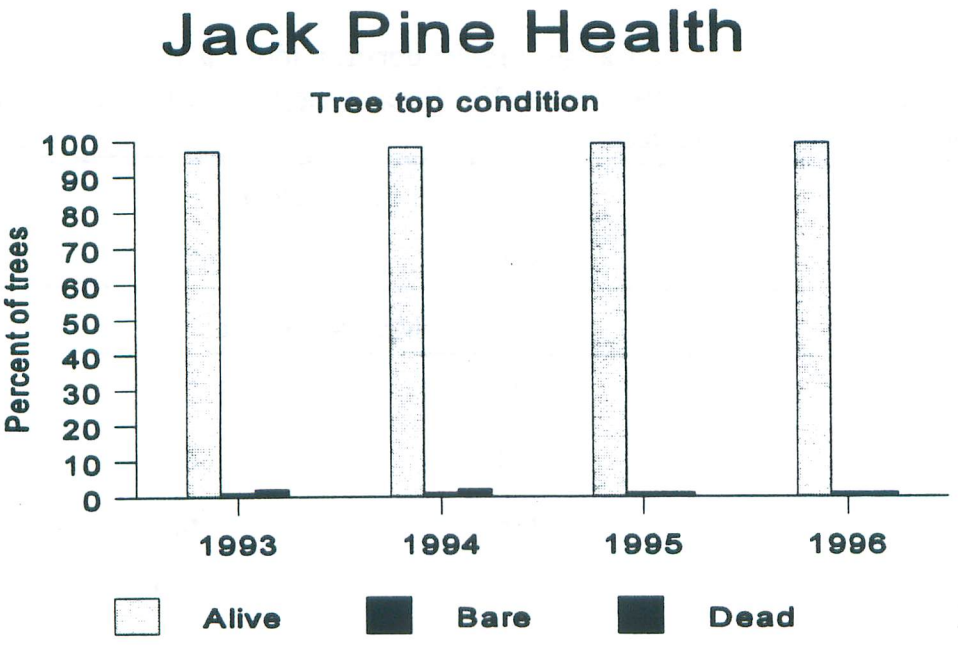

Figure 15. Comparison of the top condition of jack pine (Pinus banksiana *Lamb.) in the jack pine health plots in the Northwest Region from 1993 to 1996.*

Zimring roads. This has probably resulted from a jack pine budworm infestation that occupied large portions of this district from the late 1980s to 1991. Other plots in young stands (usually less than 3 m in height) with poor top conditions may be a result of damage by insects such as the white pine weevil (*Pissodes strobi* [Peck]) or eastern pine shoot borer (*Eucosma gloriola* Heinr.). Poor sites, which make trees more susceptible to conditions such as drought, may also be responsible for some of the dead and bare tops. Plot records have shown that the typical causes of tree mortality are Armillaria root rot and blowdown. Although not usually causing tree mortality, the western gall rust was by far the most common pest found in all age classes of plots.

A crown condition assessment (Table 7) was done for the first time in 1996 in the jack pine health plots (Appendix 5). The majority of the trees (96 percent) in this appendix were relatively healthy (Fig. 16). High winds caused 5 percent new mortality in each of two plots in the Fort Frances District; at Eltrut Lake (plot # 111) and Gallo Lake (plot # 114). *Armillaria root* rot contributed to the death of some of the trees at Zimring Road (plot # 161) in the Red Lake

District. Overall, plot mortality levels were low with only 2 percent dead in 1996.

As part of the conifer assessment the living crown was divided into three vertical sections of equal length. Each one-third was assigned an average damage level. Table 12 summarizes the condition of the vertical crown sections for the region. It can been seen from these results that most trees (55 percent) had damage in the lower one-third of the crown, particularly in the 6–35 percent damage level range. In comparison, only 23 percent and 8 percent of the jack pine had damage in the same categories in the middle and upper crowns, respectively. There were more trees with a damage level of 86–100 percent in the upper crown because of the trees with dead tops.

Table 12. Summary of damage levels as seen in the upper, middle, and lower third of the crowns of the 86 jack pine health plots for 1996 in the Northwest Region of Ontario. (Counts are based on examination of 4 104 jack pine trees.)

Crown damage levels[a] (%)	Tree crown		
	Upper[b]	Middle	Lower
	Number of trees		
None visible	3270	2222	946
1–5	513	865	764
6–15	246	623	1477
16–25	59	271	507
26–35	23	57	227
36–45	15	25	54
46–55	11	16	68
56–65	10	4	22
66–75	8	15	22
76–85	9	2	12
86–100	11	4	5

[a] Includes all types of damage affecting tree vigor (e.g., dead twigs, dead branches, dead tops, missing foliage, and damaged foliage).

[b] All trees crowns having a total length of less than 3 m were assessed in this category.

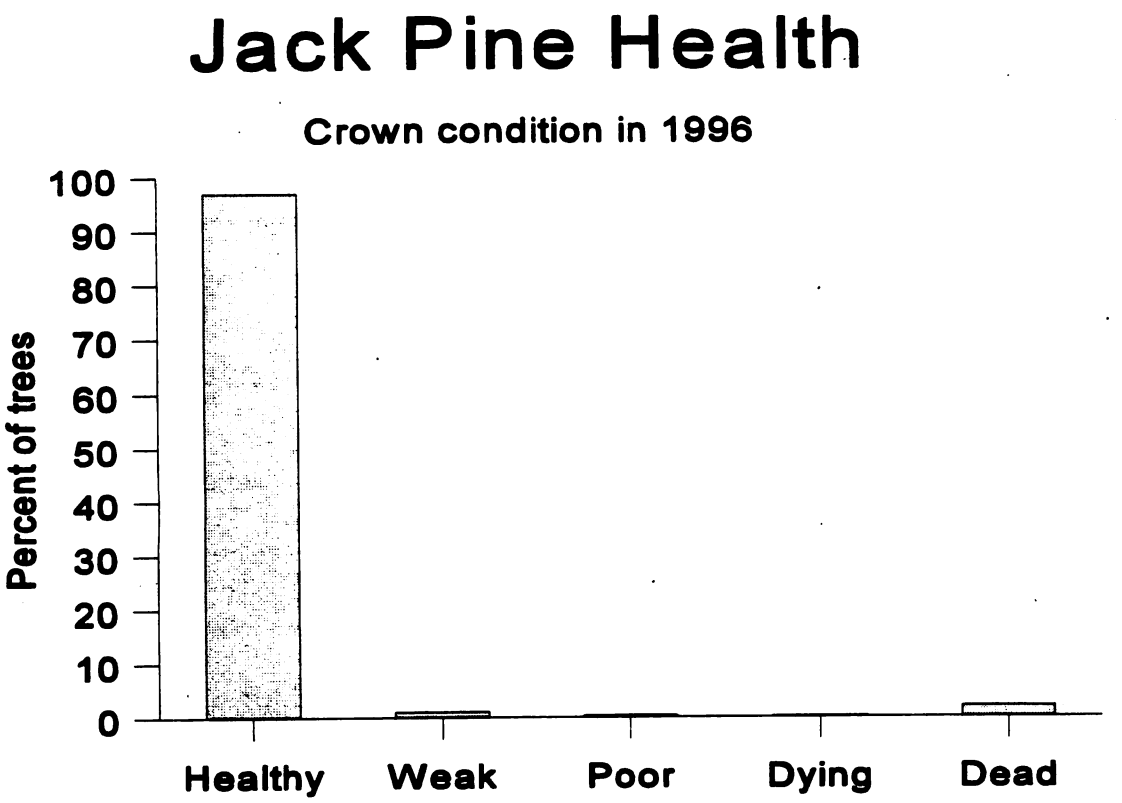

Figure 16. Tree crown condition (see Table 7) *of the jack pine* (Pinus banksiana *Lamb.) in the jack pine health plots in the Northwest Region in 1996.*

Spruce/Fir Health

A study, funded under the Northern Forestry Program, to develop a hazard rating for spruce budworm in spruce/fir stands was initiated in 1993. Numerous plots, representing stand variables such as age, site, and spruce/fir composition, were established across the Northwest Region (Fig. 17). With the recent development of the Forest Health Monitoring Unit the focus of these plots has been directed away from just the spruce budworm to a plot system that monitors the health of balsam fir, black spruce, and white spruce. Information on the current spruce budworm situation can be found in the major forest disturbances section of this report.

A spruce budworm infestation has been present in various areas of the Northwest Region since the late 1970s. Because of the tremendous impact the spruce budworm has had over the years on spruce/fir stands in the region, the trees are generally in very poor condition. Appendix 6 summarizes the condition of the tree tops and mortality from 1993 to 1996— some plots were not established until 1994. Tree mortality present when the plots were established is not reflected in this table. Generally, there has been a high number of trees with bare and dead tops over the years in many of the plots, particularly when dealing with balsam fir (Fig. 18). Black spruce and

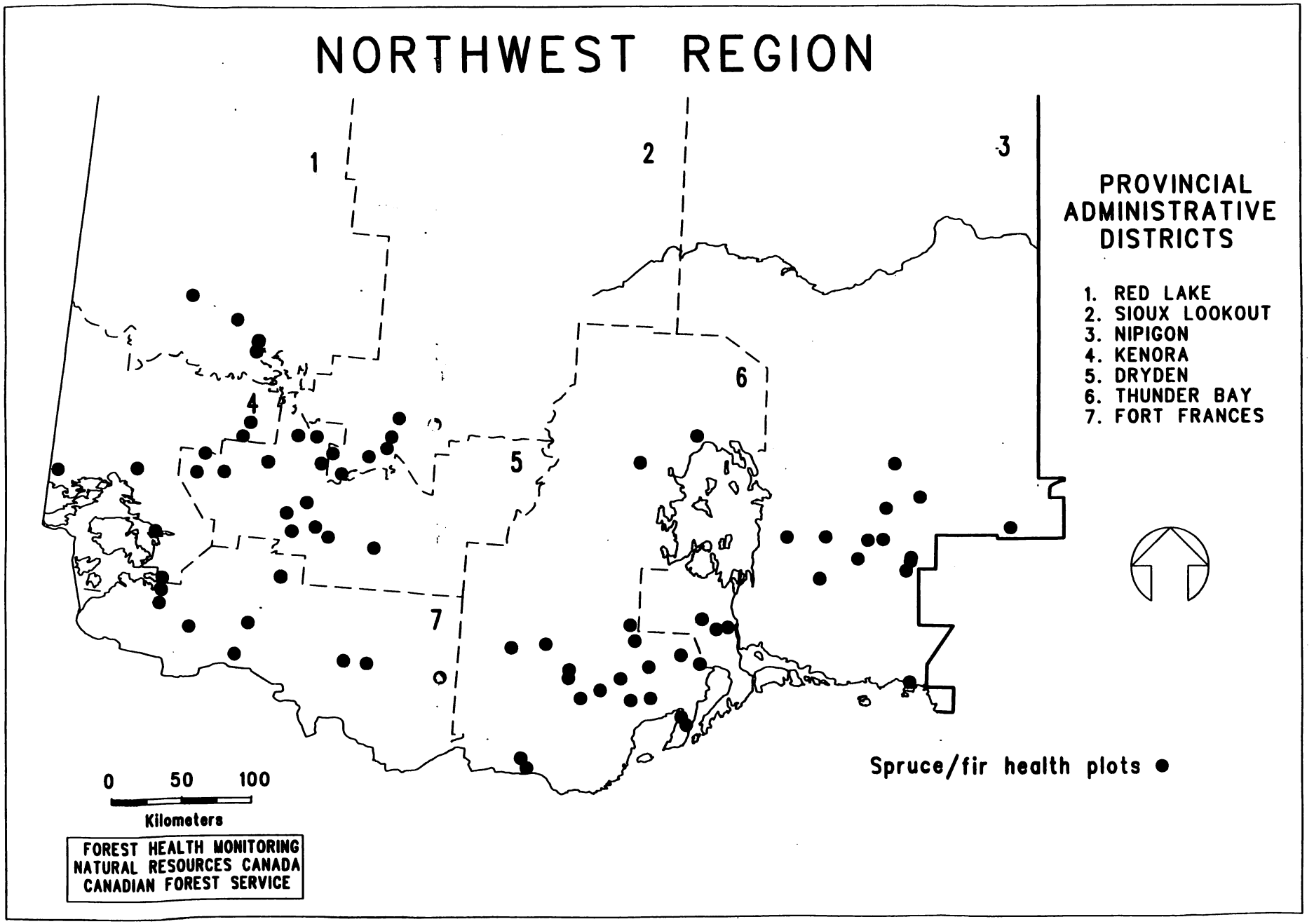

Figure 17. Locations of the spruce/fir health plots in 1996.

Spruce/Fir Health

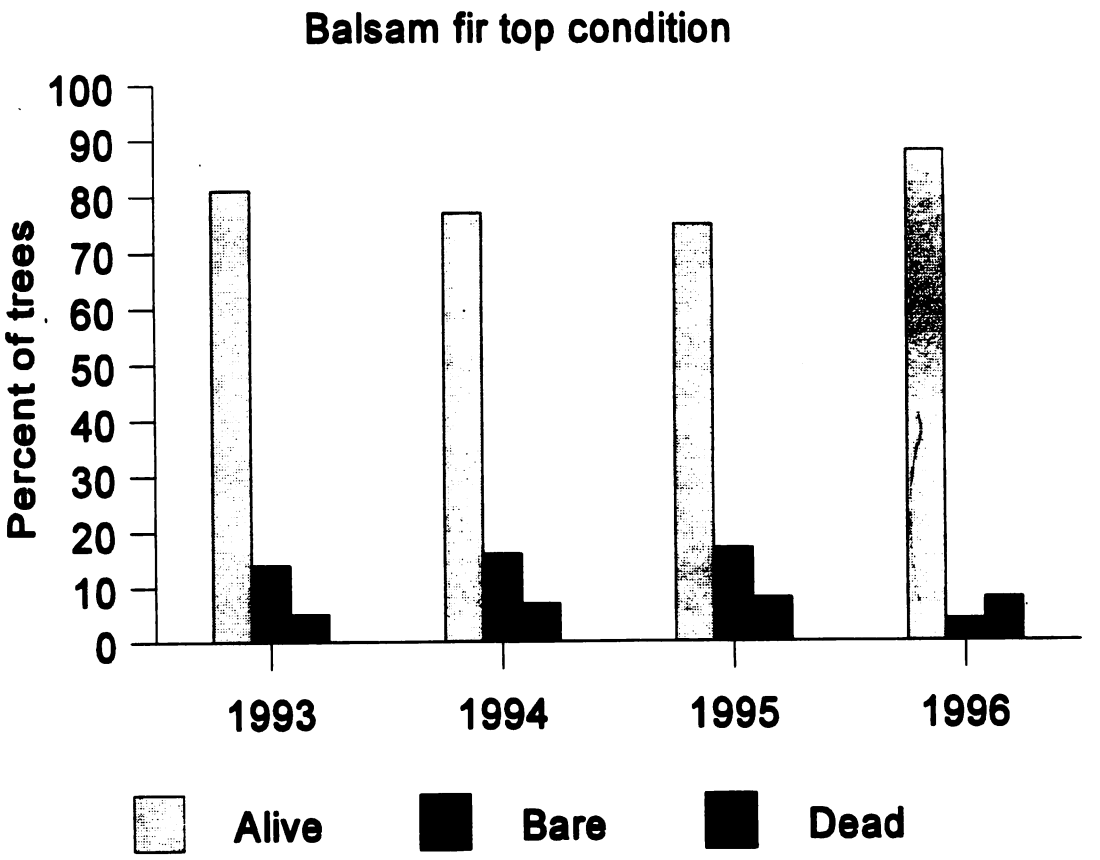

Figure 18. Comparison of the top condition of all balsam fir (Abies balsamea *[L.] Mill.) in the spruce/fir health plots in the Northwest Region from 1993 to 1996.*

white spruce tops did not suffer to the extent that the balsam fir did (Figs. 19 and 20). Also, higher annual mortality levels are reflective of the impact that the spruce budworm has had in these stands prior to and during the monitoring of the plots. In addition to the spruce budworm, various bark beetles and wood boring insects, Armillaria root rot, and blowdown have also contributed to tree mortality.

