Forest Insect and Disease Conditions in Newfoundland and Labrador in 1993

by W.J. Bowers, E.C. Bunfield, D.S. O'Brien, D.M. Stone, W.J. Sutton, K.E. Purdy, and G.C. Crew

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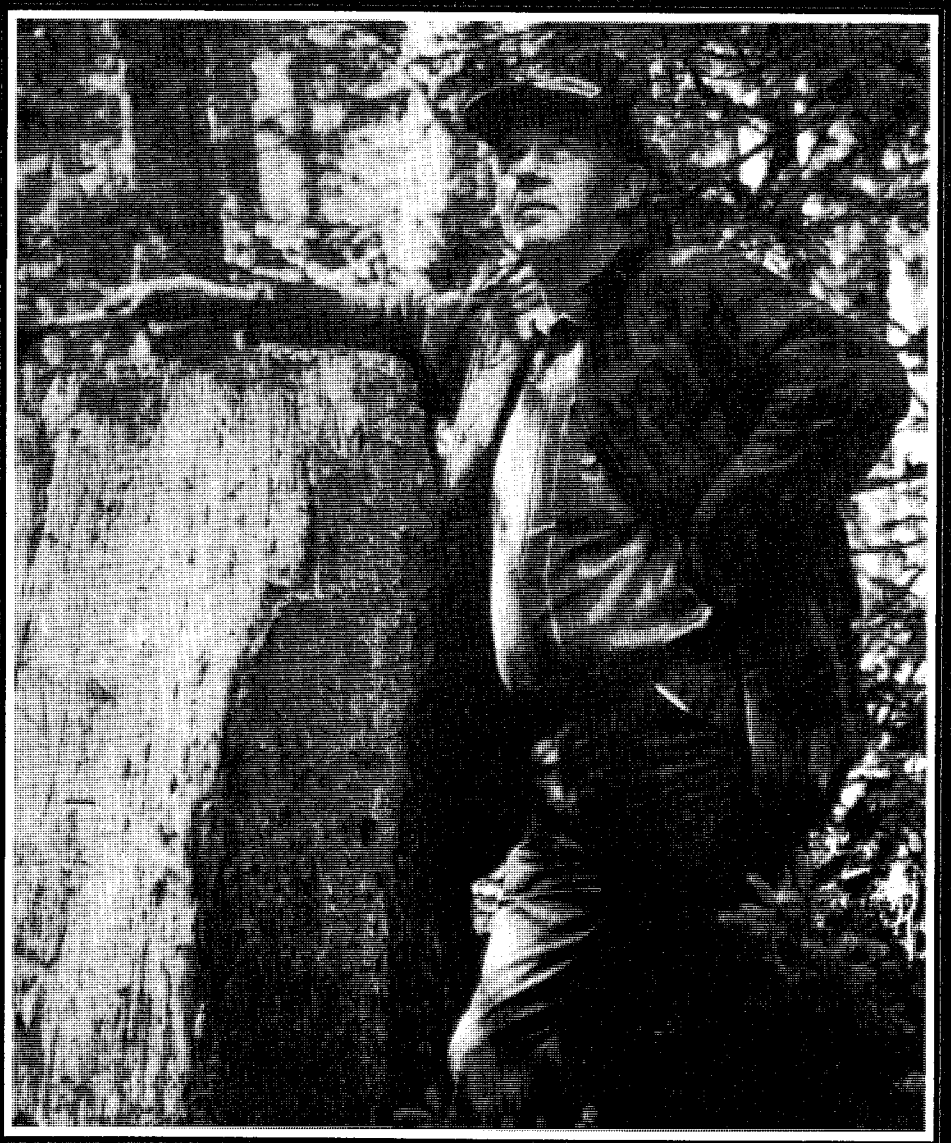

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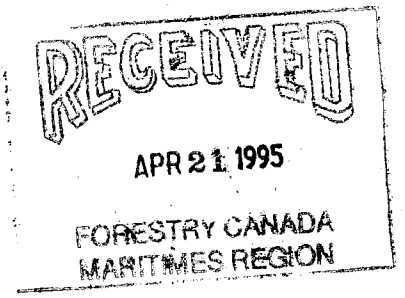
The regional program has three principal components - Silviculture, Ecology & Economics Research, Forest Protection Research, and Forestry Development.

Cover Caption:

Edgar C. Banfield, Forest Insect and Disease Survey (FIDS) Ranger inspecting the health of the trees in the permanent sample plot near Boot Brook. Edgar has retired from the Canadian Forest Service, Newfoundland and Labrador Region in 1994 after a highly productive career of 29 years.



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ABSTRACT

This report summarizes forest pest conditions in Newfoundland and Labrador in 1993 and forecasts infestations of major defoliators for 1994. Summaries were compiled from information collected by Forest Insect and Disease Survey staff in 12 districts of the Province.

Total area of infestations of the **hemlock looper** increased to 11 186 ha in 1993, from 9 808 ha in 1992. Moderate and severe defoliation for the Island in 1993 totalled 7 035 ha. The area of infestation is forecast to cover a total of 66 161 ha in 1994 including 26 340 ha of moderate and severe defoliation.

The **balsam fir sawfly** outbreak in Management District 7 near Bay d'Espoir collapsed in 1993. In Management District 14 defoliation increased to 1 739 ha of which 1 706 ha were moderate and severe. In 1994, moderate and severe defoliation is predicted to occur on 6 675 ha and 5 008 ha is forecast to be lightly defoliated.

Two other major defoliators, the **spruce budworm** and the **blackheaded budworm** both collapsed in 1993.

A total of 20 other insect species and 17 diseases caused minor forest damage.

Winter drying and frost caused varying degrees of damage both on the island and in Labrador.

Porcupine damage and squirrel damage was also particularly noticeable throughout Labrador.

RÉSUMÉ

Ce rapport résume les conditions entomologiques et pathologiques relevées à Terre-Neuve et au Labrador en 1993 et présente les prévisions des infestations des principaux défoliateurs en 1994. Ce résumé a été établi à partir des données recueillies par les employés du Relevé des insectes et des maladies des arbres dans 12 régions administratives de la province.

La superficie totale infestée par l'**arpenteuse de la pruche** a augmenté, passant de 9 808 hectares en 1992 à 11 186 hectares en 1993. Dans l'île, la défoliation modérée et grave couvrait 7 035 hectares en 1993 et devrait frapper 66 161 hectares l'an prochain, y compris 26 340 hectares de défoliation modérée et grave.

L'infestation du **diprion du sapin** qui sévissait dans la région administrative 7, près de Bay d'Espoir, s'est effondrée en 1993. La défoliation a augmenté à 1 739 hectares dans le district 14, dont 1 706 hectares de défoliation modérée et grave. En 1994, ces dernières catégories de défoliation devraient se retrouver sur 6 675 hectares et la défoliation légère sur 5 008 hectares.

En 1993, les populations de deux autres défoliateurs importants, soit la **tordeuse des bourgeons de l'épinette** et la **tordeuse à tête noire**, ont périclités.

Au total, 20 autres espèces d'insectes et 17 maladies ont causé de légers dégâts aux arbres.

Dans l'île même et au Labrador, la dessiccation hivernale et le gel ont causé des blessures plus ou moins graves .

Les dégâts dûs aux porcs-épics et aux écureuils étaient également particulièrement évidents partout au Labrador.

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Information for this report is based on the results of surveys conducted by all personnel of the Forest Insect and Disease Survey and research officers of the Forest Protection Section. The cooperation of the Provincial Department of Forestry and Agriculture, providing technical assistance, inventory maps and aircraft time for insect and disease assessment and the forest industry for providing pertinent data on harvesting and silviculture operations and road networks is gratefully appreciated. We thank Linda Richards for typing this report.

FOREST INSECT AND DISEASE CONDITIONS IN NEWFOUNDLAND AND LABRADOR IN 1993

by

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INTRODUCTION

The aim of the Forest Insect and Disease Survey is to summarize the factors that decrease the health of the forests of Newfoundland and report these changes to clients at the regional and national level. Information on forest health, including pest conditions, are disseminated through seasonal highlights, special reports, information reports and the Annual Report of the Forest Insect and Disease Survey. Pertinent data surveys are added in appendices.

This report provides forest managers with information on pest conditions in Newfoundland, forest statistics with regional information for national summaries, and forms a part of the historical record of pest conditions for Newfoundland. Insects, diseases and conditions that were widespread in 1992, are discussed in detail in the text, whereas those of lesser importance are presented in tabular form.

The Forest Insect and Disease Survey monitored the abundance of forest pests and their damage in forested areas throughout the Province in 1993. The extent of major pest infestation was mapped, population levels sampled and the distribution of damage surveyed to provide reliable estimates of pest conditions. A forecast of infestations of major defoliators is provided for 1994.

Survey personnel collected 600 insect and 180 disease samples in the 12 ranger districts (Fig. 1) and 19 Forest Management Districts (Fig. 2) in the Province.

No staff changes were made during the year and rangers remained in essentially the same districts as assigned in 1992.

Special collections of black spruce cones were sent to Dr. Jean Turgeon (NRCan, FPMI).

A total of 206 hours was flown in helicopters to sample inaccessible areas, to map insect defoliation and damage and to sample egg populations to forecast infestations of major forest defoliators.

Two new ARNEWS plots were established in the region for a total of eleven. All plots were monitored for tree health conditions. Permanent sample plots throughout the region were also re-measured for height, growth and tree health.

Quantitive and qualitative estimates of pest conditions were obtained throughout the 1993 season. Damage was assessed using the following index:

Trace	1% to 5%
Light	6% to 25%
Moderate	26% to 75%
Severe	76% to 100%
Extreme	100% plus additional damage

A damage assessment survey was conducted in the fall in coordination with the Provincial Department of Forestry and Agriculture.

Unseasonable weather was experienced throughout most of insular Newfoundland and eastern Labrador during spring and early summer, with above normal precipitation and below normal temperatures. In western Labrador normal conditions prevailed during spring and for most of July. Insect and tree developments were delayed by as much as three weeks in most areas due to abnormal weather conditions.

IMPORTANT PESTS

INSECTS

Hemlock looper
Lambdina fiscellaria fiscellaria

Seasonal development of eastern hemlock looper (EHL) was delayed by 3 weeks due to cold wet weather for most of June and July. The infestation on the Northern Peninsula collapsed in 1992 and no defoliation was observed in 1993.

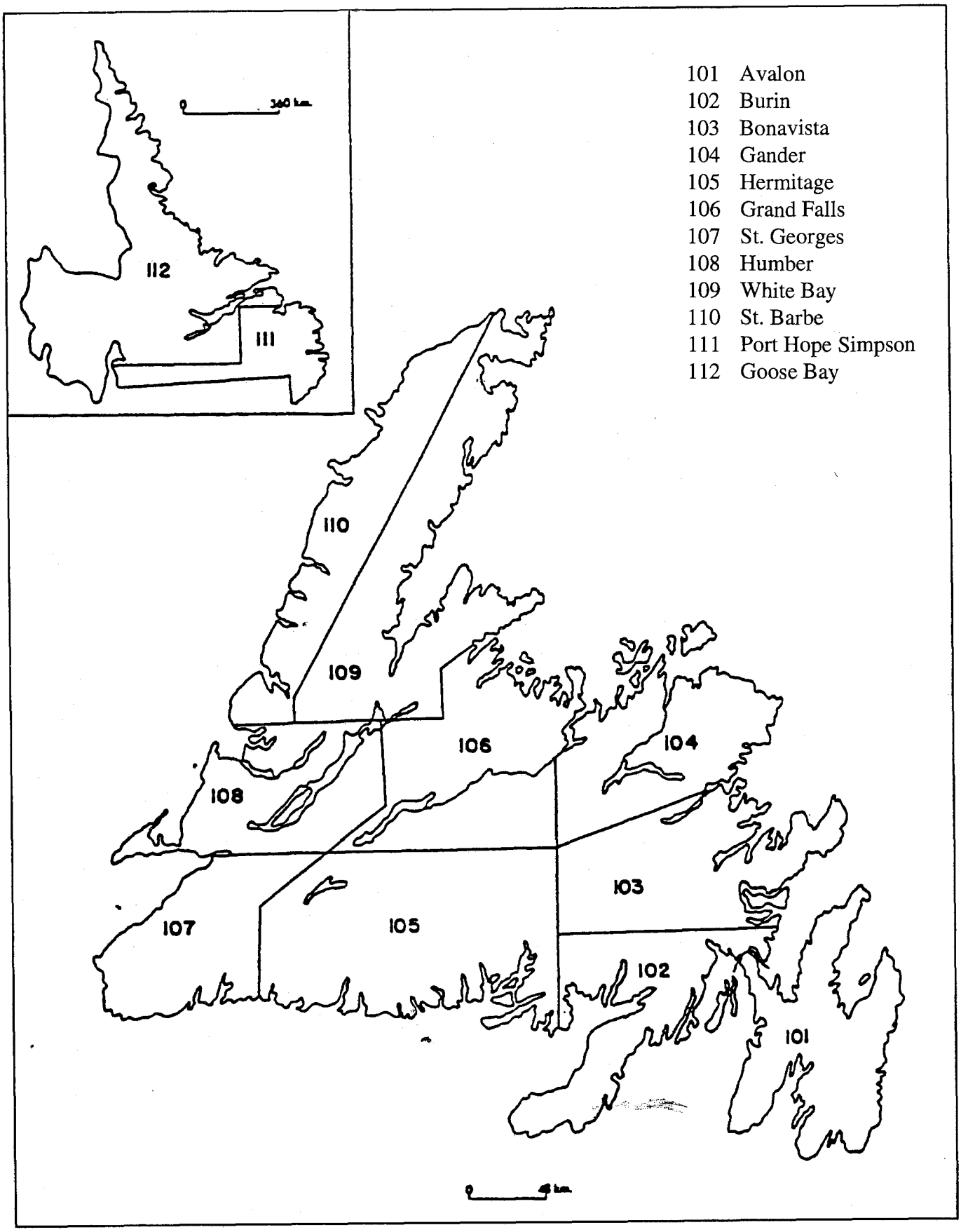


Figure 1. Forest Insect and Disease Survey Districts.

