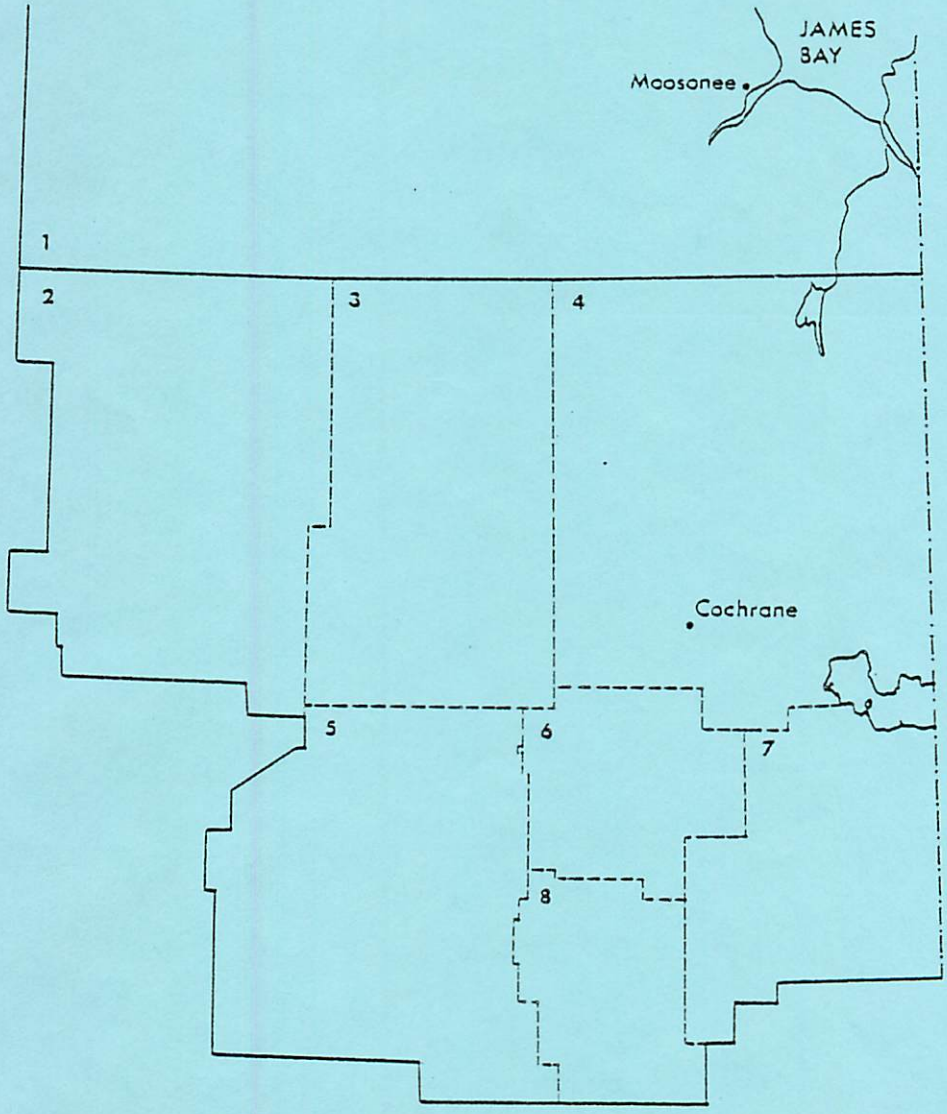
Results of forest insect and disease surveys in the NORTHERN REGION of Ontario, 1980



CARRIED OUT BY THE GREAT LAKES FOREST RESEARCH CENTRE IN CO-OPERATION WITH THE ONTARIO MINISTRY OF NATURAL RESOURCES

SURVEY HIGHLIGHTS

The effects of weather extremes were reflected in foliar discoloration over large areas of the Northern Region. The severity of damage varied considerably with geographic location and tree species but was evident to some degree in all districts (see Frontispiece).

Severe defoliation of spruce and balsam fir by the spruce budworm continued in the southern parts of Chapleau, Gogama and Kirkland Lake districts and as far north as Fort Albany in the Moosonee District. Ground and/or aerial spraying operations in nurseries, seed production areas, plantations and other high value stands were carried out against the budworm in several districts by the Ontario Ministry of Natural Resources. Heavy infestations are forecast for many areas in 1981.

Although forest tent caterpillar infestations declined appreciably in the northern districts, extensive defoliation persisted in the Cochrane District and the small infestation in the Kirkland Lake District expanded considerably. High populations of adult sawyer beetles were again present in recently harvested areas and spray operations were necessary to protect stored timber in several districts.

Surveys included examination of black spruce plantations to determine current pest problems. Factors affecting cone and seed production in the Region were also examined.

A revised format has been introduced in the 1980 report to facilitate the location of problems pertinent to specific districts. Pests are categorized according to their ability to cause damage and their current status in the Region as follows:

A - of major importance, capable of killing or severely damaging trees or shrubs;

B - of moderate importance, capable of sporadic or localized injury to trees or shrubs;

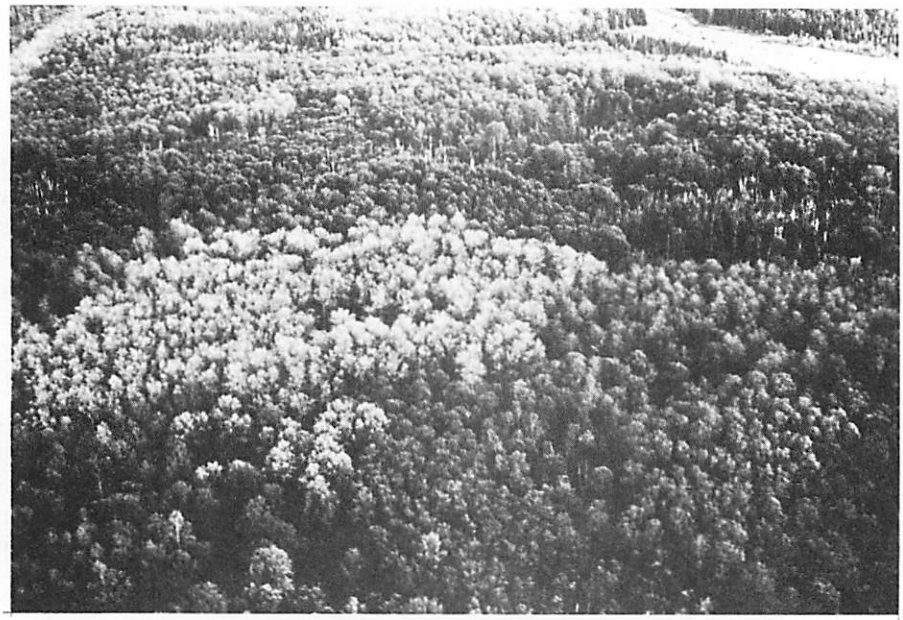
C - of minor importance, not known to present a threat to living trees or shrubs.

