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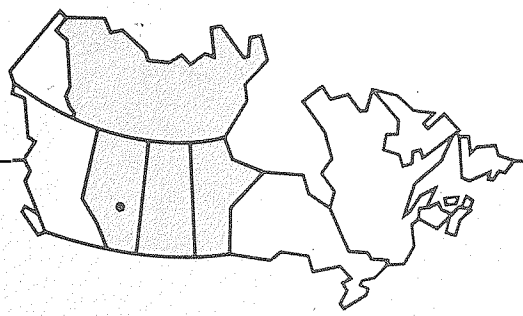
Forest insect and disease conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories in 1985 and predictions for 1986

B.H. Moody and H.F. Cerezke



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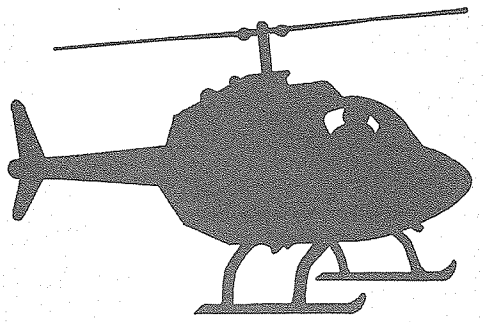

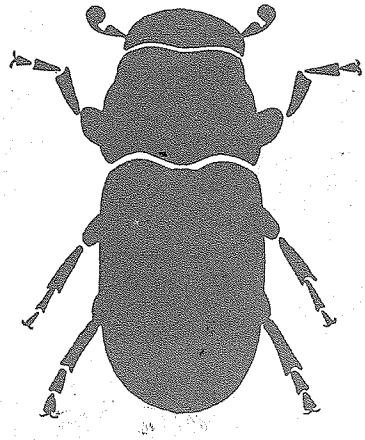

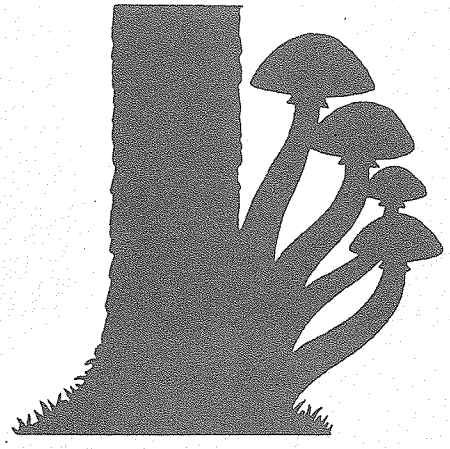

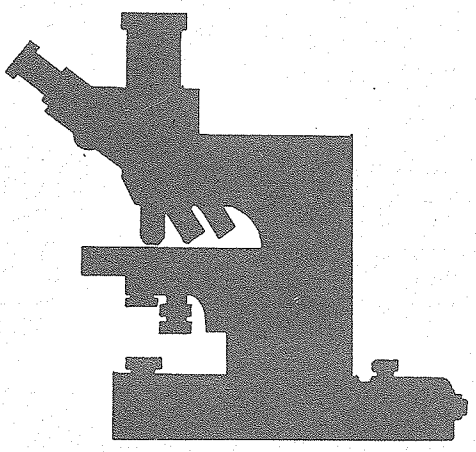

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One of six regional centers, two national forestry institutes, and a headquarters unit, NoFC is located in Edmonton, Alberta, and has district offices in Prince Albert, Saskatchewan, and Winnipeg, Manitoba. Until joining Agriculture Canada in 1984 under a Minister of State (Forestry), the Canadian Forestry Service was part of Environment Canada.

FOREST INSECT AND DISEASE CONDITIONS IN ALBERTA, SASKATCHEWAN, MANITOBA, AND THE NORTHWEST TERRITORIES IN 1985 AND PREDICTIONS FOR 1986

B.H. Moody and H.F. Cerezke

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ABSTRACT

Forest pest conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories during 1985 are summarized, and some predictions are made for 1986. Nine major pests are discussed in detail, and additional noteworthy insects, diseases, and other damage agents are reported in a table. Surveys for acid rain damage and introduced pests are also reported.

RESUME

Le rapport présente une vue générale de la situation des ravageurs forestiers en Alberta, en Saskatchewan, au Manitoba et dans les Territoires du Nord-Ouest en 1985, et quelques prédictions pour 1986. Neuf ravageurs importants sont traités en détail, tandis qu'un tableau est consacré aux autres insectes, maladies et agents d'endommagement dignes de mention. Le document comprend également, en résumé, les inventaires de dommages dus aux pluies acides et aux ravageurs introduits.

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NOTE

The exclusion of certain manufactured products does not necessarily imply disapproval nor does the mention of other products necessarily imply endorsement by the Canadian Forestry Service.

INTRODUCTION

This report summarizes forest insect and disease conditions in Alberta, Saskatchewan, Manitoba, and the Northwest Territories in 1985 and provides predictions of the infestation levels of major insect pests for 1986. Surveys were conducted mainly by the staff of the Forest Insect and Disease Survey (FIDS) of the Northern Forestry Centre, Canadian Forestry Service (CFS), with the cooperation of personnel from many federal, provincial, and municipal agencies.

We would like to acknowledge the assistance and cooperation of many individuals from the following agencies:

Agriculture Canada
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Alberta Recreation and Parks
City of Edmonton
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City of Saskatoon
City of Winnipeg
Department of Northern Saskatchewan
Manitoba Agriculture
Manitoba Department of Natural Resources
Parks Canada
Prairie Farm Rehabilitation Administration Tree Nursery
Saskatchewan Agriculture
Saskatchewan Department of Parks and Renewable Resources

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Dick Wong, Insect Taxonomist

Five summer students also worked for FIDS in 1985.

The following descriptions of pests are arranged more or less according to national and regional importance. Brief remarks on other noteworthy insects, diseases, and vegetation disturbances appear in the table on pages 17–22.

SPRUCE BUDWORM
Choristoneura fumiferana (Clemens)

The number of spruce budworm infestations decreased in Manitoba but remained stable with slight increases in populations in certain areas in Saskatchewan and Alberta in 1985 (Fig. 1). These infestations were scattered over a total area of 106 500 ha compared to 170 200 ha in 1984 (Table 1). Limited control operations were carried out against the spruce budworm

Table 1. Summary of moderate-to-severe defoliation by the spruce budworm sketch-mapped from the air during 1984–85

Area	Defoliation (ha) 1984	1985	Change
Manitoba	142 700	77 500	−65 200
Saskatchewan	15 100	15 000	−100
Alberta	1 500	1 400	−100
Northwest Territories	10 900	12 500	+1 600
Total	170 200	106 400	−63 800

