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Forest insect and disease conditions in Newfoundland and Labrador in 1988

L.J. Clarke and G.C. Carew

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Cover photo: D. S. O'Brien FIDS ranger sampling Black Army Cutworm larvae, Crabbes River burn.

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ABSTRACT

This report summarizes forest pest conditions in Newfoundland and Labrador in 1988 and was compiled from information collected in 12 Forest Insect and Disease Survey Districts. Major pests of fir, spruce, pine and larch forests and deciduous tree species are discussed in detail and pests of lesser importance are tabulated.

RÉSUMÉ

Ce rapport est un résumé de la situation des ravageurs forestiers à Terre-Neuve et au Labrador en 1988. Les renseignements qu'il contient proviennent du relevé des insectes et des maladies des arbres effectué dans 12 districts. Les ravageurs des forêts de sapin d'épinette, de pin et de mélèze et ceux des espèces feuillues font l'objet d'un exposé détaillé et les les ravagers de moindre importance sont présentés sous forme de tableau.

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ACKNOWLEDGEMENTS

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, providing technicians, casual workers, inventory maps and aircraft time for insect and disease assessment and the forest industry for providing inventory figures is gratefully appreciated. We thank M.F. Gillingham for typing this report.

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INTRODUCTION

Forest insect and disease conditions for 1988 and forecasts for 1989 are reviewed in this report. The information for this report is compiled from observations and field records of the Forest Insect and Disease Survey Rangers and other survey personnel. The region is divided into 12 ranger districts with the following responsible for the districts; D.M. Stone, Humber - St. Georges; D.S. O'Brien, St. Barbe - White Bay; E.C. Banfield, Grand Falls - Hermitage - Gander; W.J. Sutton, Bonavista - Burin - Avalon - Port Hope Simpson - Goose Bay. Other survey personnel in 1988 were: J. Hudak, Head, Forest Insect and Disease Survey; L.J. Clarke, Chief Ranger; A.G. Raske, Entomologist; K.E. Pardy, Insectory Technician, Identification and Insect Collection; G.C. Carew, Pathology Technician, Identification and Herbarium Collection. The Forest Insect and Disease Survey Districts and the Provincial Forest Management Units are included for reference in Figures 1 and 2.

SUMMARY

Weather conditions during the past winter were cold with a heavy snowfall throughout most of the Province, except for the Avalon Peninsula where milder temperatures and less than normal snowfall occurred. Early spring weather was cold and wet but temperatures were

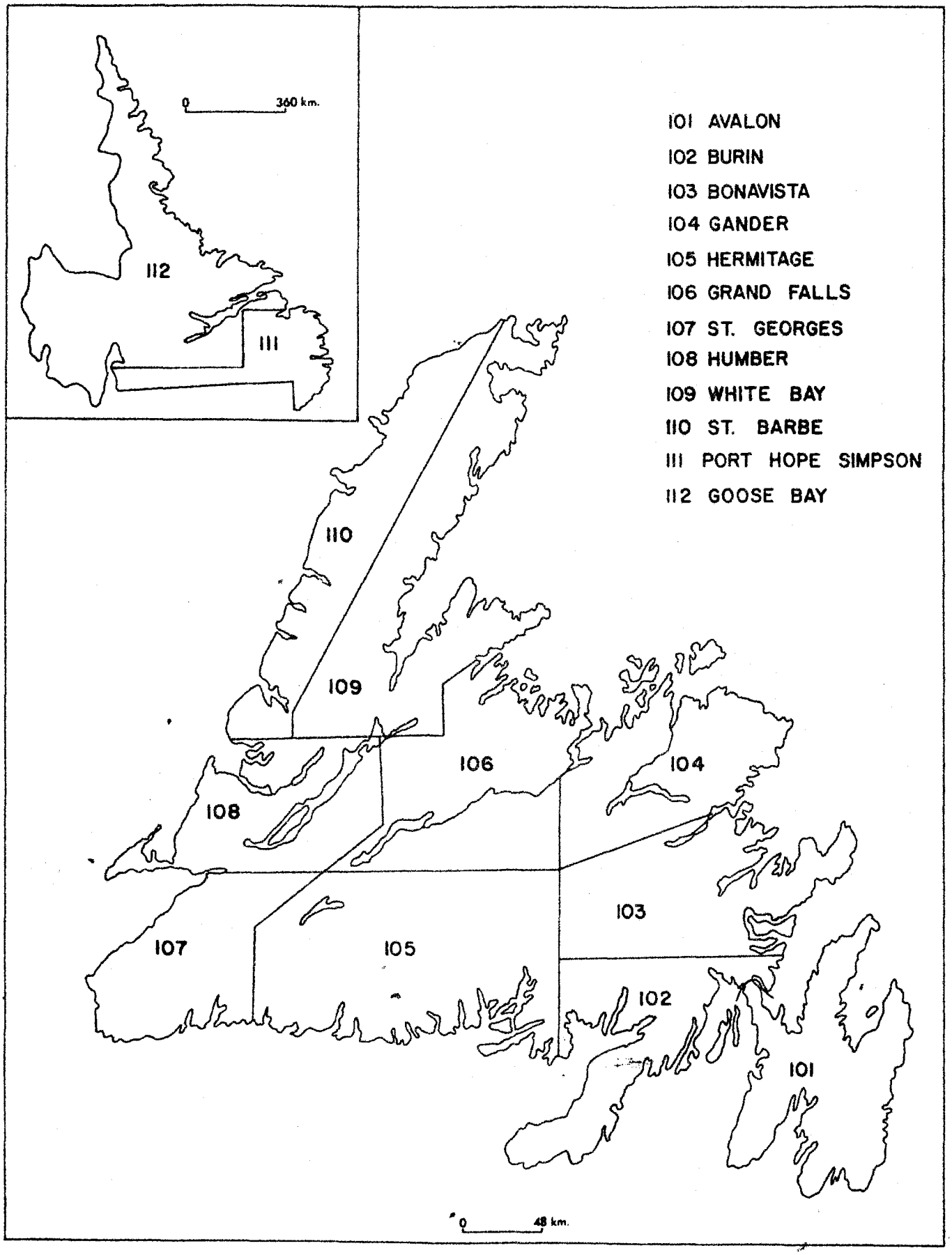

Fig. 1. Forest Insect and Disease Survey Districts.