The generous assistance and cooperation extended by personnel of the Ontario Ministry of Natural Resources in all districts of the Region during the field season are gratefully acknowledged.

L. S. MacLeod

D. C. Constable

W. A. Ingram



Frontispiece. Cold damage, June 1980.

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INSECTS

Category A

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

The results of damage surveys, population sampling, and egg-mass counts will be included with those of other regions in a special report to be published later this year. This report provides a complete description and analysis of developments in the spruce budworm situation in Ontario in 1980 and gives infestation forecasts for the province for 1981.

Birch Leafminer, *Fenusa pusilla* (Lep.)

First and second generation leafminers again caused extensive and severe defoliation of white birch (*Betula papyrifera* Marsh.) trees in rural, urban and forested areas in several districts of the Region. Repeated attacks of large trees have caused pronounced deterioration and increased susceptibility to attack by borers, particularly on rural and urban sites. Areas of severe defoliation occurred in Kendrey Township, Cochrane District; in the Timmins and South Porcupine areas, Timmins District; in Kirkland Lake, Englehart, Earlton, New Liskeard and Elk Lake areas in Kirkland Lake District; and in Chapleau, Chapleau District. Moderate damage was recorded at Ivanhoe Provincial Park and through Cassidy Township, Chapleau District and in Halliday and Garvey townships, Gogama District.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Populations of the forest tent caterpillar on trembling aspen (*Populus tremuloides* Michx.) continued to decline in the Hearst, Kapuskasing and Moosonee districts but increased considerably in the Cochrane and Kirkland Lake districts (Fig. 1).

In the Cochrane District severe defoliation was recorded from Clute Township to Cochrane and north to Gardiner Crossing on the Abitibi River. This infestation was centred in Greenwater Provincial Park and covered an area of approximately 132 866 ha (328,320 acres).

The infestation in Kapuskasing District declined to a relatively small area of 81 ha (200 acres) in Shackleton Township. Pockets of light defoliation were observed at several locations in the Hearst and Moosonee districts.

In Kirkland Lake District the infestation located near Englehart expanded to cover parts of the townships of Chamberlain, Evanturel and Marter and all of Dack Township. Severe defoliation

NORTHERN REGION

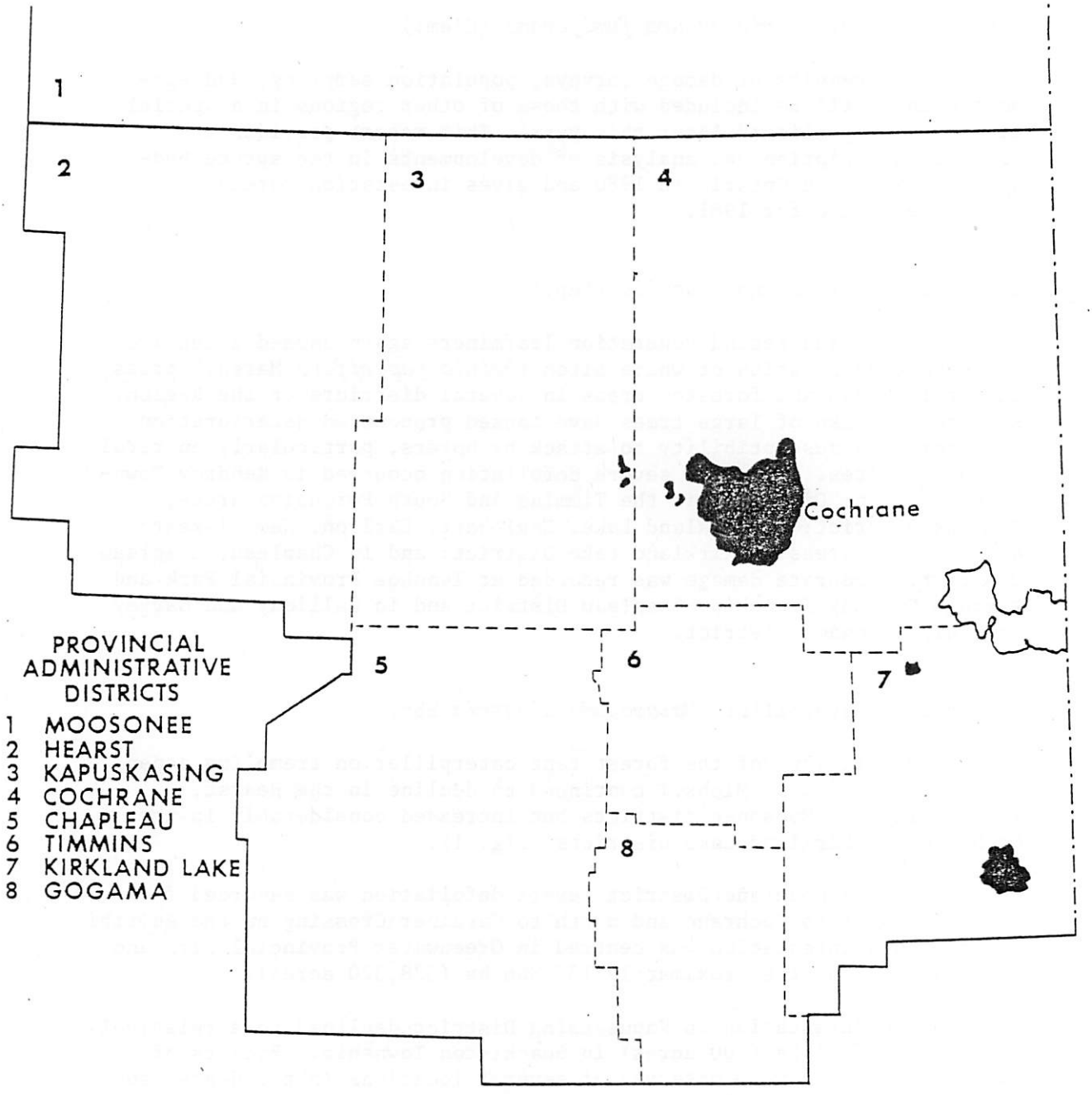

Fig. 1. FOREST TENT CATERPILLAR

Area within which moderate-to-severe defoliation of trembling aspen occurred in 1980. . . . . .

of trembling aspen was general through this area. Defoliation was particularly severe in Kap-Kig-Iwan Provincial Park where park users found the larvae annoying. A small pocket of light infestation also occurred in Beatty Township near Painkiller Lake northeast of Matheson.