The ARNEWS system of assessing crown conditions (Table 7) was used in the spruce/fir plots for the first time in 1996 (Appendix 7). The column in this appendix that lists the old dead trees does not include any dead trees that were present in the plot when it was established. The overall crown condition of the various species in the plots is mainly a result of the compounding affect of spruce budworm defoliation over the years. Numerous plots had crown damage levels exceeding 3.0, the relatively healthy category. In all plots across the region 29 percent of the living balsam fir (1 222 trees) were found in Category 4.0 or higher; 16 percent (456 trees) of the trees died in 1996 (Fig. 21). A total of 17 percent of the 527 black spruce and 50 percent of the

230 white spruce were positioned in Category 4.0 or higher (Figs. 22 and 23). In 1996 mortality levels of 3 percent (16 trees) in the black spruce and 5 percent (14 trees) in the white spruce were recorded.

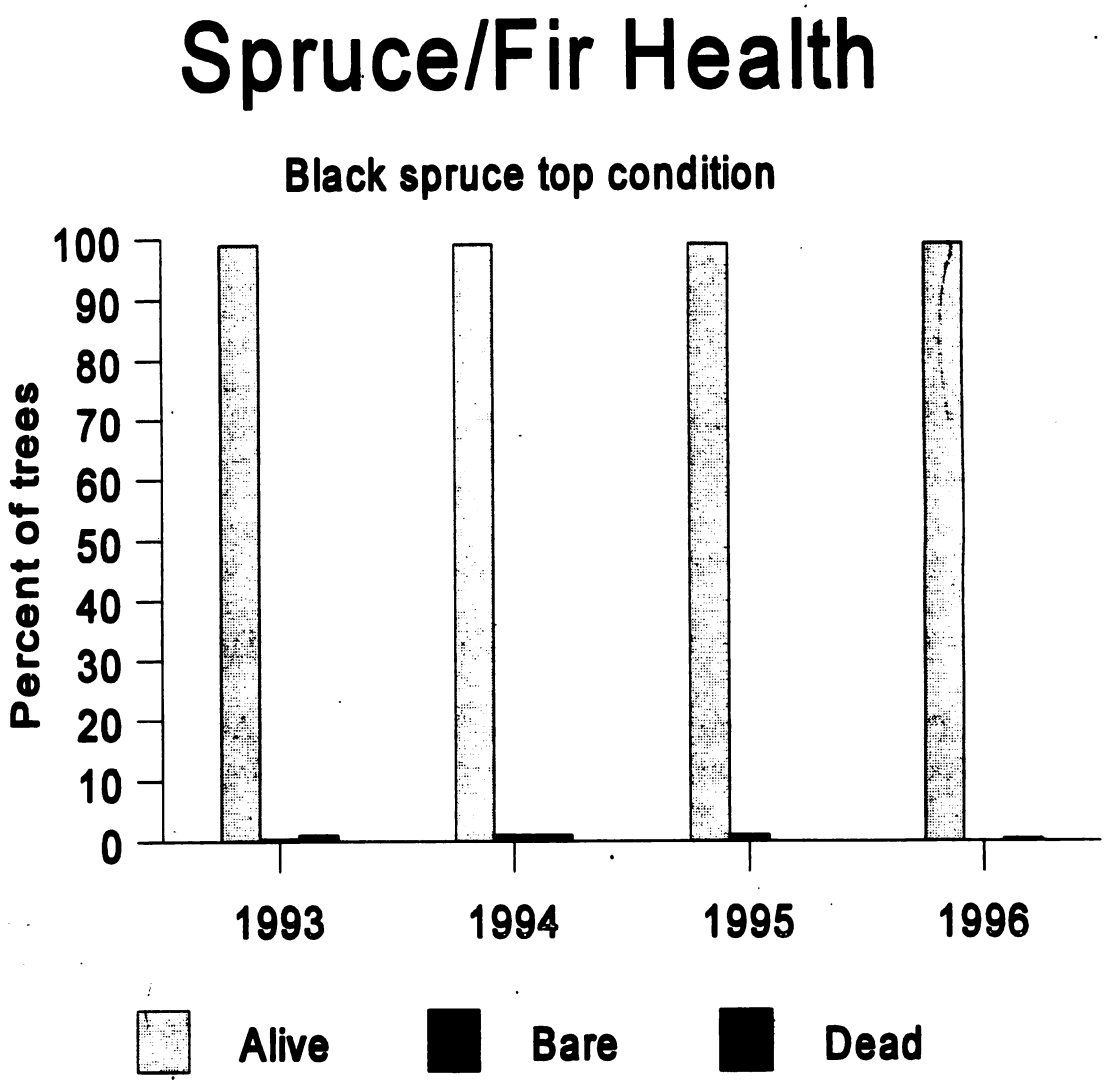

Figure 19. Comparison of the top condition of all black spruce (Picea mariana *[Mill.] B.S.P.) in the spruce/fir health plots in the Northwest Region from 1993 to 1996.*

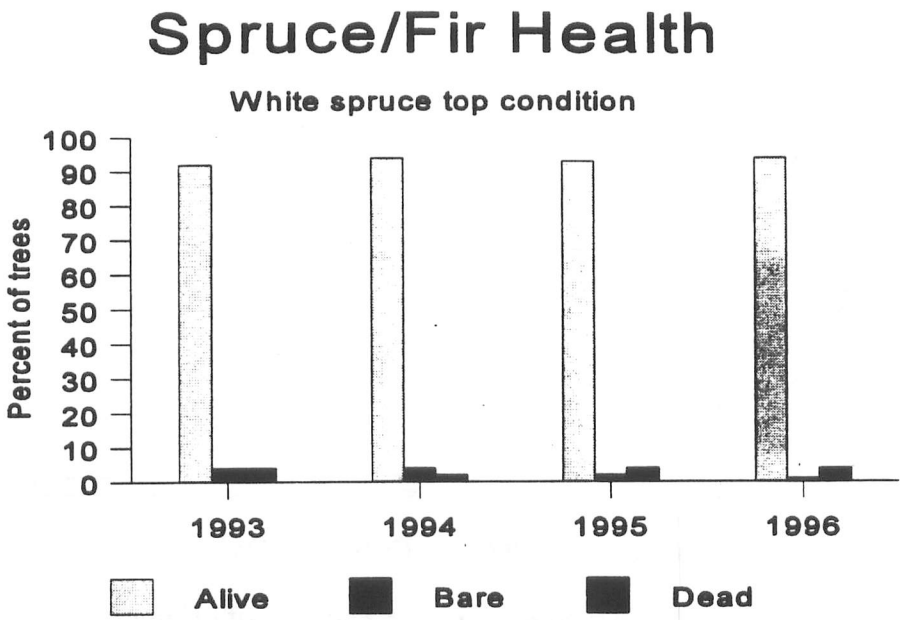

Figure 20. Comparison of the top condition of all white spruce (Picea glauca *[Moench] Voss.) in the spruce/fir health plots in the Northwest Region from 1993 to 1996.*

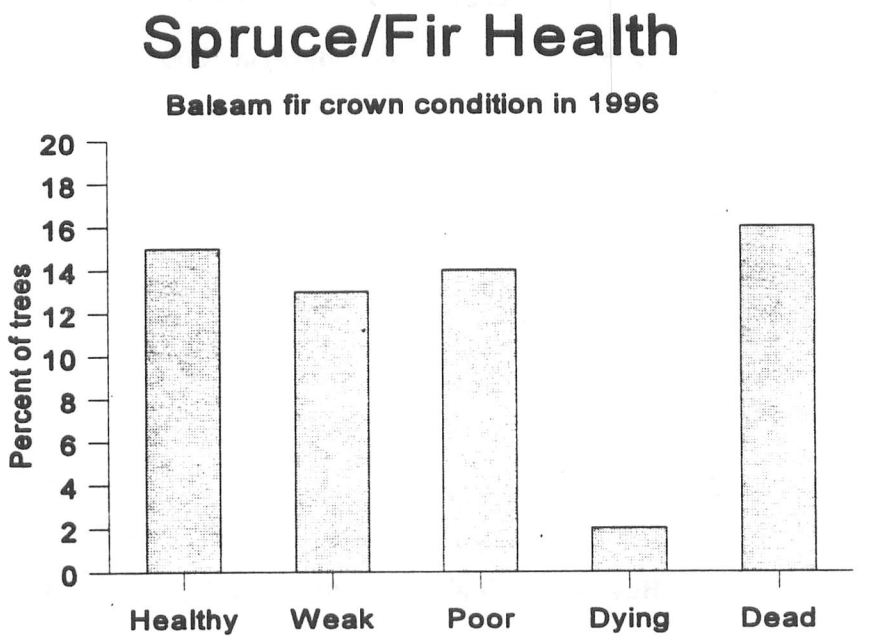

Figure 21. Tree crown condition (see Table 7) *of all the balsam fir* (Abies balsamea *[L.] Mill.) in the spruce/fir health plots in the Northwest Region in 1996.*

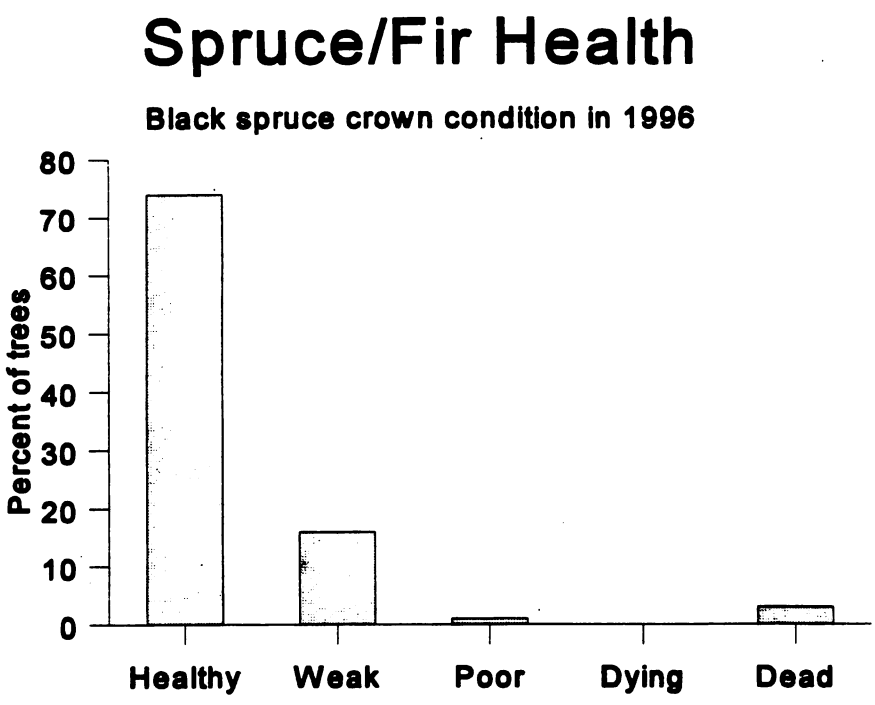

Figure 22. Tree crown condition (see Table 7) *of all the black spruce* (Picea mariana *[Mill.] B.S.P.) in the spruce/fir health plots in the Northwest Region in 1996.*

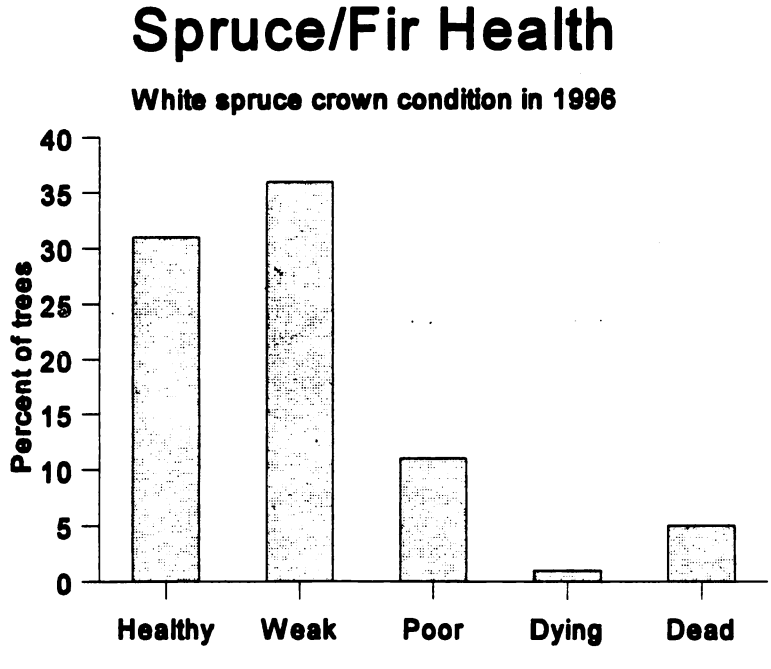

Figure 23. Tree crown condition (see Table 7) *of all the white spruce* (Picea glauca *[Moench] Voss.) in the spruce/fir health plots in the Northwest Region in 1996.*

The living portion of the tree crown was divided into three equal sections for assessment purposes. Damaged areas included those parts of the crown that have been impacted by agents to the extent that the vigor of the tree has been reduced. Again, because of the long standing spruce budworm infestation, high levels of damage were noted in the spruce/fir plots. This was particularly apparent in the balsam fir (Table 13) where the majority of the damage (6–75 percent) was found in all three levels of the crown. Very little damage was observed in the black spruce (Table 14), mainly because spruce budworm has less impact on this host. White spruce crown damage (Table 15) was similar to that of the balsam fir; all three sections of the crown were affected.

Table 13. Summary of balsam fir damage levels as seen in the upper, middle, and lower third of the crowns in 76 spruce/fir health plots for 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 1 174 balsam fir trees.)