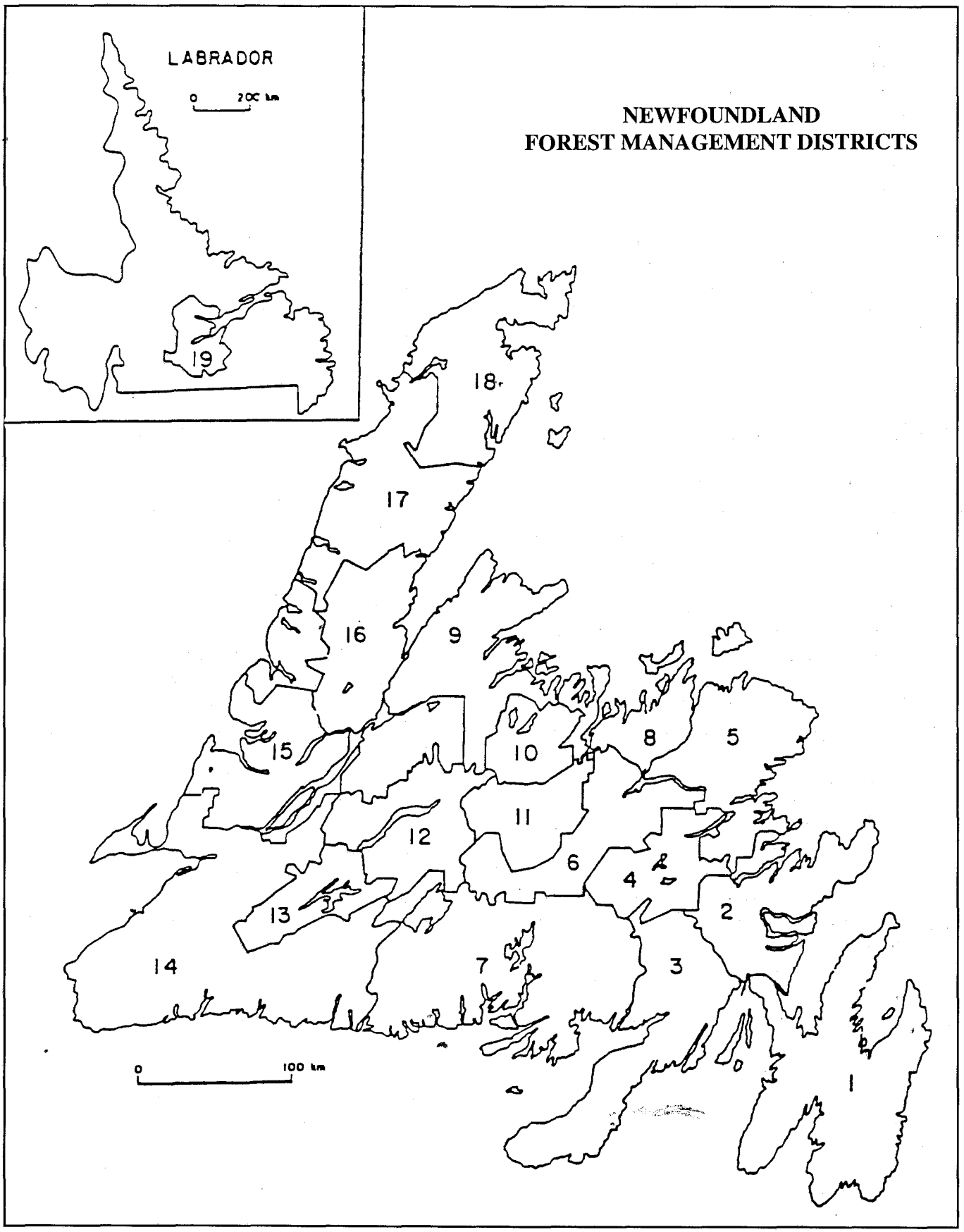


Figure 2. Newfoundland Forest Management Districts.

However, significant defoliation occurred throughout central Newfoundland in 1993 affecting areas from Bernard's Brook in the Bay d'Espoir area to as far northwest as Red Indian Lake (Fig. 3). Continued infestations of EHL caused moderate and severe defoliation in a few areas on the Avalon Peninsula (Fig. 4) and small areas of severe defoliation near Clarenville in 1993. The total area of infestation in Newfoundland increased from 9 808 ha in 1992 to 11 186 ha in 1993 with light, moderate and severe defoliation accounting for 4 151, 2 593 and 4 442 ha, respectively (Table 1). Similarly, the total area of infestation in productive forests increased from 5 625 ha in 1992 to 9 513 ha in 1993 encompassing 398 700 m^3 of timber in all 3 defoliation categories (Table 1).

Overwintering eggs were sampled at approximately 800 points across Newfoundland from mid- to late October. Moderate and severe defoliation is predicted to occur on 26 340 ha (MD 2, 4, 7, 11, 12, 13) and an additional 39 821 ha (MD 1, 2, 7, 10, 11, 12, 13, 14, 15, 16) is forecast to be lightly defoliated (Table 2, Figs. 5-7). The majority of the moderate to severe defoliation is expected to occur in central Newfoundland particularly in MD 12 (14 370 ha). Populations in MD 7 have declined and only 5 781 ha is expected to be defoliated in 1994 (Table 2). Similarly, the outbreak in eastern Newfoundland remains scattered and little defoliation is forecast for 1994.

Results from pheromone traps agree with egg counts and support the prediction of moderate to severe defoliation in central Newfoundland. In contrast, high moth populations were captured in parts of western Newfoundland where egg densities were relatively low. Close monitoring of areas with high moth counts in western Newfoundland should begin in spring.

Larvae (n = 1 307) were collected in 1993 for parasite rearing from EHL infestations in central and eastern Newfoundland. Less than 1.0% of EHL larvae were parasitized, however diseases killed 62.8% of developing larvae from Millertown (central), 68.1% of developing larvae from Brigus South, 11.9% of developing larvae from Salmonier, and 53.8% of developing larvae from Tor's Cove (eastern). Disease organisms were identified as bacteria, yeast-like organisms and fungi including *Entomophaga aulicae, Paecilomyces farinosus* and *Erynia* (= *Zoopthora*).

Pheromone Trapping

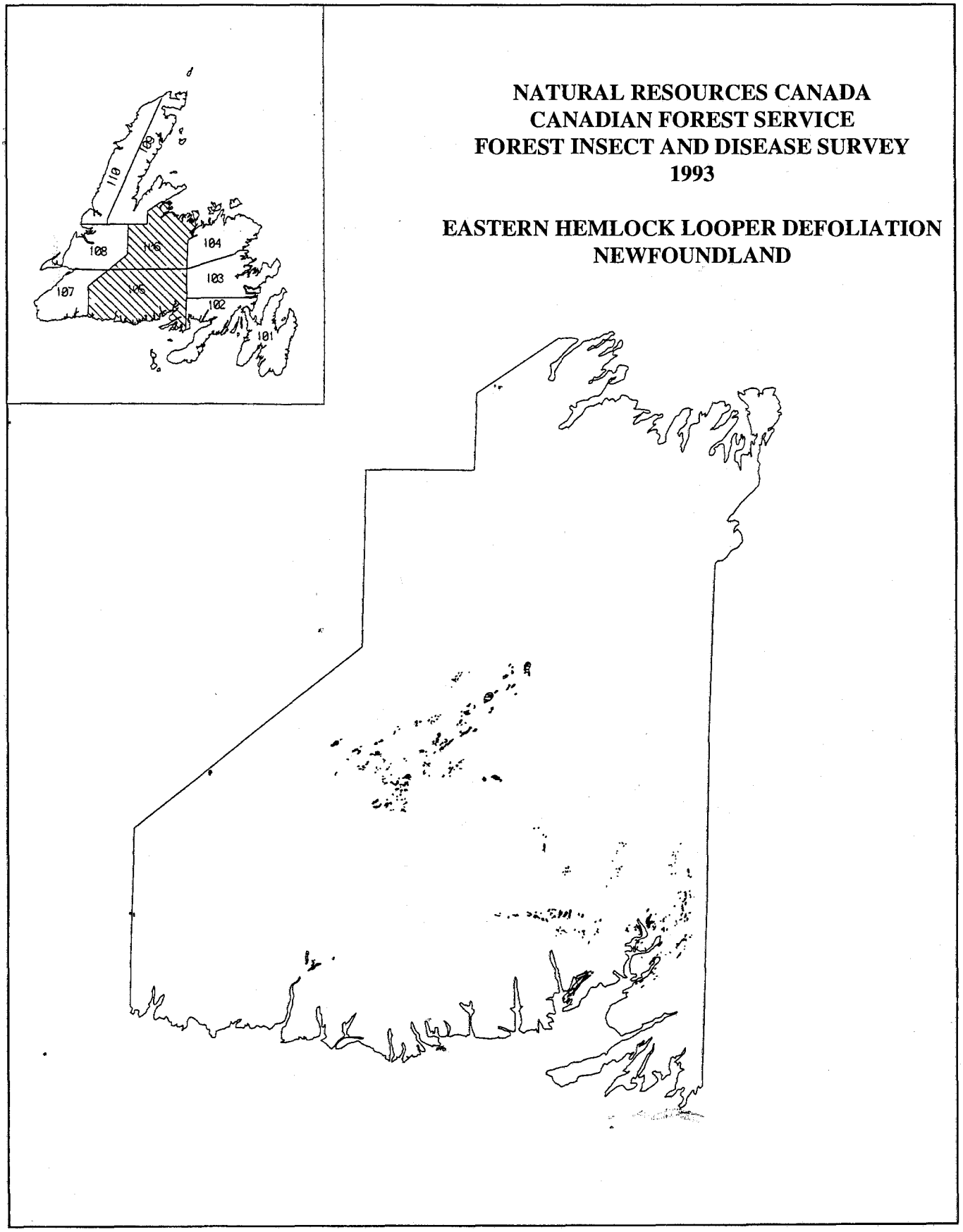
A pheromone grid was established for a second year in summer, 1993 using 50 permanent sample locations throughout Newfoundland. Two pheromone baited traps (Multi-pher I, Multi-pher II) were used to capture adult males at each location (Figs. 8-9). As reported in 1992, the Multi-pher I trap caught significantly higher numbers of moths ($\bar{x}$ = 136) than the Multi-pher II trap. The mean number of moths per trap caught in western, central and eastern Newfoundland was 447 (n = 50), 317 (n = 34), and 385 (n = 16), respectively. In comparison, the 1992 catches in western, central and eastern Newfoundland were 231, 419 and 419. In western Newfoundland high moth catches occurred near Lomond (3 459), Pinchgut Lake (2 230), Bonne Bay (1 762) and Birchy Lake (1 605). The highest catches in central Newfoundland occurred near Exploits Dam (3 400). In eastern Newfoundland, the highest catch occurred at Hillview Junction (1971).

The Newfoundland Department of Forestry and Agriculture conducted an operational spray program against EHL in 1993. Stands were treated with the biological insecticide, *Bacillus thuringiensis (B.t.)*. The insecticide was applied to protect balsam fir stands in central and south-central Newfoundland.

Spruce Budworm
Choristoneura fumiferana

Seasonal development of eastern spruce budworm (ESB) was delayed by 3 weeks due to cold wet weather for most of June and July. In 1992, moderate and severe defoliation in the Codroy Valley in southwestern Newfoundland affected 1 919 ha and light defoliation encompassed 721 ha. This infestation collapsed in 1993 and no new areas of defoliation were detected.

Pheromone traps were placed at 50 permanent sample locations throughout the Island (Fig. 10). The total number of moths captured decreased about 7-fold from 1 898 in 1992 to 259 in 1993. The overall mean catch in 1993 was 5 moths per location, compared to 38 moths per location in 1992 (Fig. 11). In western Newfoundland the mean number of moths per location was 4.7 compared to 48.6 in 1992. The highest numbers trapped were along the west coast of the Island at Campbells Creek ($\bar{x}$ number per trap = 11.3) and Bay of Islands ($\bar{x}$ number per trap = 10.7). In central Newfoundland, traps at 17 locations averaged 8.1 moths per location, a decline from 38 moths per location in 1992. The highest trap catch was at Tote Brook ($\bar{x}$ number per trap = 9.0). Trap catches in 8 locations in eastern Newfoundland, including the Avalon Peninsula, were near zero in 1993. Only 3 moths were captured at one location near Salmonier Line (See Appendix I). As in 1992 few moths were observed in traps prior to local emergence.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FOREST INSECT AND DISEASE SURVEY
1993
EASTERN HEMLOCK LOOPER DEFOLIATION
NEWFOUNDLAND
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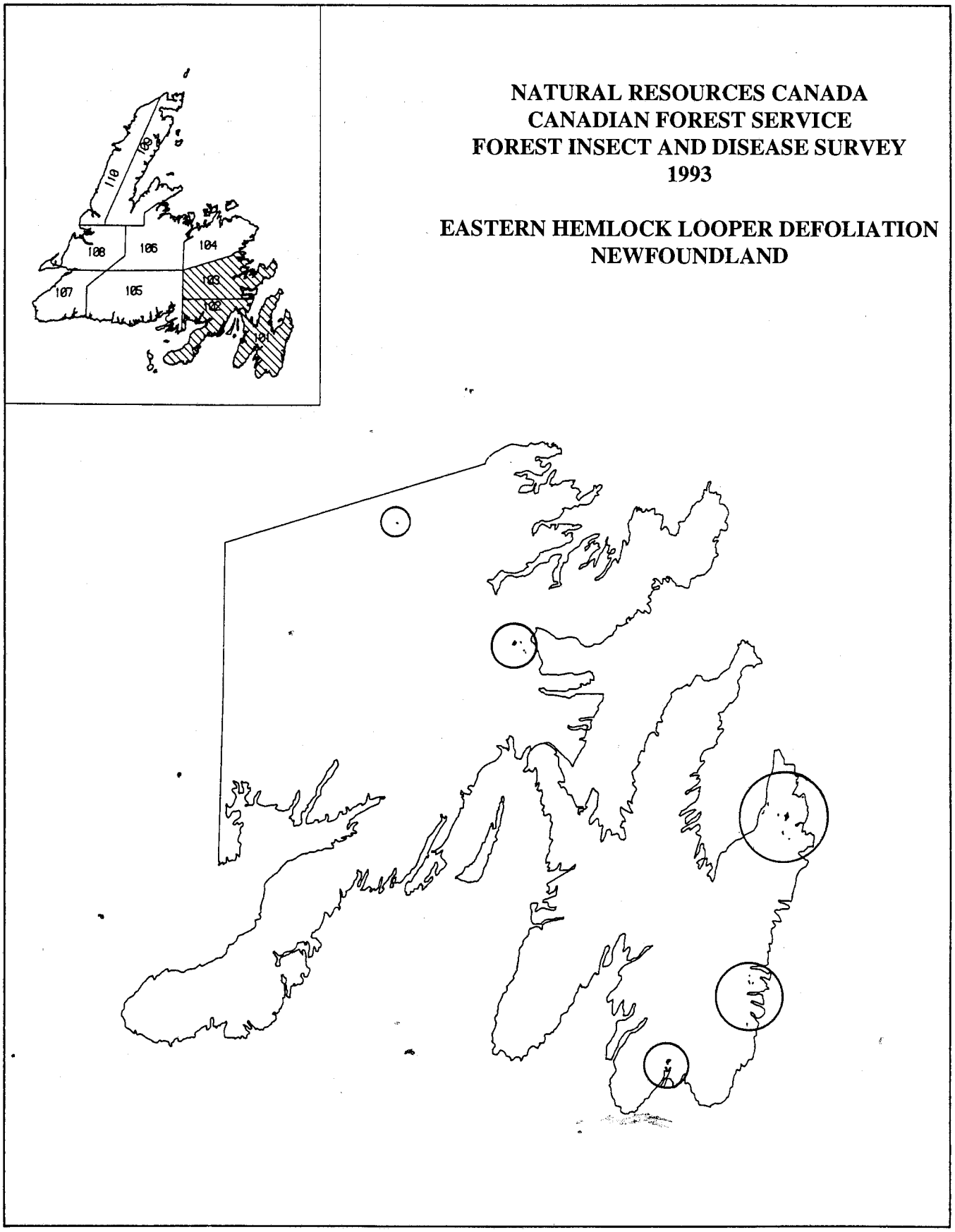
Figure 3.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CANADIAN FOREST SERVICE
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1993
EASTERN HEMLOCK LOOPER DEFOLIATION
NEWFOUNDLAND
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Figure 4.