Egg-band counts suggest a further expansion of the Englehart infestation in 1981. Trends are less clear in the forecasts for the Cochrane infestation but it is probable that pockets of severe defoliation will recur (Table 1).

Sawyer Beetles, *Monochamus* spp.

Feeding by adult sawyer beetles continued to cause appreciable damage in most districts. As in 1979 infestations were concentrated in areas where recent or current cutting operations provided an abundance of brood material. Striking damage to trees bordering cut-over stands, adjacent to log decks and storage dumps and to residuals in harvested areas was general. Although damage was usually confined to pines and spruces, in at least one instance eastern white cedar (*Thuja occidentalis* L.) was heavily attacked.

High numbers of adult beetles were observed feeding on fringe trees and in plantations in Vrooman and Invergarry townships, Gogama District and in Nimitz, Tooms and Eisenhower townships, Chapleau District. Heavy damage to group seed trees and residual black spruce (*Picea mariana* [Mill.] B.S.P.) stands was recorded in Hopkins Township, Kapuskasing District and in Fushimi Township, Hearst District. Heavy flagging of trees adjacent to log storage dumps occurred at several locations in Kapuskasing, Cochrane, Timmins and Kirkland Lake districts (Fig. 2). In Midlothian Township, Kirkland Lake District, adult feeding caused conspicuous flagging of residual white cedar trees in a 20-ha (50-acre) stand from which other conifers had been harvested.

Detailed observations revealed that damage was caused by the white spotted sawyer beetle (*Monochamus scutellatus* [Say]) and other species were rarely seen. Feeding adults were observed from 22 June to 7 August with peak numbers about the third week of July. Mill renovations and labor problems necessitated spraying operations of decked or stored logs at several locations in the Region. On at least two occasions ravens and other birds were observed actively feeding on the adult beetles.

Table 1. Summary of forest tent caterpillar egg-band counts on trembling aspen in three districts in 1980 and infestation forecasts for 1981.

Location (Twp)	Avg DBH of trees (cm)[a]	No. of trees sampled	Total no. of egg bands	Infestation forecast for 1981
Cochrane District				
Haggart	15	3	9	light
Kendrey	10	3	1	light
Colquhoun	5	1	40	severe
Calder	25	1	40	severe
Kennedy	24	3	0	nil
Fournier	12	3	13	moderate
Leitch	10	1	13	severe
Lamarche	17	3	22	moderate
Glackmeyer	14	3	22	moderate
Clute	15	3	8	light
Lennox	12	3	7	light
Webster	12	3	1	light
Kapuskasing District				
Shackleton	9	3	12	moderate
Kirkland Lake District				
Kerns	7	3	12	moderate
Beauchamp	10	1	10	severe
Chamberlain	10	1	10	severe
Dack	15	1	125	severe
Evanturel	7	1	12	severe
Armstrong	7	1	12	severe
Beatty	10	3	12	moderate

[a] 1 cm = 0.39 in.

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

Pockets of heavy infestation persisted in several districts. Severe defoliation of a white spruce (*Picea glauca* [Moench] Voss) snowhedge was observed in Fauquier Township, Kapuskasing District. Complete defoliation of young white spruce trees was recorded at many points within Ivanhoe Provincial Park, Chapleau District. High populations were again present on black spruce and white spruce snowhedges, windbreaks and plantations in Kirkland Lake and Timmins districts and many trees sustained heavy damage.

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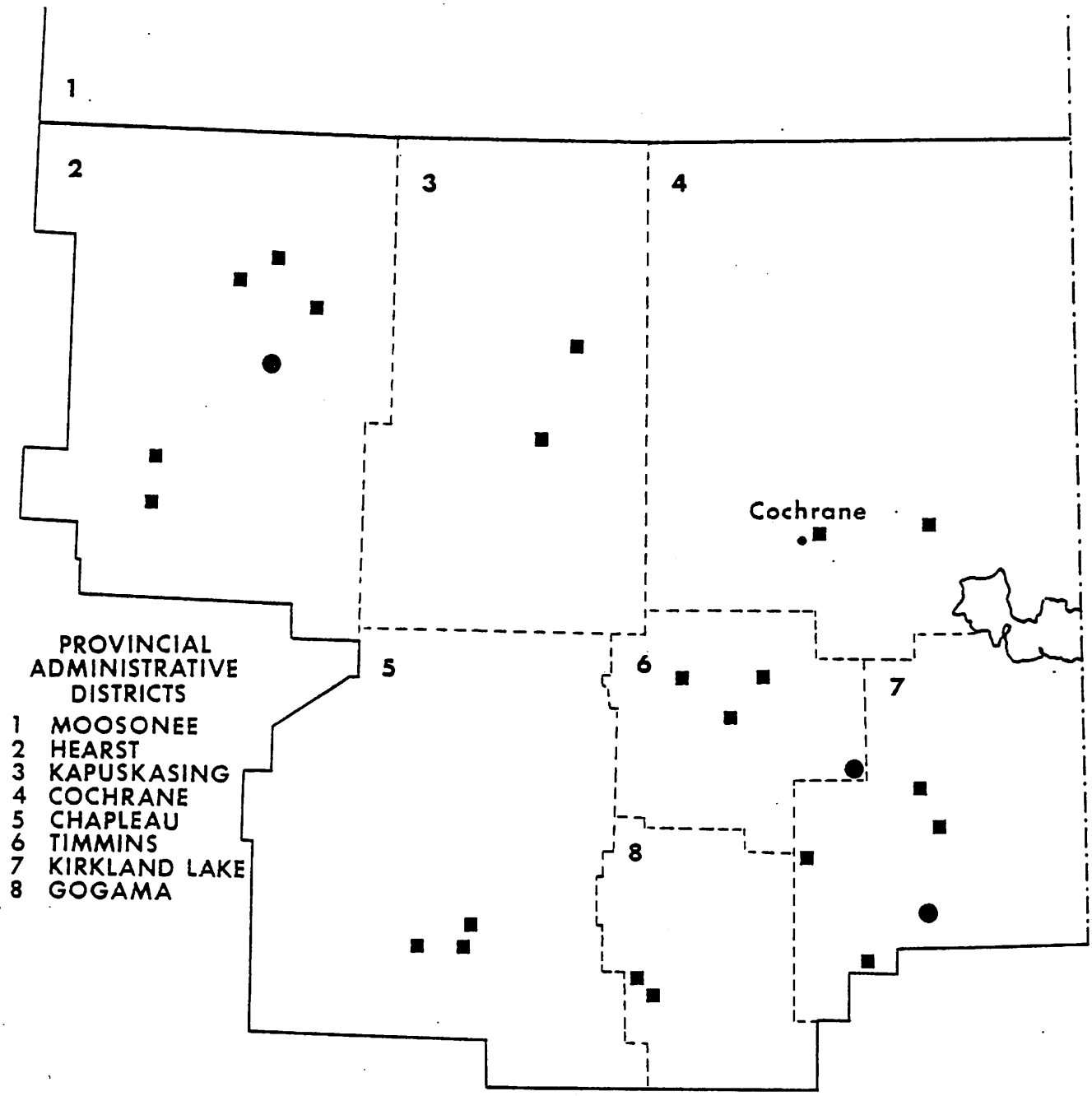