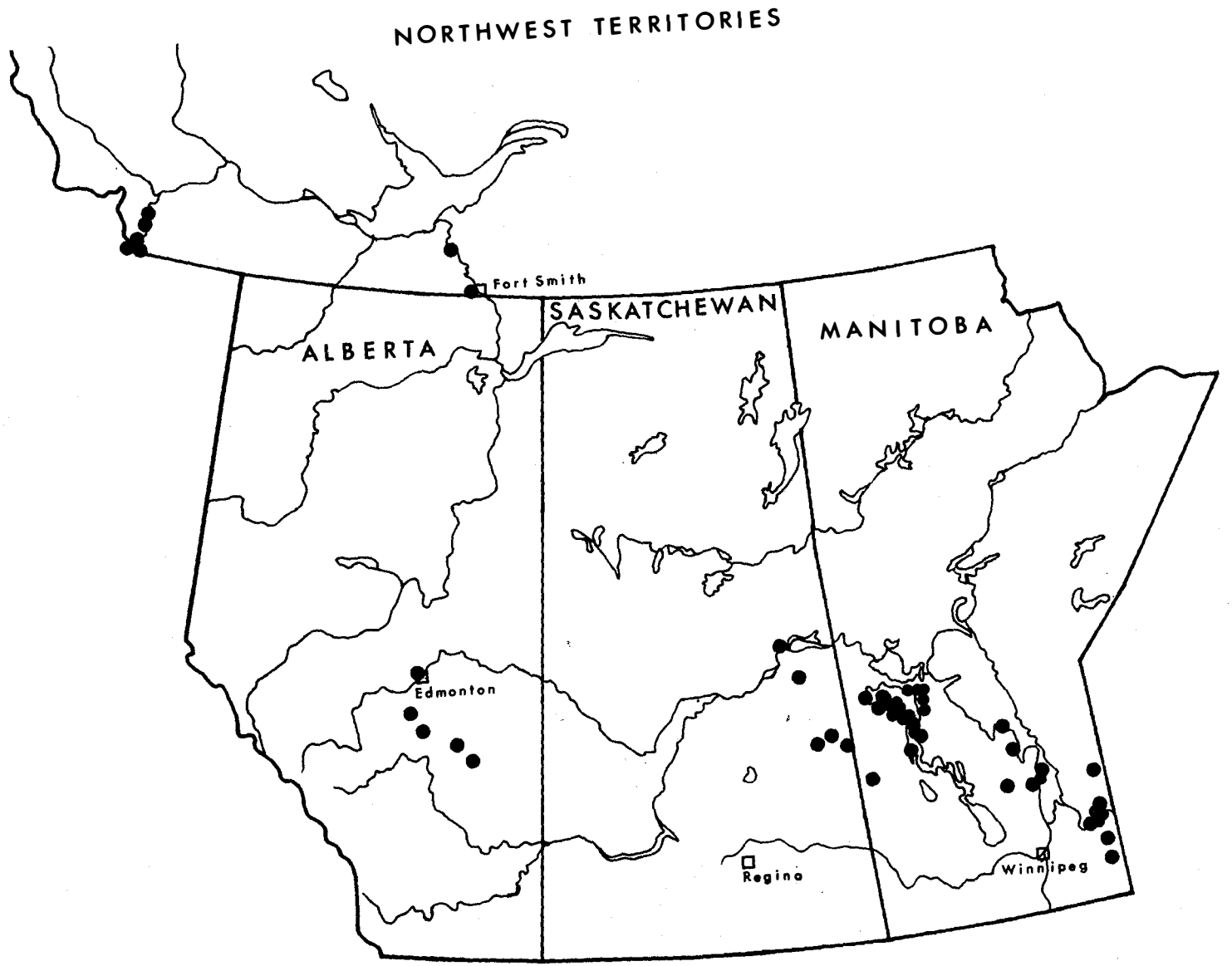

Figure 1. Areas of moderate-to-severe defoliation by the spruce budworm in 1985.

in the region except for the application of Dipel 88 (*Bacillus thuringiensis* (Berliner) (B.t.)) in small areas of white spruce in central Alberta. The general forecast for 1986, based on egg-mass counts and overwintering larval counts, is for moderate-to-severe defoliation to occur in many of the same areas. Weather, parasites, predators, and diseases may affect the predicted infestation levels.

Manitoba: A decline in areas defoliated by the spruce budworm occurred in 1985; moderate-to-severe defoliation of white spruce and balsam fir forests was mapped over 77 500 ha compared to 142 700 ha in 1984. The total areas of moderate-to-severe defoliation estimated by provincial forest sections[1] were as follows:

Mountain Forest Section	53 500 ha
Pineland Forest Section	500 ha
Lake Winnipeg East Forest Section	6 500 ha
Interlake Forest Section	17 000 ha
Total	77 500 ha

Tree decline and mortality continued in scattered areas in the Interlake and Lake Winnipeg East forest sections, where the infestations have persisted since the late 1970s. Tree mortality is about 25% in some spruce-fir stands, where most of the balsam fir component is dead. No control programs were conducted in 1985 except for the redirection of timber harvest operations into one area of high spruce budworm damage in the Lac du Bonnet district of eastern Manitoba.

The decline in budworm populations in certain areas was probably partly the result of early emergence of overwintering larvae followed by below normal temperatures in June and reduction of foliage from previous accumulated defoliations and host mortality.

Egg-mass sampling at 20 locations, conducted by the CFS and the Manitoba Department of Natural Resources, and moth counts from pheromone-baited traps indicate that moderate-to-severe defoliation may occur within the Mountain, Lake Winnipeg East, and Interlake forest sections in 1986 (Table 2).

Saskatchewan: Moderate-to-severe defoliation of white spruce and balsam fir forests occurred within an area of 15 000 ha in the Porcupine Hills and Red Earth areas in east-central Saskatchewan, similar to that in 1984. In the Porcupine Hills, higher larval populations occurred in the Usherville–Tall Pines outbreak (7 000 ha), which was first detected in 1982 between Usherville and Reserve. Moderate-to-severe defoliation also occurred in the Porcupine Hills Provincial Forest near the south boundary and northeast of Parr Hill Lake near Little Swan Road. Both infestation areas were detected in 1984. The Red Earth infestation (7 900 ha) northeast of Carrot River was detected in 1983. Most of the host timber has been harvested in the Torch River outbreak, and only about 50 ha of standing timber remains. Timber harvesting of infested spruce and fir is also in progress in the Usherville–Tall Pines and Red Earth outbreak areas.

Spruce budworm male moths from pheromone-baited traps and egg-mass counts at five locations indicate that moderate-to-severe defoliation may occur in 1986 in the Red Earth and Porcupine Hills infestation areas (Table 2).

Alberta: The spruce budworm caused varying levels of defoliation in several small areas of white spruce in central Alberta in 1985, totaling about 1 400 ha. In Edmonton, the current outbreak of moderate-to-severe defoliation of white spruce was first recorded in 1979. In 1985, the main infestation declined and only light-to-moderate defoliation occurred. Aerial spraying with B.t. was conducted in five areas of white spruce in Edmonton.

The current outbreak in the Big Knife Provincial Park area, first reported in 1982, spread northwesterly toward Donalda along the Battle River and Bigknife, Meeting, and Redwillow creeks. The total area of white spruce infested in 1985 was about 800 ha. Moderate-to-severe defoliation occurred near Castor Creek (250 ha), and defoliation was light-to-moderate along Bigstone Creek (50 ha) west of Wetaskiwin. Light-to-moderate defoliation also occurred west of Samson Lake (east of Menaik). Light defoliation occurred south of Millet in 1985, where infestations have persisted since 1981. The area was sprayed with B.t. in 1984 and 1985. Populations declined west of Bowden in the Red Lodge Provincial Park area and along highways 5 and 7 east of the Red Deer River crossing.

Spruce budworm egg-mass and overwintering larvae counts (Table 2) indicate that moderate-to-severe defoliation in 1986 may occur in Big Knife Provincial Park, near Castor, Ponoka, and Morningside, and in Red Lodge Provincial Park. Other infested areas in central

[1] Forest sections are administrative units of the Manitoba Department of Natural Resources.

Table 2. Average spruce budworm egg-mass densities in 1985 and predicted 1986 damage for Manitoba, Saskatchewan, and Alberta

Location	Avg. no. of egg masses per 10 m²	1986 damage forecast[a]
MANITOBA		
Interlake Forest Section		
Lake St. George (6 locations)[b]	14 (115)[c]	Light
Lake St. Andrew (4 locations)[b]	18 (100)	Light
Hecla Island Provincial Park (12 locations)[b]	106 (162)	Moderate
Grindstone Point Provincial Park (7 locations)[b]	52 (88)	Moderate
Mountain Forest Section		
Red Deer River	232 (120)	Severe
Riding Mountain National Park	0 —[d]	Nil
Saskatchewan River Forest Section		
Rocky Lake	0 —	Nil
Lake Winnipeg East Forest Section		
Whiteshell Provincial Park	164 —	Moderate to severe
(7 locations)[b]	144 (77)	Moderate
Wanipigow Lake	311 (13)	Severe
Wallace Lake	151 (25)	Moderate to severe
Aspen Parkland Forest Section		
Birds Hill Provincial Park	5 —	Light
Spruce Woods Provincial Park	6 —	Light
SASKATCHEWAN		
Red Earth	140 (223)	Moderate to severe
Porcupine Provincial Forest		
South boundary	392 (475)	Severe
North boundary	112 (118)	Moderate to severe
Hudson Bay	0 (0)	Nil
Duck Mountain Provincial Park	0 (0)	Nil
ALBERTA		
Big Knife Provincial Park	— (239)	—
Castor	106 (253)	Moderate to severe
Millet	26 (295)	Light
Morningside	160 —	Severe
Ponoka	345 —	Severe

[a] Egg mass per 10 m² and potential defoliation:
Light = Up to 25 = <25% defoliation
Moderate = 50–100 = 26–50% defoliation
Severe = 200+ = 50+% defoliation

[b] Source: Beaubien, Y. 1985. Spruce budworm egg mass survey, 1985. Manit. Dep. Nat. Resour., For. Branch. Winnipeg, Manit. Rep. 85-3.

[c] Figures in brackets are for 1984.

[d] Indicates no collections made.

Alberta and new infestations along the Steen and Chinchaga rivers in northern Alberta are expected to have light-to-moderate defoliation in 1986.

Northwest Territories: Moderate-to-severe defoliation, which has occurred on Long Island in the Slave River for the past several years, seems to have declined in 1985 in mature white spruce but has spread 1.0–1.5 km inland on the eastern banks of the river. Much of the newly infested timber is black spruce, covering about 1 000 ha.

A previous infestation near Little Buffalo River that was eradicated by forest fires in 1981 has recurred between the Little Buffalo and Salt rivers and has caused severe defoliation over 100 ha.