Table 1. Areas (ha) of defoliation** and gross merchantable volume (m^3) of affected stands caused by the hemlock looper in productive forests and areas of defoliation of total infestation in Newfoundland in 1993.

Mgmt. Dist.	Productive Forest*								Total Infestation (ha)			
	Light		Moderate		Severe		Total					
	Area	Vol. (x 000)	Area	Vol. (x 000)	Area	Vol. (x 000)	Area	Vol. (x 000)	Light	Mod.	Sev.	Total
1	29	2.7	186	5.4	485	10.5	700	18.6	29	219	490	738
2	66	6.3	180	16.7	31	3.0	277	25.9	70	185	31	286
7	1 035	55.8	991	61.8	1 517	78.7	3 543	196.3	1 059	1 050	2 071	4 180
12	2 036	7.7	573	11.7	1 166	56.2	3 775	75.5	2 070	641	1 210	3 921
13	97	1.2	90	2.8	293	5.3	480	9.3	385	162	318	865
14	415	38.5	302	33.3	21	1.3	738	73.1	538	336	322	1 196
Totals	3 678	112.2	2 322	131.7	3 513	155	9 513	398.7	4 151	2 593	4 442	11 186

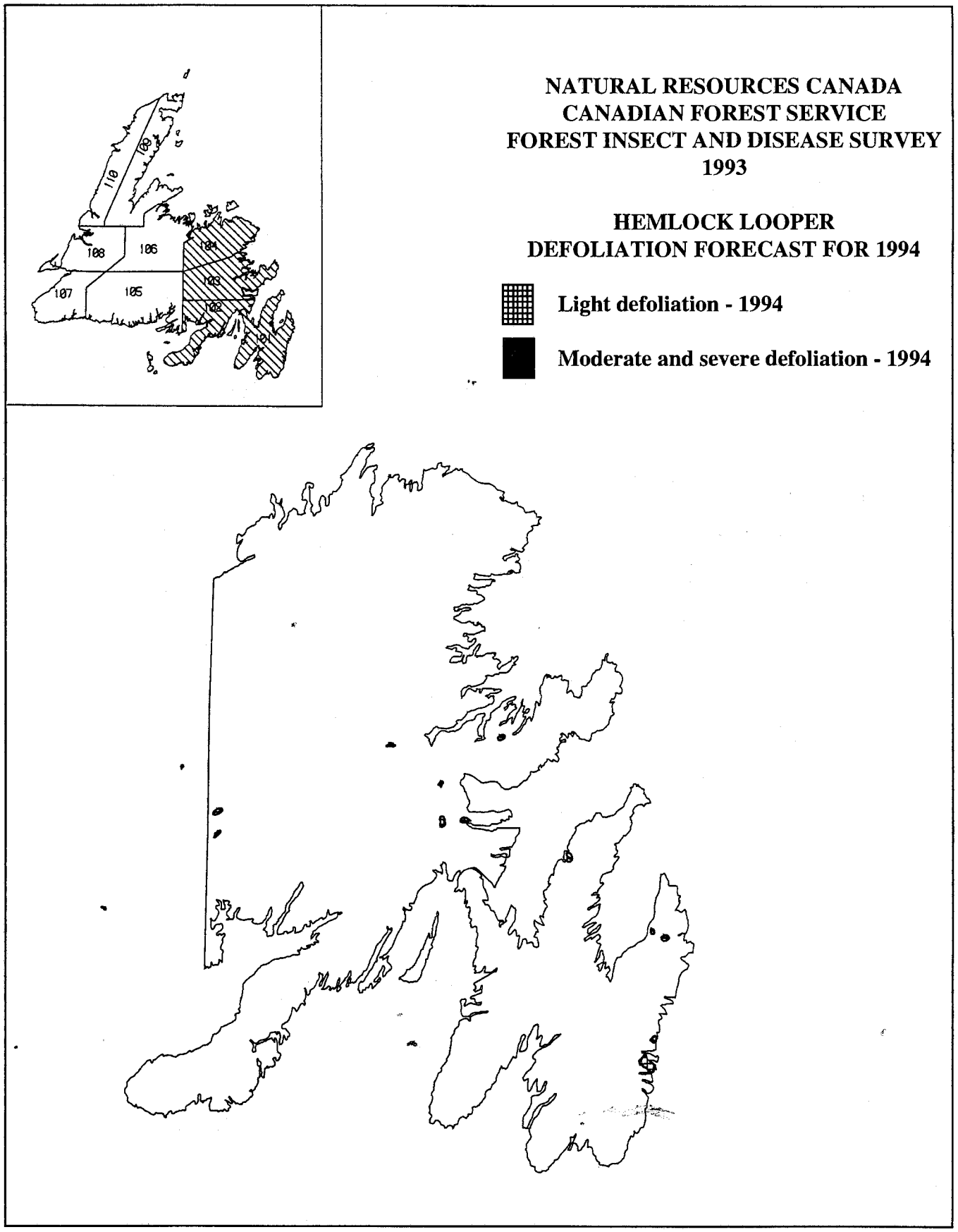
*Provided by the Forest Management Division, Dept. of Forestry & Agriculture.

Table 2. Areas (ha) of defoliation by the hemlock looper forecast in forested areas of Newfoundland for 1994.

Management District No.	Defoliation Class*		
	Light**	Moderate & Severe***	Total
1	4 764	-	4 764
2	1 800	600	2 400
4	-	600	600
7	9 514	5 781	15 295
10	600	-	600
11	1 200	1 131	2 331
12	15 581	14 370	29 951
13	2 762	3 858	6 620
14	600	-	600
15	2 400	-	2 400
16	600	-	600
Total	39 821	26 340	66 161

* Light = 6-25%
Moderate = 26-75%
Severe = 76-100%

** Areas with low egg density (1-3 eggs/branch)
*** Areas with moderate and high egg density (4 or more eggs/branch)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CANADIAN FOREST SERVICE
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1993
HEMLOCK LOOPER
DEFOLIATION FORECAST FOR 1994
Light defoliation - 1994
Moderate and severe defoliation - 1994
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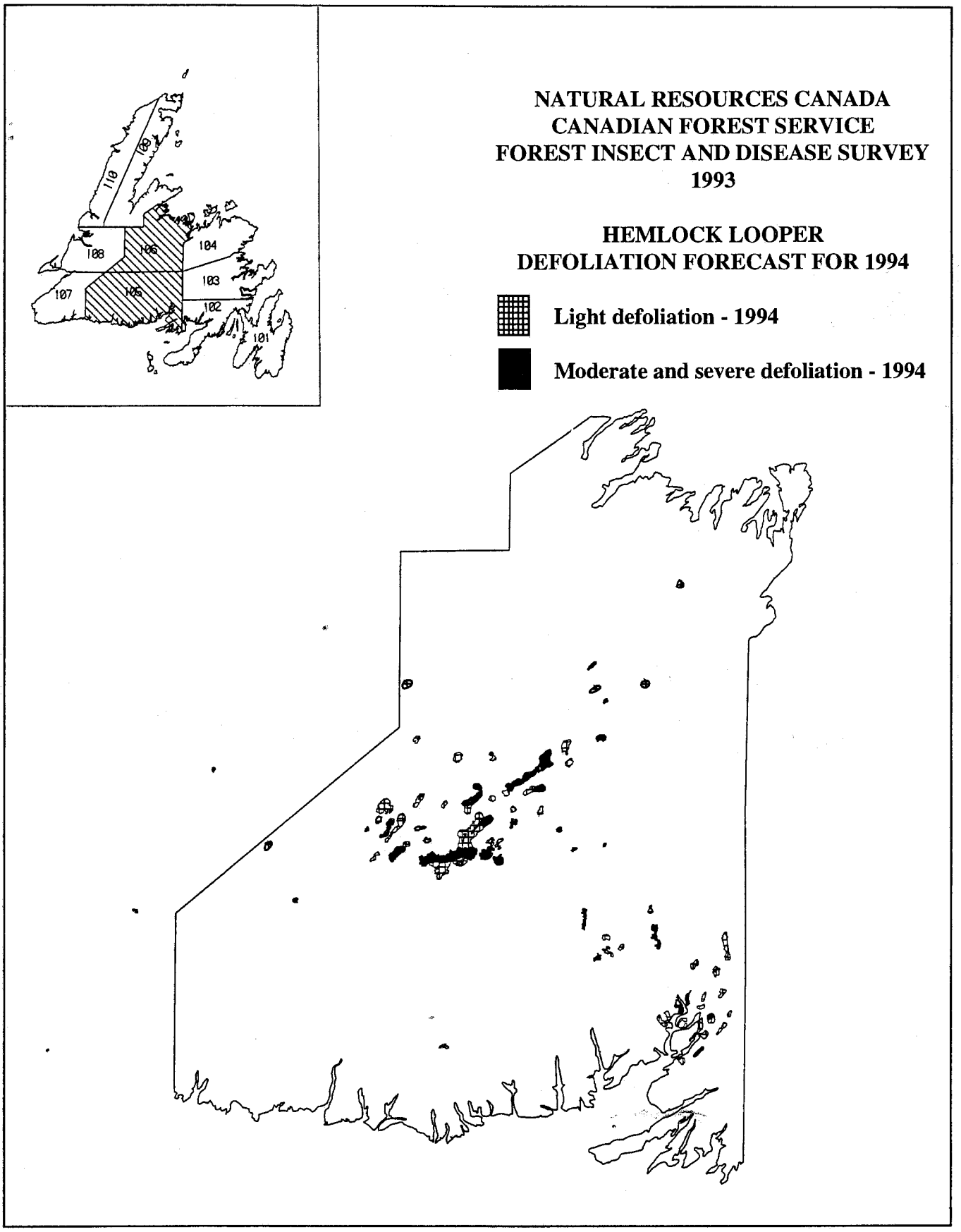
Figure 5.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HEMLOCK LOOPER
DEFOLIATION FORECAST FOR 1994
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Moderate and severe defoliation - 1994
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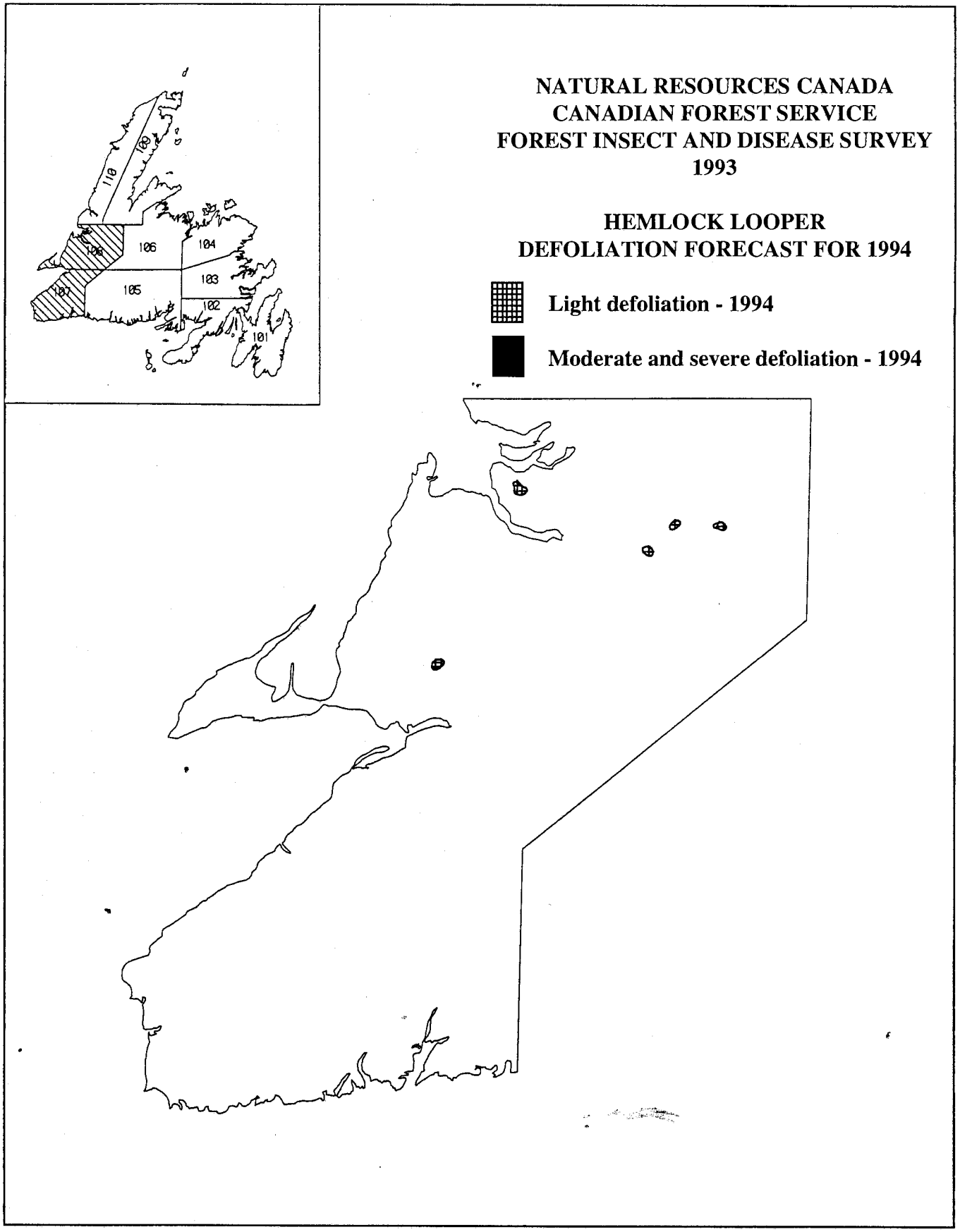
Figure 6.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HEMLOCK LOOPER
DEFOLIATION FORECAST FOR 1994
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Moderate and severe defoliation - 1994
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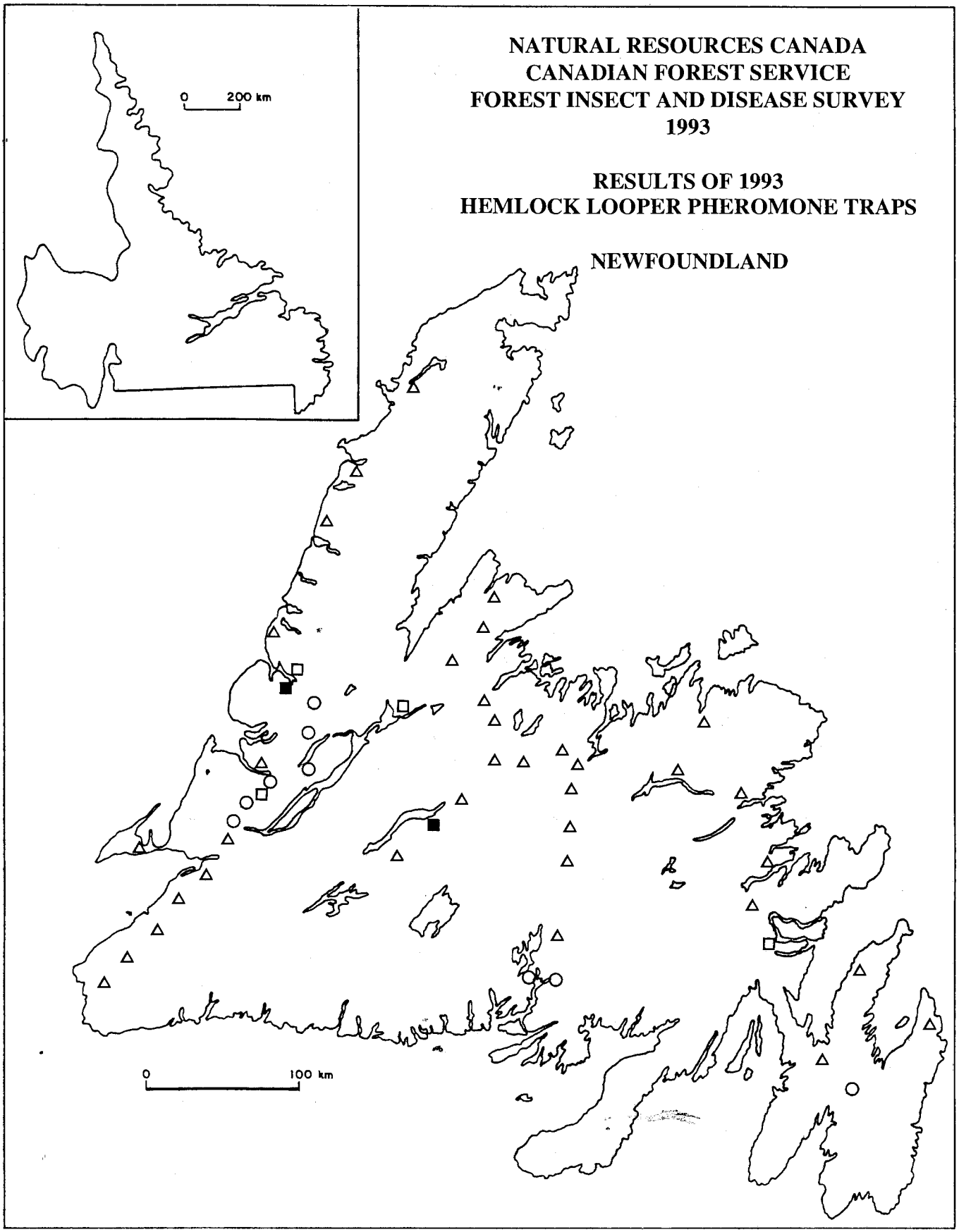
Figure 7.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1993
RESULTS OF 1993
HEMLOCK LOOPER PHEROMONE TRAPS
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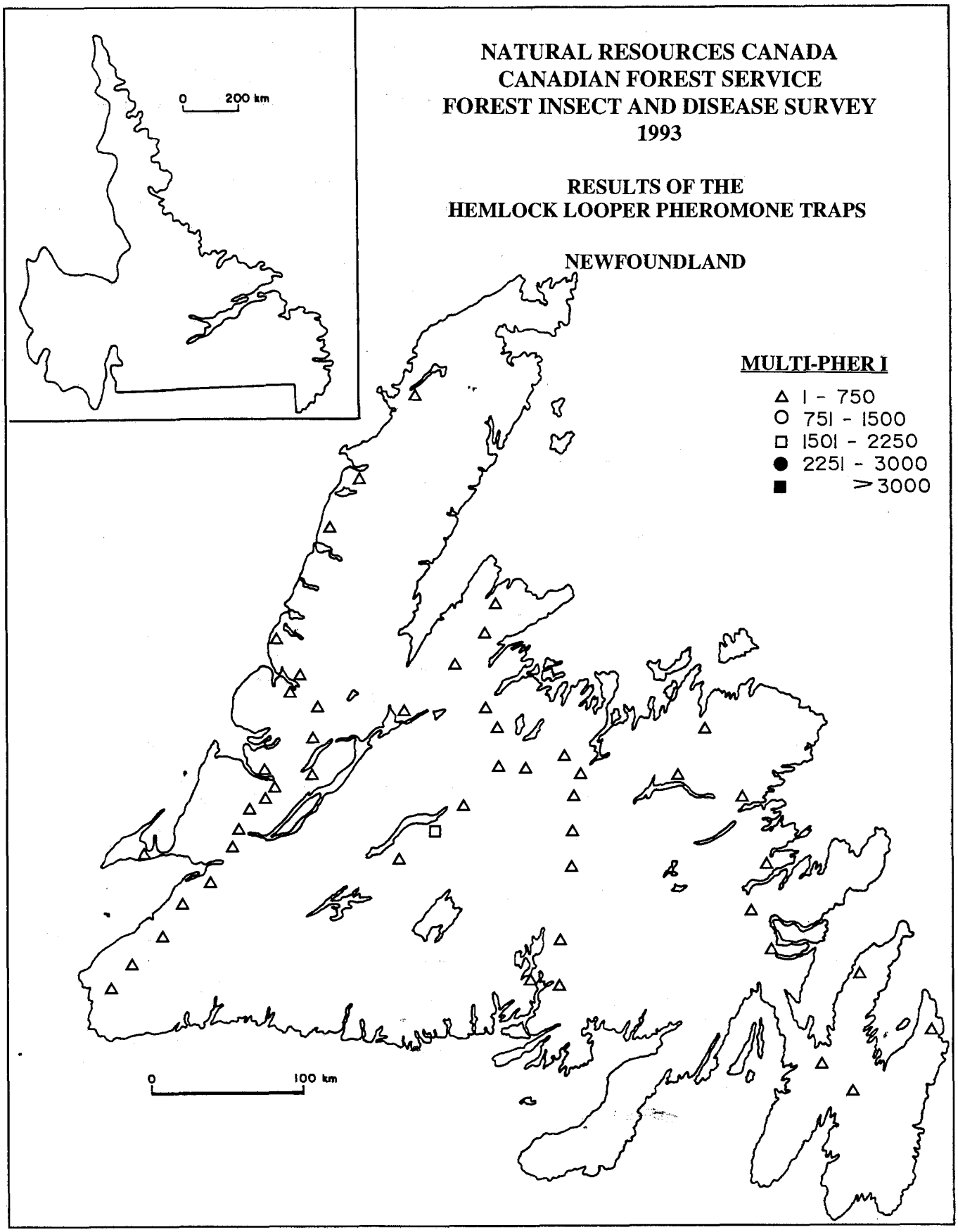
0 100 km