Fig. 2. MONOCHAMUS ACTIVITY 1980

Damage areas . . . . . ■

Control areas . . . . . ●

White Pine Weevil, *Pissodes strobi* (Peck)

Leader damage by this perennial pest of pine and spruce regeneration ranged from 0 to 29% at monitor plots through the Region (Table 2).

Table 2. Summary of tree damage caused by the white pine weevil in seven districts in 1979 and 1980 (counts based on the examination of 100 trees at each location).

Location (Twp)	Host	Avg ht of trees (m)[a]	Trees weeviled (%) 1979	1980
Hearst District				
Studholme	jP	2.7	2	2
Studholme	bS	1.8	3	4
Cochrane District				
Dundonald	jP	4.0	0	5
Calder	wS	1.5	3	2
Kapuskasing District				
Idington	bS	6.2	-	1
Shearer	bS	1.9	-	9
Kirkland Lake District				
Burt	jP	2.4	9	10
Dunmore	jP	2.7	10	12
Bowman	jP	3.0	8	7
McEvay	jP	3.0	9	8
Sharpe	jP	2.4	6	12
Evanturel	wP	2.4	26	29
Timmins District				
Thorneloe	jP	3.4	8	9
Timmins	jP	2.1	14	11
Gogama District				
Invergarry	jP	1.2	-	4
Jack	jP	1.2	3	2
Vrooman	jP	1.2	3	2

(continued)

Table 2. Summary of tree damage caused by the white pine weevil in seven districts in 1979 and 1980 (counts based on the examination of 100 trees at each location (concluded).

Location (Twp)	Host	Avg ht of trees (m)[a]	Trees weeviled (%) 1979	1980
Chapleau District				
Carew	jP	1.8	-	2
Sadler	jP	1.8	-	2
Gallagher	jP	1.7	-	2
Fawn	jP	3.6	4	3
Edith	jP	1.5	-	6
Esther	jP	1.8	-	4
Cosens	jP	1.2	-	4
Pinogami	jP	1.8	4	4

[a] 1 m = 3.28 ft

Larch Sawfly, *Pristiphora erichsonii* (Htg.)

No significant change in population levels of this sawfly was observed in 1980. Tamarack (*Larix laricina* [Du Roi] K. Koch.) over an area of 5 ha (12.35 acres) along the Fraser River in McCoig Township, Hearst District were again severely defoliated. Lightly defoliated trees were observed at numerous locations through Hearst, Kapuskasing, Chapleau and Gogama districts. A few scattered colonies were present in stands in Michaud and Chamberlain townships, Kirkland Lake District but defoliation was negligible in these areas. Severe defoliation of tamarack stands did occur at many points in the Region but in all instances the defoliator was the spruce budworm.

Mountain Ash Sawfly, *Pristiphora geniculata* (Htg.)

As in recent years population levels of this sawfly were very high throughout the range of mountain ash (*Sorbus* spp.) in the Region. Severe defoliation was general in both urban and forested areas and deterioration of ornamental trees caused concern to property owners at several locations.

Aspen Leafroller, *Pseudexentera oregonana* Wlshm.

The downward trend in population levels of this leafroller continued in 1980. No extensive areas of aspen defoliation were observed, although pockets of light infestation persisted in the Swastika, Larder Lake, Matheson and Belle Vallee areas of the Kirkland Lake District and in Dundonald Township, Cochrane District.

Category B

Larch Casebearer, *Coleophora laricella* Hbn.

Casebearer populations remained relatively stable in 1980. Slight increases were recorded at monitoring plots in Hearst, Kapuskasing and Cochrane districts with a high of five casebearers per branch tip on native tamarack in Fournier Township, Cochrane District. The insect was of little consequence in other districts of the Region.

Eastern Pineshoot Borer, *Eucosma gloriola* Heinr.

High numbers of the shoot borer persisted in jack pine (*Pinus banksiana* Lamb.) plantations in several districts. Leader mortality ranged from 12 to 23% at quantitative sampling stations in the Kirkland Lake and Timmins districts.

American Aspen Beetle, *Gonioctena americana* (Schaef.)

Conspicuous damage of trembling aspen foliage by this beetle was common through the southern districts of the Region. Regeneration stands suffered severe defoliation at many locations in these areas. The heaviest damage occurred near Grassy Lake in Kemp Township and along the Gogama Air Service Road in Noble Township, Gogama District. High levels of foliar damage were also recorded in Gallagher, Deans, and Daoust townships, Chapleau District and in Black, Cook and Playfair townships, Kirkland Lake District.

Aspen Leafblotch Miner, *Lithocolletis ontario* Free.

A general reduction in population levels of this leafminer resulted in less conspicuous damage to trembling aspen foliage in 1980. Severe discoloration was restricted to regeneration, notably along Highway 101 in Chapleau, Caouette and Gilliland townships, Chapleau District and in Dublin and Chester townships, Gogama District. Only light mining was observed in other districts of the Region.

Redheaded Jack Pine Sawfly, *Neodiprion virginianus* complex

Severely defoliated jack pine trees were observed in several districts. In most instances damage was confined to open grown trees on dry, rocky sites. Heaviest damage was recorded in Dupuis, Tooms, and Eisenhower townships, Chapleau District; in Hazen and Noble townships, Gogama District; and at Nagagami River in McMillan Township, Hearst District. Pockets of lightly infested trees occurred in Esker Lakes and Kettle Lakes Provincial Parks in the Kirkland Lake and Timmins districts.

Category C

Poplar Leaf Beetle, *Chrysomela walshi* Brown

High numbers of this beetle again caused severe discoloration and damage to balsam poplar (*Populus balsamifera* L.) foliage at many locations in the Region. Moderate defoliation occurred in Carter Township, Gogama District; in Hillary, Keefer, Hoyle and Godfrey townships, Timmins District; and in Hilliard and Grenfell townships, Kirkland Lake District. Severe discoloration was recorded along the Chain of Lakes Road from O'Brien Township, Kapuskasing District south to Wadsworth Township in the Chapleau District.