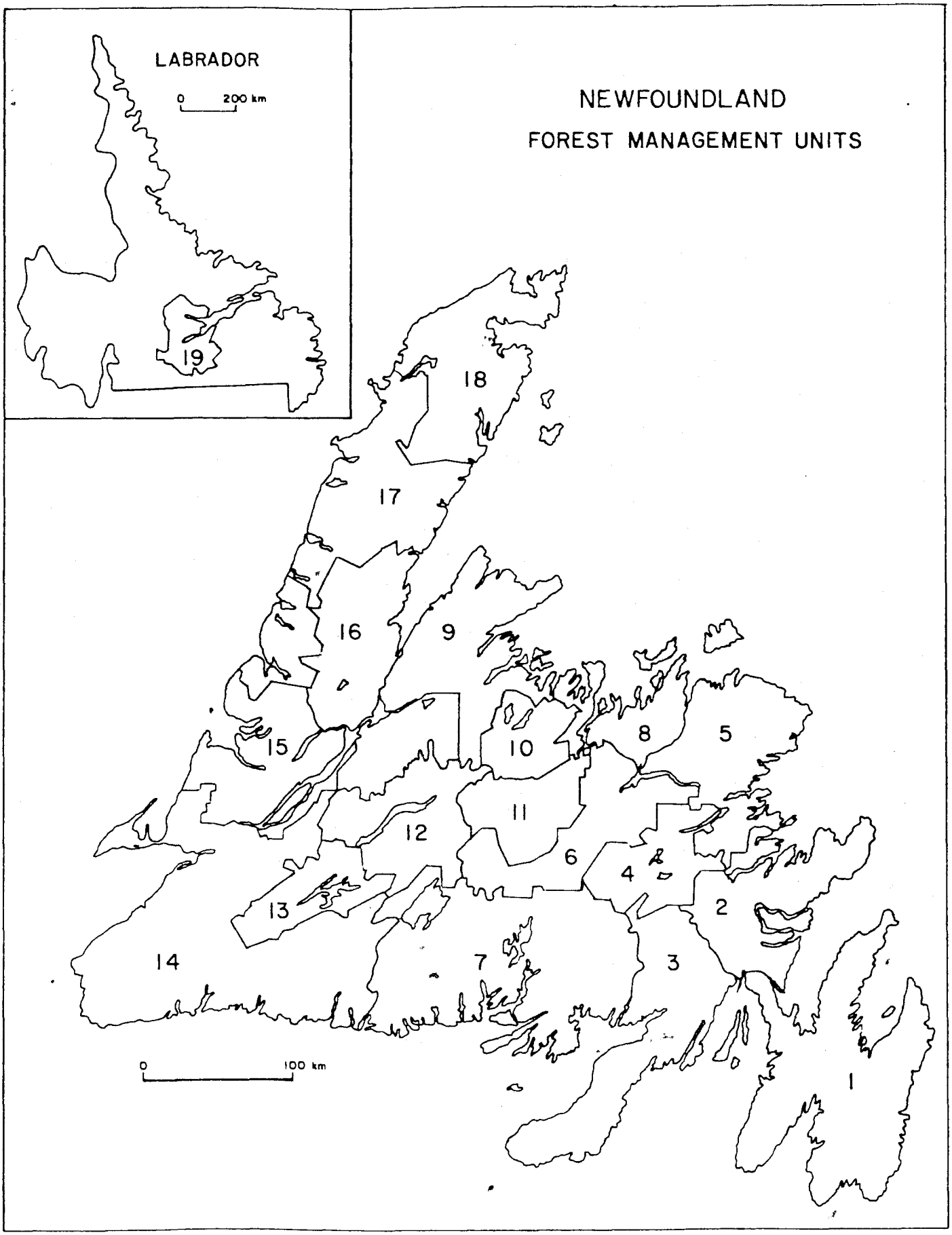

Figure 2. Newfoundland Forest Management Units.

above normal for May and June with warm and sunny conditions. July was foggy, wet and cool on the Northern Peninsula and cloudy, warm and humid with above normal precipitation for the rest of the Island. August and September were mostly warm and sunny. Labrador weather was cloudy, cool and wet in early summer but warm and sunny from mid-July to the end of summer. Tree development and growth was good in 1988 with many coniferous tree species producing an excellent cone crop both on the Island and in Labrador.

The **hemlock looper** continued to be the most damaging insect in 1988. Population levels of the **spruce budworm** were lower in western Newfoundland. Pheromone traps were deployed at 50 permanent locations across the Island. The **balsam woolly adelgid** continued to cause damage to young balsam fir stands in western Newfoundland and in several isolated areas in central and eastern Newfoundland. The **black-headed budworm** caused severe defoliation to overmature stands of balsam fir and some mortality of spruce on the Northern Peninsula. The **black army cutworm** caused severe damage and mortality of black spruce seedlings in plantations in several areas on the Island. The **larch sawfly** infestation on the Avalon Peninsula continued at a lower level of intensity. The **European pine sawfly** continued to spread throughout the St. John's - Mount Pearl areas and in towns around the Conception Bay area. Wood samples and possible insect vectors were collected to determine the presence of the **pinewood nematode.**

The **birch casebearer** caused severe defoliation of white birch throughout eastern and central Newfoundland and light damage in western areas. A severe outbreak of the **poplar serpentine leafminer** continued for the sixth consecutive year in the Lower Churchill River. The **satin moth** caused severe damage of poplar trees in several towns throughout the Island and in natural stands from Gander to Badger. The **ugly nest caterpillar** attacked various hardwood trees and shrubs along the lower Humber River in western Newfoundland.

Surveys were carried out in Sitka spruce plantations throughout the Island to find the distribution of **Scleroderris canker. Armillaria root rot** was detected in black spruce decline plots near Northwest Gander River. Severe reddening of balsam fir foliage caused by **winter drying** was common and widespread along the west coast of the Northern Peninsula. **Dwarf mistletoe** continued to spread in a black spruce stand near Gambo. A high incidence of **broom rust of balsam fir** was recorded in southeastern Labrador. A high incidence of **needle rust** occurred on blue spruce in a commercial nursery at Markland. **Winter drying** was common along coastal areas of the Northern Peninsula. **Frost injury** was recorded in several areas on the Island in natural regenerating balsam fir stands. A moderate incidence of **leaf and shoot blight of poplar** occurred on new foliage of balsam and silver poplar in Markland. Many natural regenerating aspen were also damaged by the disease on the Island and in Labrador.

European poplar canker continued to cause dieback and mortality of immature and mature Lombardy poplars on the Avalon Peninsula.

Black knot was common throughout the Island causing up to 20% damage to pin cherry and plum trees. A high incidence of **Marssonina leaf spot** occurred at Goose Bay, Pouch Cove and St. John's where up to 80% of the foliage was damaged on some trees. **Nectria canker** and **die-back** was recorded in Mount Pearl, Paradise and St. John's. Hardwoods were affected generally, with numerous stem and branch cankers. A high incidence of **shot hole** of European cherry occurred at Markland where over 90% of the trees were affected. It also affected pin cherry along the Churchill Road in Labrador.

The pheromone trap program was continued in cooperation with Agriculture Canada to monitor the accidental introduction of the Gypsy moth. Forest tent caterpillar pheromone traps were placed throughout the Island to monitor for possible introduction of this pest. Traps were also used in burnt over areas to monitor the black army cutworm.

Approximately 87 hours were flown during aerial surveys and 85 hours during egg sampling and monitoring of hemlock looper and spruce budworm populations.

Special surveys and studies conducted by survey rangers and by other forest protection personnel included the reassessment of the ARNEWS plots, defoliation on hemlock looper population dynamics plots, plot layout for experimental applications of chemical and biological insecticides, sampling for natural mortality of the hemlock looper, assessing balsam woolly adelgid and black army cutworm populations in sprayed and unsprayed areas, spraying a polyhedrosis virus to control the European

pine sawfly, collecting mountain-ash sawfly for parasite studies and monitoring populations of the masked shrew in four permanent plots across the Island.

SPRUCE AND FIR PESTS

Eastern Hemlock Looper
Lambdina fiscellaria fiscellaria

The looper continued to be the most important pest on the Island again this year. The annual aerial survey recorded moderate and severe defoliation on about 12 900 ha and light defoliation on about 4700 ha (Fig. 3, Table 1). Most of these areas were defoliated in 1987 and the reddish discoloration of foliage was less evident this year in most of these stands. The main outbreak occurred in western Newfoundland. High larval numbers were recorded at O'Regans, South Branch, Gros Morne National Park, Portland Creek, Daniels Harbour, River of Ponds, Hawkes Bay, Castor River, Ten Mile Lake, Main Brook and Northwest Arm near Roddickton.