Light-to-moderate defoliation occurred in the Liard River valley in much the same area as in 1984, but defoliation was less intense in 1985. The only area of significant expansion was west of Fort Liard toward the Kotaneelee River valley and Yukon boundary and south to the B.C. border (6 500 ha). An additional 5 000 ha of light-to-moderate defoliation occurred along the Liard River to a point near its confluence with the Blackstone River. No egg-mass survey was conducted, but infestations are expected to continue.

JACK PINE BUDWORM
Choristoneura pinus pinus Freeman

Jack pine budworm infestations in Manitoba and Saskatchewan increased significantly in 1985, and light-to-moderate defoliation was recorded for the first time in Alberta. Moderate-to-severe defoliation occurred over a total area of 2 175 000 ha in the three provinces compared to 788 000 ha in 1984 (Fig. 2).

Manitoba: The jack pine budworm was the major pest in Manitoba during 1985, causing moderate-to-severe defoliation of jack pine within a total area of 2 047 500 ha, about 2.7 times the area infested in 1984. The expansion occurred in the Pineland, Lake Winnipeg East, Mountain, Hayes River, and Nelson River forest sections. A slight decline in population levels occurred in the north Interlake, Highrock, and Saskatchewan River forest sections of Manitoba. Severe defoliation of jack pine was sporadic in these areas.

In general, jack pine budworm infestations expanded in most provincial forest sections; areas of jack pine moderately-to-severely defoliated are shown below by provincial forest section:

Lake Winnipeg East	730 500 ha
Interlake	395 000 ha
Saskatchewan River	262 500 ha
Mountain	209 500 ha
Nelson River	206 000 ha

Other forest sections affected include: Aspen Parkland, 4 500 ha; Pineland, 48 000 ha; Highrock, 91 000 ha; Churchill, 30 500 ha; and Hayes River, 70 000 ha.

Egg-mass sampling was conducted at 18 locations throughout the province to monitor for populations and to forecast infestation levels for 1986. Results indicate that moderate-to-severe defoliation could occur in similar areas as in 1985; however, a decline is expected in areas where moderate-to-severe defoliation has occurred during the previous 3–4 years and has caused a cessation of male flower production. Most of these areas are in the northern parts of the outbreak, where climatic factors may be unfavorable for budworm development.

In **Saskatchewan**, there was a significant increase in the jack pine budworm infestations in 1985, and moderate-to-severe defoliation of jack pine occurred within an area of 130 000 ha compared to 27 000 ha last year.

The largest area of continuous defoliation occurred from Island Falls, Pelican Narrows, and Jan, Hanson, and Amisk lakes eastward to the Manitoba border (65 000 ha), a 2.5-fold increase over last year. Other areas with moderate-to-severe defoliation include: Suggi Lake southward along the Saskatchewan and Torch rivers to Nipawin, including Torch River Provincial Forest (23 000 ha); the area between the towns of Carrot River and Battle Heights (2 800 ha); the Fort à la Corne Provincial Forest (15 000 ha); the Nisbet Provincial Forest area (1 500 ha); the Hudson Bay-Leaf Lake area to the Pasquia Hills (22 200 ha); the area between the Red Deer River and Armit (500 ha); and a few scattered stands in the Porcupine Hills and Porcupine Plain area (1 200 ha).

Jack pine budworm egg-mass counts indicate that for 1986, moderate-to-severe defoliation may occur throughout the same areas that were infested in 1985 (Table 3).

Alberta: Previous to 1985 no jack pine budworm infestation had been recorded in Alberta; however, in 1985, light-to-moderate defoliation occurred in a few hectares of jack pine stands near Clyde and Tawatinaw in central Alberta. Egg-mass counts and overwintering larvae counts indicate that light or moderate defoliation will occur in these areas in 1986.

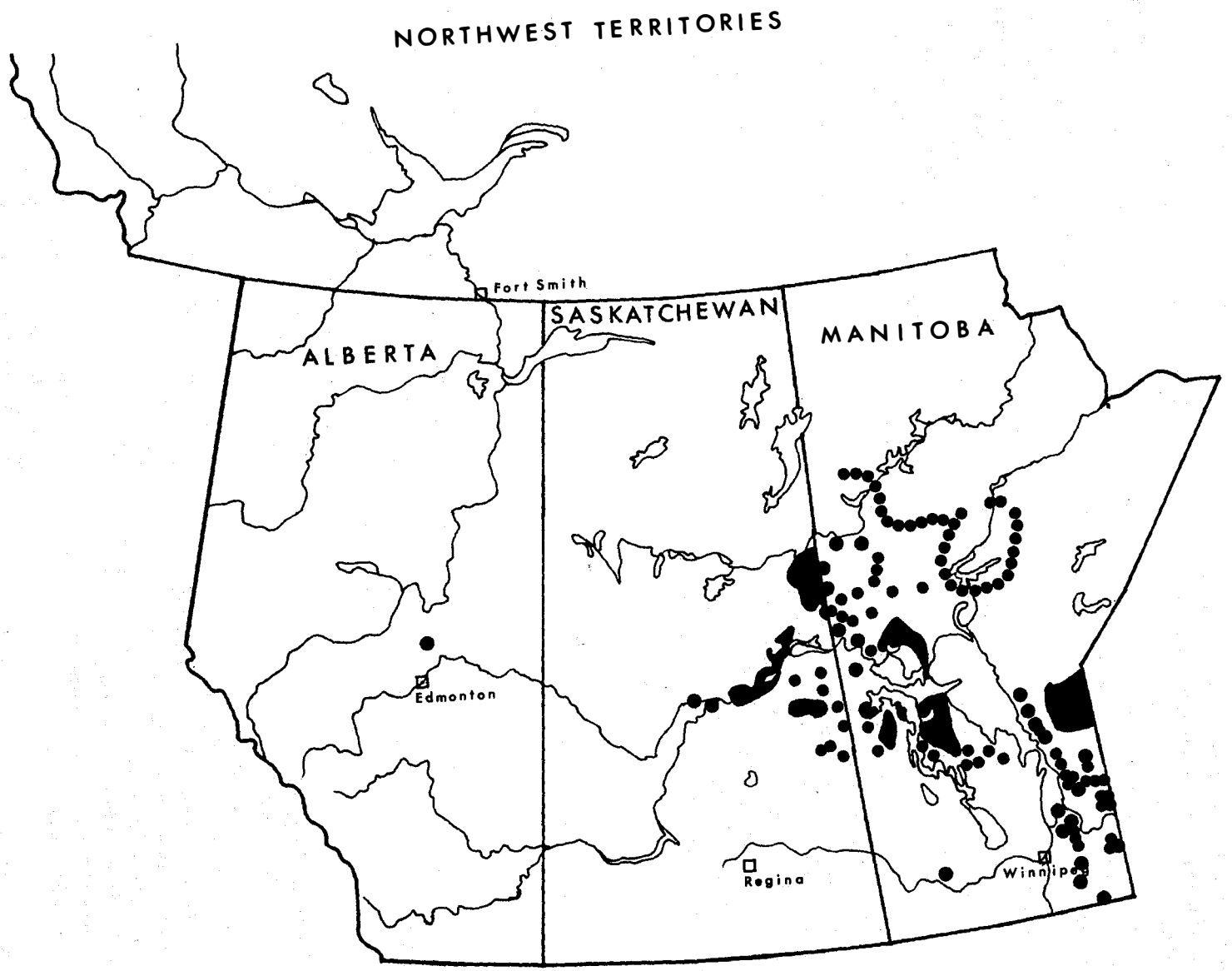

Figure 2. Areas of moderate-to-severe defoliation by the jack pine budworm in 1985.

Table 3. Results of the 1985 jack pine budworm egg-mass survey in Manitoba and Saskatchewan and 1986 forecast

Location	Avg. no. of egg masses per 10 m²		Predicted defoliation for 1986
MANITOBA			
North of Grand Rapids			
Plot 1	15	(103)[a]	Light
Plot 2	0	(56)	Nil
Plot 3	34	(70)	Moderate
Plot 4	0	(78)	Nil
Plot 5	62	(182)	Moderate
Plot 6	67	(371)	Moderate
Plot 7	52	(95)	Moderate
Plot 8	25	(104)	Light
5 km south of Grand Rapids–Plot 9	52	(55)	Moderate
13 km south of Grand Rapids–Plot 10	9	(62)	Light
Marchand	45	(0)	Moderate
Westray	57	(38)	Moderate
Wallace Lake	155	(77)	Severe
Bélair	130	(9)	Moderate
Point du Bois	0	(0)	Nil
Rennie	67	(0)	Moderate
Vassar	60	(7)	Moderate
Spruce Woods Provincial Park	25	—[b]	Light
Duck Mountain Provincial Park	36	—	Light to moderate
Rosenburg	7	(0)	Light
Gypsumville	26	—	Light to moderate
Clearwater Provincial Park	39	—	Light to moderate
Kississing	146	—	Moderate to severe
Suwannee River	76	—	Moderate
Lynn Lake	117	—	Moderate
Thompson	144	—	Moderate to severe
Agassiz Provincial Forest	4	—	Light
SASKATCHEWAN			
Nipawin — north	35	(225)	Light to moderate
Nipawin — south	65	(0)	Moderate
Hudson Bay — south	24	(164)	Light
Nisbet Provincial Forest			
West of Prince Albert	81	—	Moderate
West of Shell River	17	—	Light
East of Prince Albert	106	—	Moderate
Fort à la Corne Provincial Forest	89	(0)	Moderate
Creighton	196	(220)	Severe
McBride Lake	167	(14)	Severe
Johnson Lake	260	(76)	Severe
Torch River Provincial Forest	197	—	Severe
Hanson Lake Road—Torch River	0	—	Nil

[a] Figures in brackets are for 1984.
[b] Indicates no collections made.