Crown damage levels[a] (%)	Tree crown		
	Upper[b]	Middle	Lower
	Number of trees		
None visible	82	49	17
1–5	34	11	2
6–15	201	143	86
16–25	181	197	113
26–35	168	165	132
36–45	112	138	148
46–55	111	118	136
56–65	119	114	113
66–75	83	122	132
76–85	51	61	140
86–100	78	56	155

[a] Includes all types of damage affecting tree vigour (e.g., dead twigs, dead branches, dead tops, missing foliage, and damaged foliage).

[b] All trees having crowns less than 3 m in length were assessed in this category.

Table 14. Summary of black spruce damage levels as seen in the upper, middle, and lower third of the crowns in 56 spruce/fir health plots for 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 559 black spruce trees.)

Crown damage levels[a] (%)	Tree crown		
	Upper[b]	Middle	Lower
	Number of trees		
None visible	300	173	53
1–5	146	114	66
6–15	105	145	141
16–25	10	90	130
26–35	4	21	93
36–45	2	8	24
46–55	2	3	25
56–65	1	0	14
66–75	2	2	5
76–85	0	3	6
86–100	2	0	2

[a] Includes all types of damage affecting tree vigour (e.g., dead twigs, dead branches, dead tops, missing foliage, and damaged foliage).

[b] All trees having crowns less than 3 m in length were assessed in this category.

Table 15. Summary of white spruce damage levels as seen in the upper, middle, and lower third of the crowns in 67 spruce/fir health plots for 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 288 white spruce trees.)

Crown damage levels[a] (%)	Tree crown		
	Upper[b]	Middle	Lower
	Number of trees		
None visible	29	14	10
1–5	13	3	0
6–15	90	29	14
16–25	54	53	26
26–35	42	67	41
36–45	26	49	34
46–55	16	27	23
56–65	6	16	39
66–75	13	13	34
76–85	3	10	38
86–100	10	7	29

[a] Includes all types of damage affecting tree vigour (e.g., dead twigs, dead branches, dead tops, missing foliage, and damaged foliage).

[b] All trees having crowns less than 3 m in length were assessed in this category.

QUARANTINE PESTS

Gypsy Moth, *Lymantria dispar* (L.)

Defoliation by the gypsy moth caterpillar has not yet been found in the Northwest Region. The closest infestation is in the Sudbury District in the south central part of the Northeast Region. In an effort to detect the presence of this forest insect, pheromone trapping has been carried out for 12 years in the Northwest Region. Trace levels of male moths have been captured over the years at various sites.

Two delta style pheromone traps were deployed at each of 19 sites across the region in 1996. The park locations trapped were as follows: Blue Lake and Sandbar Lake parks in the Dryden District; Caliper Lake, Lake of the Woods, and Quetico (Dawson Trail Campground) parks in the Fort Frances District; Rushing River and Sioux Narrows parks in the Kenora

District; Lake Nipigon, MacLeod, Neys, Rainbow Falls, and Rossport parks in the Nipigon District; Pakwash Park in the Red Lake District; Ojibway Park in the Sioux Lookout District; and Inwood, Kakabeka Falls, and Sleeping Giant parks in the Thunder Bay District. Trapping was also carried out at Minaki Lodge in the Kenora District and at Leunenburger's Fly-In Service (Nakina Base) in the Nipigon District. A single moth was found in a trap at Lake Nipigon Provincial Park in the Nipigon District in 1996. Two moths had been captured at this park in 1992.

Appendix 1. Northwest Region–Spruce Budworm. (Summary of defoliation estimates and egg-mass counts in 1996 and infestation forecasts for 1997. All sampling was done in spruce/fir health plots.)

Location	Host[a]	Estimated defoliation in 1996 (%)	Number of egg masses per 9.29m^2 of foliage	Infestation forecasts for 1996[b]	Accumulated damage[c]
Dryden District (10 locations)					
Coronary Lake–stand 278	bF	30	303	S	5
Emmons Lake–stand 451	bF	6	133	M-S	3
Emmons Lake–stand 451	wS	12	859	S	1
Forest Lake–stand 22	bF	13	0	N	2
Ilsley Township–stand 270	bF	11	0	N	1
Langton Township–stand 144	bF	64	175	M-S	3
Langton Township–stand 144	wS	50	813	S	2
McIlraith Township–stand 10	bF	43	140	M-S	4
McIlraith Township–stand 10	bS	12	182	M-S	1
North Road–stand 9	bF	86	261	S	6
North Road–stand 9	bS	8	484	S	1
Rugby Township–stand 96	bF	19	100	M-S	6
Rugby Township–stand 96	wS	34	516	S	2
Satterly Township–stand 135	bF	10	50	L-M	4
Satterly Township–stand 135	bS	16	72	M-S	1
Southworth Township–stand 32	bF	6	0	N	7
Fort Frances District (7 locations)					
Big Sawbill Lake–stand 196	bF	10	489	S	6
Calm Lake–stand 108	bF	10	0	N	6
Calm Lake–stand 108	bS	3	43	M-S	1
Claxton Township–stand 23	bF	4	0	N	7
French Lake	bF	6	0	N	8
French Lake	wS	12	134	M-S	2
Lake Hope–stand 124	bF	23	738	S	2

Appendix 1. Northwest Region–Spruce Budworm. (Summary of defoliation estimates and egg-mass counts in 1996 and infestation forecasts for 1997. All sampling was done in spruce/fir health plots.) (cont'd)

Location	Host[a]	Estimated defoliation in 1996 (%)	Number of egg masses per 9.29m^2 of foliage	Infestation forecasts for 1996[b]	Accumulated damage[c]
Fort Frances District (7 locations) (concl).					
Menary Township–stand 84	bF	38	582	S	2
Watten Township–stand 158	bF	13	333	S	5
Kenora District (5 locations)					
April Lake–stand 134	bF	68	555	S	3
Cliff Lake–stand 251	bF	28	66	L-M	8
Cliff Lake–stand 251	wS	49	904	S	2
Ewart Township–stand 28	bF	4	16	L-M	-
Haycock Township–stand 384	bF	20	233	S	3
Willingdon Township–stand 156	bF	2	0	N	-
Nipigon District (10 locations)					
Ashmore Township–stand 191	bF	3	6	L-M	5
Ashmore Township–stand 191	wS	2	0	N	1
Booth Township–stand 47	bF	3	0	N	6
Burrows Lake South–stand 123	bF	3	8	L	2
Burrows Lake South–stand 123	wS	4	0	N	2
Catlonite Road	bF	4	15	L-M	4
Catlonite Road	bS	0	0	N	1
Grain Township (Coldwell)	bF	0	0	N	-
Legault Township East	bF	5	13	L-M	3
Legault Township East	wS	3	99	M	3
Nakina Township–stand 119	bF	18	0	N	2
Nakina Township –stand 119	wS	13	79	L-M	2
Nibs Lake–stand 348	bF	3	11	L-M	4

Appendix 1. Northwest Region–Spruce Budworm. (Summary of defoliation estimates and egg-mass counts in 1996 and infestation forecasts for 1997. All sampling was done in spruce/fir health plots.) (cont'd)

Location	Host[a]	Estimated defoliation in 1996 (%)	Number of egg masses per 9.29m^2 of foliage	Infestation forecasts for 1996[b]	Accumulated damage[c]
Nipigon District (10 locations) (concl.)					
Nibs Lake–stand 348	wS	2	29	L-M	4
Parent Township–stand 2696	bF	8	0	N	1
Parent Township–stand 2696	wS	3	0	N	1
Windigokan Lake–stand 267	bF	5	24	L-M	7
Red Lake District (3 locations)					
Baird Township–stand 162	bF	14	76	M-S	7
Goldpine Road–stand 734	bF	28	330	S	6
Goldpine Road–stand 734	wS	20	647	S	5
Snake Falls Road–stand 38	bF	24	360	S	7
Snake Falls Road–stand 38	wS	25	209	M-S	2
Sioux Lookout District (7 locations)					
Burma Lake Road–stand 282	bF	17	104	M-S	5
Burma Lake Road–stand 282	bS	13	0	N	1
Deception Lake–stand 96	bF	49	306	S	3
Drayton Township–stand 234	bF	23	167	M-S	2
Drayton Township–stand 234	wS	18	276	M-S	1
Foley Lake–stand 287	bF	45	208	M-S	3
Pape Lake–stand 136	bF	12	78	M-S	3
Pickerel Township–stand 230	bF	15	78	M-S	2
Pickerel Township–stand 230	wS	52	472	S	2
Thunder Bay District (14 locations)					
Buzzer Lake Road–stand 13	bF	15	144	M-S	6

Appendix 1. Northwest Region–Spruce Budworm. (Summary of defoliation estimates and egg-mass counts in 1996 and infestation forecasts for 1997. All sampling was done in spruce/fir health plots.) (cont'd)

Location	Host[a]	Estimated defoliation in 1996 (%)	Number of egg masses per 9.29m^2 of foliage	Infestation forecasts for 1996[b]	Accumulated damage[c]
Thunder Bay District (14 locations) (concl.)					
Buzzer Lake Road–stand 13	wS	12	304	S	2
Decoursey Lake–stand 62	bF	5	0	N	2
Dog Lake–stand 60	bF	35	18	L	5
Fallis Township–stand 281	bF	6	0	N	1
Forbes Township–stand 256	bF	19	0	N	2
Gorham Township–stand 99	bF	49	0	N	5
Gorham Township–stand 99	wS	73	73	M-S	3
Hicks Lake Road–stand 65	bF	3	0	N	1
Michener Township–stand 276	bF	16	77	M-S	2
Milkshake Lake–stand 136	bF	4	11	L-M	5
Milkshake Lake–stand 136	wS	19	12	L	3
Sandstone Lake–stand 283	bF	4	7	L	2
Soper Township–stand 186	bF	6	41	L-M	2
Walkingshaw Lake–stand 393	bF	54	89	L-M	1
Waweig Lake–stand 265	bF	5	134	M-S	+
Wolf River Road–stand 93	bF	11	39	L-M	5

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

Appendix 2. Northwest Region–Jack Pine Budworm. (Summary of defoliation estimates and egg-mass counts in 1996 and infestation forecasts for 1997 on jack pine. All sampling was done in jack pine health plots.)

Location	Estimated defoliation in 1996 (%)	Total number of egg masses on six 61 cm branch tips	Infestation forecasts for 1997[a]
Dryden District (3 locations)			
Breithaupt Township–stand 208	0	0	N
Mutrie Township–stand 311	7	0	N
Revell River–stand 398	1	0	N
Fort Frances District (4 locations)			
Dawn Road–stand 212	0	0	N
Eltrut Lake–stand 249	1	0	N
Lake Despair–stand 24	1	0	N
Prince Road–stand 18	4	0	N
Kenora District (5 locations)			
April Lake–stand 139	1	0	N
Coyle Township–stand 245	1	0	N
Devonshire Township–stand 503	3	0	N
Gundy Township–stand 319	1	0	N
Snook Lake–stand 207	3	0	N
Red Lake District (4 locations)			
Conifer Lake–stand 190	1	0	N
Ear Falls–stand 42	1	0	N
McDonough Township–stand 403	1	0	N

Appendix 2. Northwest Region–Jack Pine Budworm. (Summary of defoliation estimates and egg-mass counts in 1996 and infestation forecasts for 1997 on jack pine. All sampling was done in jack pine health plots.) (concl.)

Location	Estimated defoliation in 1996 (%)	Total number of egg masses on six 61 cm branch tips	Infestation forecasts for 1997[a]
Red Lake District (4 locations) (concl.)			
Sidace Lake Road–stand 230	0	0	N
Sioux Lookout District (4 locations)			
Goodie Lake–stand 49	1	0	N
McAree Township–stand 57	0	0	N
Moose Lake Road–stand 116	0	0	N
Wrong Road–stand 266	0	0	N

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

Appendix 3. Table 6. Summary of pest damage found in nine ARNEWS plots in the Northwest Region of Ontario in 1996.

Location	Plot number	Pest	Host[a]	Number of trees examined	Estimated damage (%)	Incidence (%)
Dryden District						
Mafeking Township	502	*Neodiprion pratti banksianae* Roh. Blackheaded jack pine sawfly	jP	18	<5	67
		Endocronartium harknessii (J.P. Moore) Y. Hirats. Western gall rust	jP	18	<5[b]	11
Pine Road	536	*Endocronartium harknessii* (J.P. Moore) Y. Hirats. Western gall rust	jP	38	<5[b]	13
Fort Frances District						
Sapawe	535	*Phellinus igniarius* (L.:Fr.) Quél. False tinder fungus	tA	53	–	17
Kenora District						
Caribou Falls	538	*Bucculatrix canadensisella* Cham. Birch skeletonizer	wB	1	<5	100
Nipigon District						
Margo Lake	523	*Phyllonorycter ontario* (Free.) Aspen leafblotch miner	wB	1	5	100
		Chrysomyxa ledi (Alb. & Schwein.) de Bary Spruce needle rust	bS	6	5	100
Priske Township	535	*Argyrotaenia mariana* (Fern.) Graybanded leafroller and *Nites betulella* (Bsk.) Blackdotted birch leaftier	wB	23	5	50
		Messa nana (Klug) Early birch leaf edgeminer	wB	23	5	13

Appendix 3. Table 6. Summary of pest damage found in nine ARNEWS plots in the Northwest Region of Ontario in 1996. (concl.)

Location	Plot number	Pest	Host[a]	Number of trees examined	Estimated damage (%)	Incidence (%)
Nipigon District (concl.)						
Priskse Township	535	*Phratora hudsonia* Brown Birch leaf beetle	wB	23	10	73
Wiggins Township	511	*Armillaria ostoyae* (Romagn.) Herink Armillaria root rot	bF	2	–	50
		Profenusa thomsoni (Konow) Ambermarked birch leafminer	wB	12	5	50
Sioux Lookout District						
Sandel Lake	513	*Choristoneura fumiferana* (Clem.) Spruce budworm	bS	64	<5	100
		Neodiprion pratti banksianae Roh. Blackheaded jack pine sawfly	jP	13	<5	69
		Endocronartium harknessii (J.P. Moore) Y. Hirats. Western gall rust	jP	13	<5[b]	8
Thunder Bay District						
Fowler Township	502	*Choristoneura fumiferana* (Clem.) Spruce budworm	bF	3	15	100

[a] bF = balsam fir, bS = black spruce, jP = jack pine, tA = trembling aspen, and wB = white birch.
[b] Affected trees had galls present on branches only.

Appendix 3. Table 8. Summary of the crown condition and tree mortality from 1993 to 1996 for the coniferous hosts in seven ARNEWS plots in the Northwest Region of Ontario. (Only host trees that consisted of 10 percent or more of the plot are included.)