In eastern Newfoundland population levels were high in several isolated areas on the Avalon Peninsula in Butterpot Provincial Park, Paddy's Pond, St. Phillips, LaManche Provincial Park and Shoe Cove Brook near Pouch Cove. No infestations occurred in central Newfoundland.

Many of the infestations in western and eastern Newfoundland collapsed in the later larval instars due to natural mortality factors including parasites and diseases.

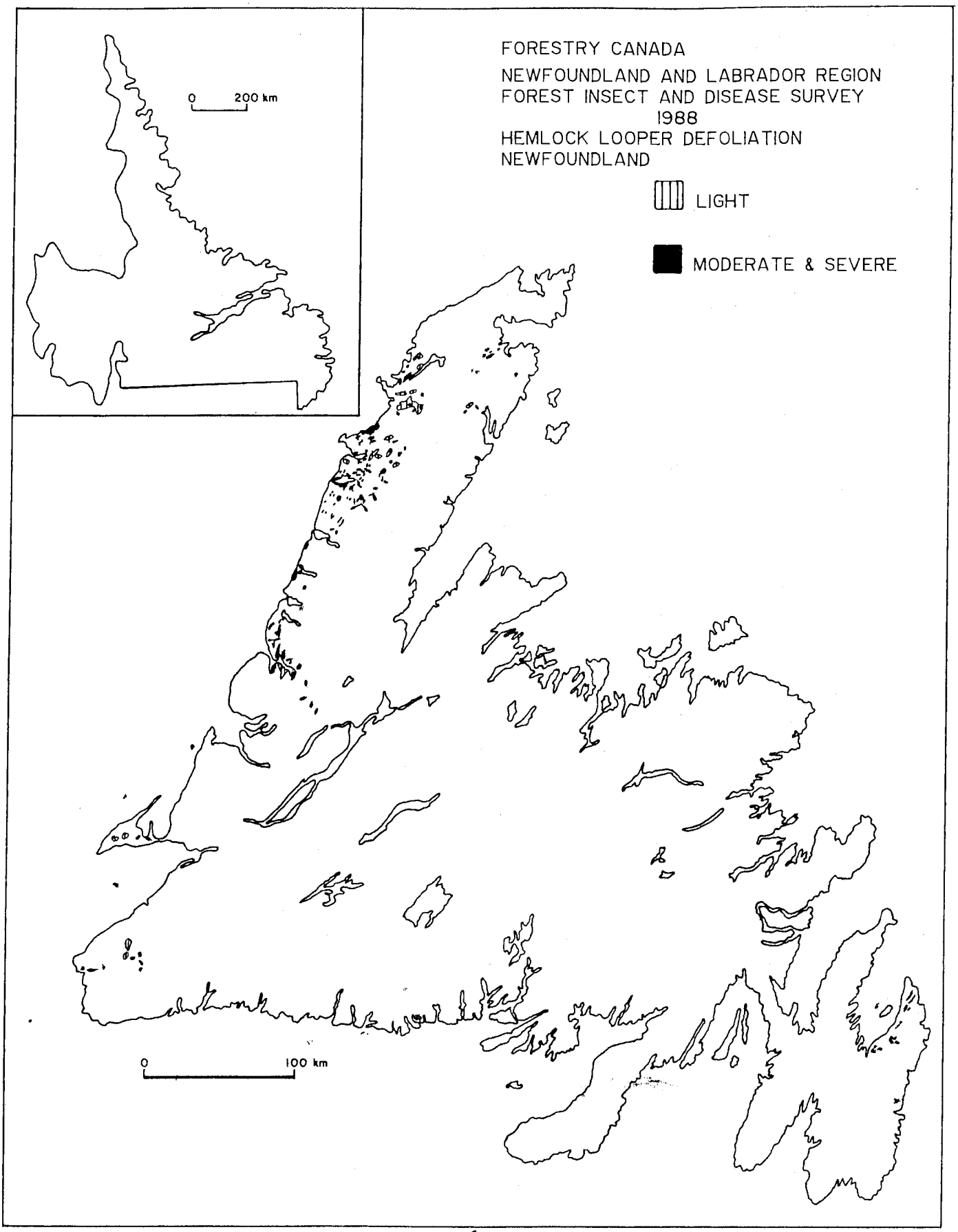

Figure 3. Areas of defoliation by the hemlock looper in productive forests of Newfoundland in 1988.

Table 1. Areas (ha) of defoliation caused by the hemlock looper in productive forests of Newfoundland in 1988.

Management Unit No.	Defoliation Class*			
	Light	Moderate	Severe	Total
1	51	99	1 170	1 320
14	476	136	632	1 244
15	204	-	394	598
16	-	-	34	34
17	3 369	983	7 436	11 788
18	65	-	241	306
Total	4 165	1 218	9 907	15 290
GMNP	544	-	1 792	2 336
GRAND TOTAL	4 709	1 218	11 699	17 626

*Light = 1-25%
Moderate = 26-75%
Severe = 76-100%

Hemlock looper outbreaks in Newfoundland usually last 3-6 years and occur at intervals of 10-15 years in stands where mature balsam fir is dominant. The present outbreak began in 1983 in central and eastern Newfoundland and in 1985 in western Newfoundland. The outbreak started to collapse in 1986 in central and eastern Newfoundland and in 1987 and 1988 on the Avalon Peninsula and in western Newfoundland.

The Department of Forestry conducted an operational control program against the looper and treated 45 100 ha with fenitrothion and 23 700 ha with Bacillus thuringiensis (B.t.).

Forestry Canada in cooperation with the Newfoundland Department of Forestry conducted an experimental spray program testing the effectiveness of new formulations and dosages of B.t. and diflubenzuron.

Forestry Canada also assisted Parks Canada, providing pre-spray and post-spray data in a control program against the looper with B.t. near camping areas in Gros Morne National Park.

Looper samples were collected from 17 locations in 1988 to assess the level of biological mortality factors. Most larval and pupal parasites were the tachinid flies, Winthemia occidentis and Madremyia saundersii. The incidence of pathogenic fungi was much greater in larval than in pupal samples. Entomophaga aulicae was the major fungal disease. Erynia radicans, Paecilomyces farinosus and Verticillium spp. occurred with lower incidence.

Parasitism and fungal disease in late instar larvae averaged 13% and 33% respectively in the older part of the infestation and 1% and 5% in the newer parts. Pupal parasitism was 29% and 4% in the older and newer infestations respectively, while fungi caused about 4% pupal mortality throughout the outbreak.

In addition to the above, 14% and 28% of the larvae were infected in the older and newer infestations respectively by a fungus tentatively identified as Aureobasidium pullulans. This fungus was less common in pupae.

The aerial survey was completed in early August. Tree mortality was more than 90% in most stands severely defoliated in 1987. The intensity of defoliation in 1988 was not as severe as in 1987 because looper populations collapsed during the late larval instars in most areas. However, additional tree mortality is expected in unprotected stands by 1989.

The egg survey commenced in mid-October and branch samples were collected from 561 points throughout the Island. Many samples had no looper eggs, and the outbreak has virtually collapsed. Only two areas, about 10 500 ha in size, are forecast to have moderate and severe defoliation in 1989 (Table 2, Fig. 4). These areas are located on the Northern Peninsula, one near Leg Pond and the other near Main Brook.