Figure 8.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CANADIAN FOREST SERVICE
FOREST INSECT AND DISEASE SURVEY
1993
RESULTS OF THE
HEMLOCK LOOPER PHEROMONE TRAPS
NEWFOUNDLAND
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MULTI-PHER I
1 - 750
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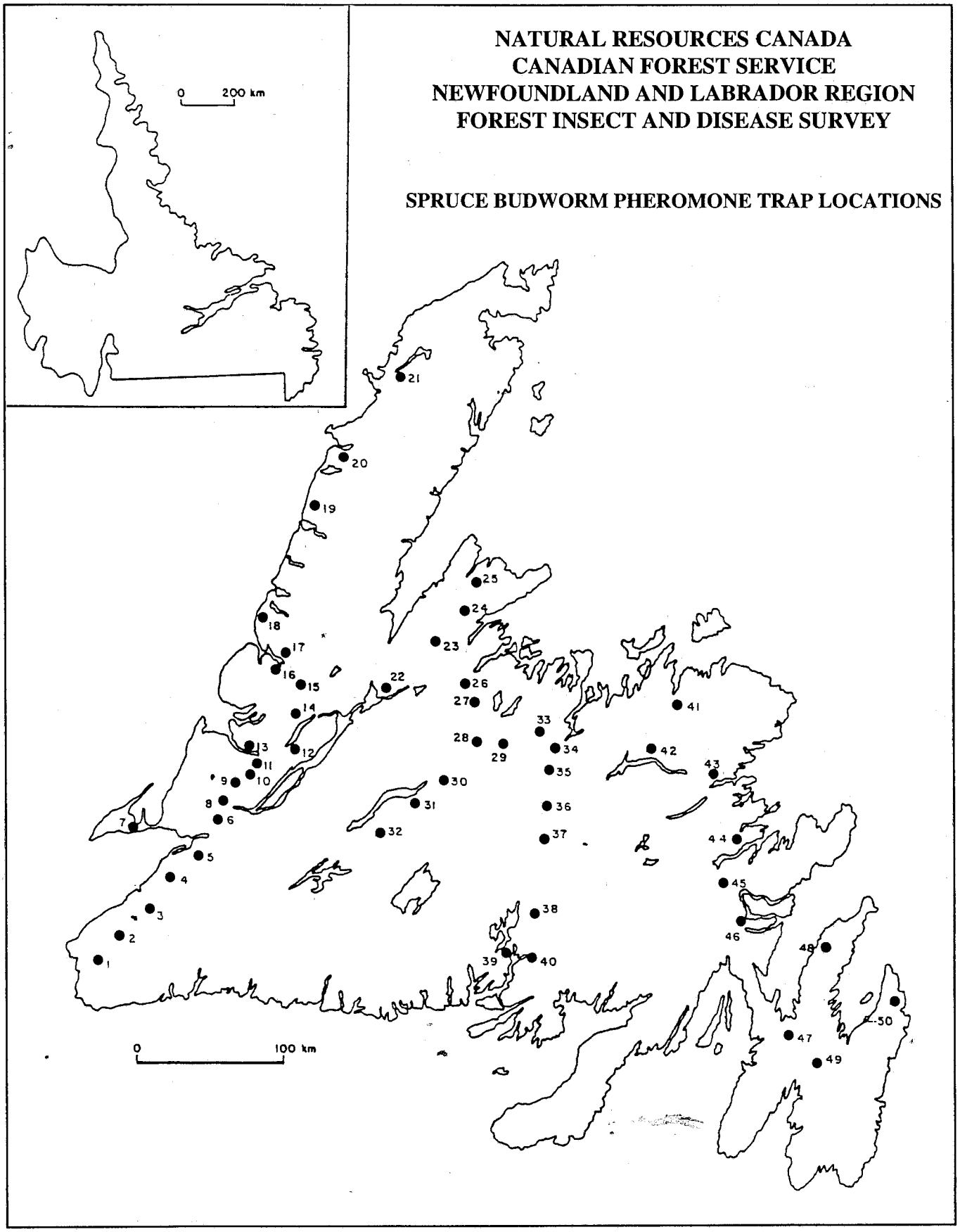
1501 - 2250
2251 - 3000
>3000
0 100 km

Figure 9.


NATURAL RESOURCES CANADA
CANADIAN FOREST SERVICE
NEWFOUNDLAND AND LABRADOR REGION
FOREST INSECT AND DISEASE SURVEY
SPRUCE BUDWORM PHEROMONE TRAP LOCATIONS
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0 100 km
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Figure 10.

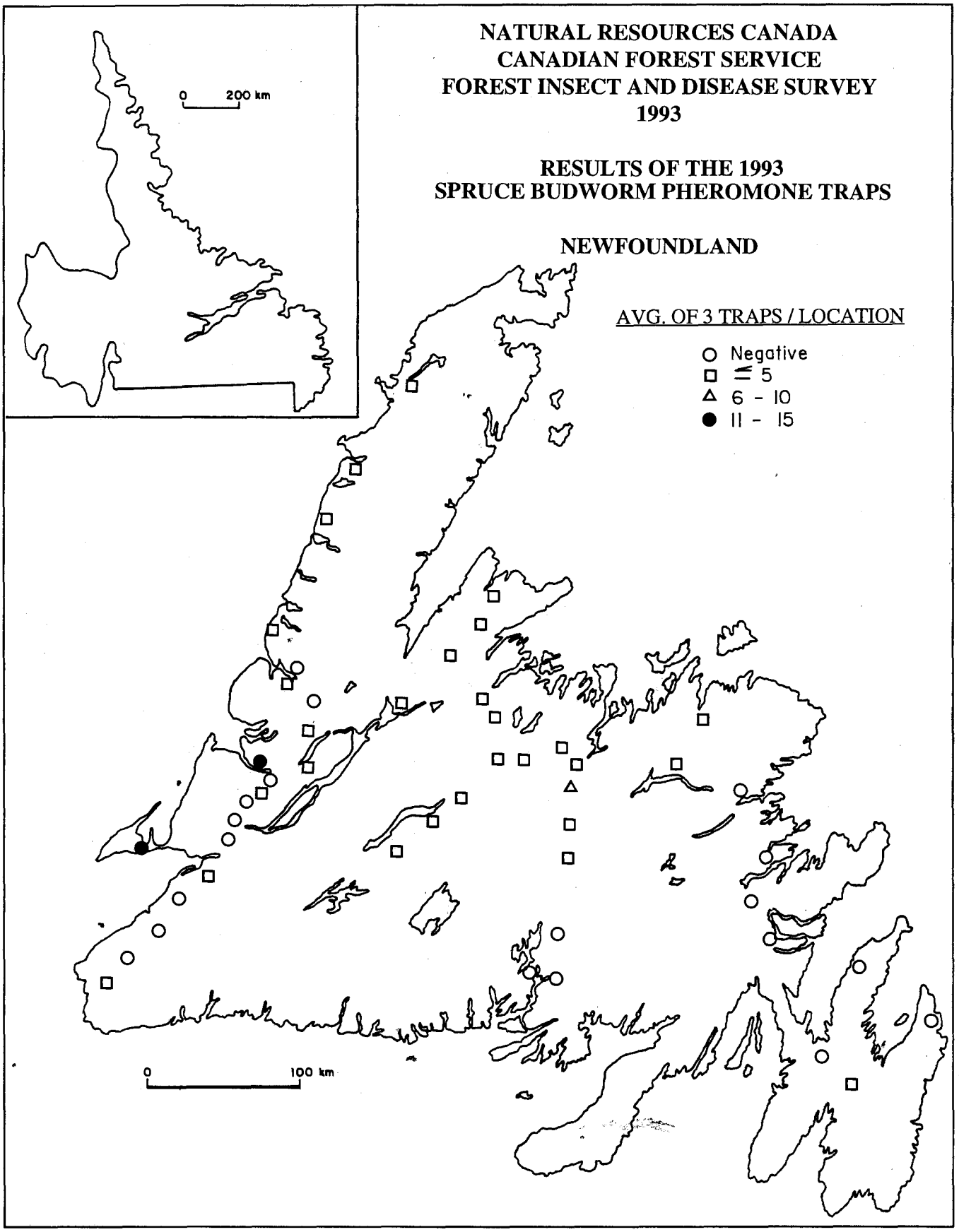
NATURAL RESOURCES CANADA
CANADIAN FOREST SERVICE
FOREST INSECT AND DISEASE SURVEY
1993
RESULTS OF THE 1993
SPRUCE BUDWORM PHEROMONE TRAPS
NEWFOUNDLAND
0 200 km
AVG. OF 3 TRAPS / LOCATION
Negative
≤ 5
6 - 10
11 - 15
0 100 km

Figure 11.