ASPEN DEFOLIATORS
Primarily the forest tent caterpillar (*Malacosoma disstria* Hubner) and the large aspen tortrix (*Choristoneura conflictana* (Walker))

Aerial and ground surveys indicated that the total area of trembling aspen forests severely defoliated increased in 1985 in Alberta and Saskatchewan and declined in Manitoba (Fig. 3). Moderate-to-severe defoliation of trembling aspen and other deciduous tree species was mapped over a total area of 2 313 000 ha (Table 4). Two-thirds of the defoliation occurred in the agricultural zones in Alberta and Saskatchewan. The forest tent caterpillar was the major defoliator species across the prairie provinces. The large aspen tortrix, the Bruce spanworm, *Operophtera bruceata* (Hulst), and the early aspen leaf curler, *Pseudexentera oregonana* (Walsingham) were present but caused noticeable defoliation only in a few small areas. No aspen defoliation was reported in the Northwest Territories.

Table 4. Summary of moderate-to-severe defoliation by the forest tent caterpillar sketch-mapped from the air in 1985

Province	Area mapped (ha)	Estimated aspen defoliation (ha)
Manitoba	19 500	19 500
Saskatchewan	31 302	31 302
Alberta	2 262 300[a]	155 000
Total	2 313 102	205 802

[a] About 75–80% of this area is in the agricultural zone.

In **Manitoba**, the forest tent caterpillar was the major defoliator of trembling aspen. Defoliation levels in 1985 decreased, and moderate-to-severe defoliation occurred over a total area of 19 500 ha of aspen. Most of the defoliation was located in the Saskatchewan River Forest Section and covered an area of 18 500 ha. The other areas of defoliation occurred in the Aspen Parkland (500 ha) and the Nelson River (500 ha) forest sections. Forest tent caterpillar egg-band surveys in 12 locations indicated that a further decline in the current infestation areas will occur in 1986.

In **Saskatchewan**, aspen defoliation was mapped over a total of 31 302 ha. Moderate-to-severe defoliation of trembling aspen and other associated broadleaf hosts increased in an area extending from the eastern side of Greenwater Lake Provincial Park through the Piwei Lakes and Big Valley Lake area to Hazel Dell, a total of 20 000 ha. Scattered stands with similar defoliation were also more prevalent from Macklin to the Marsden-Neilburg areas and from Lloydminster northward to Worthington Lake (11 000 ha). A few small stands were defoliated between Sheho and Invermay (100 ha), at Nipawin (2 ha), and north of Prairie River in the Pasquia Hills (200 ha).

Egg-band surveys conducted at 20 locations indicated that light-to-moderate defoliation with scattered severe defoliation may occur from Hazel Dell to Greenwater Lake Provincial Park, from Worthington Lake to Lloydminster, and from the Macklin and Neilburg areas to Lloydminster.

In **Alberta**, infestations by the forest tent caterpillar increased, and moderate-to-severe defoliation occurred on 155 000 ha of trembling aspen stands scattered throughout a total land area of about 2 260 000 ha. Three-quarters of this area is in the agricultural zones. The largest area, in east-central Alberta, straddled the Alberta-Saskatchewan border from Provost north to the Frog Lake–Tulliby Lake area and extended westerly to Two Hills, Mundare, Lavoy, Hardisty, and Castor. Although the total land area involved is extensive, infested aspen stands within this area are relatively small and scattered and are estimated to consist of 62 000 ha.

Moderate-to-severe defoliation in the Athabasca-Jarvie-Redwater infestation area, which is more densely forested, occurred over an area of 79 000 ha of aspen. The Wapiti River outbreak, south of Grande Prairie, ranged over 2 000 ha of moderately-to-severely defoliated aspen. Approximately 7 000 ha of aspen stands were similarly defoliated in the Majeau Lake–Lac la Nonne area, and about 2 300 ha were defoliated between Sandy Lake and Stony Plain. Elsewhere, small isolated infestations of less than a total of 1 000 ha of aspen occurred at 11 locations in central Alberta including Elk Island National Park.

Egg-band surveys carried out in late fall of 1985 suggest there will be some increases in caterpillar populations in 1986 and perhaps a larger area of defoliation.

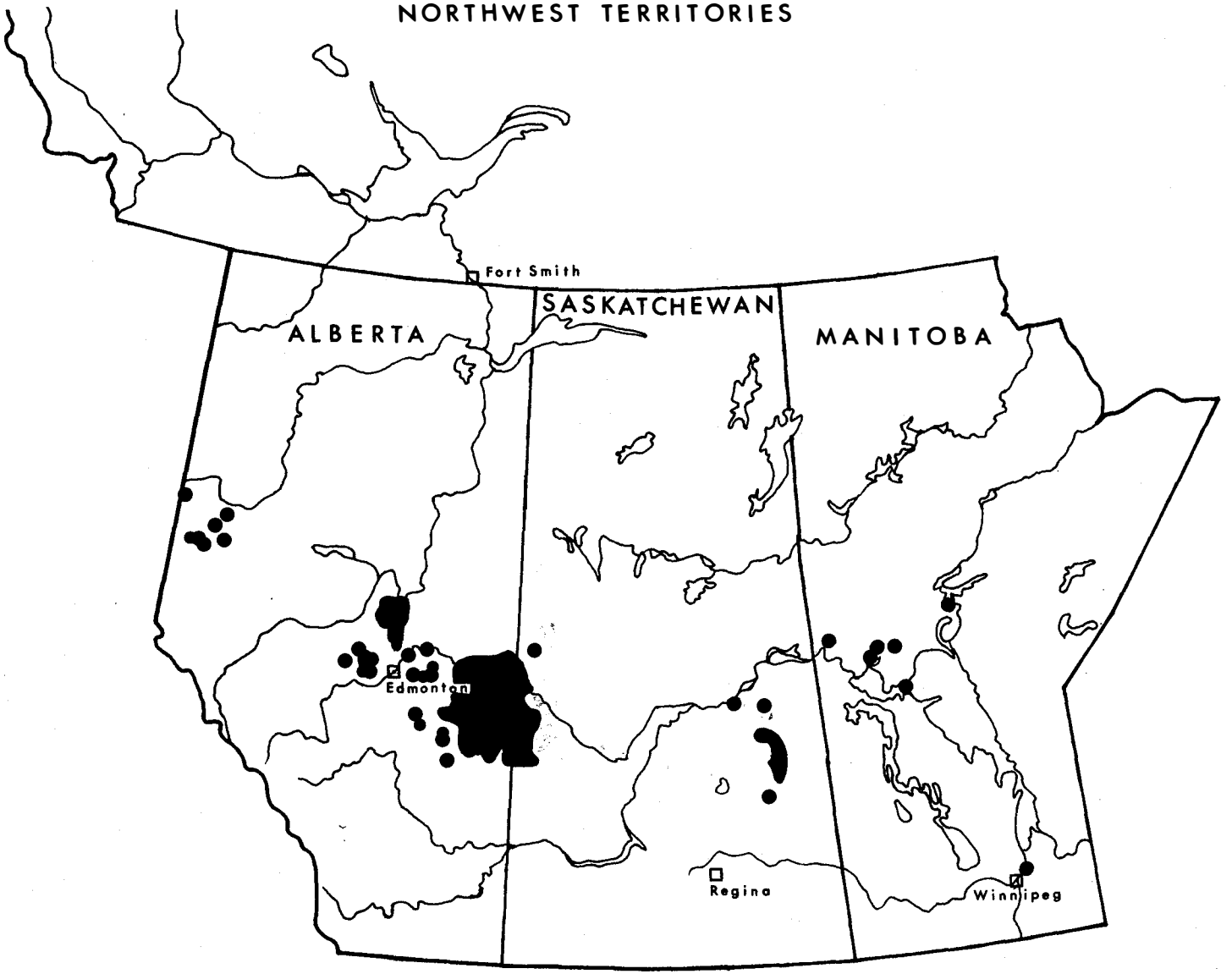

Figure 3. Areas of moderate-to severe defoliation of trembling aspen primarily by the forest tent caterpillar in 1985.