Location	Plot number	Host[a]	Number of trees examined	Year	Crown conditon[b]							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[c]	Old dead[c]	Trees cut
					Number of trees									
Dryden District														
Mafeking Township	522	jP	18	1993	17	0	0	0	0	0	0	0	0	1
			18	1994	17	0	0	0	0	0	0	0	0	1
			18	1995	17	0	0	0	0	0	0	0	0	1
			18	1996	17	0	0	0	0	0	0	0	0	1
Pine Road	536	jP	38	1993	37	0	0	0	1	0	0	0	0	0
			38	1994	37	0	0	0	1	0	0	0	0	0
			38	1995	37	0	0	0	1	0	0	0	0	0
			38	1996	33	0	5	0	0	0	0	0	0	
Fort Frances District														
Dance Township	512	jP	59	1993	46	0	0	2	0	0	0	0	11	0
			59	1994	48	0	0	0	0	0	0	0	11	0
			60	1995	49	0	0	0	0	0	0	0	11	0
			60	1996	48	0	0	0	0	0	0	1	11	0

Appendix 3. Table 8. Summary of the crown condition and tree mortality from 1993 to 1996 for the coniferous hosts in seven ARNEWS plots in the Northwest Region of Ontario. (Only host trees that consisted of 10 percent or more of the plot are included.) (cont'd)

Location	Plot number	Host[a]	Number of trees examined	Year	Crown conditon[b]								Cumulative mortality	
					1	2	3	4	5	6	7	New dead[c]	Old dead[c]	Trees cut
					Number of trees									
Nipigon District														
Wiggins Township	511	wS	26	1993	0	6	7	7	0	0	0	2	4	0
			26	1994	0	0	13	5	1	0	0	1	6	0
			26	1995	1	7	9	0	0	0	0	2	7	0
			26	1996	10	1	1	0	0	0	0	5	9	0
		bS	10	1993	0	6	0	0	0	0	0	0	4	0
			10	1994	0	3	3	0	0	0	0	0	4	0
			10	1995	3	3	0	0	0	0	0	0	4	0
			10	1996	2	0	0	0	0	0	0	4	4	0
Margo Lake	523	jP	10	1993	8	0	0	0	0	0	0	0	2	0
			10	1994	8	0	0	0	0	0	0	0	2	0
			10	1995	8	0	0	0	0	0	0	0	2	0
			10	1996	7	1	0	0	0	0	0	0	2	0
		bS	6	1993	0	6	0	0	0	0	0	0	0	0

Appendix 3. Table 8. Summary of the crown condition and tree mortality from 1993 to 1996 for the coniferous hosts in seven ARNEWS plots in the Northwest Region of Ontario. (Only host trees that consisted of 10 percent or more of the plot are included.) (cont'd)

Location	Plot number	Host[a]	Number of trees examined	Year	Crown conditon[b]							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[c]	Old dead[c]	Trees cut
					Number of trees									
Nipigon District (concl.)														
Margo Lake	523	bS	6	1994	3	3	0	0	0	0	0	0	0	0
			6	1995	1	5	0	0	0	0	0	0	0	0
			6	1996	6	0	0	0	0	0	0	0	0	0
Sioux Lookout District														
Sandel Lake	513	bS	57	1993	0	0	52	1	0	0	0	0	4	0
			57	1994	0	0	53	0	0	0	0	0	4	0
			63	1995	0	0	57	1	0	0	0	1	4	0
			63	1996	3	0	54	0	0	0	0	1	5	0
		jP	13	1993	11	0	0	1	0	1	0	0	0	0
			13	1994	12	0	0	1	0	0	0	0	0	0
			13	1995	12	0	0	1	0	0	0	0	0	0
			13	1996	4	0	9	0	0	0	0	0	0	0

Appendix 3. Table 8. Summary of the crown condition and tree mortality from 1993 to 1996 for the coniferous hosts in seven ARNEWS plots in the Northwest Region of Ontario. (Only host trees that consisted of 10 percent or more of the plot are included.) (cont'd)

Location	Plot number	Host[a]	Number of trees examined	Year	Crown conditon[b]							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[c]	Old dead[c]	Trees cut
					Number of trees									
Thunder Bay District														
Fowler Township	502	bS	49	1993	18	28	0	0	0	0	0	0	3	0
			49	1994	0	46	0	0	0	0	0	0	3	0
			49	1995	13	32	1	0	0	0	0	0	3	0
			49	1996	45	0	0	0	1	0	0	0	3	0
		bF	7	1993	0	1	0	3	1	0	0	1	1	0
			7	1994	0	0	1	1	0	1	2	0	2	0
			7	1995	0	1	0	2	0	2	0	0	2	0
			7	1996	0	0	0	1	3	0	0	1	2	0

[a] bF = balsam fir, bS = black spruce, jP = jack pine, and wS = white spruce.

[b] 1 = no defoliation; 2 = only current foliage defoliated, less than 25 percent; 3 = current and/or some older foliage defoliated, less than 25 percent; 4 = 25 to 50 percent defoliation; 5 = 51 to 75 percent defoliation; 6 = 76 to 90 percent defoliation; and 7 = more than 90 percent defoliation.

[c] Tree mortality resulting from natural causes.

Appendix 3. Table 9. Summary of the crown condition and tree mortality from 1993 to 1996 for the deciduous hosts in five ARNEWS plots in the Northwest Region of Ontario. (Only host trees that consisted of 10 percent or more of the plot are included.)

Location	Plot number	Host[a]	Number of trees examined	Year	Crown condition[b]											Cumulative mortality		
					10	20	30	35	40	45	50	55	60	65	70	New dead[c]	Old dead[c]	Trees cut
					Number of trees													
Fort Frances District																		
Sapawe	534	tA	53	1993	48	1	0	0	0	0	0	0	0	0	0	2	2	0
			53	1994	47	2	0	0	0	0	0	0	0	0	0	0	4	0
			53	1995	36	0	8	1	4	0	0	0	0	0	0	0	4	0
			53	1996	5	1	33	0	9	0	0	0	0	0	0	1	4	0
Kenora District																		
Caribou Falls Road	538	tA	17	1993	0	0	12	0	5	0	0	0	0	0	0	0	0	0
			17	1994	0	0	6	0	11	0	0	0	0	0	0	0	0	0
			17	1995	0	0	14	0	2	0	0	0	0	0	0	1	0	0
			17	1996	4	0	8	0	4	0	0	0	0	0	0	0	1	0
Nipigon District																		
Wiggins Township	511	wB	12	1993	11	0	0	0	0	0	0	0	0	0	0	0	1	0
			12	1994	9	0	0	0	1	1	0	0	0	0	0	0	1	0
			12	1995	6	2	1	0	1	0	0	1	0	0	0	0	1	0
			12	1996	0	0	6	3	2	0	0	0	0	0	0	0	1	0

Appendix 3. Table 9. Summary of the crown condition and tree mortality from 1993 to 1996 for the deciduous hosts in five ARNEWS plots in the Northwest Region of Ontario. (Only host trees that consisted of 10 percent or more of the plot are included.) (concl.)

Location	Plot number	Host[a]	Number of trees examined	Year	Crown condition[b]											Cumulative mortality		
					10	20	30	35	40	45	50	55	60	65	70	New dead[c]	Old dead[c]	Trees cut
					Number of trees													
Nipigon District (concl.)																		
Schreiber Township	535	wB	23	1993	6	0	10	0	4	3	0	0	0	0	0	0	0	0
			23	1994	8	1	5	2	6	0	1	0	0	0	0	0	0	0
			23	1995	1	0	9	8	2	2	0	0	1	0	0	0	0	0
			23	1996	1	0	8	5	2	6	1	0	0	0	0	0	0	0
Red Lake District																		
Ear Falls	537	wB	23	1993	9	0	6	0	7	1	0	0	0	0	0	0	0	0
			23	1994	6	0	12	0	5	0	0	0	0	0	0	0	0	0
			23	1995	0	0	16	0	7	0	0	0	0	0	0	0	0	0
			23	1996	9	0	14	0	0	0	0	0	0	0	0	0	0	0

[a] tA = trembling aspen and wB = white birch.

[b] 10 = no damage; 20 = foliage thin, off-color with no dead branches or bare twigs visible; 30 = no dead branches present and bare twigs present in up to 5 percent of the crown; 35 = no dead branches present and bare twigs present in more than 6 percent of the crown; 40 = dead branches and bare twigs present in up to 15 percent of the crown; 45 = dead branches and bare twigs present in 16 to 25 percent of the crown; 50 = dead branches and bare twigs present in 26 to 37 percent of the crown; 55 = dead branches and bare twigs present in 38 to 50 percent of the crown; 60 = dead branches and bare twigs present in 51 to 75 percent of the crown; 65 = dead branches and bare twigs present in 76 percent or more of the crown; and 70 = more than 50 percent of the crown dead with only small adventitious branches present, usually at the base of the crown or stem.

[c] Tree mortality resulting from natural causes.

Appendix 3. Table 10. Summary of annual mortality for on and off plot tree species found in six ARNEWS plots from 1985 to 1996 in the Northwest Region of Ontario.

Host (Plots with host)	Dominance[a]	Number of trees examined	Annual mortality												
			1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total (%)
			Number of trees												
Balsam fir	1	16	0	0	0	0	0	2	0	1	0	1	1	2	7 (44)
(502 511 513 523)	2	4	0	0	0	0	0	0	0	0	1	0	0	0	1 (25)
Black spruce	1	140	1	0	0	0	2	2	2	2	0	1	1	4	15 (11)
(502 511 513 523)	2	39	0	0	1	0	0	0	0	1	0	0	0	2	4 (10)
White spruce	1	19	0	0	0	0	0	2	1	0	1	0	0	4	8 (42)
(511)	2	18	0	0	0	0	0	1	1	0	3	1	2	1	9 (50)
Jack pine	1	132	1	2	0	0	1	1	3	3	0	0	0	1	12 (9)
(512 513 522 523)	2	9	0	2	1	0	0	0	0	1	0	0	0	0	4 (44)
White birch	1	14	0	0	0	1	0	0	1	0	1	0	0	0	3 (21)
(502 511 512)	2	17	0	0	0	0	1	0	0	1	0	0	0	0	2 (12)
Trembling aspen	1	4	0	0	0	0	0	0	1	0	0	0	0	0	1 (25)
(512 523)	2	2	0	0	0	0	0	0	1	0	0	0	1	0	2 (100)

[a] 1 = dominant and codominant trees and 2 = intermediate and suppressed trees.

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.)