The Newfoundland Department of Forestry and Agriculture did not conduct an operational control program against spruce budworm in 1993.

Overwintering populations were sampled in conjunction with the hemlock looper and blackheaded budworm egg sampling from mid- to late October. No defoliation by spruce budworm is forecast for 1994.

Balsam Woolly Adelgid
Adelges piceae

Management of balsam fir stands in Newfoundland is complicated by the balsam woolly adelgid (BWA), *Adelges piceae*. Presently, foresters do not have enough information concerning BWA biology and its impacts to avoid losses to adelgid. The Island-wide survey for BWA was completed by FIDS in 1991 and surveys in Management Districts 14, 8 and 2 continued in 1992 and 1993. Populations of BWA remain high throughout many areas of balsam fir with the exception of the Northern Peninsula where the insect is probably limited by low winter temperatures. The total area affected by BWA exceeds 160 000 ha with 123 044, 22 176, and 14 825 of light, moderate and severe damage, respectively. The majority of the damage (108 375 ha) occurs in the less than 40-year-old age class. Also, damage has been recorded on approximately 5 000 ha of pre-commercially thinned stands.

Balsam Fir Sawfly
Neodiprion abietis

Populations of balsam fir sawfly (BFS) in Management District 14 (Bay d'Espoir) that caused severe defoliation in 1991 collapsed in 1992. No significant defoliation occurred in the Bay d'Espoir area in 1993. An infestation in western Newfoundland increased from 1 256 ha in 1992 to 1 739 ha in 1993 (Table 3, Fig. 12). The infestation encompassed 1 497 ha of severe defoliation, 209 ha of moderate defoliation and 33 ha of light defoliation. The area of infestation in productive forests of western Newfoundland was 1 188 ha compared to 1 134 ha in 1992 and encompassed 20 800 m^3 of timber in all defoliation categories (Table 3).

Branch samples were collected in fall 1993. Counts of eggs on needles (1 branch per tree; 5 trees per sampling point) indicated that at Bottom Brook and along the TCH north of Bottom Brook (MD 14) defoliation will increase to 11 683 ha in 1994 (Fig.13). Areas with moderate to severe defoliation is expected to account for 6 675 ha and 5 008 ha will be lightly defoliated (Table 4). Egg counts in 1993 were exceedingly high on many branches (> 1000 per branch). This finding, coupled with the paucity of disease and parasites in 1993, suggest the western Newfoundland outbreak will continue for some time.

A number of parasites are reported from BFS. Parasites that emerged in 1992 from 1991 material collected from western Newfoundland were identified as *Otlophorus* sp. (*Hymenoptera: Ichneumonidae*). Additional work is in progress to identify parasites of BFS. A viral disease tentatively identified as a nuclear polyhedrosis virus was responsible for reducing high populations of BFS in eastern Newfoundland in 1992.

Blackheaded Budworm
Acleris variana

Seasonal development of eastern blackheaded budworm (BHB) was delayed by 3 weeks due to cold wet weather for most of June and July. The latest outbreak of blackheaded budworm started on the Northern Peninsula in 1987 and encompassed 35 000 ha of balsam fir forests. Moderate and severe defoliation occurred mainly in overmature stands, with some light defoliation in pre-commercially thinned stands. In several areas of the outbreak BHB fed in association with the hemlock looper and both insects contributed to tree mortality.

Moderate and severe defoliation encompassed 3 757 ha and light defoliation affected 2 955 ha in 1992. This outbreak declined sharply in 1993 and no defoliation was observed on the Northern Peninsula. Scattered populations of BHB were present on the Avalon Peninsula but no significant defoliation occurred.

There was no experimental or operational control program against the blackheaded budworm in 1993. Successful identification of the sex pheromone of BHB was completed and work is in progress to develop a pheromone-based monitoring program for BHB.

Overwintering egg numbers were sampled from mid- to late October. No defoliation is forecast for 1994.

European Pine Sawfly
Neodiprion sertifer

The European pine sawfly (EPS) was first recorded in Newfoundland in 1974 in a Scots pine plantation near

Table 3. Areas (ha) of defoliation and gross merchantable volume (m^3) of affected stands caused by the balsam fir sawfly in productive forests and areas of defoliation of total infestation in Newfoundland in 1993.

Mgmt. Dist.	Productive Forest*								Total Infestation (ha)			
	Light		Moderate		Severe		Total					
	Area	Vol. (x 000)	Area	Vol. (x 000)	Area	Vol. (x 000)	Area	Vol. (x 000)	Light	Mod.	Sev.	Total
14	33	2.7	144	3.6	1 041	14.6	1 188	20.8	33	209	1 497	1 739
Totals	33	2.7	144	3.6	1 041	14.6	1 188	20.8	33	209	1 497	1 739

*Provided by the Forest Management Division, Dept. of Forestry & Agriculture.

Table 4. Areas (ha) of defoliation by the balsam fir sawfly forecast in forested areas of Newfoundland for 1994.

Management Dist. No.	Defoliation Class*		
	Light**	Moderate & Severe***	Total
14	5 008	6 675	11 683

* Light = 6-25%
Moderate = 26-75%
Severe = 76-100%

** Areas with low egg density (6-20 eggs/branch)
*** Areas with moderate and high egg density (21 or more eggs/branch)

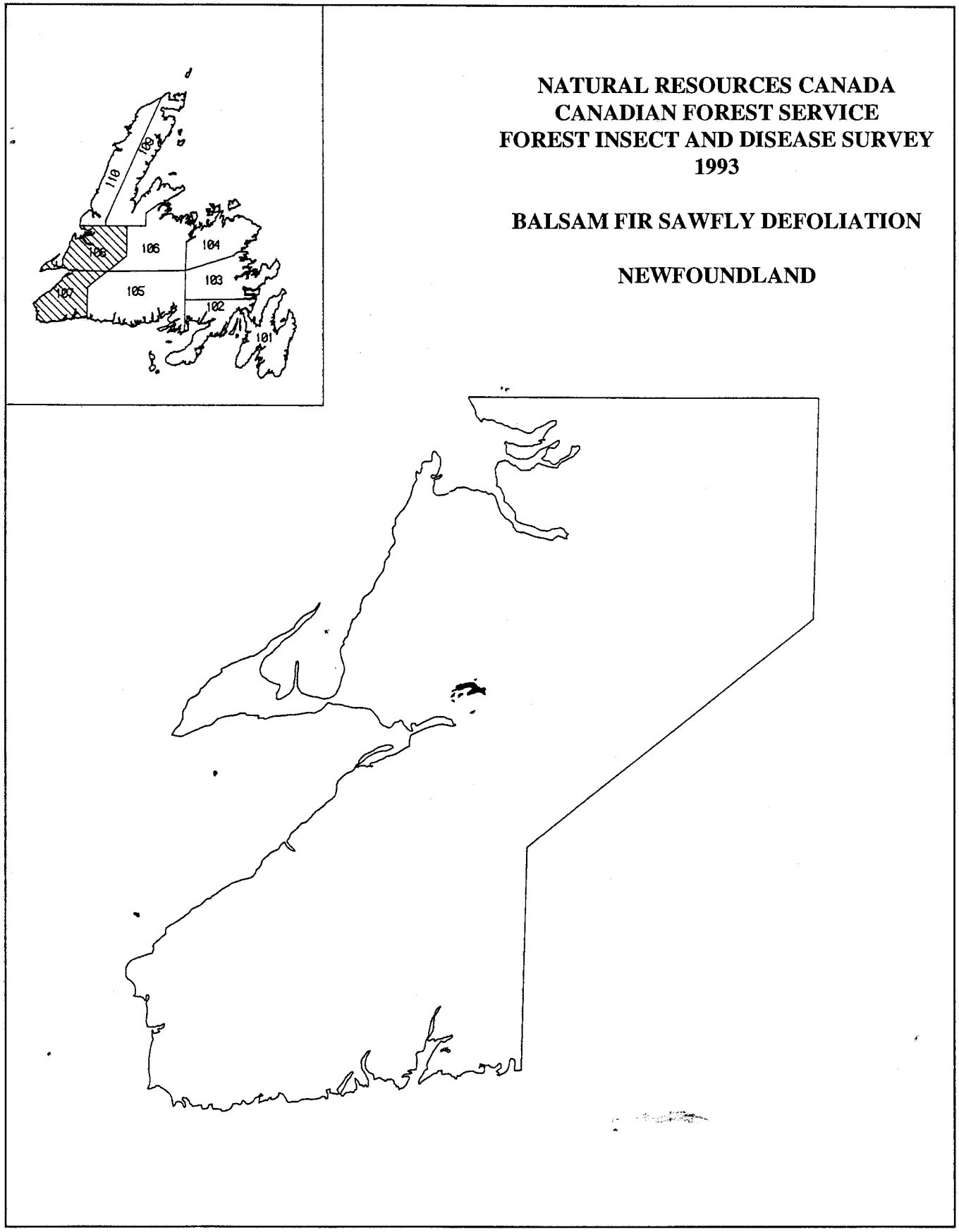
NATURAL RESOURCES CANADA
CANADIAN FOREST SERVICE
FOREST INSECT AND DISEASE SURVEY
1993
BALSAM FIR SAWFLY DEFOLIATION
NEWFOUNDLAND
110
109
108
106
104
107
105
103
102
101

Figure 12.

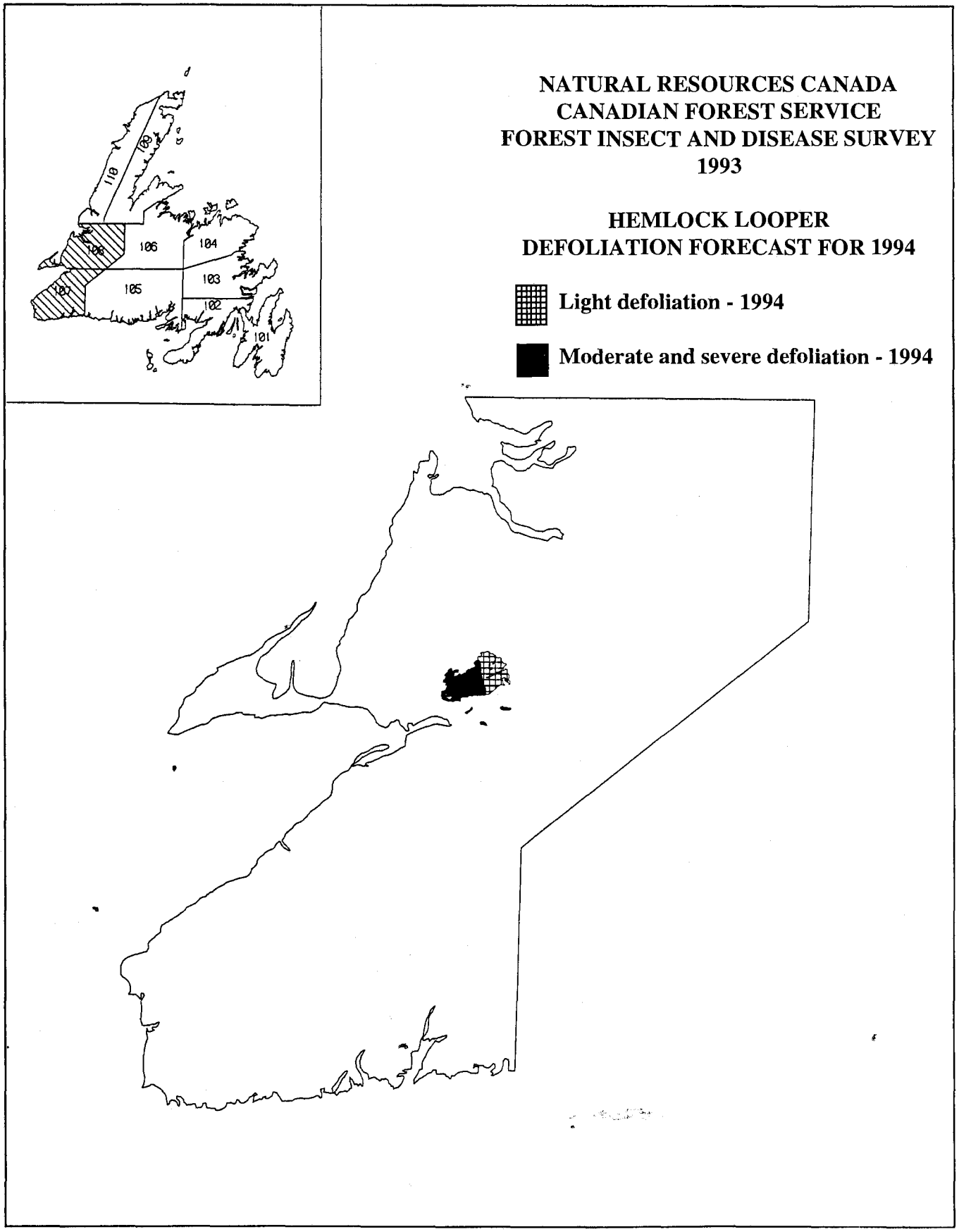
NATURAL RESOURCES CANADA
CANADIAN FOREST SERVICE
FOREST INSECT AND DISEASE SURVEY
1993
HEMLOCK LOOPER
DEFOLIATION FORECAST FOR 1994
Light defoliation - 1994
Moderate and severe defoliation - 1994
110
109
108
106
104
103
105
102
107
101

Figure 13.