Jack Pine Tip Beetle, *Conophthorus banksianae* McPherson

Conspicuous damage by this beetle was again common in plantations and young stands of jack pine at many locations. Populations varied considerably, with the percentage of trees attacked ranging from 3 to 55. In Colquhoun and Clergue townships, Cochrane District, 14 and 3%, respectively, of the trees were affected. The percentage of trees attacked in Chapleau District ranged from 13 to 28, and in Gogama District from 15 to 22. Higher populations were general in the Kirkland Lake and Timmins districts, where a maximum of 55% of the trees in monitor plots were infested with an average of eight attacks per tree.

Spruce Coneworm, *Dioryctria reniculelloides* Mut. & Mun.

Appreciable numbers of this insect were recovered from spruce budworm samples in several districts. Populations varied considerably at white spruce sampling locations but averaged 18% of the total insect population. An unusual relationship was encountered in Arnott Township where the insect population on white spruce was composed of 39% *D. reniculelloides* and other associated species and 61% spruce budworm.

Poplar Gall Mite, *Eriophyes* sp.

Small groups of trembling aspen trees were occasionally heavily infested with these gall mites at several locations in the Kirkland Lake District. The dwarfed, shrunken foliage was particularly striking in the southeastern part of the district and northeast of Matheson. Little damage was observed in other districts of the Region.

Table 3. Other forest insects.

Insect	Host(s)	Remarks	Rating
Acrobasis betulella Hlst. Birch tubemaker	wB	low levels recorded in Kirkland Lake District and in Caouette and Abney twp, Chapleau District	C
Adelges lariciatus (Patch) Spruce gall aphid	wS	commonly found in Chapleau and Gogama districts	B
Adelges strobilobius Kalt. Woolly larch aphid	bS	heavy damage on understory trees throughout the Shoals Provincial Park, Chapleau District	C
Altica ambiens alni Harr. Alder flea beetle	Alder	heavy damage to alder throughout the Region; severe defoliation in Gilliland Twp, Chapleau District, Garrison and Munro twp, Kirkland Lake District	B
Archips argyrospilus (Wlk.) Fruit tree leafroller	Po, wB	further decline recorded throughout the Region; associated with *A. rosaceana* at many locations; severe damage necessitated control in a hybrid poplar plantation in Shaw Twp, Timmins District	C
Archips cerasivoranus (Fitch) Uglynest caterpillar	pCh, cCh	common throughout the Region along roadsides and in old open fields; moderate-to-heavy defoliation in Studholme Twp, Hearst District	B

(continued)

Table 3. Other forest insects (continued).

Insect	Host(s)	Remarks	Rating
Chilothrips pini Hood Flower thrips	wS	high numbers recorded in budworm development checks in Studholme Twp, Hearst District	C
Choristoneura rosaceana Harr. Obliquebanded leafroller	tA, mM	low levels recorded in Dalmas and Margaret twp, Chapleau District and trace levels throughout the remainder of the Region	C
Corythucha elegans Drake Willow-and-poplar lace bug	Willow	leaf skeletonizing common throughout Chapleau and Gogama districts	B
Epinotia momonana Kft. Alder budminer	Alder	heavy damage in Fournier Twp, Cochrane District and to a lesser degree throughout northern section of the Region	C
Halisidota maculata Harr. Spotted tussock moth	mM	common on Manitoba maple (*Acer negundo* L.) throughout the town of Chapleau	C
Holcocera immaculella McD. Conifer micro moth	rP	moderate damage to red pine (*Pinus resinosa* Ait.) flowers in Macmurchy Twp, Gogama District	C
Malacosoma californicum pluviale Dyar. Western tent caterpillar	pCh, tA	common at low levels throughout the Region; heavy over a 0.8-ha (2-acre) area in Clute Twp, Cochrane District	B
Micurapteryx salicifoliella (Cham.) Willow leafblotch miner	W	heavy defoliation persisted in the Hornepayne area and spread north to the Kabinakagami River and east through Hearst into the area around Mattice	C

(continued)

Table 3. Other forest insects (concluded).

Insect	Host(s)	Remarks	Rating
Neodiprion nanulus nanulus Schedl. Red pine sawfly	jP, rP	scattered colonies recorded on jack pine in Kirkland Lake District, and on jack pine and red pine in Chapleau and Gogama districts	B
Neodiprion pratti banksianae Roh. Jack pine sawfly	jP	light defoliation of open-grown trees around OMNR base at Biscotasing	A
Paraprociphilus tessellatus (Fitch) Woolly alder aphid	Alder	common throughout Hearst and Cochrane districts; heavier throughout Fauquier and Abbott twp, Kapuskasing District	C
Petrova albicapitana (Busck.) Northern pitch twig moth	jP	low numbers on jack pine regeneration at Kipling Dam, Kapuskasing District	C
Phyllocoptes didelphis Keifer A poplar blister mite	ltA	severe damage at one location in Asquith Twp, Gogama District	C
Pineus strobi (Htg.) Pine bark aphid	wP	trees heavily infested at gatehouse in Greenwater Provincial Park, Cochrane District	B
Pulicalvaria piceaella Combed spruce needleminer	wS	low levels found in budworm development checks across Cochrane, Kapuskasing and Hearst districts	C
Pyrrhalta decora (Say) Gray willow leaf beetle	W	low numbers of both larvae and adults on willow (*Salix* spp.) in Clute and Calder twp, Cochrane District	C

TREE DISEASES

Category A

Needle Rusts of Spruce, *Chrysomyxa ledi* (Alb. & Schw.) d By. and *C. ledicola*

As in 1979 these foliage rusts of spruce occurred generally throughout the Region but at low infection levels, and resultant damage was negligible. Damage was confined mainly to lower branches of mature trees with only low levels of defoliation being observed.

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

This organism was detected throughout much of the Region in varying degrees of intensity (Table 4). To date only the North American race of this disease has been found in the Region.

Table 4. Sampling locations and levels of the North American race of Scleroderris canker in 1980.

Location (Twp)	Tree species	Avg ht of trees (m)[a]	Level of intensity
Chapleau District			
Caverley	jP	0.3	negative
Cosens	jP	0.9	trace
Dalmas	jP	0.3	negative
Deans	jP	7.5	moderate
Deans	rP	7.5	moderate
Fawn	jP	2.1	negative
Hong Kong	jP	2.1	negative
Gogama District			
Cabot	rP	4.5	moderate
Jack	jP	2.5	negative
Vrooman	jP	2.1	negative
Hearst District			
Arnott	jP	1.0	trace
Studholme	jP	2.5	low

(continued)

Table 4. Sampling locations and levels of the North American race of Scleroderris canker in 1980 (concluded).