Table 2. Areas (ha) of defoliation by the hemlock looper forecast in productive forests of Newfoundland for 1989.

Management Unit No.	Defoliation Class*		
	Light**	Moderate & Severe***	Total
1	5 833	-	5 833
9	268	-	268
12	419	-	419
15	296	-	296
17	5 418	7 620	13 038
18	4 025	2 904	6 929
Total	16 259	10 524	26 783
GMNP	719	-	719
GRAND TOTAL	16 978	10 524	27 502

*Light = 1-25%
Moderate = 26-75%
Severe = 76-100%

**Areas with low egg density (2-3 eggs/branch).

***Areas with moderate and high egg density (4 or more eggs/branch).

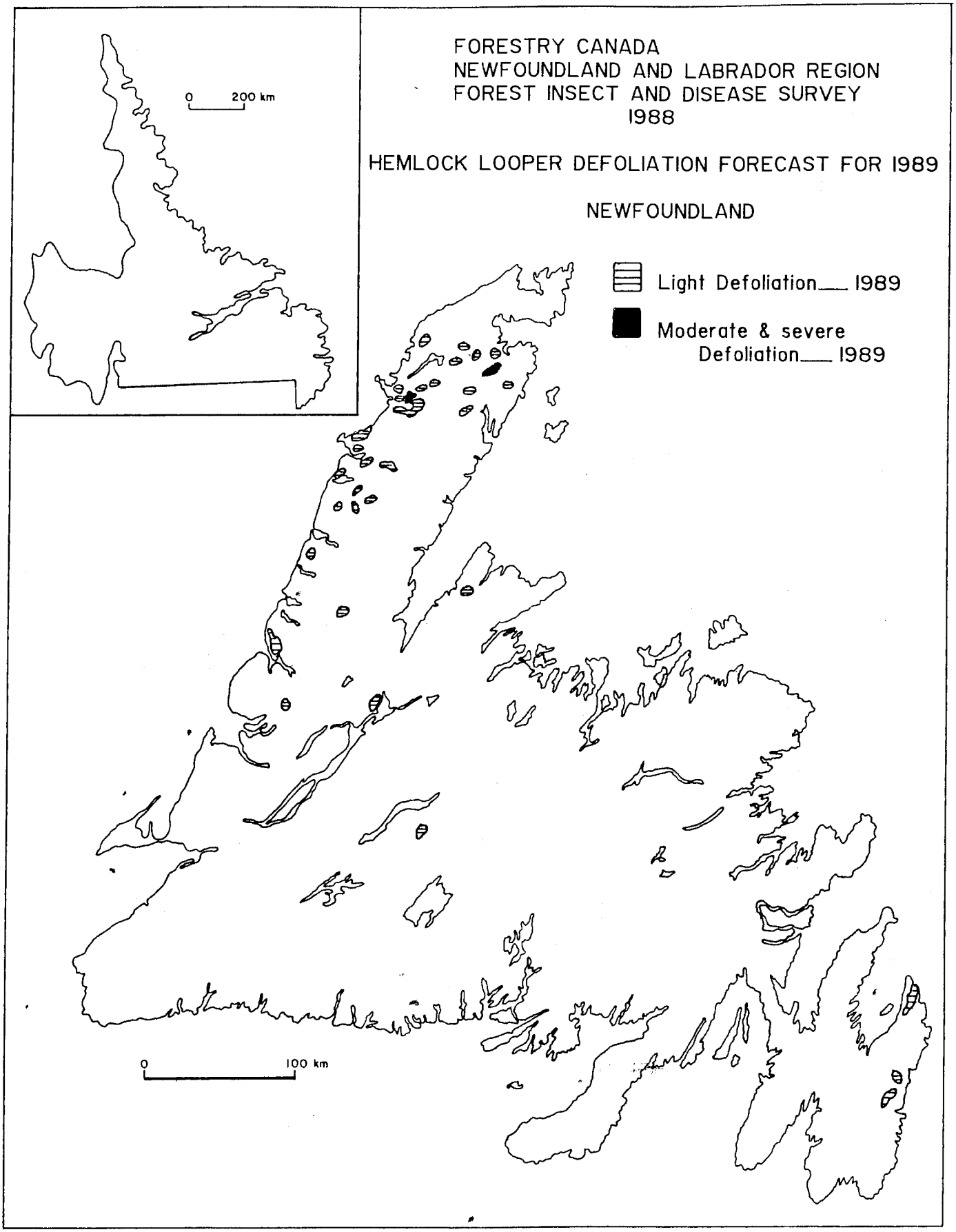

Figure 4. Areas of defoliation by the hemlock looper forecast in Newfoundland for 1989.

Light defoliation is forecast to occur in numerous small areas scattered from Bonne Bay to Main Brook on the Northern Peninsula and in two areas on the Avalon Peninsula (Fig. 4). The area of light defoliation is forecast to cover about 17 000 ha in 1989. An additional 11 200 ha are forecast to have very low larval numbers and defoliation may not become evident in 1989.

Spruce Budworm
Choristoneura fumiferana

Population levels in the three small infestations at South Branch, Baie Verte and Ten Mile Lake decreased in 1988. Larval numbers were high initially in the South Branch area and moderate and severe defoliation occurred on 272 ha near Overfalls Brook and Mollychignic Brook in western Newfoundland (Fig. 5, Table 3). Low larval numbers occurred near Southwest Brook on the Baie Verte Peninsula and very few spruce budworm larvae were recorded in the Ten Mile Lake infestation where most of the defoliation was caused by blackheaded budworm.