Location	Plot number	Average height (m)	Year	Condition of top			Cumulative tree mortality[a]	Trees cut
				Live	Bare	Dead		
				Number of trees				
Dryden District								
Breithaupt Township	91	13.5	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	48	0	0	2	0
Basket Lake	92	8.8	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	0	0	1	0
Bradshaw Township	93	23.4	1993	47	3	0	0	0
			1994	49	0	0	1	0
			1995	47	0	1	2	0
			1996	47	0	0	3	0
Bradshaw Township	94	9.8	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	0	0	1	0
McIlraith Township	95	8.4	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Hodgson Township	96	22.5	1993	49	0	1	0	0
			1994	48	0	0	2	0
			1995	47	0	0	3	0
			1996	47	0	0	3	0
Ilsley Township	97	7.2	1993	50	0	0	0	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top: Live	Bare	Dead	Cumulative tree mortality[a]	Trees cut
				Number of trees				
Dryden District (cont'd)								
Ilsley Township	97		1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Lac Seul - Williams Bay	98	19.0	1993	50	0	0	0	0
			1994	48	0	1	1	0
			1995	47	0	1	2	0
			1996	47	0	0	3	0
Lac Seul - Route Bay	99	15.0	1993	50	0	0	0	0
			1994	49	0	0	1	0
			1995	49	0	0	1	0
			1996	49	0	0	1	0
Mafeking Township	100	16.7	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	49	0	0	1	0
McNevin Township	101	24.8	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Mutrie Township	102	18.9	1993	50	0	0	0	0
			1994	49	0	0	1	0
			1995	49	0	0	1	0
			1996	49	0	0	1	0
Revell River	103	16.7	1993	50	0	0	0	0
			1994	50	0	0	0	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top			Cumulative tree mortality[a]	Trees cut
				Live	Bare	Dead		
				Number of trees				
Dryden District (concl.)								
Revell River	103		1995	50	0	0	0	0
			1996	49	0	0	1	0
Suzanne Lake	105	10.4	1993	48	2	0	0	0
			1994	48	0	1	1	0
			1995	49	0	0	1	0
			1996	49	0	0	1	0
Turtle River	106	20.0	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Wabigoon Township	107	17.8	1993	50	0	0	0	0
			1994	49	1	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Wabigoon Township	108	21.5	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	0	0	1	0
Fort Frances District								
Claxton Township	109	2.8	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Dance Township	181	2.8	1993	50	0	0	0	0
			1994	50	0	0	0	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top: Live	Bare	Dead	Cumulative tree mortality[a]	Trees cut
				Number of trees				
Fort Frances District (cont'd)								
Dance Township	181		1995	49	1	0	0	0
			1996	49	0	0	1	0
Dawn Road	110	17.3	1993	49	0	1	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Eltrut Lake	111	18.7	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	48	0	0	2	0
			1996	43	0	0	7	0
Eltrut Lake	112	17.7	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	0	0	1	0
Fish Hawk Road	113	16.5	1993	50	0	0	0	0
			1994	49	0	1	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Gallo Lake	114	19.6	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	44	0	0	6	0
Heathcliff Lake	115	2.5	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top: Live	Bare	Dead	Cumulative tree mortality[a]	Trees *cut*
				Number of trees				
Fort Frances District (cont'd)								
Heathcliff Lake	115		1996	50	0	0	0	0
Hillyer Creek	116	2.1	1993	44	0	6	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	48	0	1	0	1
Lake Despair	117	14.0	1993	49	0	1	0	0
			1994	48	0	1	1	0
			1995	49	0	0	1	0
			1996	47	0	1	2	0
Prince Road	118	16.7	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	47	0	0	3	0
Rawlinson Creek	119	17.8	1993	49	1	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	0	0	1	0
Rawlinson Creek	120	20.5	1993	49	0	1	0	0
			1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	48	0	0	2	0
Skull Lake	121	20.5	1993	44	4	2	0	0
			1994	47	0	3	0	0
			1995	47	1	1	1	0
			1996	46	0	0	4	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top			Cumulative tree mortality[a]	Trees cut
				Live	Bare	Dead		
				Number of trees				
Fort Frances District (concl.)								
Straw Lake	122	19.6	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	46	0	0	4	0
Triple Road	123	16.3	1993	49	1	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	0	0	1	0
Kenora District								
April Lake	124	14.1	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Kirkup Township	125	16.0	1993	49	1	0	0	0
			1994	49	1	0	0	0
			1995	48	0	2	0	0
			1996	49	0	0	1	0
Coyle Township	126	10.9	1993	48	0	2	0	0
			1994	48	0	2	0	0
			1995	48	0	1	1	0
			1996	47	1	0	2	0
Devonshire Township	127	15.6	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	49	0	0	1	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top: Live	Bare	Dead	Cumulative tree mortality[a]	Trees cut
				Number of trees				
Kenora District (cont'd)								
Gundy Township	128	14.5	1993	43	0	7	0	0
			1994	46	1	2	1	0
			1995	43	0	6	1	0
			1996	47	0	2	1	0
Work Township	129	15.2	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
John Lake	130	3.1	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
MacNicol Township	131	15.7	1993	49	0	1	0	0
			1994	47	0	1	2	0
			1995	47	0	1	2	0
			1996	47	0	0	3	0
Mark Lake	132	3.4	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Jaffray Township	133	15.8	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Snook Lake	134	15.1	1993	49	0	1	0	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top: Live	Bare	Dead	Cumulative tree mortality[a]	Trees cut
				Number of trees				
Kenora District (concl.)								
Snook Lake	134		1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	49	0	0	1	0
Stokes Lake	135	14.1	1993	49	0	1	0	0
			1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	49	0	0	1	0
Wabigoon Lake	137	13.4	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	0	0	1	0
Red Lake District								
Bateman Township	138	3.4	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Bateman Township	139	2.7	1993	46	0	4	0	0
			1994	48	0	1	1	0
			1995	47	0	1	1	0
			1996	45	0	2	1	2
Coli Lake	140	2.1	1993	48	0	2	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	44	0	3	0	3
Conifer Lake	141	18.4	1993	50	0	0	0	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top: Live	Bare	Dead	Cumulative tree mortality[a]	Trees cut
				Number of trees				
Red Lake District (cont'd)								
Conifer Lake	141		1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	47	0	0	3	0
Ear Falls	142	18.4	1993	48	1	1	0	0
			1994	48	0	1	1	0
			1995	48	0	0	2	0
			1996	46	1	1	2	0
Emarton Lake	143	11.2	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	1	0	0	0
Flundra Lake	144	9.7	1993	48	1	1	0	0
			1994	49	0	1	0	0
			1995	48	1	1	0	0
			1996	47	0	3	0	0
Gleave Lake	145	8.8	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	48	2	0	0	0
Graves Township	146	1.4	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
McDonough Township	147	17.6	1993	47	1	2	0	0
			1994	48	0	1	1	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top: Live	Bare	Dead	Cumulative tree mortality[a]	Trees cut
				Number of trees				
Red Lake District (cont'd)								
McDonough Township	147		1995	48	0	0	2	0
			1996	48	0	0	2	0
McDonough Township	148	16.3	1993	48	0	2	0	0
			1994	49	0	0	1	0
			1995	48	0	0	2	0
			1996	47	0	0	3	0
McDonough Township	149	15.4	1993	45	0	5	0	0
			1994	50	0	0	0	0
			1995	49	0	1	0	0
			1996	48	1	0	1	0
McKenzie Bay Road	150	10.1	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
McKenzie Bay Road	151	10.5	1993	49	1	0	0	0
			1994	48	0	1	1	0
			1995	49	0	0	1	0
			1996	47	0	1	2	0
North Road	152	16.4	1993	44	0	6	0	0
			1994	44	0	5	1	0
			1995	49	0	0	1	0
			1996	49	0	0	1	0
Nungesser Road	153	15.9	1993	47	0	3	0	0
			1994	46	0	3	1	0
			1995	48	0	0	2	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top: Live	Bare	Dead	Cumulative tree mortality[a]	Trees *cut*
				Number of trees				
Red Lake District (cont'd)								
Nungesser Road	153		1996	47	0	0	3	0
Nungesser Road	154	15.7	1993	36	0	14	0	0
			1994	39	0	10	1	0
			1995	44	4	1	1	0
			1996	41	0	8	1	0
Nungesser River	156	16.7	1993	42	2	6	0	0
			1994	39	0	8	3	0
			1995	43	1	2	4	0
			1996	38	1	6	5	0
Overnight Road	157	18.9	1993	49	0	1	0	0
			1994	50	0	0	0	0
			1995	47	0	0	3	0
			1996	45	0	1	4	0
Sidace Lake Road	158	13.2	1993	49	0	1	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	48	2	0	0	0
Sidace Lake Road	159	2.9	1993	49	0	1	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Wenesaga Lake	160	18.7	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	1	0	0	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top			Cumulative tree mortality[a]	Trees cut
				Live	Bare	Dead		
				Number of trees				
Red Lake District (concl.)								
Zimring Road	161	13.3	1993	42	1	7	0	0
			1994	46	0	4	0	0
			1995	46	1	3	0	0
			1996	43	0	0	7	0
Sioux Lookout District								
Drayton Township	163	9.1	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Elbow Lake Road	164	6.2	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Goodie Lake	165	17.2	1993	48	0	2	0	0
			1994	49	0	1	0	0
			1995	48	0	2	0	0
			1996	49	0	1	0	0
Goodie Lake	166	25.0	1993	49	0	0	1	0
			1994	49	0	0	1	0
			1995	48	0	0	2	0
			1996	47	0	0	3	0
Goodie Lake	167	3.8	1993	48	1	0	0	0
			1994	49	0	0	1	0
			1995	49	0	0	1	0
			1996	47	0	0	3	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top: Live	Bare	Dead	Cumulative tree mortality[a]	Trees *cut*
				Number of trees				
Sioux Lookout District (cont'd)								
Goodie Lake	168	3.4	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	0	0	1	0
Goodie Lake	169	24.5	1993	49	0	1	0	0
			1994	49	0	1	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
Lomond Township	170	8.4	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	49	0	0	1	0
McAree Township	171	22.3	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	50	0	0	0	0
McAree Township	172	21.6	1993	49	0	1	0	0
			1994	49	0	1	0	0
			1995	48	0	1	1	0
			1996	47	0	0	3	0
Moose Lake Road	173	17.0	1993	49	1	0	0	0
			1994	48	0	1	1	0
			1995	48	0	0	2	0
			1996	47	0	1	2	0
Moose Lake Road	174	19.8	1993	46	0	4	0	0

Appendix 4. Summary of the top condition and tree mortality in the 86 jack pine health plots from 1993 to 1996 in the Northwest Region of Ontario. (Counts are based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average height (m)	Year	Condition of top			Cumulative tree mortality[a]	Trees cut
				Live	Bare	Dead		
				Number of trees				
Sioux Lookout District (concl.)								
Moose Lake Road	174		1994	46	0	4	0	0
			1995	48	0	1	1	0
			1996	49	0	0	1	0
Moose Lake Road	175	21.7	1993	45	0	5	0	0
			1994	47	0	3	0	0
			1995	50	0	0	0	0
			1996	49	0	1	0	0
Porritt Lake	176	17.3	1993	50	0	0	0	0
			1994	50	0	0	0	0
			1995	49	0	0	1	0
			1996	48	0	0	2	0
Stanazhikimi Lake	177	20.1	1993	50	0	0	0	0
			1994	47	0	3	0	0
			1995	45	0	2	3	0
			1996	47	0	0	3	0
Stanazhikimi Lake	178	1.3	1993	46	0	4	0	0
			1994	50	0	0	0	0
			1995	50	0	0	0	0
			1996	48	0	1	1	0
Wrong Road	179	20.4	1993	48	2	0	0	0
			1994	47	0	3	0	0
			1995	48	0	1	1	0
			1996	48	0	1	1	0

[a] Tree mortality resulting from natural causes.

Appendix 5. Jack pine health data for 1996 on 86 plots established in the Northwest Region of Ontario. (Counts based on an examination of 50 jack pine trees at each location.)

Location	Plot number	Average DBH (cm)	Site class	Crown condition[a]							Cumulative mortality		
				1	2	3	4	5	6	7	New dead[b]	Old dead[b]	Trees cut
				Number of trees									
Dryden District													
Breithaupt Township	91	14.7	3	42	0	6	0	0	0	0	1	1	0
Basket Lake	92	8.7	1	42	7	0	0	0	0	0	1	0	0
Bradshaw Township	93	24.1	2	32	0	15	0	0	0	0	1	2	0
Bradshaw Township	94	10.3	3	44	0	5	0	0	0	0	1	0	0
McIlraith Township	95	9.1	2	45	0	5	0	0	0	0	0	0	0
Hodgson Township	96	20.9	2	43	0	4	0	0	0	0	0	3	0
Ilsley Township	97	10.0	2	45	0	5	0	0	0	0	0	0	0
Lac Seul - Williams Bay	98	20.0	2	29	0	18	0	0	0	0	1	2	0
Lac Seul - Route Bay	99	15.0	2	13	0	35	1	0	0	0	0	1	0
Mafeking Township	100	22.1	1	24	0	24	1	0	0	0	0	1	0
McNevin Township	101	22.0	3	45	0	5	0	0	0	0	0	0	0
Mutrie Township	102	22.0	2	38	0	11	0	0	0	0	0	1	0
Revell River	103	16.1	3	40	0	8	1	0	0	0	1	0	0
Suzanne Lake	105	13.1	1	44	0	5	0	0	0	0	0	1	0
Turtle River	106	24.0	2	17	0	32	1	0	0	0	0	0	0
Wabigoon Township	107	19.6	2	32	0	17	1	0	0	0	0	0	0

Appendix 5. Jack pine health data for 1996 on 86 plots established in the Northwest Region of Ontario. (Counts based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average DBH (cm)	Site class	Crown condition[a]							Cumulative mortality		
				1	2	3	4	5	6	7	New dead[b]	Old dead[b]	Trees cut
				Number of trees									
Dryden District (concl.)													
Wabigoon Township	108	29.5	1	19	0	28	2	0	0	0	1	0	0
Fort Frances District													
Claxton Township	109	4.0	2	50	0	0	0	0	0	0	0	0	0
Dance Township	181	4.0	2	45	0	0	1	1	0	2	1	0	0
Dawn Road	110	23.8	2	50	0	0	0	0	0	0	0	0	0
Eltrut Lake	111	17.7	1	42	0	0	1	0	0	0	5	2	0
Eltrut Lake	112	24.3	1	47	0	0	1	1	0	0	1	0	0
Fish Hawk Road	113	15.3	2	50	0	0	0	0	0	0	0	0	0
Gallo Lake	114	23.7	2	40	0	0	4	0	0	0	5	1	0
Heathcliff Lake	115	3.4	1	50	0	0	0	0	0	0	0	0	0
Hillyer Creek	116	2.3	2	49	0	0	0	0	0	0	0	0	1
Lake Despair	117	14.1	2	46	0	0	0	1	0	1	1	1	0
Prince Road	118	21.9	2	46	0	0	1	0	0	0	3	0	0
Rawlinson Creek	119	25.5	3	47	0	0	2	0	0	0	1	0	0
Rawlinson Creek	120	27.9	2	47	0	0	1	0	0	0	1	1	0
Skull Lake	121	24.3	2	43	0	0	2	1	0	0	3	1	0

Appendix 5. Jack pine health data for 1996 on 86 plots established in the Northwest Region of Ontario. (Counts based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average DBH (cm)	Site class	Crown condition[a]							Cumulative mortality		
				1	2	3	4	5	6	7	New dead[b]	Old dead[b]	Trees cut
				Number of trees									
Fort Frances District (concl.)													
Straw Lake	122	22.7	1	46	0	0	0	0	0	0	3	1	0
Triple Road	123	22.7	2	48	0	0	1	0	0	0	1	0	0
Kenora District													
April Lake	124	17.0	3	50	0	0	0	0	0	0	0	0	0
Kirkup Township	125	18.7	1	49	0	0	0	0	0	0	1	0	0
Coyle Township	126	14.2	3	47	0	0	0	1	0	0	1	1	0
Devonshire Township	127	16.5	2	49	0	0	0	0	0	0	0	1	0
Gundy Township	128	20.5	3	29	0	16	0	2	2	0	0	1	0
Work Township	129	17.2	2	50	0	0	0	0	0	0	0	0	0
John Lake	130	3.0	2	50	0	0	0	0	0	0	0	0	0
MacNicol Township	131	19.6	2	47	0	0	0	0	0	0	1	2	0
Mark Lake	132	4.3	3	49	0	0	1	0	0	0	0	0	0
Jaffray Township	133	16.7	2	49	0	0	0	1	0	0	0	0	0
Snook Lake	134	18.7	3	49	0	0	0	0	0	0	0	1	0
Stokes Lake	135	20.1	3	48	0	0	1	0	0	0	0	1	0
Wabigoon Lake	137	12.0	2	49	0	0	0	0	0	0	1	0	0

Appendix 5. Jack pine health data for 1996 on 86 plots established in the Northwest Region of Ontario. (Counts based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average DBH (cm)	Site class	Crown condition[a]							Cumulative mortality		
				1	2	3	4	5	6	7	New dead[b]	Old dead[b]	Trees cut
				Number of trees									
Red Lake District													
Bateman Township	138	3.8	2	50	0	0	0	0	0	0	0	0	0
Bateman Township	139	2.9	1	47	0	0	0	0	0	0	0	1	2
Coli Lake	140	1.8	2	46	0	0	0	0	0	0	0	0	3
Conifer Lake	141	22.9	2	47	0	0	0	0	0	0	2	1	0
Ear Falls	142	19.8	2	48	0	0	0	0	0	0	0	2	0
Emarton Lake	143	9.2	3	50	0	0	0	0	0	0	0	0	0
Flundra Lake	144	8.8	3	50	0	0	0	0	0	0	0	0	0
Gleave Lake	145	8.4	3	50	0	0	0	0	0	0	0	0	0
Graves Township	146	1.4	3	50	0	0	0	0	0	0	0	0	0
McDonough Township	147	17.2	3	48	0	0	0	0	0	0	0	2	0
McDonough Township	148	15.4	1	47	0	0	0	0	0	0	1	2	0
McDonough Township	149	13.8	2	49	0	0	0	0	0	0	1	0	0
McKenzie Bay Road	150	8.5	2	50	0	0	0	0	0	0	0	0	0
McKenzie Bay Road	151	8.1	1	48	0	0	0	0	0	0	1	1	0
North Road	152	20.2	2	49	0	0	0	0	0	0	0	1	0
Nungesser Road	153	16.8	3	47	0	0	0	0	0	0	1	2	0