Scattered patches of moderate-to-severe defoliation caused by the large aspen tortrix occurred in the Calgary west, Priddis, and Millarville areas in southern Alberta. Moderate-to-severe defoliation by the large aspen tortrix also occurred in Birds Hill Provincial Park in southeastern Manitoba.

MOUNTAIN PINE BEETLE
Dendroctonus ponderosae Hopkins

The outbreak of the mountain pine beetle in Alberta, Saskatchewan, and the Rocky Mountain national parks continued to decline in 1985, except perhaps in Kootenay National Park, where infestations were similar to those in 1984. In southwestern Alberta, infestations occurred in stands of lodgepole and limber pines, and no new infestations were detected.

Provincial forest lands: The estimated tree mortality from 1984 attacks in the Bow-Crow Forest was 130 000 lodgepole pine, or an estimated volume of 42 770 m^3, and 30 000 limber pine. Most of the lodgepole pine mortality (95% or more) occurred directly east of Waterton Lakes National Park in the area known as Pole Haven. Other smaller infestations occurred on Hastings Ridge, along Whitney, Mill, and Gladstone creeks, and in a few small patches near the northern boundary of Waterton Lakes National Park (Fig. 4). The limber pine mortality occurred in stands scattered throughout the Porcupine Hills and adjacent areas and southward along the eastern fringe of the foothills.

Salvage harvesting of beetle-killed trees was minor in 1985; however, the control program of the Alberta Forest Service, initiated in 1980, was continued in areas mostly north of the Crowsnest Pass corridor. Approximately 6 500 infested lodgepole pine and 23 500 infested limber pine were cut and burned during the winter of 1984–85. Many of the infested pine were from locations where semiochemical lures for the mountain pine beetle had been deployed by the Alberta Forest Service as part of the control strategy. A total of 1 000 lures were distributed throughout the control areas.

Provincial parks: Infestations of the mountain pine beetle in provincial parks in the Cypress Hills of southwestern Saskatchewan and southeastern Alberta continued in similar locations as reported in 1984, but were much reduced (Fig. 4). About 100 red-topped trees were identified during aerial and ground surveys in both provinces, compared to over 500 trees identified in the previous year. Control programs, consisting of the deployment of semiochemical lures and sanitation cuttings of infested pine, were actively pursued by both provinces. During the winter months of 1984–85, 108 infested pine were cut and burned on the Alberta side of the Cypress Hills, and 84 were similarly treated on the Saskatchewan side. The control program, now in a cleanup phase, has been successful, in part due to the placement of semiochemical lures (800 in Saskatchewan and 200 in Alberta) at strategic locations for detecting beetle populations and for concentrating them onto baited-trap trees.

National parks: The number of recent beetle-killed trees in Yoho National Park in 1985 was estimated to be 60, a considerable reduction from 1984. Most of the trees were located south of Emerald Lake and in the valley along the Amiskwi River. In Kootenay National Park, 2 000 recently killed pine were estimated in the area between Pitts Creek and Mount Wardle, similar to the amount reported last year. Additional recently killed trees were at scattered locations from Pitts Creek to the south end of the park and near Radium and were probably similar in number to that reported last year. No control action was taken during the 1984–85 winter months in Kootenay National Park.

In Banff and Waterton Lakes national parks, about 50 and 100 recently killed pine were recorded; all were in similar areas reported previously (Fig. 4). Aerial surveys were again conducted in Jasper National Park, but no beetle infestations were observed. About 40 1984-attacked and a similar number of 1985-attacked lodgepole pine were identified within several kilometres west of Mount Robson Provincial Park in British Columbia. That province plans to carry out sanitation cutting of these infestations to reduce the risk of spread eastward by the beetle.

SPRUCE BEETLE
Dendroctonus rufipennis (Kirby)

Infestations of the spruce beetle remained low throughout **Alberta** in 1985. Several white spruce stands surveyed in the Peace River, Grande Prairie, and Footner Lake forests indicated that endemic populations were confined to a few small groups of standing trees, to single trees, and in windthrown spruce.

Several extensive overmature stands still remain in northern forest districts and are susceptible to spruce beetle attack. Salvage logging in 1984 and 1985 has helped to reduce the areas of susceptible forest and losses caused by the spruce beetle.

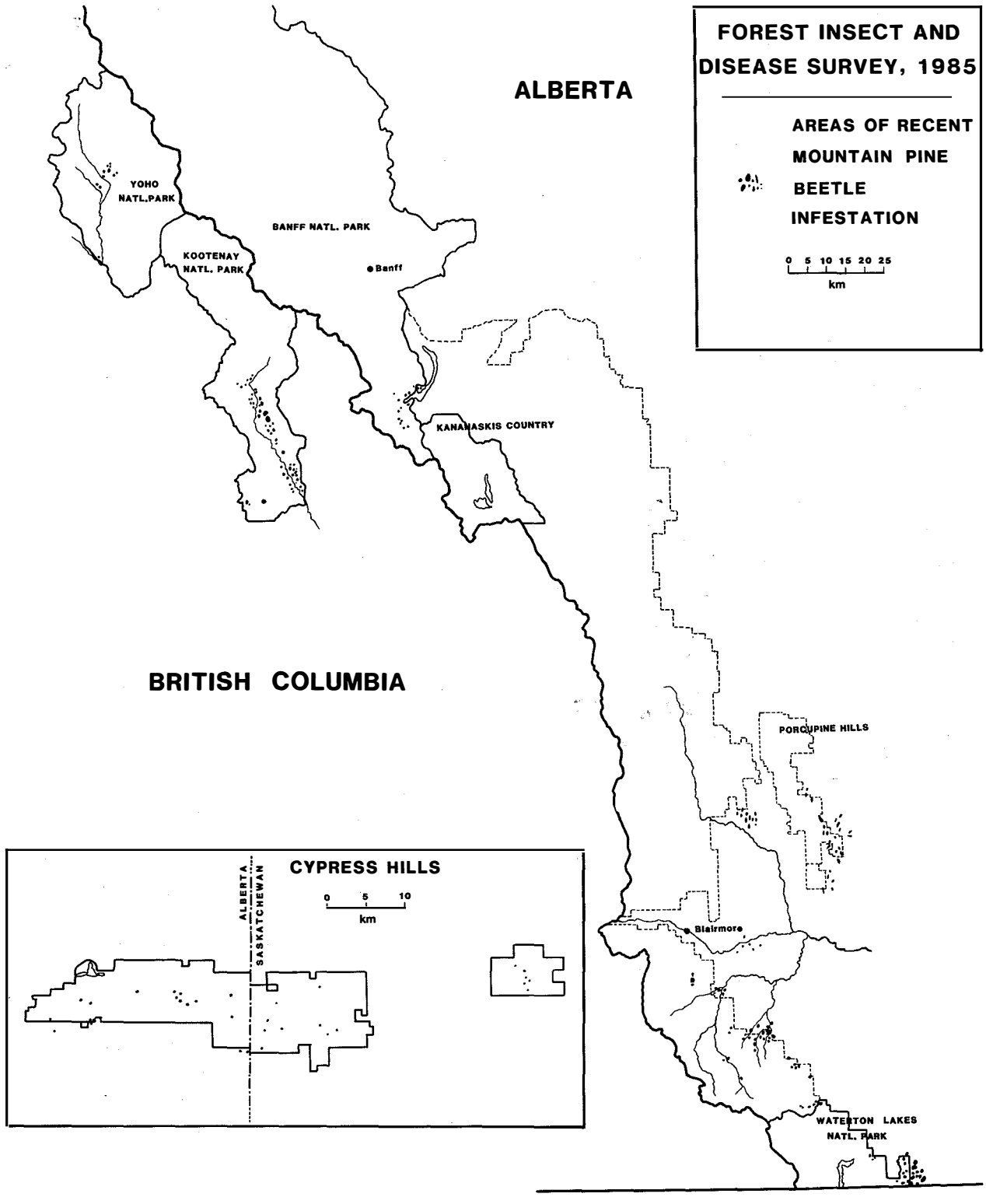

Figure 4. Areas of mountain pine beetle infestations in southwestern Alberta and the Cypress Hills on the Alberta-Saskatchewan border in 1985.

In the southern Bow-Crow Forest, where 18 sites were monitored, the number of infested trees was less than 10% of that recorded in 1984, indicating declining and endemic populations.