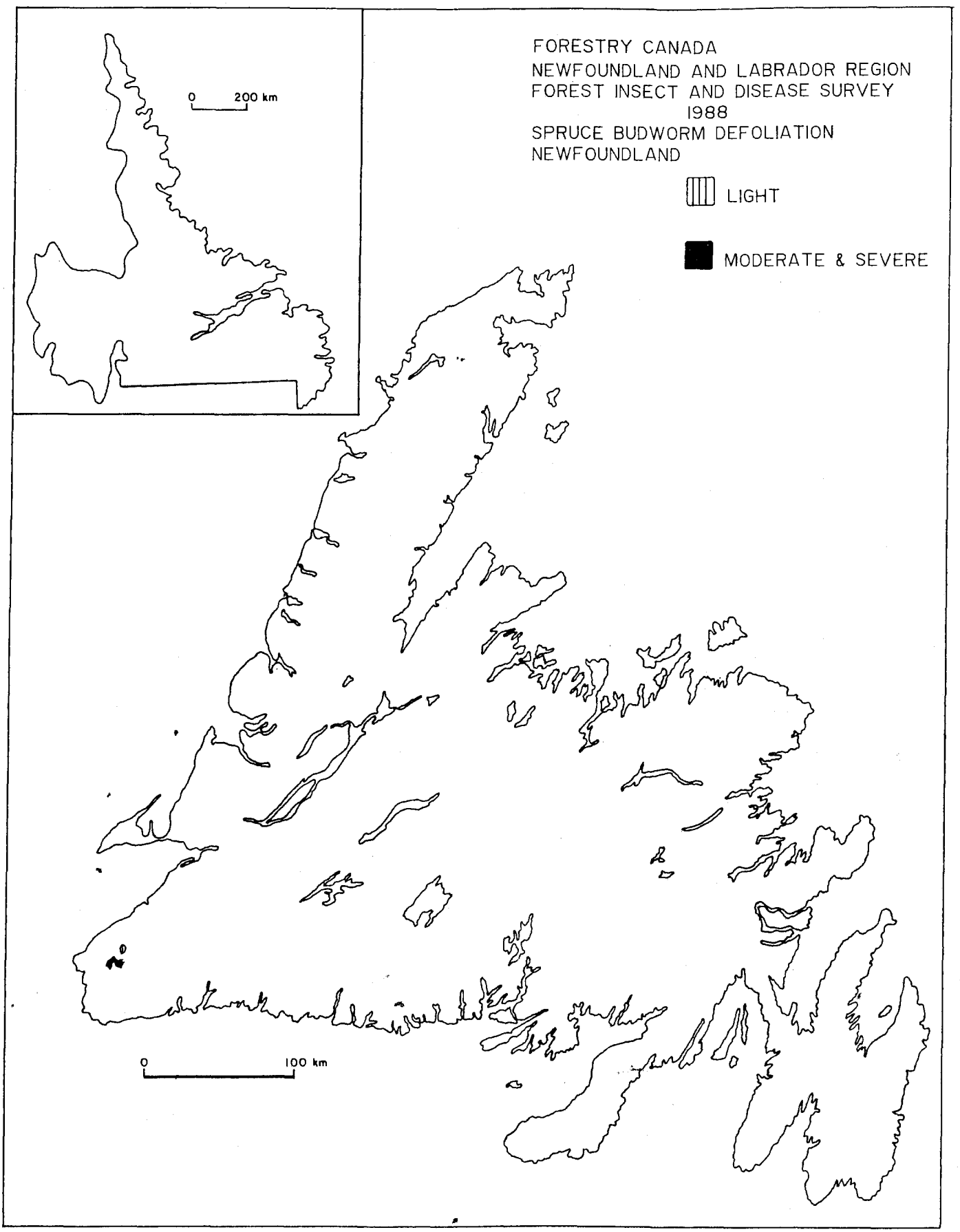

Figure 5. Areas of defoliation by the spruce budworm in Newfoundland in 1988.

Table 3. Areas (ha) of defoliation caused by the spruce budworm in productive forests of Newfoundland in 1988.

Management Unit No.	Defoliation Class*			
	Light	Moderate	Severe	Total
14	34	34	238	306
Total	34	34	238	306

*Light = 1-25%
Moderate = 26-75%
Severe = 76-100%

General sampling during early summer showed an increase in spruce budworm populations along the west coast of the Northern Peninsula, however populations decreased during later instars, and in some areas budworm populations collapsed. Insect parasites caused about 10% mortality in budworm larvae and about 30% in pupae in the infestation near Baie Verte. Larval and pupal mortality from disease was about 1%.

There was no operational or experimental control program conducted against the spruce budworm in 1988.

The main larval parasites were Glypta fumiferanae and Apanteles fumiferanae. The most commonly detected fungal pathogen was Paecilomyces farinosus causing about 1% infection. Less than 1% of the samples were infected by Nosema fumiferanae. The fungus Entomophaga aulicae did not occur in budworm populations in 1988. In addition about 4% of the budworm samples were infected by a fungus tentatively identified as Aureobasidium pullulans.

Pheromone traps baited with a moth attractant were placed at 50 permanent sample locations throughout the Island (Fig. 6). The number of

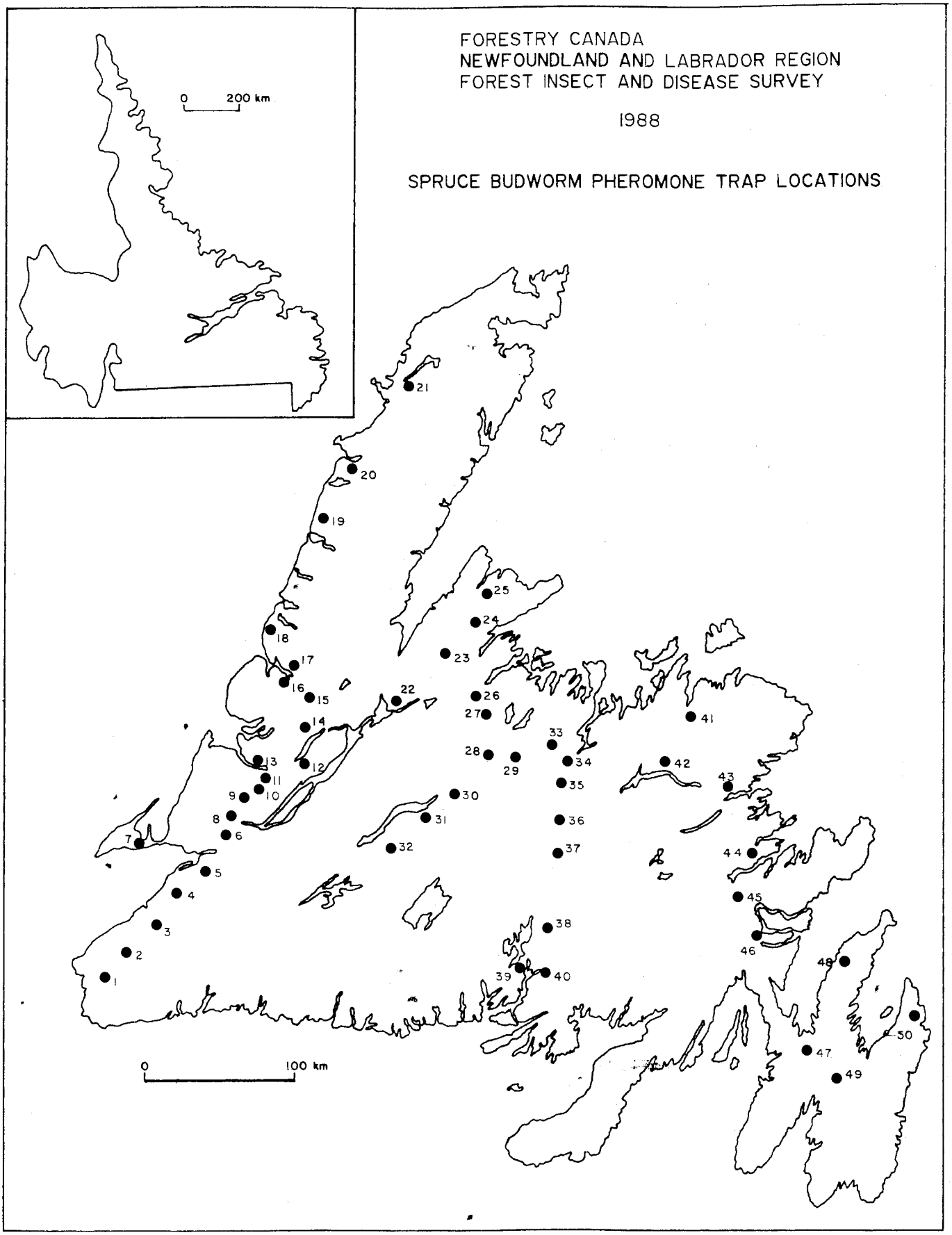

Figure 6. Spruce budworm pheromone trap locations.

moths trapped decreased from 477 in 1987 to 186 in 1988. This is the third consecutive year of decrease. Most moths were trapped along the west coast with the highest numbers recorded at Overfalls Brook (136) near an infestation. The number of moths trapped ranged from 1-10 at 9 of 16 locations along the west coast, extending as far north as Daniel's Harbour and no moths were trapped at the other seven sites. Only two moths were trapped near an infestation on the Baie Verte Peninsula. Three sites about 40 km inland produced a total of four budworm moths. No moths were trapped in central or eastern Newfoundland.