Location (Twp)	Tree species	Avg ht of trees (m)[a]	Level of intensity
Cochrane District			
Dundonald	jP	3.0	negative
Freele	jP	2.0	negative
Hepburn	jP	4.0	moderate
Stinson	jP	3.0	negative
Clergue	jP	1.5	low
Kapuskasing District			
Kipling	jP	3.0	trace
Timmins District			
German	jP	4.5	moderate
German	rP	4.5	moderate
German	wP	1.5	stem cankers
Macklem	jP	3.0	trace
Sheraton	jP	3.0	trace
Kirkland Lake District			
Black	jP	13.7	trace
Grenfell	rP	1.8	negative
Munro	jP	3.7	trace
McCool	jP	4.6	low

[a] 1 m = 3.28 ft

Category B

Spruce Needle Cast, *Isthmiella crepidiformis* (Darker) Darker

This parasitic fungus which occurred on old foliage of black spruce was found throughout the Region. In Idington Township, Kapuskasing District, 60% of the host trees were affected and there was 16% foliar damage. In Cochrane and Hearst districts, foliar damage ranged from 12% to 60%.

Table 5. Other forest diseases.

Organism	Host(s)	Remarks	Rating
Ceratocystis ulmi (Buism.) C. Moreau Dutch elm disease	wE	no extension of the present range but mortality continues in the Region	A
Ciborinia whetzelii (Seaver) Seaver Ink spot of aspen	tA	generally much lower levels than in previous years	A
Coleosporium asterum (Diet.) Syd. A needle rust of pine	jP	heavy infections on roadside regeneration in Kipling Twp, Kapuskasing District, and trace levels common at many locations in the Region	C
Cronartium ribicola J.C. Fisch. White pine blister rust	wP	isolated pockets of severe infections in the form of stem cankers at Wrong Lake, Chapleau District, Kap-Kig-Iwan Provincial Park, Kirkland Lake District and on windbreak trees	A
Davisomycella ampla (Davis) Darker A needle cast	jP	heavy infections, Kipling Twp, Kapuskasing District and low levels at many locations in the Region	B
Endocronartium harknessii (J.P. Moore) Y. Hirat. Globose gall rust	jP	widespread, causing branch mortality on young trees at scattered locations and light levels on 2-0 seedlings, Gogama Nursery, Gogama District	B
Hendersonia pinicola Wehm. A needle blight	jP	heavy infections on old foliage, Studholme Twp, Hearst District	B
Hypoxylon mammatum (Wahl.) J.H. Miller Stem canker of aspen	tA	commonly observed killing trees throughout the Region	A
Lophodermium piceae (Fckl.) Hoehn. Needle rust of spruce	wS	low levels of fruiting present on needles in Clute Twp, Cochrane District	B

(continued)

Table 5. Other forest diseases (concluded).

Organism	Host(s)	Remarks	Rating
Lophodermium pinastri (Schrad. ex Hook.) Chev. Needle cast of pines	jP	low levels of defoliation on scattered regeneration in Chapleau and Gogama districts	B
Melampsora epitea Thuem. Willow leaf rust	W	common through the Region	C
Rhytisma punctatum (Pers.) Fr. Speckled tar spot	mM	trace levels through the Region	C
Rhizina undulata Fr. ex Fr.	ground	found at one location following forest fire, Mountbatten Twp, Chapleau District	A
Animal damage	jP, rP	damage by rabbits and squirrels common at many locations	
Winter drying	conifers	trace levels of damage especially in exposed areas	

Abiotic Damage

Cold Damage (frost and snow)

Adverse weather conditions during the period 8-10 June (Fig. 3) caused varying degrees of foliar damage (Table 6) throughout the Region. Observations made during aerial mapping (Fig. 4) revealed extensive damage to a wide variety of tree species (Frontispiece). The most spectacular damage occurred on trembling aspen at widely scattered points and was especially noticeable on hills, ridges and along river banks. Cold temperatures accompanied by snow caused foliage to turn brown at many locations causing premature leaf drop, which resulted in partial or complete defoliation of host trees. Balsam poplar was also severely damaged throughout the Region. Coniferous trees that suffered light-to-severe foliar damage were white spruce, black spruce and

balsam fir (*Abies balsamea* [L.] Mill.). Other tree species affected by cold temperatures were birch (*Betula* spp.), maple (*Acer* spp.) and ash (*Fraxinus* spp.). Damage was also noted on less important shrub trees such as cherry (*Prunus* spp.), alder (*Alnus* spp.) and willow.