DUTCH ELM DISEASE
Ceratocystis ulmi (Buisman) C. Moreau

In **Manitoba**, Dutch elm disease (DED) surveys were conducted primarily by the Manitoba Department of Natural Resources with cooperation from FIDS and Parks Canada. The Province reported that DED continued to increase in wild elm stands, but the incidence of diseased elms in urban centers with control programs was comparatively low. Less than 1% of the elms in Winnipeg and less than 2% of the elms in Brandon were diseased. Most of these diseased trees were found in wild stands along river banks, where control measures are less effective. The number of municipalities with DED increased from 62 to 72 in 1985 (Fig. 5).

The disease continued to increase along most of the rivers in southern Manitoba. Large increases have occurred on the Red and Assiniboine rivers around Winnipeg and along the Assiniboine River around Portage la Prairie, Brandon, and west of Brandon. The Whitemud River area around Westbourne had a significant increase in diseased elms, as did the east escarpment of Riding Mountain National Park. The smaller river and creek systems in south-central Manitoba also experienced more pockets of infection. The Souris River area southwest of Brandon again had large concentrations of diseased elms.

In Riding Mountain National Park, DED continued to be the most serious pest in 1985. Parks Canada identified over 50 diseased elm trees by ground and aerial surveys, compared to about 9 trees in 1984. These infected trees were spread throughout the park, and many were in inaccessible areas.

In **Saskatchewan**, intensive surveys failed to detect any diseased trees in 1985. Endemic populations of the native elm bark beetle, *Hylurgopinus rufipes* (Eichhoff) were found in elms in several areas in the province. No evidence of the native elm bark beetle or DED was found in **Alberta**.

DWARF MISTLETOES
Arceuthobium americanum Nuttal ex Engelmann on jack and lodgepole pines and *A. pusillum* Peck on white and black spruces

Dwarf mistletoes on pines and spruces are a perennial problem in the prairie provinces and cause witches'-brooms, stem deformation, reduced growth, and tree mortality, especially in jack pine.

In **Manitoba**, the Forestry Branch of the Manitoba Department of Natural Resources continued its intensive dwarf mistletoe management program. Aerial surveys were conducted to identify, locate, and map dwarf mistletoe–infected stands. These were followed by ground surveys. In 1985, a total of 192 km of dwarf mistletoe–infected stands were surveyed along cruise lines in the Grand Rapids, Easterville, Devils Lake, Kettle Hills, and Moose Lake areas. The basic treatment program being conducted in Manitoba includes post-harvest cleanup, sanitation thinning and pruning in young stands, sanitation treatments in burned-over areas, and salvage operations.

In 1985, postlogging treatments were prescribed in the Moose Lake, Bélair, Cowan, and Easterville areas. A total of 195 ha of moderately infected young pine was treated by sanitation cutting operations in the Bélair (60 ha), Easterville (20.2 ha), Devils Lake (10 ha), Kettle Hills (20 ha), and Mitchell Lake (25 ha) areas. Sixty hectares of buffer strips were identified and treated near Grand Rapids as a postfire treatment.

In **Saskatchewan**, the Department of Parks and Renewable Resources has salvaged unproductive dwarf mistletoe–infested jack pine stands in the Nisbet Provincial Forest for use as firewood. These areas have been scarified and regenerated.

In southwestern **Alberta**, aerial and ground surveys have been conducted in dwarf mistletoe–infected lodgepole pine stands by the Alberta Forest Service. These data will be integrated into the forest management program to help set priorities and control future cut sequences.

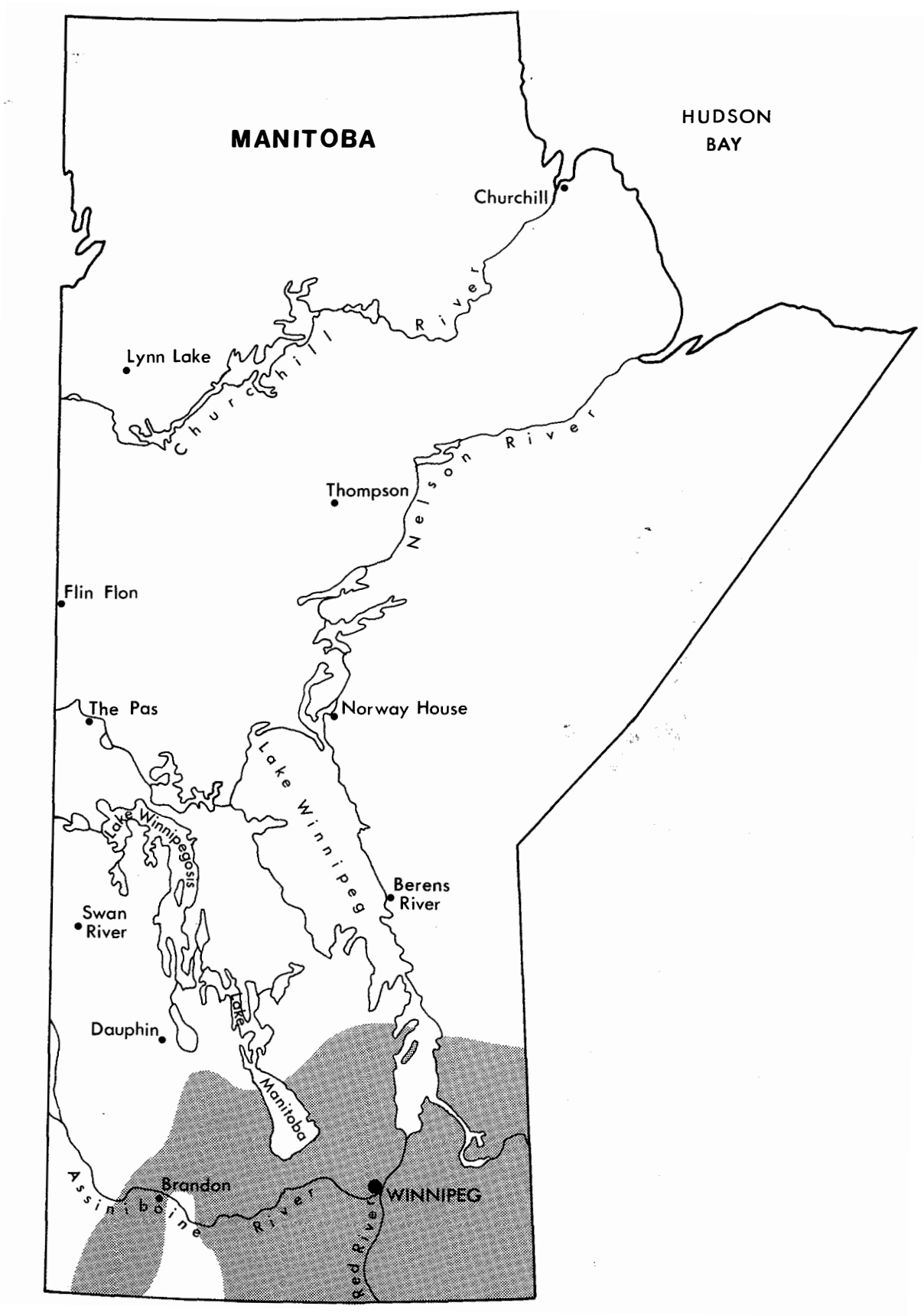

Figure 5. Areas of Dutch elm disease infections in Manitoba in 1985.

ARMILLARIA ROOT ROT
Armillaria obscura (Secret.) Herink and several other biological forms or species

Localized but significant mortality has been noticed in many locations in Alberta, Saskatchewan, and Manitoba in naturally regenerated stands and plantations of conifers. Abundant production of sporophores (mushrooms) was observed across the region during the fall of 1985. About 50 mushroom samples, more than 150 diploid cultures, and more than 100 haploid cultures were obtained from all three prairie provinces in 1985. These specimens will help to identify the distribution pattern of the different biological forms and provide culture material for research.

Based on cultural characteristics, mating experiments, and morphological examinations of sporophores, the main organism associated with the mortality of young conifers in the prairie provinces is now confirmed as *Armillaria obscura*. Two or possibly three more forms (species) exist in the region, but further confirmation is needed to establish species identification. Inoculation experiments are under way to evaluate host specificity and relative virulence of major forms within the region.

Armillaria root rot continues to be a problem in red pine plantations in eastern **Manitoba**. In an impact study initiated in 1983 by the Manitoba Forestry Branch, the disease was monitored in active infection centers in 9-, 11-, and 12-year-old red pine plantations. Within the five study plots, cumulative mortality due to Armillaria ranged from 12.9 to 31.9% by the end of the 1985 season. Numerous active infection centers have been found in 30- to 35-year-old red pine plantations in southeastern Manitoba.

LARCH SAWFLY
Pristiphora erichsonii (Hartig)

In the **Northwest Territories**, larch sawfly populations declined for the third consecutive year, possibly as the result of pupal mortality caused by high water levels. Defoliation was generally light except in the area from the junction of the Liard Highway to about 30 km west of Fort Simpson and south to Sibbeston Lake, where it was moderate-to-severe. Moderate-to-severe defoliation of small patches of larch also occurred south along the Liard Highway to Blackstone River Park.