The egg survey to forecast the 1989 infestation was conducted in 122 locations throughout the Island in conjunction with the hemlock looper egg survey in mid-October. Moderate and severe defoliation is forecast to occur in three areas totalling about 1200 ha; one near south Branch, one at Codroy Pond and the third near Southwest Brook on the Baie Verte Peninsula. Light defoliation is forecast in numerous small patches distributed from the Codroy Valley to Bonne Bay in western Newfoundland and from Baie Verte to Gander in central Newfoundland. One isolated light infestation is also expected near Hawkes Bay on the Northern Peninsula and near Whitbourne on the Avalon Peninsula. Light defoliation is forecast to occur on about 9100 ha in 1989 (Fig. 7, Table 4).

Balsam Woolly Adelgid
Adelges piceae

Surveys conducted throughout the Island over the past several years showed that populations had been increasing annually especially in young stands of balsam fir. In 1988, a preliminary survey of active

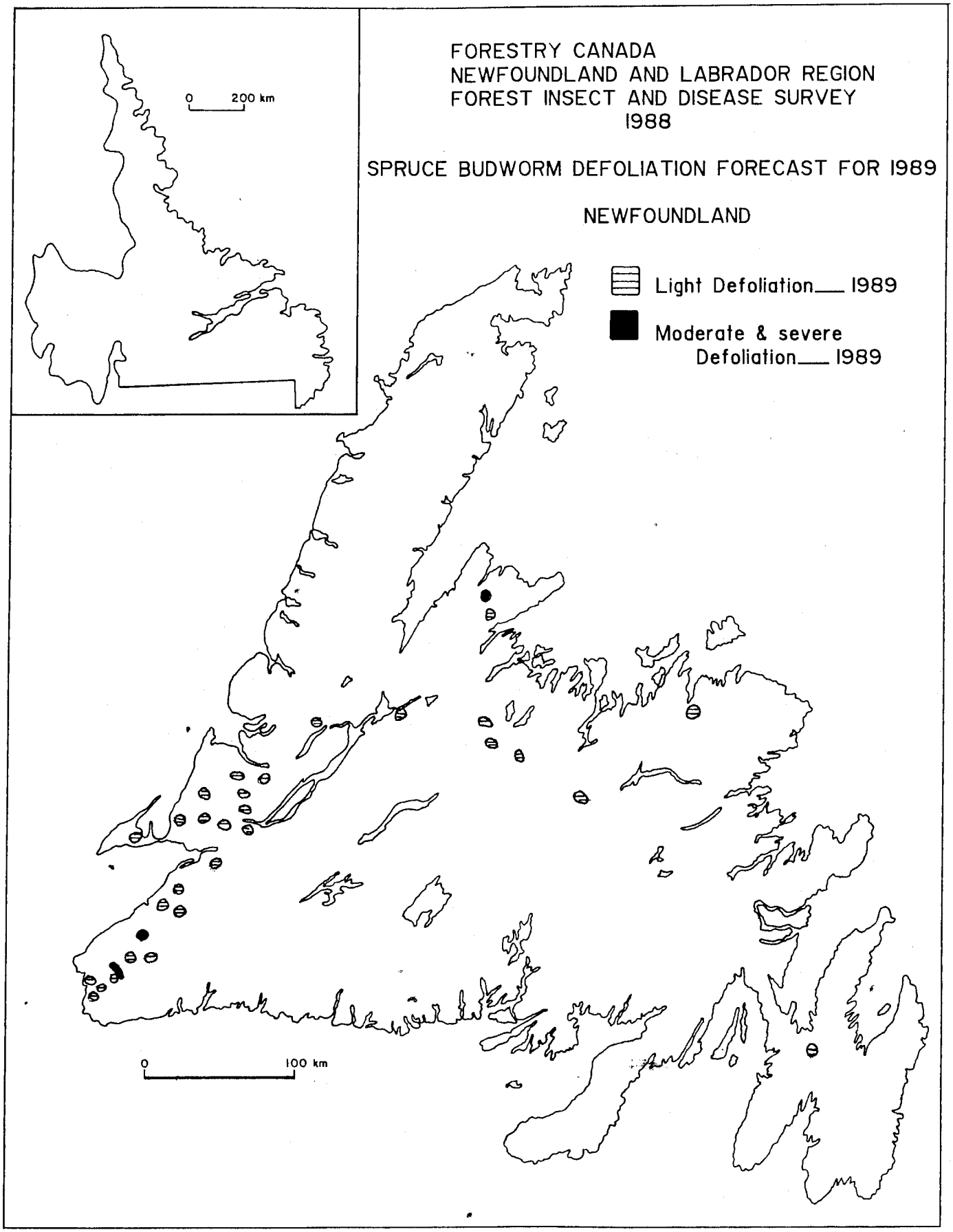

Figure 7. Areas of defoliation by the spruce budworm forecast in productive forests of Newfoundland for 1989.

Table 4. Areas (ha) of defoliation by the spruce budworm forecast in productive forests of Newfoundland for 1989.

Management Unit No.	Defoliation Class*		
	Light	Moderate & Severe	Total
1	316	-	316
5	366	-	366
9	306	292	598
10	468	-	468
11	366	-	366
14	5 135	953	6 088
15	1 980	-	1 980
16	207	-	207
Total	9 144	1 245	10 389

*Light = 1-25%
Moderate = 26-75%
Severe = 76-100%

infestations in thinned stands showed about 90% of the stands damaged by the adelgid are in western Newfoundland. New active infestations occurred near Portland Creek on the Northern Peninsula and around Conception Bay and Tors Cove on the Avalon Peninsula.

The last adelgid outbreak lasted from 1949-67 and caused severe damage and tree mortality in fir stands throughout southwestern areas of the Island. The present outbreak began in 1979 and has been steadily increasing. Populations of the adelgid are expected to increase again in 1989 particularly in western areas of the Island. Research to develop effective, practical controls of this adelgid will be conducted by the Newfoundland & Labrador Region in cooperation with the Forest Pest Management Institute. More intensive surveys to delineate the distribution of adelgid infestations and damage are also planned.

Blackheaded Budworm
Acleris variana

The infestation of blackheaded budworm along the Plum Point - Roddickton Road continued in 1988 for the second consecutive year. Moderate and severe defoliation occurred on 3720 ha and light defoliation on 4389 ha (Table 5, Fig. 8). Population levels ranged from about 40-500 per beating sample and caused from 50-100% defoliation on current foliage in overmature stands of balsam fir.

In Newfoundland budworm infestations occur at intervals of about 5-10 years and subside about 2-3 years after attack without causing tree mortality. Parasites play a major role in the collapse of these infestations. However, collections of larvae from the Plum Point - Roddickton Road area showed only 5% parasitism.

A small infestation of the budworm also occurred along the Salmonier Line but larvae from this area were 67% parasitized and no defoliation is forecast to occur in this area in 1989.

Table 5. Areas (ha) of defoliation caused by the blackheaded budworm in productive forests of Newfoundland in 1988.