Appendix 5. Jack pine health data for 1996 on 86 plots established in the Northwest Region of Ontario. (Counts based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average DBH (cm)	Site class	Crown condition[a]							Cumulative mortality		
				1	2	3	4	5	6	7	New dead[b]	Old dead[b]	Trees cut
				Number of trees									
Red Lake District (concl.)													
Nungesser Road	154	21.3	1	49	0	0	0	0	0	0	0	1	0
Nungesser River	156	19.7	3	45	0	0	0	0	0	0	1	4	0
Overnight Road	157	21.8	2	46	0	0	0	0	0	0	1	3	0
Sidace Lake Road	158	12.5	2	50	0	0	0	0	0	0	0	0	0
Sidace Lake Road	159	3.4	3	50	0	0	0	0	0	0	0	0	0
Wenesaga Lake	160	17.6	1	50	0	0	0	0	0	0	0	0	0
Zimring Road	161	10.8	3	43	0	0	0	0	0	0	7	0	0
Sioux Lookout District													
Drayton Township	163	9.3	2	49	0	1	0	0	0	0	0	0	0
Elbow Lake Road	164	9.0	3	47	0	3	0	0	0	0	0	0	0
Goodie Lake	165	14.8	3	43	0	5	1	0	0	1	0	0	0
Goodie Lake	166	24.7	1	42	0	5	0	0	0	0	1	2	0
Goodie Lake	167	4.6	2	44	0	2	1	0	0	0	2	1	0
Goodie Lake	168	3.5	1	46	0	3	0	0	0	0	1	0	0
Goodie Lake	169	23.4	2	39	0	11	0	0	0	0	0	0	0
Lomond Township	170	8.2	1	46	0	3	0	0	0	0	1	0	0

Appendix 5. Jack pine health data for 1996 on 86 plots established in the Northwest Region of Ontario. (Counts based on an examination of 50 jack pine trees at each location.) (cont'd)

Location	Plot number	Average DBH (cm)	Site class	Crown condition[a]							Cumulative mortality		
				1	2	3	4	5	6	7	New dead[b]	Old dead[b]	Trees cut
				Number of trees									
Sioux Lookout District (concl.)													
McAree Township	171	25.5	2	41	0	8	1	0	0	0	0	0	0
McAree Township	172	23.3	2	40	0	7	0	0	0	0	2	1	0
Moose Lake Road	173	19.0	3	18	0	27	3	0	0	0	0	2	0
Moose Lake Road	174	17.3	1	29	0	20	0	0	0	0	0	1	0
Moose Lake Road	175	19.0	2	33	0	15	1	1	0	0	0	0	0
Porrit Lake	176	18.7	1	29	0	18	1	0	0	0	1	1	0
Stanzhikimi Lake	177	19.1	3	21	0	25	1	0	0	0	0	3	0
Stanzhikimi Lake	178	1.2	3	45	0	4	0	0	0	0	1	0	0
Wrong Road	179	20.6	2	41	0	8	0	0	0	0	0	1	0

[a] 1 = no defoliation, 2 = only current foliage defoliated less than 25 percent, 3 = current and/or some older foliage defoliated less than 25 percent, 4 = 25–50 percent defoliation, 5 = 51–75 percent defoliation, 6 = 76–90 percent defoliation, 7 = more than 90 percent defoliation.

[b] Tree mortality resulting from natural causes.