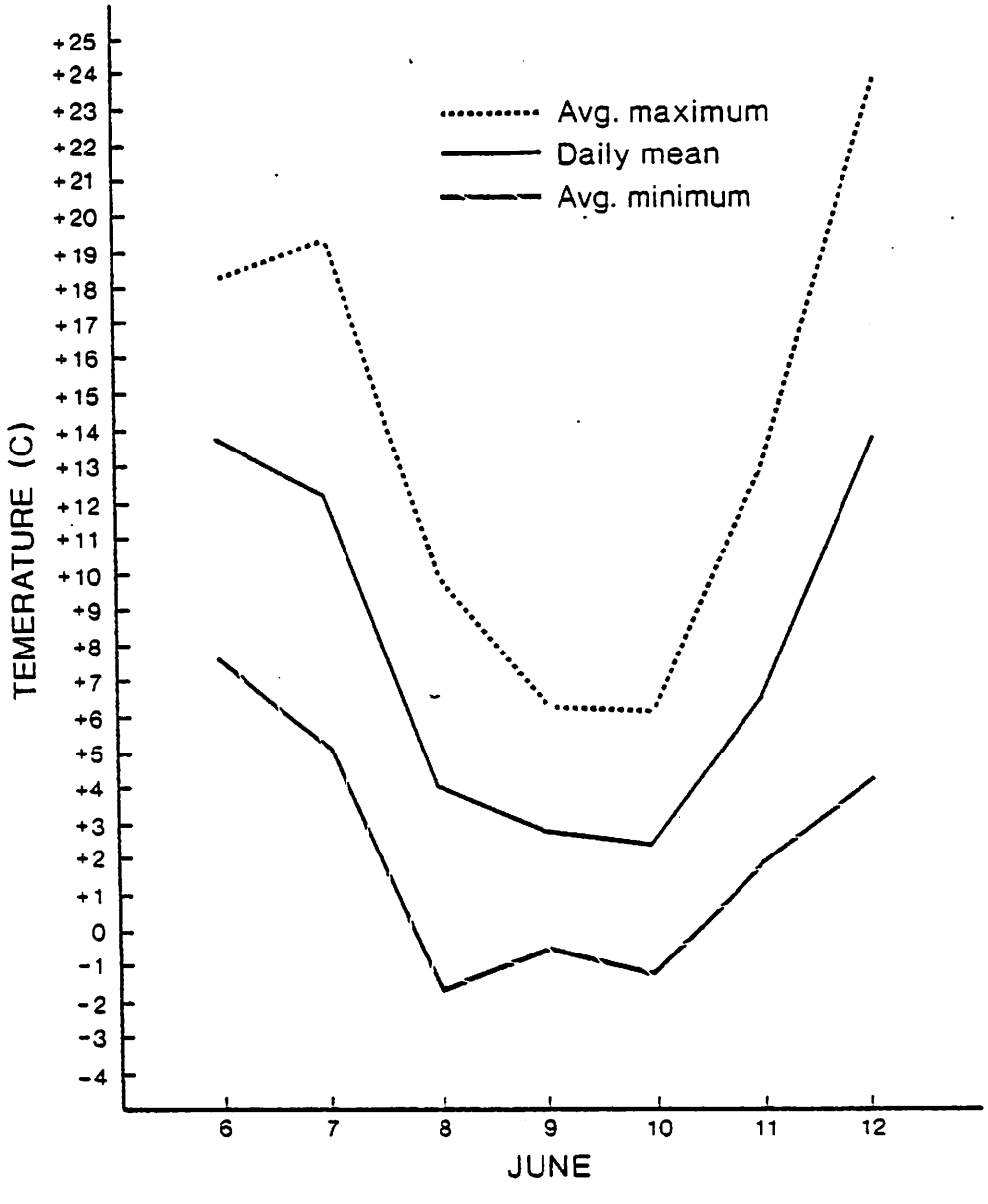

Fig. 3. Maximum, minimum and daily mean temperatures during period 6-12 June, for Northern Region.

Table 6. Summary of cold damage evaluations in six districts in 1980.

Location (Twp)	Tree species	Avg ht of trees (m)[a]	Trees affected (%)	Foliar damage (%)
Chapleau District				
Gallagher	bS	0.9	100	50
Edith	tA	14.0	100	100
Caverley	bF	0.7	100	100
Caverley	wS	0.9	80	90
Manning	wS	1.7	100	67
Chapleau Nursery	wS	seedlings	75	30
Chapleau Nursery	jP	seedlings	2	trace
Mallard	tA	14.0	100	100
Gogama District				
Jack	tA	14.0	100	97
Macmurchy	tA	15.0	100	80
Miramichi	tA	14.0	100	100
Cochrane District				
Sargeant	wS	6.0	98	80
Sargeant	bF	10.0	100	30
Stinson	wS	15.0	100	95
Stinson	bF	15.0	100	95
Kapuskasing District				
Slack	bF	10.0	100	35
Slack	tA	15.0	40	28
Slack	bPo	6.0	100	58
Harmon	bF	12.0	100	40
Kirkland Lake District				
Taylor	bF	4.5	100	100
Taylor	wS	6.1	100	80
Catharine	tA	1.8	62	40
McGarry	tA	9.2	50	50
Stock	bS	1.8	100	80
Beauchamp	tA	3.7	100	100

(continued)

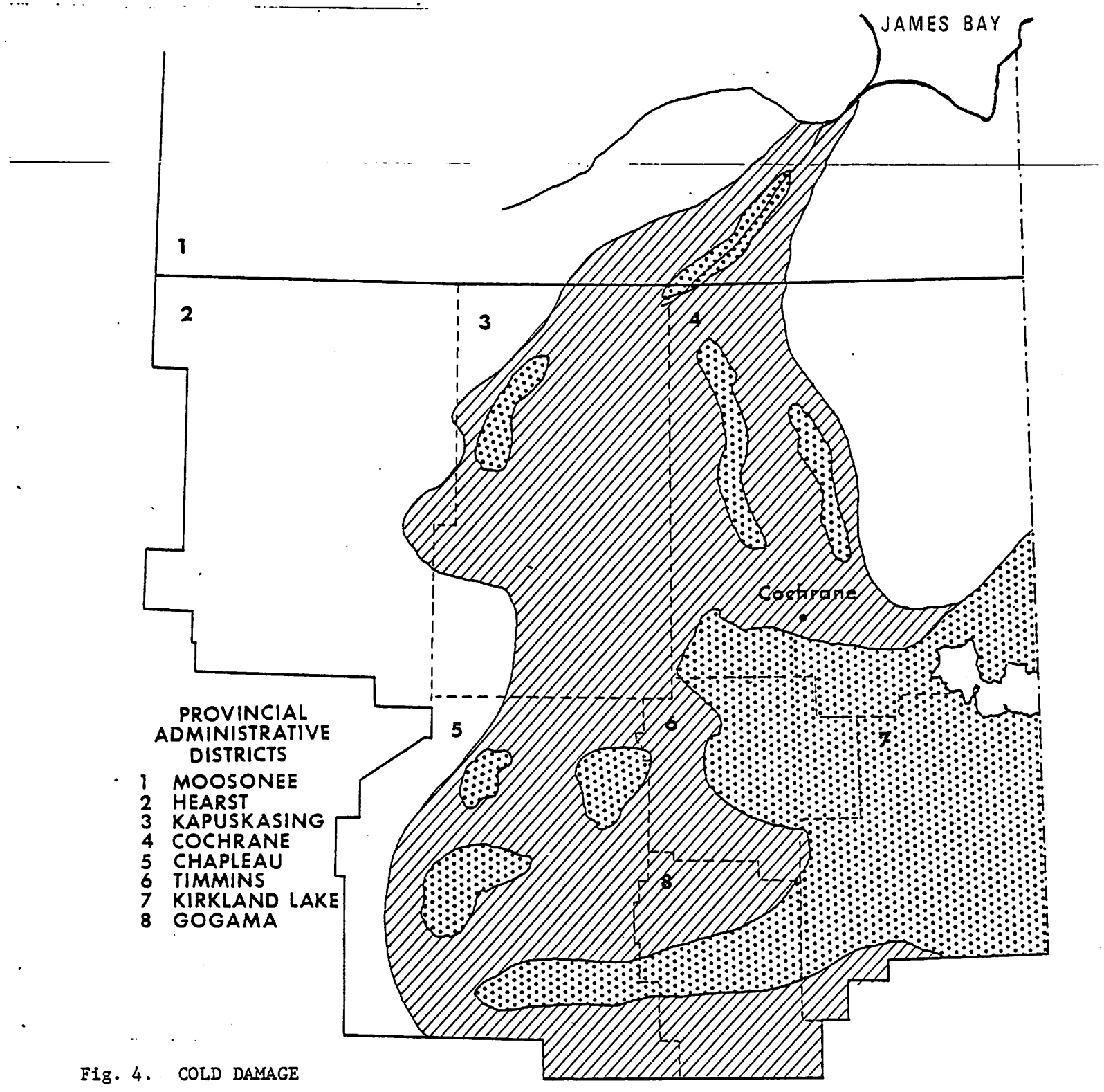

Fig. 4. COLD DAMAGE

Areas within which cold damage occurred in 1979.