Windsor Lake and has now infested 2-needle pines in St. John's and other locations on the Avalon Peninsula where 60-70% of pines are infested. In recent years the insect was recorded at Whitbourne, Tilton, Clarkes Beach, and Brigus. EPS continues to spread, despite attempts to prevent the transportation of conifers from the Avalon Peninsula to other areas of the Province. In 1993 several ornamental pines at Burin were infested and larvae were collected from infested trees. This is the first time EPS has been recorded at a location outside the Avalon Peninsula (Fig. 14). The discovery of EPS in Burin is highly significant because this expansion in its range has increased the risk to Newfoundland's native red pine stands, a species that is rare and vulnerable to local extinction. Defoliation by EPS was minimal where sertifervirus spray was applied, but varying degrees of damage occurred at all other sites. The insect is expected to continue to spread throughout Newfoundland. Increased emphasis will be placed on strategies to manage EPS in 1994. Sites known to be infested with the sawfly will be visited and trees will be sprayed with virus or removed.

Black Army Cutworm
Actebia fennica

Numerous areas of potential black army cutworm outbreaks were checked in late May but no high populations were observed. Two locations in western Newfoundland, burnt in August 1992, were monitored further for black army cutworm during late May and early June. The average number of larvae per m^2 was 6.9 at South Branch. Moderate to severe defoliation occurred in widely scattered patches. Most damage was confined to hardwoods and herbaceous plants and relatively little damage was observed on black spruce seedlings planted in 1992. The number of larvae recorded near the TCH, 5.7 km west of Flat Bay Brook averaged 0.5 per m^2. Light to moderate damage occurred on ground vegetation but no significant defoliation occurred on black spruce seedlings. Pheromone-baited traps were deployed at both of the above locations and at St. Teresa road to detect black army cutworm adults during their flight period. Prescribed burns carried out by the Department of Forestry and Agriculture at St. Fintan's and the experimental area near Glide Lake in late summer were also monitored with pheromone-baited traps. Adult trap catches at all locations were low, ranging from 24 to 113 moths, indicating low risk of black army cutworm damage for 1994.

Larch Sawfly
Pristiphora erichsonii

In 1993, relatively high populations of larch sawfly were recorded from ground checks covering a large area of western Labrador from the Quebec border east to Churchill Falls and north to Esker. This area consists primarily of black spruce stands with small stands of larch growing mainly near marshes and river beds. The intensity of the defoliation for 1993, determined during the aerial survey conducted in late August, showed moderate to severe defoliation from Metchin River (east of Churchill Falls) to the Ossokmanuan reservoir. Defoliation was generally light in the Wabush and Ashuanipi Lake areas with scattered small moderate patches throughout. Low larval numbers were also recorded in eastern Labrador, near Goose Bay. In western Newfoundland, light defoliation was recorded on Japanese larch at Pasadena and on larch near Deer Lake.

In central Newfoundland severe defoliation by larch sawfly was recorded at several locations during the aerial survey, viz.: Meelpaeg Lake - Snowshoe Lake - Rogerson Lake; Star Lake and near the southwest end of Red Indian Lake, between Lloyd's River and Tulk's Brook.

Results of the annual fall shrew trapping program in the four permanent shrew plots across the Island showed a marked decrease in populations in two of the four plots as compared to 1992 (Table 5).

Balsam Gall Midge
Dasineura balsamicola

High populations of balsam gall midge were observed in many areas of western Newfoundland in 1992. Infestations continued in 1993 at McKenzies Brook in Gros Morne National Park and areas near Bonne Bay Pond, Daniels Harbour and Hawkes Bay. Damage was moderate on over 50% of the trees in these areas. Severe defoliation of thinned balsam fir stands near Kennedy Lake is attributed to three years of continued balsam gall midge infestation.

In central Newfoundland, outbreaks of the midge were observed during the fall egg surveys at Red Cross Lake; Lake Douglas area and near Talley Pond where 30-50%, 10-40% and 20% damage respectively, was recorded. Moderate damage was also recorded on all balsam fir trees in the ARNEWS plot at Long Harbour in eastern Newfoundland.

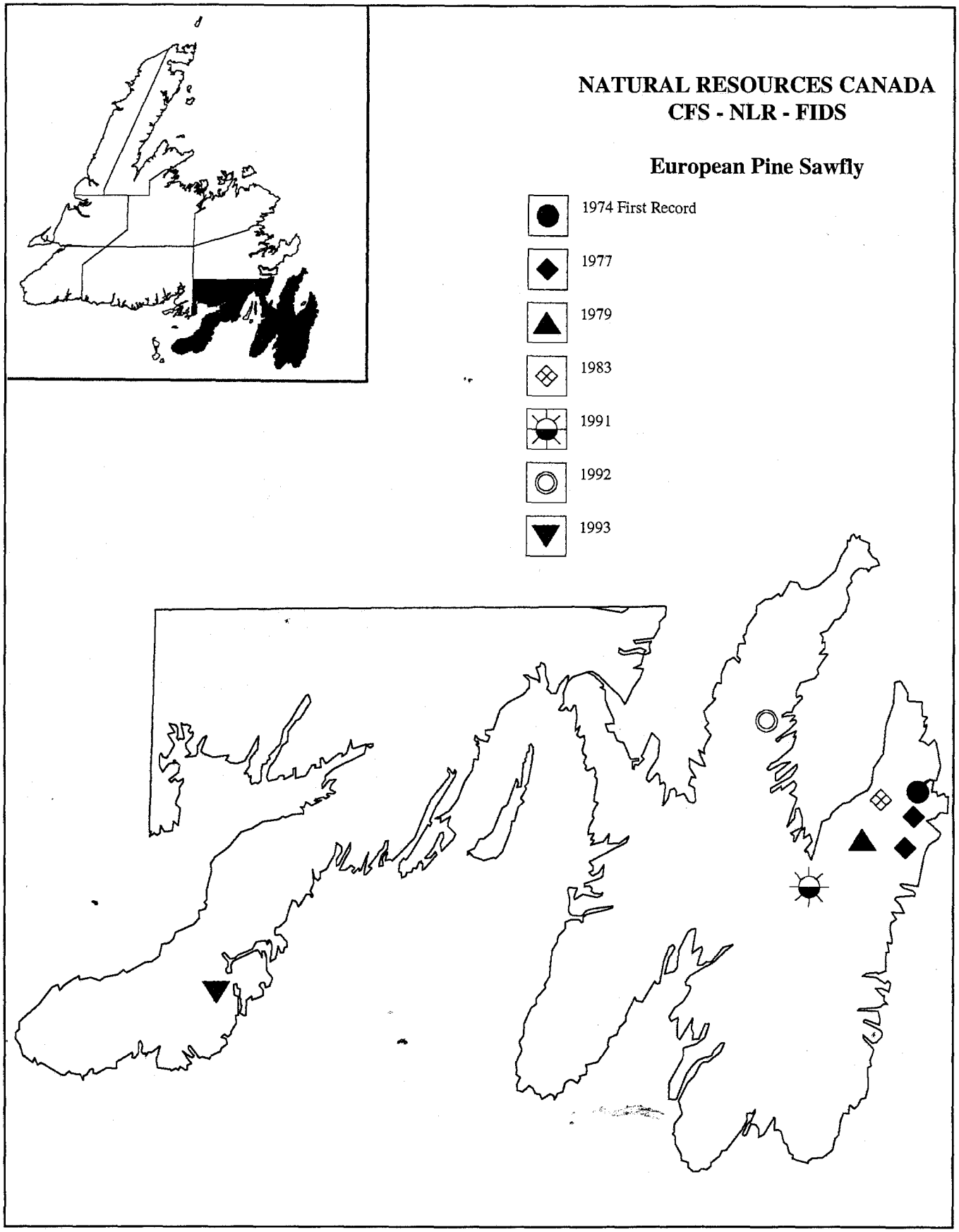
NATURAL RESOURCES CANADA
CFS - NLR - FIDS
European Pine Sawfly
1974 First Record
1977
1979
1983
1991
1992
1993

Figure 14.

Table 5. Estimated number of shrews per hectare from 1988 - 1993 in Newfoundland.

Location	1988	1989	1990	1991	1992	1993
St. Georges	6.44	4.30	1.09	14.01	4.30	2.14
Hall's Bay	5.73	3.21	0.97	8.60	4.30	4.30
Terra Nova National Park	5.73	6.44	0.97	8.60	4.30	4.30
Paddy's Pond	-	8.60	0.00	5.36	5.36	2.14

Spruce Beetle
Dendroctonus rufipennis

Populations of spruce bark beetle continue to expand in the Humber Valley between Pasadena and Corner Brook and in scattered areas throughout western Newfoundland. The infestation in the Humber Valley has resulted in significant white spruce mortality.

Spruce Budmoth
Zeiraphera canadensis

Spruce budmoth remained common on white spruce throughout the western region and caused light damage on 50% of the shoots of white spruce over several hectares of forest near the Arches Provincial Park in 1992. Light damage was recorded on less than 10% of the shoots on trees in this area in 1993. White spruce stands in the McKenzies Brook area in Gros Morne National Park were also attacked with 5-10% of the new shoots defoliated. Spruce bud moth is common on the Avalon Peninsula wherever the host tree occurs but little damage was recorded.

Root Collar Weevil
Hylobius sp.

Girdling was evident on several Scots pines located in Grand Codroy Provincial Park. Evidence of feeding by root collar weevil was also observed on pine trees at South Brook Park near Pasadena. Five percent of the Scots pine in a small Christmas tree plantation at Nicholsville, were dying or dead following attack by root collar weevil.

Pine Aphid
Cinara sp.

An infestation of pine aphid occurred throughout a Scots pine plantation near Nicholsville in western Newfoundland. New shoots, branches and stems on 5-10% of the trees were infested with very high populations. Damage was light on most of the trees, however moderate damage to ornamental white pine occurred in the same area.

Poplar Serpentine Leafminer
Phyllocnistis populiella

An infestation of leafminer has been active in eastern Labrador for the past 10 years and continued to cause defoliation in 1993. Moderate to severe defoliation was recorded in trembling aspen stands in the Churchill River Valley from Minipi River to Goose Bay and in a few stands along Goose River. Light to moderate damage occurred near the west end of Grand Lake and in small patches along the Beaver, Susan, Red Wine and Naskaupi Rivers. Damage was also observed from Happy Valley to Northwest River but was generally light with some patches of moderate to severe defoliation. Light damage also occurred throughout central Newfoundland and defoliation ranged from 10 to 25%.

Birch Casebearer
Coleophora serratella

Low populations of birch casebearer and light defoliation was recorded throughout central Newfoundland and on the Avalon Peninsula, with one exception, near South Brook (Hall's Bay) where 70% browning occurred to a 0.5 ha stand of young white birch. Low insect numbers

and insignificant damage was recorded in western Newfoundland.

Psyllids

These sap sucking insects are common on pin cherry in many areas of the Province. Populations on the Avalon Peninsula and in central Newfoundland were higher than normal in 1993, and were found in association with fire blight disease on pin cherry. High numbers of psyllids were also found on speckled alder in eastern Labrador in the Happy Valley to Northwest River area and in many river valleys. Residents of the town of Happy Valley - Goose Bay expressed concern about this pest as alder is common on private property and along walking trails throughout the area.

Satin Moth
Leucoma salicis

The satin moth has caused severe defoliation to ornamentals in Corner Brook during recent years. In 1993, poplar and willow trees near Church Street, along West Valley road and near Corner Brook Pulp and Paper Mill were 50-90% defoliated. Willows on the Blomidon golf course were 20% defoliated. Moderate damage to willow was also observed in eastern Newfoundland at Mount Pearl and along the west shore of Conception Bay.

Striped Alder Sawfly
Hemichroa crocea

A small infestation of striped alder sawfly occurred along the Fig River, south of Winokapau Lake in Labrador, and caused severe defoliation in several patches of speckled alder.

Bruce Spanworm
Operophtera bruceata

In eastern Labrador in 1992, the bruce spanworm affected white birch stands between Pena's River and Edward's Brook, and in three separate areas on the north side of Churchill River where moderate and severe defoliation was recorded over an estimated 1000 ha. In 1993, damage to white birch encompassing approximately 3000 ha occurred in the same general area along the north side of the Churchill River. A total of 1200 ha was severely defoliated while light and moderate damage accounted for approximately 1 800 ha. An infestation of spanworm was recorded near Gander, Newfoundland, from 1954-55, however this is the first infestation recorded by FIDS in Labrador. It is suspected from old damage observed in white birch stands that infestations were present in previous years. Infestations recorded in Canada and Northern USA have lasted 2-3 years.

Birch Leafminer
Fenusa pusilla

In insular Newfoundland light damage caused by birch leafminer occurred at Piper's Hole Provincial Park, where 20% defoliation was recorded. High populations in the Happy Valley - Goose Bay area caused severe damage particularly in ornamental white birch. This insect occasionally reaches outbreak proportions throughout Newfoundland and Labrador. FIDS recorded the last outbreak in Labrador in 1987. A collection of larvae was forwarded to the Canadian Forest Service at Edmonton for rearing and identification of parasites.

Aspen Leaf Roller
Pseudexentera oregonana

Throughout central Newfoundland aspen damage by leaf rollers was common. Light damage, ranging from 5-20% and one area of moderate damage with 30% occurred near Grand Falls.

Willow Sawfly
Nematus limbatus

Willow sawfly occurred in association with the satin moth on golden willow near Mount Pearl. Damage was moderate.

Mountain-Ash Sawfly
Pristiphora geniculata

Populations of mountain-ash sawfly varied from low to high in widely separated locations throughout central Newfoundland. Only light defoliation was recorded in all areas.