Management Unit No.	Defoliation Class*			
	Light	Moderate	Severe	Total
17	-	411	-	411
18	4 389	310	2 999	7 698
Total	4 389	721	2 999	8 109

* Light = 1-25%
Moderate = 26-75%
Severe = 76-100%

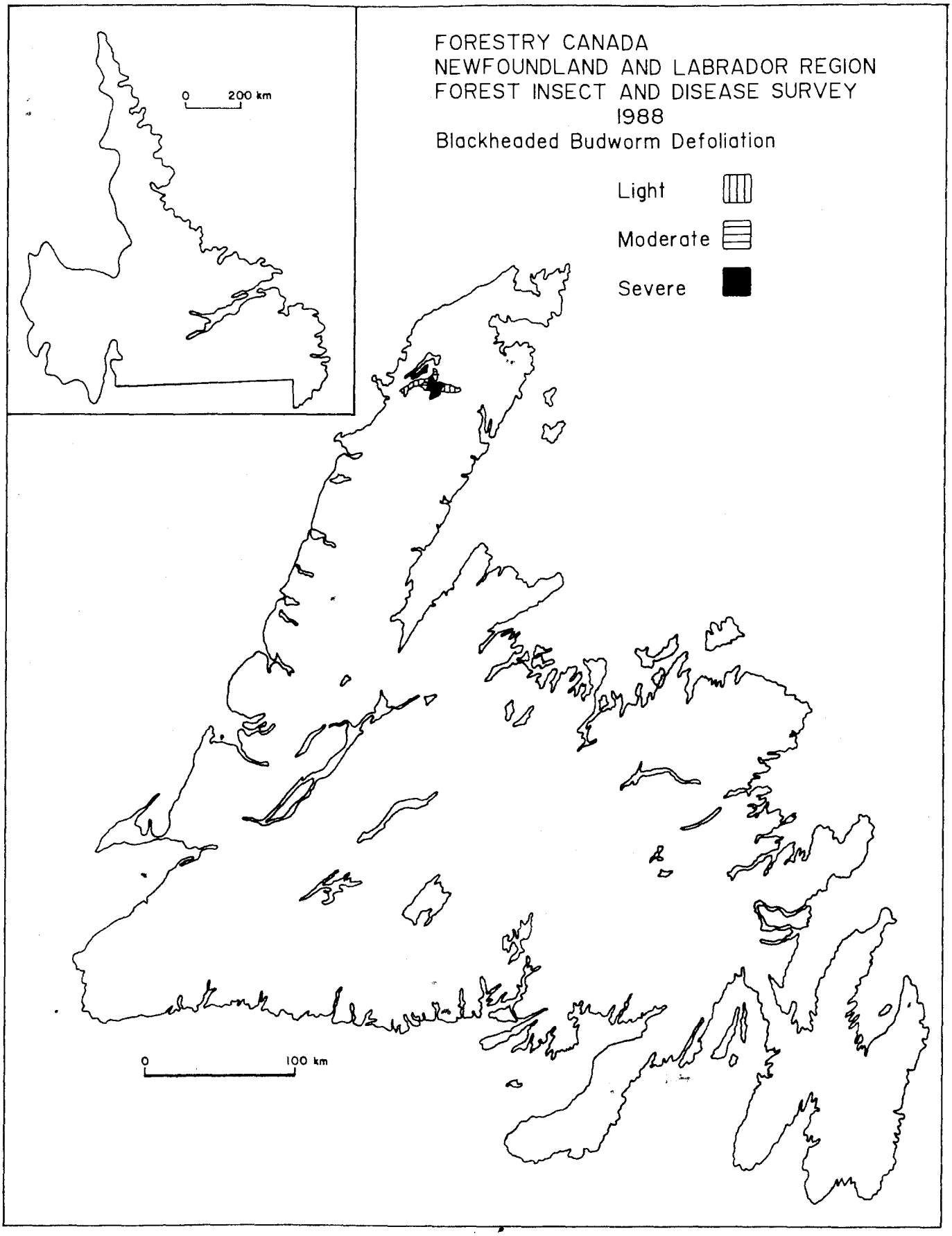

Figure 8. Areas of defoliation by the blackheaded budworm in Newfoundland in 1988.

Black Army Cutworm
Actebia fennica

High population levels of this cutworm occurred in 1988 in burned over areas planted with black spruce near Journois Brook, Crabbes River, Red Cliff, Rolling Pond and Northwest Gander and in an unplanted area along the Westport Road on the Baie Verte Peninsula.

Population levels are expected to remain high in all areas in 1989; however the cutworm is not expected to cause seedling defoliation or mortality in older burnt over areas with advanced growth of herbaceous plants. In recently burnt over areas (less than three years) with little or no herbaceous plants, severe defoliation of seedlings could occur in 1989.

Infestations of this cutworm occur periodically in Newfoundland in recently (1-2 year old) burned over areas. The last infestation occurred in 1983 in the Burnt Berry Brook plantation in central Newfoundland and collapsed in 1984 by a fungal disease, Entomophthora species. In the present infestations no diseased larvae has been found and populations are expected to continue in 1989. Traps were placed in seven burnt over locations to monitor moth flights (Fig. 9, Table 6) and additional traps are proposed in other burnt over areas in 1989 (Fig. 10).