Severe foliar damage . . . . . .

Light-to-moderate foliar damage

Table 6. Summary of cold damage evaluations in six districts in 1980 (concluded).

Location (Twp)	Tree species	Avg ht of trees (m)[a]	Trees affected (%)	Foliar damage (%)
Timmins District				
Hillary	tA	10.7	100	90
Hassard	tA	15.3	100	90
Shaw	tA	15.3	100	90
Godfrey	bF	12.2	100	100

[a] 1 m = 3.28 ft

Special Surveys

Black Spruce Cone Survey

Extensive damage to cone and seed production by the spruce budworm and other insects prompted a more detailed survey of this problem in 1980. Black spruce cone samples were obtained from upland and lowland sites and, where possible in a budworm-free area, from budworm-infested trees within the infestation. Cones were then examined to obtain data on the proportion of damaged cones, the degree of damage to cones and the identity and relative importance of insects affecting cones. Cones were also checked for the presence of diseases. Some results of the survey are summarized in Table 7.

Survey of Black Spruce Plantations

A special survey was conducted throughout northern Ontario to determine the impact of insect and disease problems in high-value black spruce plantations. Eleven stands were examined with selections from 0.5-2.0, 2.1-6.0 and over 6 m height classes (1.6-6.6 ft, 6.7-19.7 ft, and over 19.7 ft). Evaluations were performed by using standard sampling techniques during the periods of 10-27 June and 14 July-1 August. The principal insects and diseases surveyed that revealed negative results are as follows: Insects--Sawyer beetles (*Monochamus* spp.) and yellow-headed spruce sawfly (*Pikonema alaskensis* [Roh.]). Diseases--Eastern dwarf mistletoe (*Arceuthobium pusillum* Pk.), *Armillaria mellea* (Vahl ex Fr.) Kumm.) and needle rusts of spruce (*Chrysomyxa ledi* d By. and *C. ledicola* Lagh.). Positive results are summarized in Table 8.

Table 7. A summary of the percentages of damaged black spruce male and female flowers collected between 3 June and 18 June and damaged black spruce cones collected between 24 July and 31 July in six districts in 1980

Site and location	No. of flowers examined		Flowers damaged (%)		Developed cones examined	Developed cones damaged (%)	No. of cones damaged by[a]	
	Male	Female	Male	Female			Lepidoptera	Other insects
Lowland - within spruce budworm infestation:								
Chapleau District								
Eisenhower Twp	0	261	0	24	100	39	17	19
Cogama District								
Garvey Twp	0	272	0	35	100	68	65	8
Hearst District								
Fushimi Twp	139	114	59	81	0*	0	-[b]	-
Larkin Twp	209	112	17	55	100	47	41	8
Kapuskasing District								
Abbott Twp	24	73	50	75	30*	83	20	1
Hopkins Twp	8	219	75	70	8*	100	8	0
Cochrane District								
Fournier Twp	201	151	35	78	5*	80	2	0
Freele Twp	327	90	38	73	0*	0	-	-
Sargeant Twp	208	233	15	31	7*	86	6	0
Kirkland Lake District								
Grenfell Twp	68	200	49	28	100	59	46	36
Michaud Twp	295	98	15	65	0*	0	-	-
Average			39.2	56.0		70.2		

(continued)

Table 7. A summary of the percentages of damaged black spruce male and female flowers collected between 3 June and 18 June and damaged black spruce cones collected between 24 July and 31 July in six districts in 1980 (concluded).

Site and location	No. of flowers examined		Flowers damaged (%)		Developed cones examined	Developed cones damaged (%)	No. of cones damaged by[a]	
	Male	Female	Male	Female			Lepidoptera	Other insects
Upland - within spruce budworm infestation:								
Chapleau District								
Keith Twp	0	242	0	96	100	46	31	16
Gogama District								
Garibaldi Twp	0	342	0	61	100	17	15	16
Cochrane District								
Freele Twp	96	183	58	86	98	62	59	2
Sargeant Twp	242	206	15	51	4*	25	1	0
Hearst District								
Studholme Twp								
Duckwing Lake	0	63	0	92	44	89	36	4
Abram Lake	164	202	8	30	100	19	14	3
Wickateed Twp	255	45	44	96	0*	0	-	-
Kapuskasing District								
Abbott Twp	2	31	0	68	100	61	60	0
Hopkins Twp	0	250	0	69	9*	100	9	0
Kirkland Lake District								
Grenfell Twp	169	308	55	85	100	71	56	15
Michaud Twp	200	200	10	24	0*	0	-	-
Average			31.8	68.8		54.5		

* Heavy flower damage by insects and/or frost resulting in little or no cone production.
[a] Damage to an individual cone may be caused by more than one insect.
[b] Unable to determine relative abundance of insects because no cones were produced for insects to feed on.

Table 8. Summary of damage in the special black spruce survey

Location (Twp)	Avg ht of trees (m)[a]	*C. fumiferana* + *D. reniculelloides* trees attacked (%)	defoliation (%)	*P. strobi* Trees attacked (%)	Frost trees affected (%)	Foliar damage (%)
Chapleau District						
Cosens	0.8	80.6	2.0	0	100	50
Edith	1.2	100	2.0	0	100	25
Topham	0.6	100	2.0	0	100	61
Cogama District						
Garibaldi	0.6	58.6	trace	0	60	15
Hearst District						
Mattice	4.7	99.3	34.5	2	99	11
Hanlan	8.8	100	23.0	2	92	13
Studholme	2.3	30.0	1.8	0	-	-
Kapuskasing District						
Idington	8.8	100	25.9	0	100	12
Shearer	1.9	78.6	2.5	13	86	11
Cochrane District						
Fournier	1.6	100	5.9	0	100	18
Kirkland Lake District						
Stock	1.7	5.1	7.0	0	0	0
Gross	1.7	63.0	10.0	0	85	14

[a] 1 m = 3.28 ft