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live (Number of trees)	Condition of top: Bare (Number of trees)	Condition of top: Dead (Number of trees)	Annual mortality[b]	Trees cut
Dryden District									
Bridges Township	113	bF	14.3	1993	30	6	3	5	0
				1994	12	14	1	12	0
				1995	4	0	9	14	0
				1996	6	0	2	5	0
Coronary Lake	114	bF	12.3	1993	13	8	0	14	0
				1994	16	2	0	3	0
				1995	14	1	2	1	0
				1996	15	0	1	1	0
Dore Lake	116	bF	11.3	1993	12	2	9	7	0
				1994	8	5	4	6	0
				1995	8	0	7	2	0
				1996	10	0	3	2	0
Emmons Lake	117	bF	12.2	1993	12	2	4	7	0
				1994	3	8	4	3	0
				1995	1	2	10	2	0
				1996	9	0	2	2	0
		wS	15.6	1993	11	1	1	0	0
				1994	11	1	1	0	0
				1995	12	0	1	0	0
				1996	12	0	1	0	0
		bS	16.6	1993	5	0	0	0	0
				1994	5	0	0	0	0
				1995	5	0	0	0	0
				1996	4	0	0	1	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live	Bare	Dead	Annual mortality[b]	Trees cut
					Number of trees				
Dryden District (cont'd)									
Forest Lake	118	bF	10.4	1993	24	5	0	11	0
				1994	19	3	0	7	0
				1995	16	1	2	3	0
				1996	14	0	0	5	0
		bS	12.6	1993	7	0	0	0	0
				1994	7	0	0	0	0
				1995	7	0	0	0	0
				1996	6	0	0	1	0
Ilsley Township	119	bF	10.1	1993	13	0	0	0	0
				1994	13	0	0	0	0
				1995	13	0	0	0	0
				1996	13	0	0	0	0
		bS	11.9	1993	26	0	0	0	0
				1994	26	0	0	0	0
				1995	26	0	0	0	0
				1996	26	0	0	0	0
Langton Township	120	bF	14.3	1993	1	1	0	3	0
				1994	1	1	0	0	0
				1995	0	0	2	0	0
				1996	1	0	1	0	0
		wS	14.9	1993	12	0	1	0	0
				1994	12	0	0	1	0
				1995	12	0	0	0	0
				1996	11	0	0	1	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top			Annual mortality[b]	Trees cut
					Live	Bare	Dead		
					Number of trees				
Dryden District (cont'd)									
Langton Township	120	bS	14.5	1993	26	0	0	0	0
				1994	26	0	0	0	0
				1995	25	0	0	1	0
				1996	25	0	0	0	0
McIlraith Township	123	bF	9.1	1993	6	0	0	0	0
				1994	6	0	0	0	0
				1995	4	0	0	2	0
				1996	4	0	0	0	0
		bS	8.6	1993	45	0	0	0	0
				1994	45	0	0	0	0
				1995	45	0	0	0	0
				1996	44	0	1	0	0
North Road	124	bF	10.9	1993	9	0	0	0	0
				1994	6	2	0	1	0
				1995	4	3	1	0	0
				1996	4	0	2	2	0
		bS	15.1	1993	31	0	0	0	0
				1994	31	0	0	0	0
				1995	31	0	0	0	0
				1996	31	0	0	0	0
Rugby Township	125	bF	16.9	1993	16	6	6	3	0
				1994	7	7	5	9	0
				1995	5	1	5	8	0
				1996	7	0	1	3	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live (Number of trees)	Bare (Number of trees)	Dead (Number of trees)	Annual mortality[b]	Trees cut
Dryden District (cont'd)									
Rugby Township	125	wS	12.5	1993	8	2	4	5	0
				1994	6	4	0	4	0
				1995	6	0	2	2	0
				1996	6	0	1	1	0
Sandy Point Road	126	bF	10.5	1993	30	7	0	8	0
				1994	29	4	1	3	0
				1995	19	4	5	6	0
				1996	20	0	2	6	0
		bS	5.9	1993	8	0	0	0	0
				1994	8	0	0	0	0
				1995	8	0	0	0	0
				1996	8	0	0	0	0
Satterly Township	127	bF	10.6	1993	30	7	0	8	0
				1994	10	3	0	3	0
				1995	5	3	0	5	0
				1996	7	0	0	1	0
		bS	10.3	1993	26	1	0	0	0
				1994	26	1	0	0	0
				1995	26	1	0	0	0
				1996	27	0	0	0	0
Southworth Township	128	bF	9.8	1993	12	2	7	9	0
				1994	10	1	4	6	0
				1995	8	3	3	1	0
				1996	6	0	4	4	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live (Number of trees)	Condition of top: Bare (Number of trees)	Condition of top: Dead (Number of trees)	Annual mortality[b]	Trees cut
Dryden District (concl.)									
Southworth Township	128	wS	14.8	1993	4	1	0	0	0
				1994	4	1	0	0	0
				1995	4	0	1	0	0
				1996	4	0	1	0	0
Fort Frances District									
Big Sawbill Lake	131	bF	12.0	1993	11	2	1	2	0
				1994	10	1	2	1	0
				1995	12	1	0	0	0
				1996	12	0	1	0	0
		wS	15.6	1993	12	0	0	1	0
				1994	12	0	0	0	0
				1995	12	0	0	0	0
				1996	11	0	1	0	0
Calm Lake	132	bF	11.5	1993	–	–	–	–	–
				1994	7	2	0	0	0
				1995	5	4	0	0	0
				1996	9	0	0	0	0
		wS	15.0	1993	–	–	–	–	–
				1994	3	0	0	0	0
				1995	3	0	0	0	0
				1996	3	0	0	0	0
		bS	13.5	1993	–	–	–	–	–
				1994	9	1	0	0	0
				1995	10	0	0	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live	Bare	Dead	Annual mortality[b]	Trees cut
					Number of trees				
Fort Frances District (cont'd)									
Calm Lake	132	bS		1996	10	0	0	0	0
Claxton Township	133	bF	8.9	1993	20	8	0	0	0
				1994	6	17	0	5	0
				1995	0	15	6	0	0
				1996	11	0	0	10	0
		wS	15.0	1993	4	1	0	0	0
				1994	2	2	0	1	0
				1995	3	0	1	0	0
				1996	3	0	0	1	0
French Lake	134	bF	11.5	1993	23	3	0	12	0
				1994	23	0	1	2	0
				1995	21	1	0	2	0
				1996	21	0	0	1	0
Lake Hope	135	bF	7.6	1993	45	0	0	1	0
				1994	13	31	0	1	0
				1995	3	35	5	1	0
				1996	36	1	0	6	0
Menary Township	136	bF	11.7	1993	18	0	0	0	0
				1994	14	4	0	0	0
				1995	4	12	0	2	0
				1996	12	3	0	1	0
Perch Lake	137	bF	11.2	1993	–	–	–	–	–
				1994	3	5	1	2	0
				1995	7	1	1	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live (Number of trees)	Condition of top: Bare (Number of trees)	Condition of top: Dead (Number of trees)	Annual mortality[b]	Trees cut
Fort Frances District (cont'd)									
Perch Lake	137	bF		1996	7	0	0	2	0
		wS	11.1	1993	–	–	–	–	–
				1994	12	2	0	1	0
				1995	11	0	1	2	0
				1996	10	0	0	2	0
		bS	12.9	1993	–	–	–	–	–
				1994	22	0	2	0	0
				1995	22	1	0	1	0
				1996	22	0	0	0	0
Preacher Lake	138	bF	9.4	1993	8	0	1	2	0
				1994	8	0	1	0	0
				1995	8	1	0	0	0
				1996	9	0	0	0	0
		wS	18.3	1993	2	1	0	1	0
				1994	3	0	0	0	0
				1995	3	0	0	0	0
				1996	3	0	0	0	0
Watten Township	139	bF	9.3	1993	21	5	0	2	0
				1994	6	17	0	3	0
				1995	4	18	1	0	0
				1996	16	2	0	5	0
		bS	11.7	1993	8	0	0	0	0
				1994	8	0	0	0	0
				1995	8	0	0	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top			Annual mortality[b]	Trees cut
					Live	Bare	Dead		
					Number of trees				
Fort Frances District (concl.)									
Watten Township	139	bS		1996	6	0	0	2	0
Kenora District									
April Lake	141	bF	15.3	1993	37	1	0	2	0
				1994	19	6	1	12	0
				1995	20	5	0	1	0
				1996	13	1	2	9	0
		wS	15.0	1993	3	0	0	1	0
				1994	3	0	0	0	0
				1995	3	0	0	0	0
				1996	3	0	0	0	0
		bS	15.0	1993	6	0	0	1	0
				1994	6	0	0	0	0
				1995	6	0	0	0	0
				1996	6	0	0	0	0
Cliff Lake	142	bF	12.0	1993	24	6	1	1	0
				1994	8	1	1	21	0
				1995	7	1	0	2	0
				1996	2	0	1	5	0
		wS	16.8	1993	17	0	0	0	0
				1994	16	0	0	1	0
				1995	15	0	1	0	0
				1996	15	0	0	1	0
Ewart Township	143	bF	10.0	1993	11	1	1	2	0
				1994	11	0	1	1	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top			Annual mortality[b]	Trees cut
					Live	Bare	Dead		
					Number of trees				
Kenora District (concl.)									
Ewart Township	143	bF	10.0	1995	12	0	0	0	0
				1996	10	0	0	2	0
Godson Township	145	bF	10.0	1993	15	8	0	0	0
				1994	1	10	10	2	0
				1995	0	9	8	4	0
				1996	10	0	1	6	0
		wS	14.5	1993	3	0	0	0	0
				1994	3	0	0	0	0
				1995	3	0	0	0	0
				1996	2	0	0	1	0
Haycock Township	146	bF	9.7	1993	9	0	2	2	0
				1994	7	1	3	0	0
				1995	3	6	2	0	0
				1996	8	0	2	1	0
Willington Township	153	bF	9.8	1993	29	6	3	2	0
				1994	7	22	7	2	0
				1995	6	16	4	10	0
				1996	12	0	2	12	0
Nipigon District									
Ashmore Township	154	bF	6.3	1993	25	0	0	0	0
				1994	23	0	0	2	0
				1995	21	0	0	2	0
				1996	12	1	0	8	0
		wS	10.7	1993	12	1	1	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top			Annual mortality[b]	Trees cut
					Live	Bare	Dead		
					Number of trees				
Nipigon District (cont'd)									
Ashmore Township	154	wS		1994	13	0	1	0	0
				1995	10	1	1	2	0
				1996	10	1	0	1	0
		bS	14.3	1993	6	1	0	0	0
				1994	7	0	0	0	0
				1995	7	0	0	0	0
				1996	6	0	1	0	0
Bikerace Lake	155	bF	13.4	1993	29	0	0	5	0
				1994	22	0	3	4	0
				1995	10	3	5	7	0
				1996	7	0	1	10	0
Booth Township	157	bF	7.5	1993	31	1	0	10	0
				1994	20	4	1	7	0
				1995	11	1	1	13	0
				1996	8	1	1	3	0
		bS	10.1	1993	4	0	0	0	0
				1994	2	1	0	1	0
				1995	1	0	0	2	0
				1996	1	0	0	0	0
Burrows Lake South	159	bF	13.7	1993	26	6	1	3	0
				1994	31	0	0	2	0
				1995	28	0	0	3	0
				1996	15	5	0	7	0
		wS	16.2	1993	15	1	0	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top			Annual mortality[b]	Trees cut
					Live	Bare	Dead		
					Number of trees				
Nipigon District (cont'd)									
Burrows Lake South	159	wS		1994	15	1	0	0	0
				1995	16	0	0	0	0
				1996	15	0	1	0	0
Catlonite Road	161	bF	12.8	1993	13	9	14	1	0
				1994	28	0	0	8	0
				1995	10	7	3	8	0
				1996	4	2	0	14	0
		wS	13.6	1993	6	0	1	0	0
				1994	7	0	0	0	0
				1995	6	0	1	0	0
				1996	6	1	0	0	0
		bS	12.5	1993	12	0	1	0	0
				1994	12	0	0	1	0
				1995	12	0	0	0	0
				1996	12	0	0	0	0
Errington Township	165	bF	13.5	1993	44	0	0	3	0
				1994	43	0	0	1	0
				1995	32	11	0	11	0
				1996	10	0	0	22	0
		bS	9.6	1993	8	0	0	0	0
				1994	8	0	0	0	0
				1995	8	0	0	0	0
				1996	7	0	0	1	0
Eskwanonwatin	166	bF	9.4	1993	13	7	0	13	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live (Number of trees)	Condition of top: Bare (Number of trees)	Condition of top: Dead (Number of trees)	Annual mortality[b]	Trees cut
Nipigon District (cont'd)									
Eskwanonwatin	166	bF		1994	15	0	0	5	0
				1995	15	0	0	0	0
				1996	11	0	0	4	0
		bS	13.8	1993	17	0	0	1	0
				1994	17	0	0	0	0
				1995	16	0	0	1	0
				1996	16	0	0	0	0
Grain Township	167	bF	8.2	1993	9	4	1	34	0
				1994	6	4	0	4	0
				1995	9	0	1	0	0
				1996	2	2	3	3	0
John Ahl Road	168	bF	13.1	1993	28	5	0	2	0
				1994	2	2	15	14	0
				1995	4	0	4	11	0
				1996	0	1	0	7	0
		wS	18.6	1993	3	0	0	2	0
				1994	1	0	0	2	0
				1995	1	0	0	0	0
				1996	0	1	0	0	0
		bS	17.3	1993	12	0	0	0	0
				1994	11	0	1	0	0
				1995	10	0	0	2	0
				1996	10	0	0	0	0
Legault Township	171	bF	11.5	1993	36	14	2	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live	Bare	Dead	Annual mortality[b]	Trees cut
					Number of trees				
Nipigon District (cont'd)									
Legault Township	171	bF		1994	48	0	0	4	0
				1995	31	6	5	6	0
				1996	14	0	0	28	0
Nakina Township	173	bF	9.6	1993	27	2	0	1	0
				1994	29	0	0	0	0
				1995	27	2	0	0	0
				1996	4	0	6	19	0
		wS	18.6	1993	12	0	0	0	0
				1994	12	0	0	0	0
				1995	12	0	0	0	0
				1996	7	0	3	2	0
		bS	16.2	1993	8	0	0	3	0
				1994	8	0	0	0	0
				1995	7	0	0	1	0
				1996	4	0	0	3	0
Nibs Lake	174	bF	12.3	1993	14	3	3	5	0
				1994	7	2	4	10	0
				1995	4	0	2	7	0
				1996	2	1	0	3	0
Parent Township	176	bF	11.7	1993	47	0	0	2	0
				1994	41	0	0	6	0
				1995	36	0	0	5	0
				1996	20	2	1	13	0
		wS	14.7	1993	5	0	0	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top			Annual mortality[b]	Trees cut
					Live	Bare	Dead		
					Number of trees				
Nipigon District (concl.)									
Parent Township	176	wS		1994	5	0	0	0	0
				1995	5	0	0	0	0
				1996	5	0	0	0	0
		bS	12.0	1993	12	0	0	0	0
				1994	12	0	0	0	0
				1995	11	0	0	1	0
				1996	11	0	0	0	0
Raynar Township	178	bF	13.2	1993	58	0	0	2	0
				1994	54	0	0	4	0
				1995	51	0	0	3	0
				1996	38	1	1	11	0
		wS	18.9	1993	7	0	0	0	0
				1994	7	0	0	0	0
				1995	7	0	0	0	0
				1996	7	0	0	0	0
Suicide Lake	180	bF	15.5	1993	41	0	1	0	0
				1994	24	0	0	18	0
				1995	4	1	2	17	0
				1996	0	1	0	6	0
Windigokan Lake	183	bF	10.8	1993	32	0	0	8	0
				1994	20	0	0	12	0
				1995	6	7	2	5	0
				1996	5	2	0	7	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live	Bare	Dead	Annual mortality[b]	Trees cut
					Number of trees				
Red Lake District									
Baird Township	184	bF	12.2	1993	45	1	0	1	0
				1994	7	18	15	6	0
				1995	23	11	2	4	0
				1996	7	0	2	27	0
Detector Lake	185	bF	12.0	1993	33	0	1	6	0
				1994	6	14	0	14	0
				1995	13	3	1	3	0
				1996	3	0	0	14	0
		wS	15.7	1993	6	0	0	0	0
				1994	6	0	0	0	0
				1995	6	0	0	0	0
				1996	5	0	1	0	0
Goldpine Road	186	bF	14.8	1993	30	6	0	1	0
				1994	16	10	5	5	0
				1995	25	5	0	1	0
				1996	13	0	5	12	0
		wS	18.1	1993	12	0	0	0	0
				1994	12	0	0	0	0
				1995	11	0	1	0	0
				1996	11	0	0	1	0
Snake Falls Road	189	bF	13.4	1993	41	0	0	2	0
				1994	18	15	5	3	0
				1995	31	3	0	4	0
				1996	10	0	8	16	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live (Number of trees)	Condition of top: Bare (Number of trees)	Condition of top: Dead (Number of trees)	Annual mortality[b]	Trees cut
Red Lake District (concl.)									
Snake Falls Road	189	wS	26.0	1993	13	0	0	0	0
				1994	13	0	0	0	0
				1995	13	0	0	0	0
				1996	13	0	0	0	0
Wenesaga Lake	190	bF	10.7	1993	30	3	0	0	0
				1994	18	13	0	2	0
				1995	22	7	1	1	0
				1996	15	0	9	6	0
		wS	14.8	1993	11	0	0	0	0
				1994	11	0	0	0	0
				1995	11	0	0	0	0
				1996	11	0	0	0	0
		bS	13.5	1993	6	0	0	0	0
				1994	5	0	0	1	0
				1995	5	0	0	0	0
				1996	5	0	0	0	0
Sioux Lookout District									
Burma Lake Road	191	bF	16.8	1993	9	3	0	0	0
				1994	8	4	0	0	0
				1995	4	7	0	1	0
				1996	7	0	0	4	0
		bS	16.4	1993	32	0	1	0	0
				1994	32	0	1	0	0
				1995	33	0	0	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live	Bare	Dead	Annual mortality[b]	Trees cut
					Number of trees				
Sioux Lookout District (cont'd)									
Burma Lake Road	191	bS		1996	33	0	0	0	0
Deception Lake	192	bF	8.9	1993	37	8	3	2	0
				1994	36	6	1	5	0
				1995	28	3	11	1	0
				1996	27	0	8	7	0
Drayton Township	193	bF	13.2	1993	33	2	2	0	0
				1994	32	1	1	3	0
				1995	28	1	3	2	0
				1996	23	0	2	7	0
		bS	12.0	1993	5	0	0	0	0
				1994	5	0	0	0	0
				1995	5	0	0	0	0
				1996	5	0	0	0	0
Foley Lake	195	bF	12.6	1993	17	9	2	1	0
				1994	25	2	1	0	0
				1995	27	1	0	0	0
				1996	24	1	1	2	0
		bS	12.2	1993	19	0	0	0	0
				1994	19	0	0	0	0
				1995	19	0	0	0	0
				1996	18	0	0	1	0
Lomond Township	196	bF	11.7	1993	14	5	2	1	0
				1994	14	4	0	3	0
				1995	10	4	1	3	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live	Bare	Dead	Annual mortality[b]	Trees cut
					Number of trees				
Sioux Lookout District (concl.)									
Lomond Township	196	bF		1996	11	1	0	3	0
		wS	17.0	1993	6	0	0	0	0
				1994	6	0	0	0	0
				1995	5	1	0	0	0
				1996	5	0	0	1	0
		bS	14.0	1993	13	0	0	0	0
				1994	13	0	0	0	0
				1995	13	0	0	0	0
				1996	11	0	0	2	0
Pape Lake	198	bF	12.6	1993	28	5	2	6	0
				1994	26	2	2	5	0
				1995	22	1	1	6	0
				1996	11	0	4	9	0
Pickerel Township	199	bF	11.2	1993	18	3	3	1	0
				1994	14	1	2	7	0
				1995	9	0	2	6	0
				1996	6	0	3	2	0
		bS	18.0	1993	6	0	0	0	0
				1994	6	0	0	0	0
				1995	6	0	0	0	0
				1996	6	0	0	0	0
Thunder Bay District									
Buzzer Lake Road	201	bF	7.3	1993	12	16	0	0	0
				1994	25	0	1	2	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live (Number of trees)	Condition of top: Bare (Number of trees)	Condition of top: Dead (Number of trees)	Annual mortality[b]	Trees cut
Thunder Bay District (cont'd)									
Buzzer Lake Road	201	bF		1995	5	20	0	1	0
				1996	15	3	2	5	0
		bS	7.7	1993	14	0	1	0	0
				1994	14	0	0	1	0
				1995	12	2	0	0	0
				1996	14	0	0	0	0
Decourcey Lake	205	bF	8.9	1993	24	25	1	0	0
				1994	46	2	1	1	0
				1995	44	2	0	3	0
				1996	33	4	2	7	0
		wS	20.0	1993	6	0	1	0	0
				1994	7	0	0	0	0
				1995	6	0	1	0	0
				1996	7	0	0	0	0
Dog Lake	206	bF	10.0	1993	20	4	0	4	0
				1994	18	0	6	0	0
				1995	13	8	2	1	0
				1996	9	0	0	7	7
		bS	11.9	1993	9	0	0	0	0
				1994	9	0	0	0	0
				1995	9	0	0	0	0
				1996	9	0	0	0	0
Fallis Township	207	bF	16.9	1993	–	–	–	–	–
				1994	33	12	2	1	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top			Annual mortality[b]	Trees cut
					Live	Bare	Dead		
					Number of trees				
Thunder Bay District (cont'd)									
Fallis Township	207	bF		1995	47	0	0	0	0
				1996	46	0	1	0	0
Forbes Township	208	bF	17.6	1993	49	0	1	1	0
				1994	47	0	1	2	0
				1995	44	2	1	1	0
				1996	39	1	1	6	0
Fowler Township	209	bF	13.0	1993	12	0	0	1	0
				1994	12	0	0	0	0
				1995	12	0	0	0	0
				1996	11	0	0	1	0
		bS	14.1	1993	47	0	0	2	0
				1994	46	0	0	1	0
				1995	46	0	0	0	0
				1996	45	0	0	1	0
Glen Township	210	bF	13.4	1993	29	0	0	3	0
				1994	29	0	0	0	0
				1995	29	0	0	0	0
				1996	27	0	0	2	0
		wS	13.6	1993	4	1	0	0	0
				1994	4	0	0	1	0
				1995	4	0	0	0	0
				1996	4	0	0	0	0
Gorham Township	211	bF	13.2	1993	26	2	0	0	0
				1994	28	0	0	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top			Annual mortality[b]	Trees cut
					Live	Bare	Dead		
					Number of trees				
Thunder Bay District (cont'd)									
Gorham Township	211	bF		1995	27	1	0	0	0
				1996	26	1	0	1	0
		wS	22.7	1993	10	0	0	0	0
				1994	10	0	0	0	0
				1995	10	0	0	0	0
				1996	10	0	0	0	0
		bS	12.5	1993	11	0	0	0	0
				1994	11	0	0	0	0
				1995	11	0	0	0	0
				1996	11	0	0	0	0
Hicks Lake Road	212	bF	8.9	1993	26	0	0	0	0
				1994	26	0	0	0	0
				1995	25	1	0	0	0
				1996	26	0	0	0	0
		bS	7.9	1993	12	0	0	0	0
				1994	11	0	0	1	0
				1995	11	0	0	0	0
				1996	11	0	0	0	0
Joeboy Lake	213	bF	9.1	1993	6	19	5	1	0
				1994	10	11	0	9	0
				1995	2	8	0	11	0
				1996	1	0	0	9	0
Kenna Lake	215	bF	12.7	1993	–	–	–	–	–
				1994	35	0	0	3	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live (Number of trees)	Condition of top: Bare (Number of trees)	Condition of top: Dead (Number of trees)	Annual mortality[b]	Trees cut
Thunder Bay District (cont'd)									
Kenna Lake	215	bF		1995	34	0	0	1	0
				1996	33	0	0	1	0
		bS	15.5	1993	–	–	–	–	–
				1994	8	0	0	0	0
				1995	8	0	0	0	0
				1996	7	0	0	1	0
Michener Township	217	bF	15.7	1993	29	8	0	1	0
				1994	33	3	0	1	0
				1995	34	2	1	0	0
				1996	29	1	0	7	0
		bS	16.0	1993	5	0	0	0	0
				1994	5	0	0	0	0
				1995	5	0	0	0	0
				1996	5	0	0	0	0
Milkshake Lake	218	bF	11.8	1993	21	5	1	3	0
				1994	21	3	0	5	0
				1995	11	5	3	5	0
				1996	9	0	1	9	0
		wS	15.5	1993	13	0	0	2	0
				1994	10	1	0	2	0
				1995	10	1	0	0	0
				1996	10	0	0	1	0
Mountain Lake	219	bF	14.5	1993	38	5	0	5	0
				1994	40	3	0	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live	Bare	Dead	Annual mortality[b]	Trees cut
					Number of trees				
Thunder Bay District (cont'd)									
Mountain Lake	219	bF		1995	38	3	1	2	0
				1996	34	0	0	8	0
Open Bay	220	bF	11.1	1993	–	–	–	–	–
				1994	19	3	2	1	0
				1995	18	0	2	4	0
				1996	16	1	0	3	0
Sandstone Lake	221	bF	15.6	1993	44	1	0	2	0
				1994	44	0	0	1	0
				1995	43	1	0	0	0
				1996	43	0	0	1	0
Soper Township	222	bF	11.1	1993	23	4	0	0	0
				1994	26	1	0	0	0
				1995	16	11	0	0	0
				1996	21	6	0	0	0
		bS	10.5	1993	23	0	0	0	0
				1994	23	0	0	0	0
				1995	23	0	0	0	0
				1996	23	0	0	0	0
Walkingshaw Lake	223	bF	12.7	1993	21	5	1	0	0
				1994	26	1	0	0	0
				1995	24	3	0	0	0
				1996	26	0	0	1	0
		bS	11.8	1993	14	0	2	1	0
				1994	15	0	0	1	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top			Annual mortality[b]	Trees cut
					Live	Bare	Dead		
					Number of trees				
Thunder Bay District (cont'd)									
Walkingshaw Lake	223	bS		1995	15	0	0	0	0
				1996	15	0	0	0	0
Waweig Lake	224	bF	15.0	1993	–	–	–	–	–
				1994	15	0	0	2	0
				1995	10	2	0	3	0
				1996	5	0	1	6	0
		wS	20.0	1993	–	–	–	–	–
				1994	6	0	0	1	0
				1995	6	0	0	0	0
				1996	6	0	0	0	0
		bS	16.2	1993	–	–	–	–	–
				1994	22	1	0	1	0
				1995	22	1	0	0	0
				1996	21	0	0	2	0
Wolf River Road	225	bF	12.4	1993	13	11	14	0	0
				1994	23	1	12	2	0
				1995	32	3	0	1	0
				1996	19	1	4	11	0
		wS	15.6	1993	3	1	1	0	0
				1994	4	0	1	0	0
				1995	4	0	0	1	0
				1996	3	0	0	1	0
		bS	15.0	1993	4	0	0	0	0
				1994	4	0	0	0	0

Appendix 6. Northwest Region–Spruce/fir Health Plots. (Summary of the top condition and tree mortality in 76 plots from 1993 to 1996. Host species must have represented 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average height (m)	Year	Condition of top: Live (Number of trees)	Condition of top: Bare (Number of trees)	Condition of top: Dead (Number of trees)	Annual mortality[b]	Trees cut
Thunder Bay District (concl.)									
Wolf River Road	225	bS		1995	4	0	0	0	0
				1996	4	0	0	0	0

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

[b] Tree mortality resulting from natural causes. Trees tallied as dead in the first year of plot assessment were categorized as recently dead standing trees (bark not sloughing off).