Gypsy Moth
Lymantria dispar

The annual program for monitoring accidental introduction of gypsy moth to this Province was implemented by deploying 250 delta traps baited with disparlure in July 1993. Generally, sites chosen were

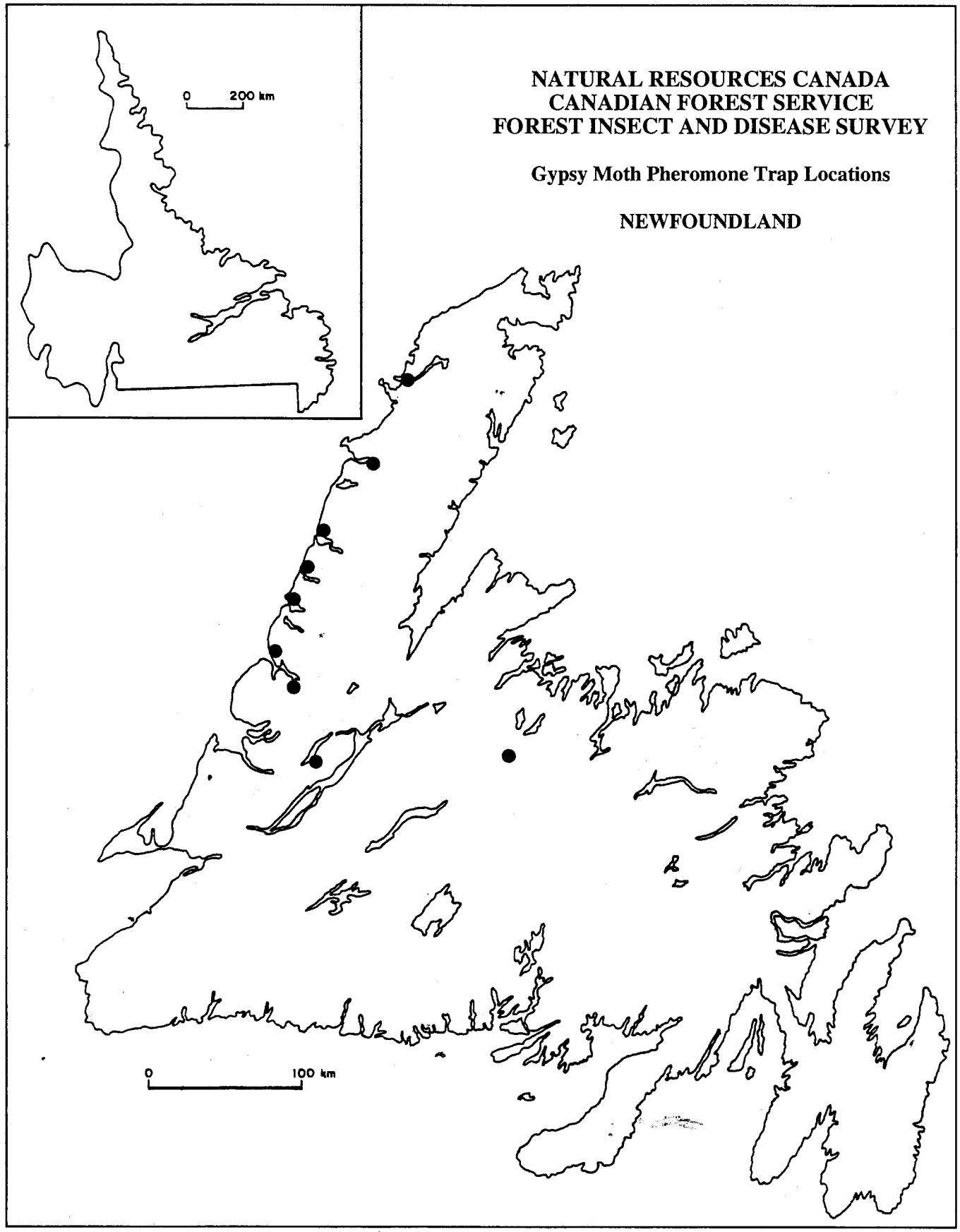
NATURAL RESOURCES CANADA
CANADIAN FOREST SERVICE
FOREST INSECT AND DISEASE SURVEY
Gypsy Moth Pheromone Trap Locations
NEWFOUNDLAND
0 200 km
0 100 km

Figure 15.

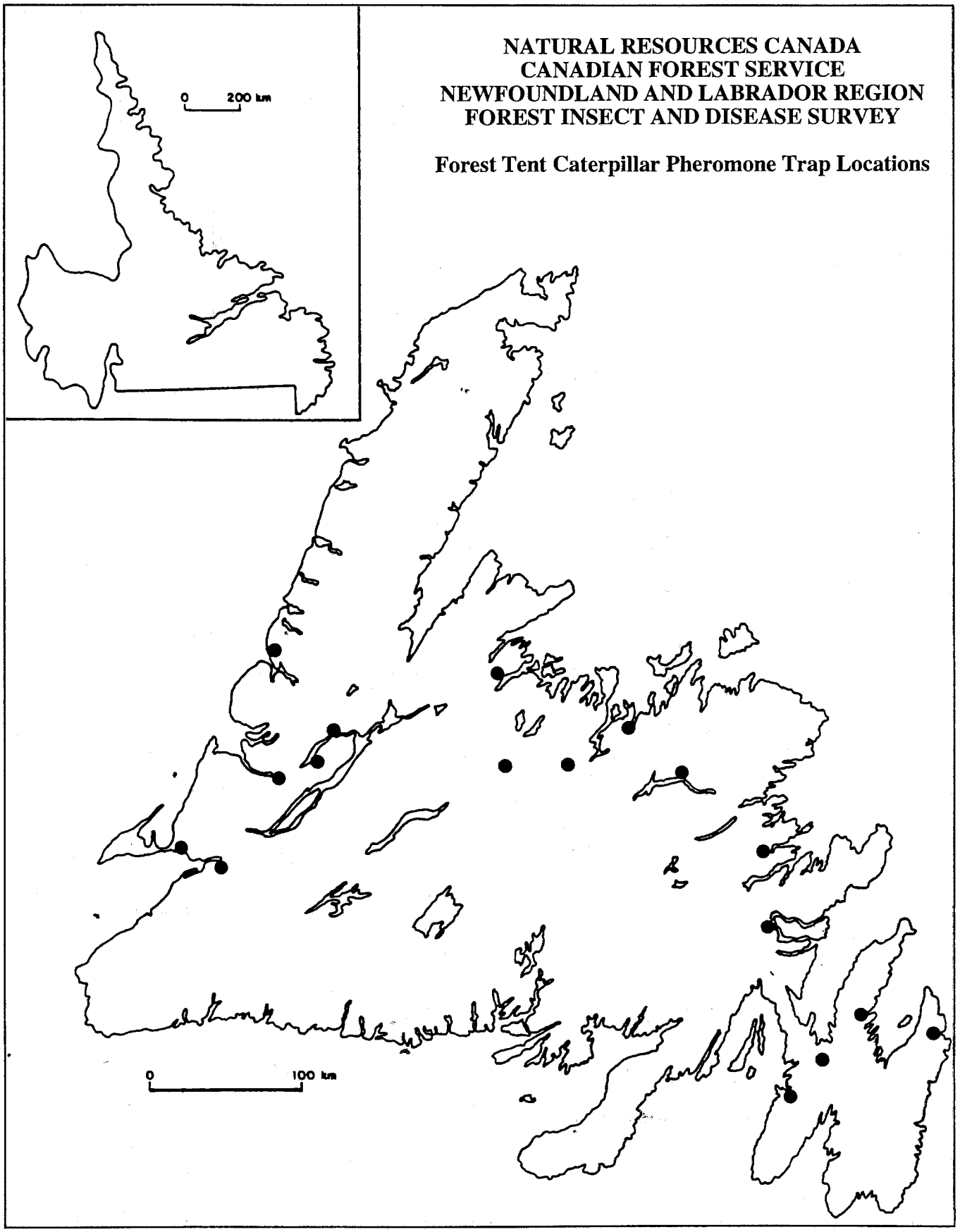
NATURAL RESOURCES CANADA
CANADIAN FOREST SERVICE
NEWFOUNDLAND AND LABRADOR REGION
FOREST INSECT AND DISEASE SURVEY
Forest Tent Caterpillar Pheromone Trap Locations
0 200 km
0 100 km

Figure 16.

Provincial and Federal campgrounds, urban and suburban recreational sites, tourist chalets and wooded areas frequented by visitors and travellers. Agriculture Canada distributed 200 traps throughout Newfoundland from the Avalon Peninsula to Port aux Basques to Plum Point on the Northern Peninsula. Distribution of traps (50) by Forestry Canada is shown in Figure 15.

Traps were collected and examined in September with negative results.

Forest Tent Caterpillar
Malacosoma disstria

A total of 100 baited delta traps were used to detect the possible introduction of forest tent caterpillar in 1993 in Newfoundland. Traps were placed throughout the Province near major urban centres and in national and provincial parks (Fig. 16). Traps were collected and examined in September with negative results.

DISEASES

Scleroderris Canker
Gremmeniella abietina &
Gremmeniella abietina var. *balsamea*

Sclerederris canker continued to spread in localized areas. Two new infection sites were recorded near St. John's and Portugal Cove. Both infections were on Austrian pine with up to 20% of the shoots infected. An old infection site on the Boulevard in St. John's had 10% of the shoots affected by this canker.

Armillaria Root Rot
Armillaria species

Stumps from recently cut fir, spruce and birch in the Glide Lake area in western Newfoundland had their roots, root collar and trunk infected by Armillaria root rot . The disease continues to cause mortality wherever susceptible hosts occur.

White Pine Blister Rust
Cronartium ribicola

Low incidences of blister rust were detected throughout the Island in 1993. In western Newfoundland infected trees were found near the Abitibi-Price camp along Southwest Brook road; in Barachois Pond Provincial Park where dead and dying trees were observed; along Little Grand Lake road; at Howley and near Sheffield Lake where approximately 10% of young white pine trees were infected and some mortality was evident; along Northwest Gander River road in central Newfoundland numerous young white pine in various stages of blister rust infection and some mortality was observed. Light damage was also recorded along Terra Nova Village road in eastern Newfoundland.

Fire Blight

The most recent record of this disease was recorded on pin cherry in 1992 in central Newfoundland. Many pin cherry trees in eastern and central Newfoundland exhibited fire blight symptoms, especially among flowers and throughout the foliage at the tips of branches. On some trees the infection had spread back into larger branches and branch mortality had occurred. Psyllids that often feed on bacterial exudate were abundant on many of the dying trees and may have contributed to tree mortality. As the disease-insect complex advances, the lower part of the tree foliage dies until there is only 5 to 10% of the foliage left. Mortality was apparent in Districts 101 to 106 following damage to 90% of the foliage.

Larch Needle Rust
Melampsora medusae

Needle rust of eastern larch caused by the pathogen *Melampsora medusae* occurred at several locations in central Newfoundland and in western Labrador. A high incidence was recorded on a few trees 1 km west of Badger and medium to high incidences along the southeast shore of Red Indian Lake. Approximately 20% of a larch stand along a 1.5 km section of road, 25 km southwest of Exploits Dam was moderately infected. High incidences were also recorded in a 20 ha stand 27 km southwest of Exploits Dam. This area has a high concentration of roadside larch and moderate to severe damage was recorded in a 7 km stretch further along the main road. In western Labrador light damage was common on roadside larch from Metchin River to Cache River with some severe patches near Wilson River.

Shoot Blight of Jack Pine
Hormonema species

Shoot blight affected 60-70% of two jack pine plantations located 27 km along South Branch road near Peters River in eastern Labrador in 1992 and some leaders and 20-70% of the lateral shoots were also damaged. The plantations are approximately 15 years old and 3-4 m high. A black yeast (*Hormonema* spp.) was isolated from the

damaged shoots. During 1993 it was noted that 50% of the leaders and 25% of the laterals had died causing multiple tops on many of the jack pine. However, resinosus was much lighter in 1993 affecting 10-20% of the leaders and laterals.

Jack pine plantations on Churchill road had 10% of the leaders and a few shoots killed by a combination of frost and shoot blight in 1992. In 1993 damage affected 20-30% of the trees in small low lying pockets throughout the plantations. Resinosus was light on trees in the area.

Needle Rusts
Chrysomyxa ledicola
Chrysomyxa empetri

A severe incidence of this pathogen was recorded on black and white spruce on the Avalon Peninsula. The area encompassed large tracts of sparsely wooded terrain in the Carbonear to Harbour Grace and Riverhead - Bryants Cove areas. Needle rusts of white and blue spruce were also common and widespread in eastern Newfoundland and on the Avalon and Bonavista Peninsulas where up to 100% of the new foliage was affected on 5% of the trees.

Sirococcus Shoot Blight
Sirococcus strobilinus

Sirococcus shoot blight was observed in patches from Goose Arm to Bonne Bay Big Pond and was particularly noticeable in the Kennedy Lake area in western Newfoundland. The disease occurred in balsam fir stands that were infested by the balsam gall midge for the past 2-3 years. This represents a new host record for the disease.

Black Knot
Apiosporina morbosa

Black knot disease was common and widespread throughout the Province. About 70% of the foliage and woody tissue was affected on scattered pin cherry trees in the Deer Lake to Cormack area. Near Pasadena, Little Rapids, Shellbird Island and Riverside Drive up to 80% of the foliage of pin cherry was infected. Severe foliage damage and some mortality was recorded on the Baie Verte Peninsula. High incidences were observed throughout the Burnt Berry Brook area in central Newfoundland and on the Avalon Peninsula in the Outer Cove and Tilton areas. Low incidences were also observed near Clarenville, and at many locations throughout the Avalon Peninsula.

Ink Spot
Ciborinia whetzelii

Trembling aspen stands growing along the Churchill road near Happy Valley and also near Otter Creek were damaged by ink spot. Damage was light affecting 20% of the foliage on a few trees within the stands.

Willow Blight
Fusicladium saliciperdum &
Glomerella miyabeana

Willow blight was common on golden and laurel willows in the Topsail, St. John's and Goulds areas with up to 10% of the foliage infected. A high incidence was recorded on golden willows in Clarenville where foliage was severely affected.

Leaf and Shoot Blight of Poplars
Venturia macularis &
Venturia populina

Leaf and shoot blight occurred on 40% of trees in a 2 ha aspen stand near Gander. The damage level was 10% on poplars at Lewisporte, Catamaran Provincial Park and South Side road near the Grand Falls paper mill. Light damage was observed on the Baie Verte Peninsula near the junction of Seal Cove and Wild Cove roads. In eastern Labrador, light damage occurred on trembling aspen regeneration and approximately 20% of the current shoots were killed in a cutover area near the mouth of Goose River.

Snow Blight
Phacidium infestans

Snow blight was common on young conifers growing in open areas along Northwest River forest access road, Grand Lake, South Branch and Churchill roads in eastern Labrador. Damage was generally light in 1993 affecting 10-20% of the lower crown on less than 10% of the young trees. Light damage was also recorded in young black spruce in roadside plantations affecting 20% of the lower crown on 25% of the trees near Cape Caribou River.

Taphrina Witches Broom
Taphrina cerasi

Damage has been recorded on pin cherry in the Happy Valley - Goose Bay area in eastern Labrador for the past few years in many locations. In 1993, up to 20% of the foliage was affected. Taphrina witches broom is responsible

for much of this damage, however black knot has also been a contributing factor in many sites.

Broom Rust
Melampsorella caryophyllacearum

Broom rust was common southeast of Windsor Lake and in the Garnish Pond area on the Burin Peninsula where numerous brooms were observed on balsam fir trees.

Gray Mold Blight
Botrytis cinerea

Gray mold blight occurred on 10% of the foliage of red currant and gooseberry (*Ribes* species) at the greenhouse in Mount Pearl. This disease, associated with Taphrina leaf blister also affected up to 40% of the foliage on white oak in the Pasadena nursery.

ABIOTIC DAMAGE

Frost Damage

Symptoms of frost damage occurred on 30% of the foliage of 50% of the trees in mainly white birch stands along the north side of East Arm and at Southeast Brook, Gros Morne National Park. Frost damage was also recorded on red maple, elm, trembling aspen, copper beech, Norway maple, tamarack larch and balsam poplar throughout the Island. In eastern Labrador frost killed or severely damaged approximately 12 000 spruce seedlings at the holding area of the provincial nursery in Happy Valley. Lack of snow cover during winter contributed to the damage. An entire stock of European larch was also killed or severely damaged, however this larch stock was suspected to be unsuitable for the Labrador climate. Frost also damaged 25-50% of the new shoots on larch in a plantation at Muskrat Lake. Larch in plantations along South Branch road received very light damage. A low incidence of frost damage was recorded in jack pine plantations along South Branch and Churchill roads, however many dead leaders and shoots were present from previous years.