In 1985, sawfly populations declined for a second consecutive year throughout Wood Buffalo National Park, with larvae developing later than in previous years. High soil moisture levels may have caused increased mortality to pupae.

In **Manitoba**, the larch sawfly caused moderate-to-severe defoliation in two main locations. It was present for the second consecutive year along Highway 10 south of the Easterville turnoff and from Thompson to near Leaf Rapids.

INTRODUCED INSECTS

A survey was made in 1985 for several introduced insects that have been present in southeastern **Manitoba** for several years and have the potential to become important forest pests. The European spruce sawfly, *Gilpinia hercyniae* (Hartig), present since 1969, was collected as far north as Silver Falls, Manitoba. Larvae of the larch casebearer, *Coleophora laricella* (Hübner), present since 1965, were not collected in 1985 in Manitoba. Pheromone traps for this species placed near Sprague, Manitoba, collected a number of adult moths, which were tentatively identified as the larch casebearer.

The mountain ash sawfly, *Pristiphora geniculata* (Hartig), collected at Falcon Lake, Manitoba, in 1984 was absent in this area in 1985.

Surveys were also conducted to determine if certain introduced pests present in Ontario, British Columbia, or adjoining states have spread to the prairie provinces. A single male gypsy moth, *Lymantria dispar* (Linnaeus), was captured in a pheromone-baited trap in Sherwood Park, **Alberta** in 1984, but none were captured in the province in 1985. The European pine shoot moth, *Rhyacionia buoliana* (Denis & Schiffermuller), present in Ontario and British Columbia, was absent in all pheromone traps set out in the prairie provinces in 1985.

ACID RAIN MONITORING

The Acid Rain National Early Warning System (ARNEWS) is a national program established in 1984 to detect early signs of acid rain damage to Canada's forests. The CFS, specifically FIDS, is responsible for establishing a series of permanent plots from which soil and foliage samples are collected and analyzed for symptoms of acid rain damage. Forest areas outside the ARNEWS plots are also observed for possible damage from acid rain.

Ten permanent plots were established (Fig. 6). There are four plots in Manitoba, located in Whiteshell Provincial Park, Duck Mountain Provincial Park,

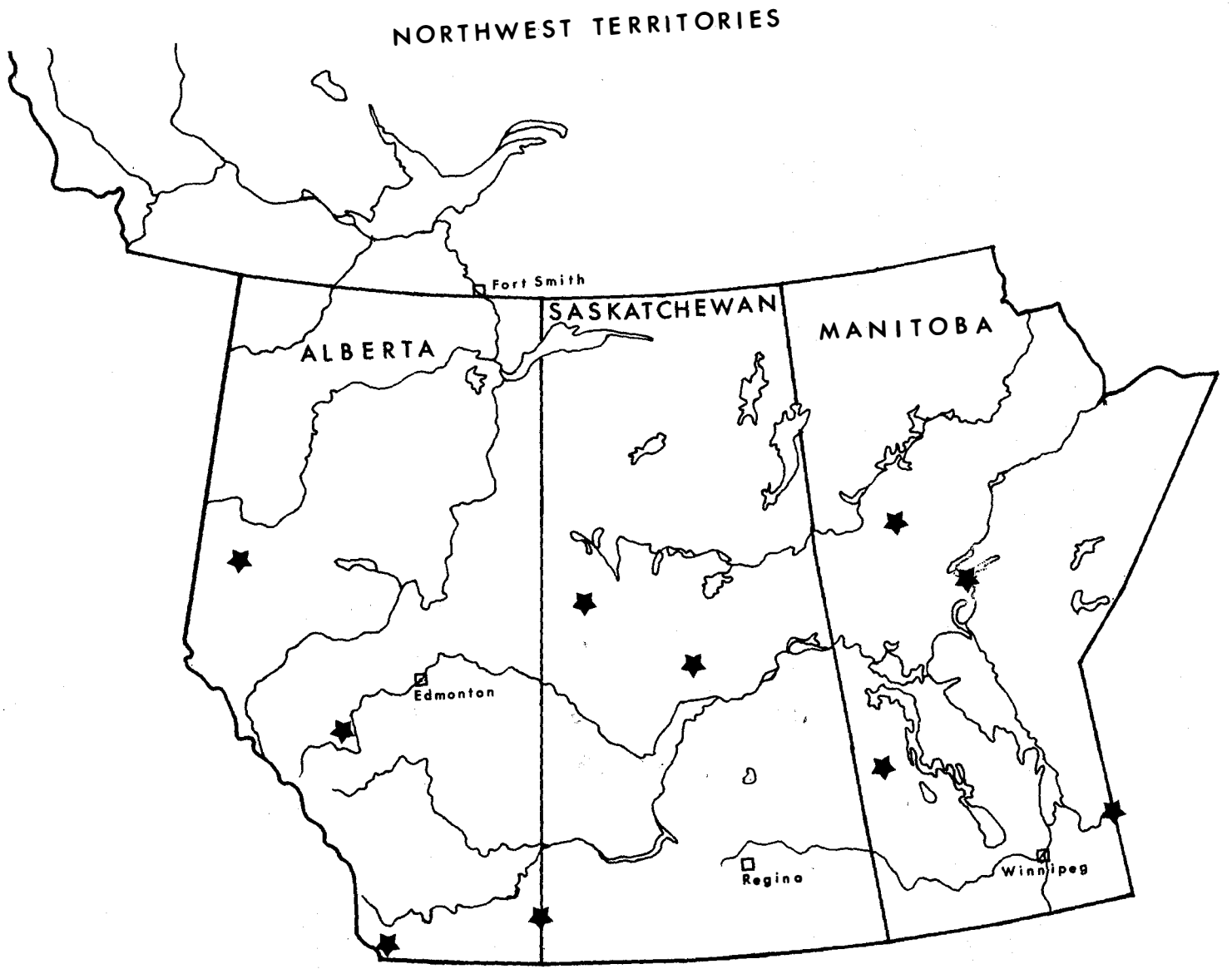

Figure 6. Locations of Acid Rain National Early Warning System (ARNEWS) plots.

Jenpeg, and Suwannee; there are two plots in Saskatchewan, in Meadow Lake Provincial Park and Prince Albert National Park; and there are four in Alberta, in Cypress Hills Provincial Park, Waterton Lakes National Park, Grande Prairie, and Rocky Mountain House.

ARNEWS plots measure 10 × 40 m, and parameters measured include tree data (height, dbh, crown length, etc.), tree and pest assessment, regeneration, and ground vegetation. Samples for foliage, soils, and tree growth analyses were also taken. Samples for chemical analyses will be taken every 5 years, and the other measurements and observations will be taken annually.

SELECTED PUBLICATIONS AND REPORTS

The following reports or publications produced recently by the Forest Insect and Disease Survey and other staff at the Northern Forestry Centre may be of interest to readers of this report.

Allen, E. 1985. Infection of young seedlings of lodgepole pine by *Endocronartium harknesii*. M.Sc. thesis. Univ. Alberta, Edmonton, Alberta.

Bella, I.E. 1985. Pest damage incidence in natural and thinned lodgepole pine in Alberta. For. Cbron. 61:233–238.

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Moody, B.H.; Cerezke, H.F. 1985. Other insects and diseases: Western and Northern Region. Pages 59-61 *in* E.S. Kondo and R.G. Taylor, compilers. Forest insect and disease conditions in Canada 1984. Can. For. Serv., Ottawa, Ontario.

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Wong, H.R.; Drouin, J.A.; Rentz, C.L. 1986. *Petrova albicapitana* (Busck) and *Petrova metallica* (Busck) (Lepidoptera: Tortricidae) in *Pinus contorta* Dougl. stands of Alberta. Can. Entomol. 117:1463–1470.

Zalasky, H. Bud defects in winter damaged Colorado spruce. Page 110 *in* W.G. Thies, compiler. Proceedings of the 33rd annual western international forest disease work conference, Olympia, Washington, September 24–27, 1985. U.S. Dep. Agric., For. Serv., Pac. Northwest For. Range Exp. Stn., Corvallis, Oregon.