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c] Number of trees							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[d]	Old dead[d]	Trees cut
Dryden District														
Bridges Township	113	bF	19.7	2	0	0	0	4	1	2	1	5	31	0
Coronary Lake	114	bF	14.9	3	0	0	1	14	1	0	0	1	18	0
Dore Lake	116	bF	12.3	3	0	0	7	1	2	1	2	2	15	0
Emmons Lake	117	bF	15.9	X	0	0	1	3	4	3	0	2	12	0
		wS	29.3		0	0	10	3	0	0	0	0	0	0
		bS	25.8		0	0	4	0	0	0	0	1	0	0
Forest Lake	118	bF	10.0	2	0	0	7	2	3	2	0	5	21	0
		bS	17.9		4	0	2	0	0	0	0	1	0	0
Ilsley Township	119	bF	12.9	3	4	0	8	0	0	1	0	0	0	0
		bS	13.9		23	0	3	0	0	0	0	0	0	0
Langton Township	120	bF	14.5	2	0	0	0	0	1	1	0	0	3	0
		wS	22.6		0	0	0	10	0	0	0	1	1	0
		bS	18.3		1	0	24	0	0	0	0	0	1	0
McIlraith Township	123	bF	11.0	2	0	0	0	4	0	0	0	0	2	0
		bS	9.5		18	0	26	1	0	0	0	0	0	0
North Road	124	bF	11.5	1	0	0	0	1	2	2	1	2	1	0

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c] (Number of trees)							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[d]	Old dead[d]	Trees cut
Dryden District (concl.)														
North Road	124	bS	19.9		0	0	26	5	0	0	0	0	0	0
Rugby Township	125	bF	23.6	X	0	0	1	7	0	0	0	3	20	0
		wS	18.6		0	0	0	3	2	0	2	1	11	0
Sandy Point Road	126	bF	10.1	1	0	0	0	7	5	4	6	6	17	0
		bS	5.8		0	0	8	0	0	0	0	0	0	0
Satterly Township	127	bF	12.0	X	0	0	0	3	2	2	0	1	17	0
		bS	11.4		20	0	6	1	0	0	0	0	0	0
Southworth Township	128	bF	12.9	X	0	0	4	5	1	0	0	4	16	0
		wS	20.3		0	0	2	2	0	0	1	0	0	0
Fort Frances District														
Big Sawbill Lake	131	bF	16.7	X	0	0	0	6	7	0	0	0	3	0
		wS	23.4		0	0	0	10	2	0	0	0	1	0
Calm Lake	132	bF	16.0	0	0	0	1	2	4	1	9	0	0	0
		wS	21.7		0	0	1	1	1	0	0	0	0	0
		bS	15.4		6	0	1	3	0	0	0	0	0	0
Claxton Township	133	bF	10.0	2	0	0	0	2	7	2	0	10	5	0

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c]							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[d]	Old dead[d]	Trees cut
					Number of trees									
Fort Frances District (concl).														
Claxton Township	133	wS	23.0		0	0	0	3	0	0	0	1	1	0
French Lake	134	bF	14.1	–	0	0	6	9	5	1	0	1	16	0
Lake Hope	135	bF	8.2	3	0	0	0	25	12	0	0	6	3	0
Menary Township	136	bF	20.5	3	0	0	0	6	7	2	0	1	2	0
Perch Lake	137	bF	14.7	0	0	0	1	3	3	0	0	2	2	0
		wS	16.9		0	0	5	3	2	0	0	2	3	0
		bS	15.9		5	0	0	16	0	1	0	1	1	0
Preacher Lake	138	bF	13.9	0	0	0	5	4	0	0	0	0	2	0
		wS	32.0		0	0	0	3	0	0	0	0	1	0
Watten Township	139	bF	14.0	2	0	0	0	4	8	6	0	5	5	0
		bS	15.8		2	0	0	3	1	0	0	2	0	0
Kenora District														
April Lake	141	bF	19.3	4	0	0	0	8	4	6	0	9	15	0
		wS	21.0		0	0	0	3	0	0	0	0	1	0
		bS	18.2		1	0	4	1	0	0	0	0	0	0
Cliff Lake	142	bF	11.9	1	0	0	0	2	1	0	0	5	24	0

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c]							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[d]	Old dead[d]	Trees cut
					Number of trees									
Kenora District (concl).														
Cliff Lake	142	wS	22.4		0	0	0	13	1	1	0	1	1	0
Ewart Township	143	bF	11.6	1	0	0	3	7	0	0	0	2	3	0
Godson Township	145	bF	14.8	1	0	0	0	3	7	0	1	6	6	0
		wS	26.0		0	0	2	0	0	0	0	1	0	0
Haycock Township	146	bF	16.3	2	0	0	2	2	3	1	2	1	2	0
Willington Township	153	bF	12.0	2	0	0	0	11	3	0	0	8	14	0
Nipigon District														
Ashmore Township	154	bF	7.7	2	13	0	0	0	0	0	0	8	4	0
		wS	16.2		11	0	0	0	0	0	0	1	2	0
		bS	15.8		7	0	0	0	0	0	0	0	0	0
Bikerace Lake	155	bF	15.9	1	8	0	0	0	0	0	0	10	16	0
Booth Township	157	bF	9.5	2	10	0	0	0	0	0	0	3	29	0
		bS	14.7		1	0	0	0	0	0	0	0	3	0
Burrows Lake South	159	bF	18.8	2	16	4	0	0	0	0	0	7	8	0
		wS	25.1		3	13	0	0	0	0	0	0	0	0
Catlonite Road	161	bF	17.7	–	6	0	0	0	0	0	0	14	17	0

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c] (Number of trees)							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[d]	Old dead[d]	Trees cut
Nipigon District (cont'd)														
Catlonite Road	161	wS	18.3		7	0	0	0	0	0	0	0	0	0
		bS	16.2		12	0	0	0	0	0	0	0	0	0
Errington Township	165	bF	16.7	1	10	0	0	0	0	0	0	22	15	0
		bS	14.6		7	0	0	0	0	0	0	1	0	0
Eskwanonwatin	166	bF	11.0	1	10	1	0	0	0	0	0	4	18	0
		bS	18.9		16	0	0	0	0	0	0	0	2	0
Grain Township	167	bF	10.3	–	7	0	0	0	0	0	0	3	38	0
John Ahl Road	168	bF	15.6	–	1	0	0	0	0	0	0	7	27	0
		wS	22.4		1	0	0	0	0	0	0	0	4	0
		bS	17.9		10	0	0	0	0	0	0	0	2	0
Legault Township	171	bF	12.5	–	14	0	0	0	0	0	0	28	10	0
Nakina Township	173	bF	13.3	2	7	3	0	0	0	0	0	19	1	0
		wS	30.8		0	10	0	0	0	0	0	2	0	0
		bS	23.5		3	1	0	0	0	0	0	3	4	0
Nibs Lake	174	bF	21.4	0	3	0	0	0	0	0	0	3	22	0
Parent Township	176	bf	15.4	–	23	0	0	0	0	0	0	13	13	0

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c]							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[d]	Old dead[d]	Trees cut
					Number of trees									
Nipigon District (concl.)														
Parent Township	176	wS	30.3		5	0	0	0	0	0	0	0	0	0
		bS	18.6		11	0	0	0	0	0	0	0	1	0
Raynar Township	178	bF	13.3	0	3	31	4	2	0	0	0	11	9	0
		wS	21.5		0	1	6	0	0	0	0	0	0	0
Suicide Lake	180	bF	16.6	4	1	0	0	0	0	0	0	6	35	0
Windigokan Lake	183	bF	14.3	0	7	0	0	0	0	0	0	7	24	0
Red Lake District														
Baird Township	184	bF	12.7	1	0	0	0	5	4	0	0	26	11	0
Detector Lake	185	bF	13.8	2	0	0	0	0	1	2	0	14	23	0
		wS	26.4		0	0	0	4	0	1	1	0	0	0
Goldpine Road	186	bF	16.2	0	0	0	1	5	6	3	3	12	7	0
		wS	26.3		0	0	0	10	0	1	0	1	0	0
Snake Falls Road	189	bF	15.0	1	0	0	0	2	6	5	5	16	9	0
		wS	42.5		0	0	2	7	4	0	0	0	0	0
Wenesaga Lake	190	bF	12.0	2	0	0	0	12	7	3	2	6	3	0
		wS	25.2		0	0	0	10	1	0	0	0	0	0

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c] Number of trees 1	2	3	4	5	6	7	New dead[d]	Cumulative mortality: Old dead[d]	Cumulative mortality: Trees cut
Red Lake District (concl.)														
Wenesaga Lake	190	bS	20.2		0	0	4	1	0	0	0	0	1	0
Sioux Lookout District														
Burma Lake Road	191	bF	18.7	X	0	0	0	0	0	7	0	4	1	0
		bS	20.9		1	0	20	12	0	0	0	0	0	0
Deception Lake	192	bF	10.4	1	0	0	7	13	10	4	1	7	8	0
Drayton Township	193	bF	15.2	2	0	0	9	16	0	0	0	7	5	0
		bS	11.3		1	0	4	0	0	0	0	0	0	0
Foley Lake	195	bF	12.7	X	0	0	0	5	15	6	0	2	1	0
		bS	14.1		0	0	6	12	0	0	0	1	0	0
Lomond Township	196	bF	12.6	2	0	0	0	4	4	4	0	3	7	0
		wS	28.3		0	0	0	5	0	0	0	1	0	0
		bS	18.2		0	0	9	2	0	0	0	2	0	0
Pape Lake	198	bF	11.8	2	0	0	3	8	4	0	0	9	17	0
Pickerel Township	199	bF	11.0	X	0	0	6	2	1	0	0	2	14	0
		bS	23.1		0	0	5	1	0	0	0	0	0	0

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c] (Number of trees)							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[d]	Old dead[d]	Trees cut
Thunder Bay District														
Buzzer Lake Road	201	bF	11.3	1	0	0	0	0	6	7	7	5	3	0
		bS	10.8		7	0	0	6	0	1	0	0	1	0
Decourcey Lake	205	bF	11.1	4	0	0	6	11	10	10	2	7	4	0
		wS	21.7		0	0	0	2	2	3	0	0	0	0
Dog Lake	206	bF	13.3	3	0	0	0	2	5	2	0	14	5	7
		bS	13.3		2	0	1	6	0	0	0	0	1	0
Fallis Township	207	bF	20.8	2	0	0	0	44	2	0	1	0	1	0
Forbes Township	208	bF	17.7	X	0	0	0	4	33	2	2	6	4	0
Fowler Township	209	bF	17.3	3	0	0	0	8	2	1	0	1	1	0
		bS	16.1		45	0	0	0	0	0	0	1	3	0
Glen Township	210	bF	17.9	2	24	2	1	0	0	0	0	2	3	0
		wS	25.7		1	3	0	0	0	0	0	0	1	0
Gorham Township	211	bF	18.4	X	0	0	6	8	8	5	0	1	0	0
		wS	25.6		0	0	0	1	7	2	0	0	0	0
		bS	16.6		5	2	4	0	0	0	0	0	0	0
Hicks Lake Road	212	bF	11.1	–	0	0	14	8	4	0	0	0	0	0

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c] (Number of trees) 1	2	3	4	5	6	7	New dead[d]	Cumulative mortality: Old dead[d]	Cumulative mortality: Trees cut
Thunder Bay District (cont'd)														
Hicks Lake Road	212	bS	8.9		9	0	0	2	0	0	0	0	1	0
Joeboy Lake	213	bF	11.2	2	0	1	0	0	0	0	0	9	21	0
Kenna Lake	215	bF	16.6	1	0	0	29	1	0	3	0	1	4	0
		bS	20.5		2	0	0	5	0	0	0	1	0	0
Michener Township	217	bF	21.3	3	0	0	0	7	19	2	2	7	0	0
		bS	22.8		1	0	3	1	0	0	0	0	0	0
Milkshake Lake	218	bF	16.5	2	0	0	0	4	5	1	0	9	13	0
		wS	23.3		0	0	0	6	3	0	1	1	4	0
Mountain Lake	219	bF	18.3	1	0	0	10	19	5	0	0	8	7	0
Open Bay	220	bF	12.8	1	0	0	3	12	1	0	1	3	5	0
Sandstone Lake	221	bF	16.1	3	0	0	29	11	2	1	0	1	3	0
Soper Township	222	bF	16.5	1	0	0	1	5	14	6	1	0	0	0
		bS	13.5		18	0	0	4	1	0	0	0	0	0
Walkingshaw Lake	223	bF	16.9	3	0	0	4	13	8	0	2	1	0	0
		bS	18.3		8	5	0	2	0	0	0	0	1	0
Waweig Lake	224	bF	18.3	2	0	0	0	0	5	0	1	6	5	0

Appendix 7. Spruce/fir health data for 1996 on 76 plots established in the Northwest Region of Ontario. (Host species must represent 10 percent or more of the conifer content of the plot to be included.) (cont'd)

Location	Plot number	Host[a]	Average DBH (cm)	Site Class[b]	Crown condition[c]							Cumulative mortality		
					1	2	3	4	5	6	7	New dead[d]	Old dead[d]	Trees cut
					Number of trees									
Thunder Bay District (concl.)														
Waweig Lake	224	wS	30.3		0	0	0	4	2	0	0	0	1	0
		bS	17.9		11	0	0	10	0	0	0	0	1	0
Wolf River Road	225	bF	15.7	X	12	12	0	0	0	0	0	11	3	0
		wS	24.8		0	2	0	1	0	0	0	1	1	0
		bS	20.4		1	3	0	0	0	0	0	0	0	0

[a] bF = balsam fir, wS = white spruce, and bS = black spruce.
[b] Site class is based on the stand working group, not necessarily on balsam fir.
[c] 1 = no defoliation, 2 = only current foliage defoliated less than 25 percent, 3 = current and/or some older foliage defoliated less than 25 percent, 4 = 25–50 percent defoliation, 5 = 51–75 percent defoliation, 6 = 76–90 percent defoliation, 7 = more than 90 percent defoliation.
[d] Tree mortality resulting from natural causes.