Frost also affected the new growth on balsam fir regeneration in many areas near Goose River, South Branch, and Grand Lake roads causing severe damage to scattered small pockets in cutover areas. Light damage also occurred on young white birch in those areas.

Winter Drying

Winter drying was common and widespread in 1993. In a black spruce plantation 7 km west of Flat Bay Brook up to 30% of the foliage was affected on 90% of the trees. Severe damage caused by winter drying in combination with salt spray was evident at Sandbanks Provincial Park and 30% of the foliage of Scots pine was affected on 70% of the trees in Grand Codroy Provincial Park. In a Sitka spruce plantation near Stag Lake up to 30% of the foliage on most of the trees were affected and 20% of Sitka spruce in a hedgerow at the Pasadena nursery are dying or dead as a result of repeated winter drying. Light to severe damage occurred to exposed white spruce and balsam fir along the road near Parsons Pond on the Northern Peninsula. Pines on the Avalon Peninsula were also severely damaged with up to 100% of the foliage on up to 50% of the trees affected. A high incidence of winter drying affected 10-20% of the foliage on jack pine in plantations near Peters River and Echo Lake in eastern Labrador. Evidence of light winter drying was also observed in plantations along Churchill road.

ANIMAL DAMAGE

Porcupine
Erethizon dorsatum

Small pockets of spruce and fir damage by the porcupine are widely scattered throughout Labrador. Damage was particularly noticeable in the Goose River to Beaver River and Winokapau Lake areas, where small patches of trees were killed or are dying. Scattered patches of recently dead and dying jack pine, caused by porcupine damage were observed south of Lac Opocopa and Ashuanipi Lake in western Labrador.

Squirrel
Tamiasciurus hudsonicus

Red squirrels continued to damage the tops of black spruce trees throughout Labrador. Twigs are torn from the stems as squirrels attempt to remove cones, giving the trees a distinctive tufted appearance. This damage was particularly noticeable along Grand Lake road.

Insect, disease or damage	Host(s)	Location	Remarks
Alder leaf beetle *Chrysomela mainensis mainensis Bech*	Speckled alder	Central Newfoundland	Low numbers. Trace of defoliation.
Animal damage	Red pine Black spruce Balsam fir Jack pine	Western Newfoundland Eastern and western Labrador	Light squirrel damage (5-10%) recorded in red pine stands near Howley. Porcupine damage was also observed on black spruce and balsam fir in eastern Labrador and on jack pine in western Labrador.
Anthracnose *Kabatiella apocrypta* (Ell. and Ev.) *Arx Marssonnia betulae* (Lib.) Magn.	Red maple White birch	Western and central Newfoundland	Low incidence on red maple at Corner Brook and Pasadena nursery. *M. betulae*, a new record caused light damage to white birch in central Newfoundland.
Apple scab *Venturia inaequalis* (Cooke) Wint.	Crab apple	Avalon Peninsula	Low incidence on ornamentals at St. John's.
Aspen leaf roller *Pseudexentera oregonana* Wlshm.	Trembling aspen	Central and eastern Newfoundland	Light damage. Common throughout central Newfoundland.
Bag worms *Solenobia walshella* (Clem.)	Balsam fir	Bonavista Peninsula	Low population.
Balsam twig aphid *Mindarus abietinus* Koch.	Balsam fir	Western Newfoundland	Common throughout the Lomond (GMNP) area.
Blackheaded aspen caterpillar *Ipimorpha pleonectusa* Grote.	Trembling aspen	Central Newfoundland	Low number. 20% defoliation.
Click beetle *Ctenicera resplendens aeraria* (Rand.)	Balsam fir	Western and central Newfoundland	Low numbers.
Collar weevil *Hylobius* sp.	Jack pine Red pine Scots pine Balsam fir	Throughout Newfoundland Eastern Labrador	Light damage recorded in western Newfoundland and eastern Labrador.

Insect, disease or damage	Host(s)	Location	Remarks
Dotted line looper *Protoboarmia porcellaria indicataria* Wlk.	Balsam fir	Central Newfoundland	Low population.
Eastern dwarf mistletoe *Arceuthobium pusillum* Peck.	Black spruce	Eastern Newfoundland	High incidence near Gambo.
Eriaphyes mites *Eriaphes* sp.	Mountain-ash Speckled alder Red currant	Throughout Newfoundland	Light to moderate damage. Populations ranged from low to high.
European alder leafminer *Fenusa dohrnii* (Tischb.)	Speckled alder	Central Newfoundland	Populations low. Light defoliation.
European poplar canker *Dothichzia populea* Sacc. and Briard	Lombardy poplar	Avalon Peninsula	High incidence.
European spruce sawfly *Gilpinia hercyniae* (Htg.)	White spruce Black spruce	Western Newfoundland Eastern Labrador	Low numbers.
False pine webworm *Acantholyda erythrocephala* (L.)	Scots pine Red pine	Avalon Peninsula	Trace of damage observed on ornamentals at St. John's.
Galls *Pontania* sp.	Willow Trembling aspen	Eastern Labrador	Light damage. Common on willow at Otter Creek.
Gray spruce tussock moth *Dasychira plagiata* (Wlk.)	Balsam fir	Western Newfoundland	Populations low.
Green balsam looper *Cladara limitaria* (Wlk.)	Balsam fir	Throughout Newfoundland	Low populations. No significant damage.
Greenheaded spruce sawfly *Pikonema dimmockii* (Cress.)	White spruce	Western and central Newfoundland	Low populations.
Hairy willow sawfly *Trichiocampus simplicornis* Norton	Willow	Central Newfoundland	Low numbers.

Insect, disease or damage	Host(s)	Location	Remarks
Leaf blister *Taphrina* sp.	White oak	Western Newfoundland	Moderate incidence on eight trees in Pasadena nursery.
Leaf blister *Taphrina carnea* Johans.	Yellow birch	Burin Peninsula	Common in Winterland area. 20-40% foliage affected.
Leaf rust *Melampsora abietis-canadensis* Ludwig ex Arth.	Trembling aspen	Central Newfoundland	10% of the foliage on 5% of the trees affected in Wooddale tree nursery.
Leaf rust *Melampsora abieti-capraerum* Tub.	Willow	Central Newfoundland	Severe incidence between South Brook (Hall's Bay) and Badger.
Leaf spot *Marssonina brunnea* (Ell. and Ev.) Sacc.	Trembling aspen	Central Newfoundland	Low incidence.
Leaf spot *Phyllosticta minima* (Berk. and Curt.) Underw. and Earle	Red maple	Western and eastern Newfoundland	Common near Pipers Hole Provincial Park.
Little spruce sawfly *Pristiphora lena kincaid*	Balsam fir	Western Newfoundland Avalon Peninsula	Low numbers.
Mountain-ash sawfly *Prstiphora geniculata* (Htg.)	Americian mountian-ash	Central Newfoundland	Low to high numbers. Trace to light defoliation.
Nectria canker *Nectria galligena* Bres.	Horse chestnut Maple Pin cherry	Avalon Peninsula	Low incidences.
Nectria dieback *Nectria cinnabarina* Tode ex Fr.	Liburnum Maple Horse chestnut	Western Newfoundland Avalon Peninsula	Low incidences.
Needle cast *Hypodermellea laricis* Tub. *Isthmiella faullii* (Darker) Darker	Tamarack larch Balsam fir	Bonavista Peninsula Eastern Newfoundland Eastern Labrador	Low to moderate incident in eastern Labrador. 5% balsam fir regeneration affected near Alexander Bay.
Ocellate gall midge *Cecidomyia acericecis* (O.S.) *Cecidomyia ocellaris* (O.S.)	Red maple	Central and eastern Newfoundland	Light damage. Low numbers.

Insect, disease or damage	Host(s)	Location	Remarks
Orange spruce needleminer *Coleotechnites piceaella* (Kft.)	Balsam fir	Western and central Newfoundland	Low populations.
Phomopsis blight *Phomopsis juniperovora* Hahn.	Juniper	Western Newfoundland	Low incidences on ornamentals at Corner Brook
Pine looper *Hypagyrtis piniata* (Pack)	Balsam fir	Western Newfoundland	Low populations.
Pineapple gall *Adelges lariciatus* Patch	White spruce	Avalon Peninsula	Low populations on ornamentals at Tilton, Conception Bay.
Four-eyed spruce bark beetle *Polygraphus rufipennis* (Kby.)	Black spruce	Eastern Labrador	Found on scattered dead host trees near Muskrat Falls.
Poplar leaftier *Nycteola cinereana* N. & D.	Willow	Eastern Labrador	Low numbers. No significant defoliation.
Redmarked caterpillar *Feralia jacosa* (Gn.)	Balsam fir White spruce	Western Newfoundland	Low populations.
Redstriped needleworm *Griselda radicana* (Heinr.)	White spruce	Western Newfoundland	Low numbers.
Rust gall *Gymnosporangium cornutum* Arth. and Kern	American mountain-ash	Avalon Peninsula	Low incidence.
Rusty tussock moth *Orgyia antigua* (L.)	Balsam fir	Western and central Newfoundland	Low numbers.
Saddleback looper *Ectropis crepuscularia* (D. & S.)	Balsam fir	Western Newfoundland	Low populations.
Satin moth *Leucoma salicis* (Linn.)	Willow Balsam poplar	Western Newfoundland Avalon Peninsula	Severe defoliation at Corner Brook in western Newfoundland. Light to moderate damage at two locations on the Avalon Peninsula.
Shot hole *Coccomyces hiemalis* Higgins	Pin cherry	Western and central Newfoundland Avalon Peninsula	Moderate to high incidences throughout all areas.

Insect, disease or damage	Host(s)	Location	Remarks
Spruce bud moth *Zeiraphera canadensis* Mut. and Free	White spruce	Western Newfoundland Avalon Peninsula	Low populations. Light defoliation.
Spruce climbing cutworm *Syngrapha alias* (Ottol.)	Balsam fir	Western Newfoundland	Low numbers.
Spruce coneworm *Dioryctria reniculelloides* Mut. & Mun.	White spruce	Western Newfoundland	Low numbers.
Striped alder sawfly *Hemichroa crocea* (Geoff.)	Speckled alder	Western Newfoundland Western Labrador	Low populations. Severe defoliation recorded along Fig River near Winokapau Lake.
Syngrapha sp.	Balsam fir	Central Newfoundland Bonavista Peninsula	Low populations.
Three-spotted click beetle *Ctenicera triundulata* (Rand.)	Balsam fir	Central Newfoundland	Low numbers.
Uglynest caterpillar *Archips cerasivoranus* (Fitch)	White birch	Western Newfoundland	Common on deciduous species on south shore of Deer Lake.
Verdigris autograph Syngrapha selecta (Wlk:)	Balsam fir	Central Newfoundland	Low population.
W-marked cutworm *Spaelotis clandestina* (Harr.)	Soil	Western Newfoundland	Low population.
White-spotted sawyer *Monochamus scutellatus* (Say)	Balsam fir Black spruce	Western Newfoundland Eastern Labrador	One specimen found at each location.
Willow leaf beetle *Chrysomela falsa* Brown	Willow	Central Newfoundland	Moderate populations. Light defoliation.
Willow leafminer *Micruropteryx salifoliella* (Chambers)	Willow	Eastern Labrador	Severe defoliation on willow at Otter Creek.
Willow sawfly *Nematus limbatus* (Cress.)	Willow	Western and eastern Newfoundland	Defoliation ranged from 50% - 100% in western Newfoundland.

Insect, disease or damage	Host(s)	Location	Remarks
Witches broom *Taphrina cerasi* (Fckl.) Sadeb.	Pin cherry	Eastern Labrador	Moderate incidence in Happy Valley - Goose Bay area.
Zeiraphera unfortunana Powell	White spruce	Avalon Peninsula	Low numbers.

APPENDIX

Locations of spruce budworm pheromone-baited* traps in Newfoundland in 1993, and the total number of larvae (per 3 tree samples) in June, the total number of male moths (per 3 traps) and the total number of overwintering larvae (per 3 branches) in October.

Plot No.	Location	No. Larvae	No. Adults	No. Overwintering Larvae
1	Overfalls Brook	0	1	0
2	Codroy Pond	0	0	-
3	Mitchells Pond	4	0	-
4	Fishells River	4	0	0
5	Barachois Brook	0	1	0
6	Trout Brook	3	0	1
7	Campbells Creek	1	34	1
8	Gallants Road	4	0	0
9	George's Lake	0	0	0
10	Pinchgut Lake Road	1	2	0
11	Corner Brook Stream	0	0	0
12	South Brook Valley	0	1	0
13	Bay of Islands	0	32	0
14	Goose Arm Road	0	1	0
15	Big Bonne Bay Pond	0	0	0
16	Lomond	2	2	0
17	East Arm, Bonne Bay	0	0	0
18	Sally's Cove	0	7	0
19	Daniel's Harbour	0	5	0
20	Hawkes Bay	0	4	0

APPENDIX I (Cont'd.)

Plot No.	Location	No. Larvae	No. Adults	No. Overwintering Larvae
21	Ten Mile Lake	0	7	0
22	Birchy Lake	14	4	0
23	Black Brook	0	1	0
24	Burlington Road	7	14	-
25	LaScie Road	2	2	0
26	West Brook Road	0	7	-
27	Gullbridge Mines Road	0	12	0
28	6.3 km W of Catamaran Park	0	13	0
29	Aspen Brook Road	0	8	0
30	Buchans Highway	0	15	-
31	5.3 km S of Exploits Dam	0	4	0
32	Quinn Lake	0	5	-
33	New Bay Pond Road	0	11	-
34	1.4 km E of Exploits River, Grand Falls	0	7	-
35	Tote Brook	0	27	0
36	Bay d'Espoir Highway, 9.1 km S, Northwest Gander River Bridge	0	13	0
37	Bay d'Espoir Highway at Gull Pond	0	6	0
38	Twillick Brook	0	0	0
39	St. Joseph's	0	0	0

Plot No.	Location	No. Larvae	No. Adults	No. Overwintering Larvae
40	Burnt Woods Road, Bay d'Espoir	0	0	3
41	Gander Bay Road	0	4	0
42	Glenwood	0	6	0
43	Gambo	0	0	2
44	4.5 km W Dunphy's Pond Rd., TNNP	0	0	-
45	Thorburn Lake	0	0	0
46	TCH, 1.2 km W Hillview Jct.	0	0	0
47	Whitbourne	0	0	0
48	Heart's Content	0	0	0
49	Salmonier Line	0	3	0
50	Torbay	0	0	-

*"Biolure" used in 1990