OTHER INSECTS AND DISEASES

Insect or disease	Host	Location	Remarks
Ash bark beetle *Leperisinus californicus* Swaine	Green ash	Alberta Saskatchewan	Common incidence causing branch and top mortality of established planted trees in several urban centers and farm shelterbelts. Damage incidence tends to increase during dry years.
Birch leaf miners *Fenusa pusilla* (Lepeletier) *Heterarthrus nemoratus* (Fallen) *Profenusa thomsoni* (Konow)	Birch species	Prairie provinces	Common throughout forested areas and urban centers. There was a decline in damage in most forested areas in Saskatchewan. Light-to-severe damage persisted in most urban areas.
Bruce spanworm *Operophtera bruceata* (Hulst)	Aspen	Alberta	Light defoliation recorded south of Calgary, Alberta. Moderate-to-severe defoliation in Birds Hill Provincial Park, Manitoba.
Chemical injury	Several species	Alberta Saskatchewan	Increase in injury and mortality to nontarget trees by chemicals, especially soil sterilants and herbicides in urban areas, and excess chlorides from road salts.
Comandra blister rust *Cronartium comandrae* Peck	Pine	Alberta NWT	Low level of infections in pine regeneration areas.
Cytospora canker *Cytospora chrysosperma* Persoon ex Fries	Poplar Mountain ash Willow	Alberta	Common on host trees in most urban areas and shelterbelts.
Eastern black-headed budworm *Acleris variana* (Fernald)	Spruce	Saskatchewan	Light-to-moderate defoliation of white spruce in a small area between Montreal Lake and Prince Albert National Park.

Other insects and diseases, continued

Insect or disease	Host	Location	Remarks
European fruit lecanium *Lecanium corni* Bouché	Many deciduous tree and shrub species	Manitoba	Common in many urban extension collections.
Fall cankerworm *Alsophila pometaria* (Harris)	Manitoba maple White elm Green ash	Prairie provinces	Low population levels persisted in southern Alberta. Continued as a major defoliator in most urban areas of Saskatchewan. Moderate-to-severe defoliation in most urban areas in southern and western Manitoba.
Fire blight *Erwinia amylovora* (Burrill) Winslow *et al.*	Apple Cotoneaster Crab apple Hawthorn Mountain ash	Alberta Saskatchewan	A noticeable increase in shoot-blight infections on mountain ash occurred in both provinces. Infection of the host species remained stable.
Frost damage	Several species	Prairie provinces NWT	Damage to buds and new shoots very common, in spruce and poplar especially.
Gray willow leaf beetle *Pyrrhalta decora decora* (Say)	Willow	Manitoba Saskatchewan	Common in many extension collections. Moderate-to-severe damage at Libau, Manitoba.
Honeysuckle aphid *Hyadaphis tataricae* (Ajzenberg)	Honeysuckle	Alberta Saskatchewan Manitoba	Common throughout urban and shelterbelt plantings. Caused severe damage to terminal shoots.
Hypoxylon canker *Hypoxylon mammatum* (Wahlenberg) J.H. Miller	Aspen	Prairie provinces	Canker infections occurred in most natural stands checked, especially in central Alberta and Saskatchewan.
Jack pine resin midge *Cecidomyia resinicola* Osten Sacken	Jack pine	Manitoba	High populations occurred on jack pine near Grand Rapids.

Other insects and diseases, continued

Insect or disease	Host	Location	Remarks
Jack pine sawfly *Neodiprion* sp.	Jack pine Lodgepole pine	Alberta Manitoba	Moderate-to-severe defoliation in jack pine plantations in the Chip Lake area, and low populations occurred near Wabamun and Edson, Alberta.
Larch casebearer *Coleophora laricella* (Hübner)	Larch	Manitoba	Light defoliation occurred near Sprague.
Lodgepole terminal weevil *Pissodes terminalis* Hopping	Jack pine Lodgepole pine	Prairie provinces	Infestations are common on young trees throughout the provinces.
Northern pitch twig moth *Petrova albicapitana* (Busck) *P. metallica* (Busck)	Jack pine Lodgepole pine	Alberta Saskatchewan	Very common in jack pine plantations surveyed in Saskatchewan. Common in native pine stands in Alberta.
Pear sawfly *Caliroa cerasi* (Linnaeus)	Mountain ash Cotoneaster Apple Plum	Alberta Saskatchewan	Continued to be a persistent and common pest on host species in urban areas.
Pine engraver *Ips pini* (Say)	Jack pine Lodgepole pine	NWT	Decline in number of trees attacked by beetles in the Fort Smith area.
Pine webworm *Tetralopha robustella* Zeller	Jack pine	Manitoba	Light damage near Milner Ridge.
Pine needle cast *Lophodermella concolor* (Dearn) Darker	Lodgepole pine	Alberta	A general decline in infections, and light infections on trees in the Calgary, Red Deer, Edmonton, and Rocky Mountain House areas. Common in natural stands in the foothills area.
Pine root-collar weevil *Hylobius* sp.	Planted pine species	Manitoba	Occurs in low numbers in some young pine plantations and regeneration only in southeast Manitoba.

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Other insects and diseases, continued

Insect or disease	Host	Location	Remarks
Pinewood nematode *Bursaphelenchus xylophilus* (Steiner and Buhrer) Nicle	Jack pine Lodgepole pine Balsam fir	Manitoba Alberta	The nematode was absent in stem samples of jack pine from Bélair Provincial Forest, in balsam fir from Whiteshell Provincial Park, Manitoba, and in lodgepole pine in southern Alberta killed by the mountain pine beetle.
Poplar blackmine beetles *Zeugophora scutellaris* Suffrian	Poplar	Alberta	Common incidence from central to southern Alberta on planted hybrid poplars.
Rabbit damage	Jack pine	NWT	Occasional roadside mortality in the NWT.
Red belt injury	Pine Fir	NWT	Moderate-to-severe red belt 4–5 km in length on south aspect of Sun Blood Mountain above Virginia Falls.
Sawyer beetles, mainly *Monochamus scutellatus* (Say)	Lodgepole pine Jack pine White spruce Black spruce	Alberta	No major infection areas reported in 1985. Two requests in Alberta were for information to protect logs in storage and on some wormholed lumber material exported to U.S. markets.
Scleroderris canker *Gremmeniella abietina* (Lagerberg) Morelet	Lodgepole pine	Alberta	Found only in known areas in Jasper National Park and recognized as an endemic nonvirulent form.
Silver leaf *Stereum purpureum* (Persoon) Fries *(Chondrostereum p.)*	Mountain ash	Alberta	A general decline recorded in 1985. Continues to be a fairly common problem affecting older plants in many urban areas.

Other insects and diseases, continued

Insect or disease	Host	Location	Remarks
Spruce gall aphids *Adelges cooleyi* (Gillette) *Pineus similis* (Gillette) *Pineus pinifoliae* (Fitch)	Spruce Pine	Alberta Saskatchewan NWT	Gall aphid damage occurred in all host areas. Considered a perennial problem and difficult to control. Common throughout the Mackenzie District. Moderate-to-severe damage in Louise Falls Territorial Park.
Spruce needle rust *Chrysomyxa* sp.	Spruce	Alberta Saskatchewan NWT	Fairly common in many areas, light-to-moderate damage occurred in the Athabasca—Fort McMurray and the Rocky Mountain House—Lodgepole areas in Alberta. Moderate-to-high incidence of the rust, but intensity generally low in all areas sampled in Saskatchewan.
Spruce spider mite *Oligonychus ununguis* (Jacobi)	Spruce Juniper Cedar	Prairie provinces	Common perennial pest on hosts in all prairie provinces, especially on mature and semimature trees in urban areas.
Two-year-cycle spruce budworm *Choristoneura biennis* Freeman	Alpine fir Engelmann spruce	Alberta	Trace-to-light defoliation occurred in the Saskatchewan Crossing area, in Banff National Park, and at Numa Creek campground in Kootenay National Park.
Western gall rust *Endocronartium harknessii* (J.P. Moore) Y. Hiratsuka	Lodgepole pine Jack pine	Prairie provinces NWT	Common at low incidence level in most young pine regeneration, in plantations, and on some urban trees throughout the region.
Western tent caterpillar *Malacosoma californicum pluviale* (Dyar)	Balsam poplar	Alberta	A general increase recorded throughout the eastern agricultural zone, especially in the Lloydminster, Wainwright, and Castor areas and in the Cypress Hills.

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Other insects and diseases, continued

Insect or disease	Host	Location	Remarks
White pine weevil *Pissodes strobi* (Peck)	Spruce Pine	Prairie provinces	Slight increase in terminal damage to spruce recorded in Alberta. In Saskatchewan, damage to spruce and pine remained static in plantations and natural forests.
Willow leaf miner *Micrurapteryx salicifoliella* (Chambers)	Willow	Prairie provinces NWT	Common in many areas. Moderate-to-severe damage on islands and banks of the Slave and Liard rivers and near Wrigley, NWT.
Winter drying	Several species	Prairie provinces	Browning of spruce, Scots pine, and cedars common especially in plantations, nurseries, and urban areas.
Yellow-headed spruce sawfly *Pikonema alaskensis* (Rohwer)	Spruce	Prairie provinces NWT	A notable increase in defoliation in all provinces. In the NWT, defoliation decreased in some areas, but was light-to-moderate near Yellowknife and Fort Simpson. Moderate-to-severe defoliation occurred in Paint Lake Provincial Recreation Park, Manitoba.