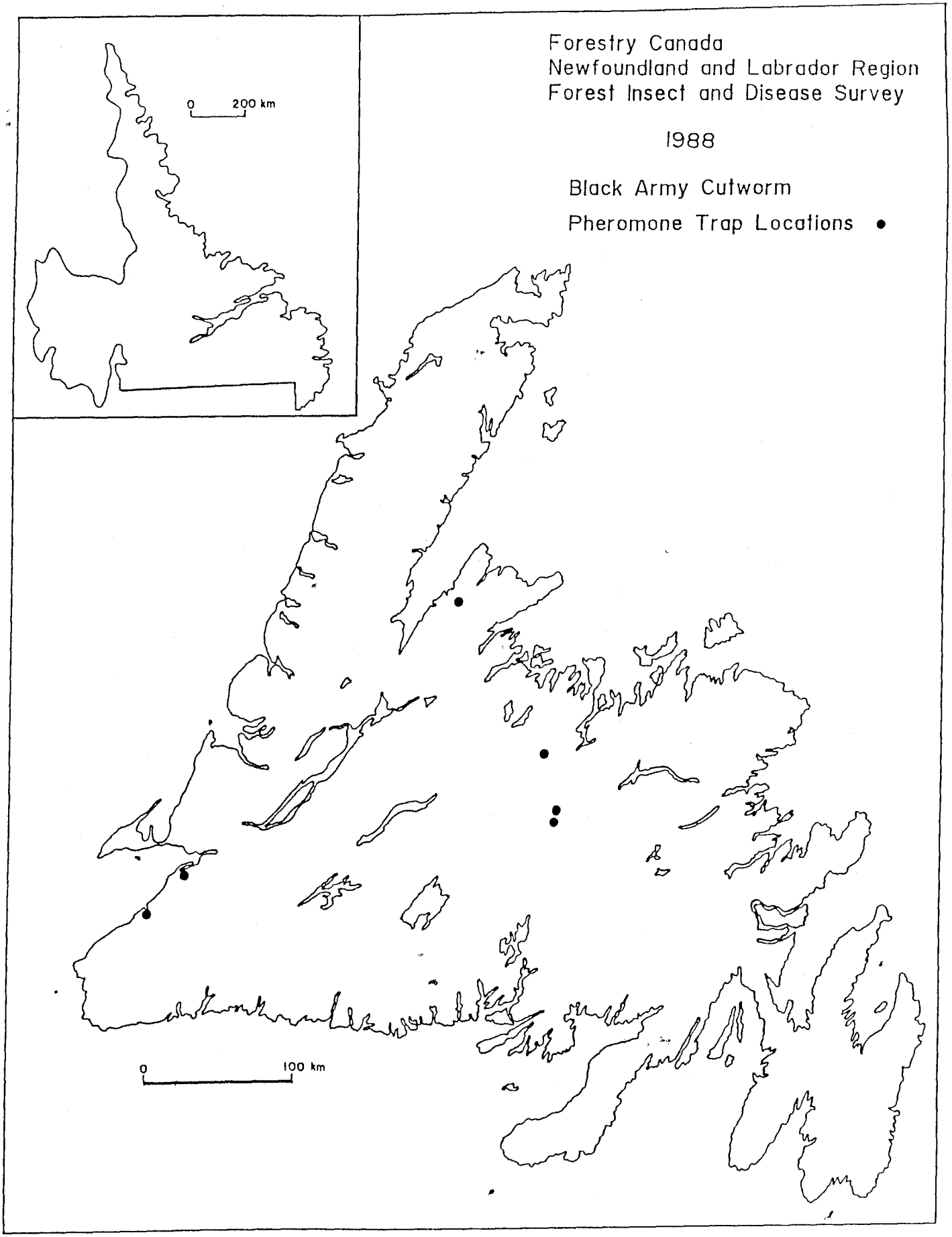

Figure 9. Black army cutworm pheromone trap locations.

Table 6. Distribution of moths of the black army cutworm caught in pheromone traps in Newfoundland in 1988.

	Trap No.					
	1	2	3	4	5	
Location	Number of moths per trap					Total
Crabbes River	66	77	25	110	127	405
Journois River	35	20	27	17	18	117
Westport Road	8	20	8	5	11	52
Red Cliff	79	*	174	97	200	550
Rolling Pond	48	96	115	73	18	350
Northwest Gander River	155	116	205	121	56	653

***No data, trap was blown down.**

Larch Sawfly
Pristiphora erichsonii

Population levels of the sawfly were high on the Avalon Peninsula in an infestation extending from Paddy's Pond to Holyrood, near Bay Bulls Pond and Whitbourne. This was the fifth year of infestation and population levels should further decline in 1989. The shrew trapping in the four permanent plots across the Island was continued and the results from 1983 to 1988 are shown in Table 7.

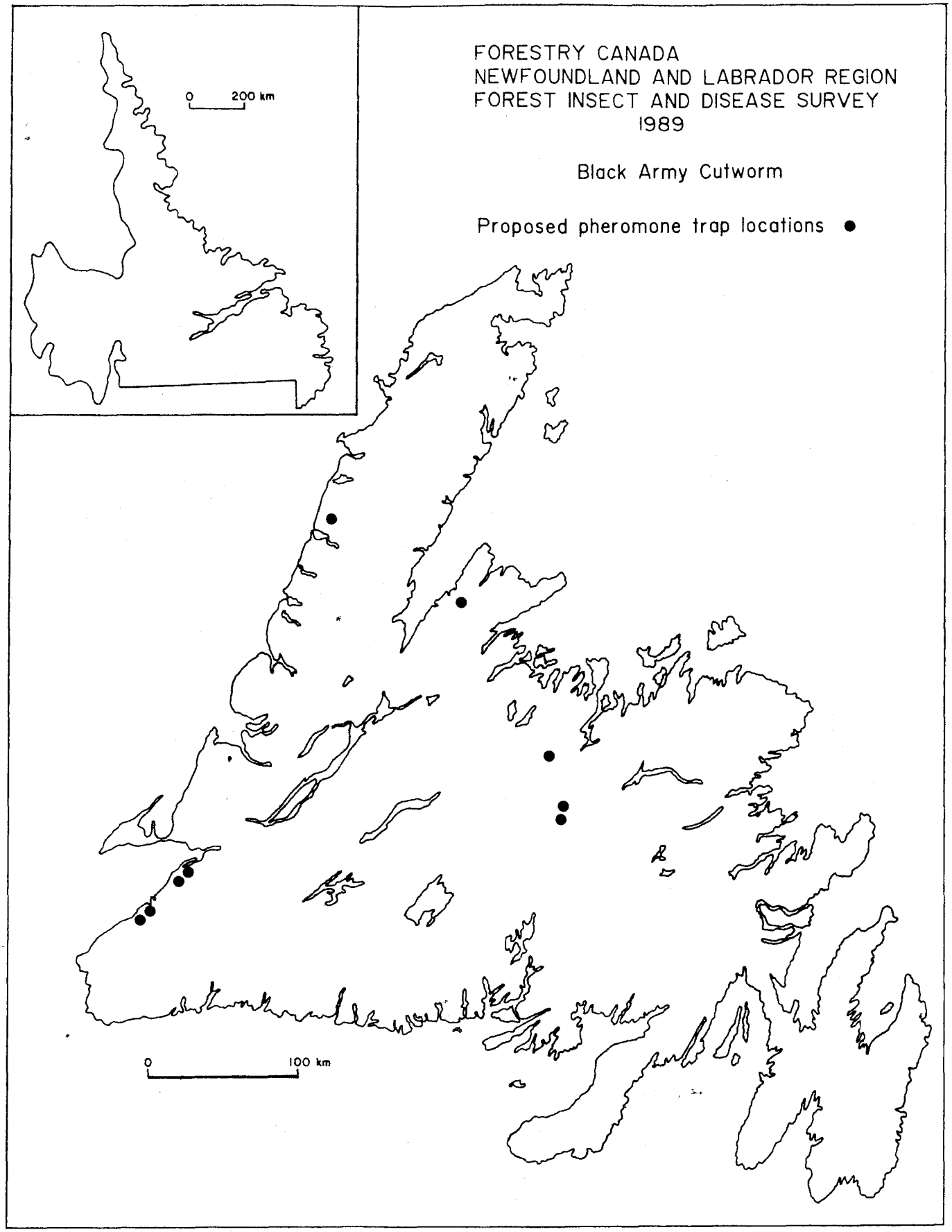

Figure 10. Proposed black army cutworm pheromone trap locations in 1989.

Table 7. Estimated number of shrews per hectare in Newfoundland.

Location	October					
	1983	1984	1985	1986	1987	1988
St. Georges	10.77	2.15	3.21	2.15	4.30	5.73
Hall's Bay	4.30	6.45	3.21	2.15	2.15	5.73
Terra Nova	4.30	10.80	-	6.42	3.24	6.44
Paddy's Pond	3.24	5.39	2.15	5.39	1.09	Plot cut

European Pine Sawfly
Neodiprion sertifer

This sawfly was accidentally introduced to the Island in 1974 and was found near Windsor Lake on the Avalon Peninsula. Parasites were introduced in 1978 as a control measure but with little effect. In 1983 a polyhedrosis virus was used to control sawfly populations on ornamental pines around Memorial University campus grounds. This virus was effective in controlling population levels and was used in consecutive years from 1983 to 1988 throughout infested areas.

In 1988 population levels were high in several areas in St. John's, Mount Pearl and around Conception Bay. These infestations are forecast to continue in 1989.

Pinewood Nematode
Bursaphelenchus xylophilus

Surveys to determine the distribution of pinewood nematodes in Newfoundland and Labrador have been conducted since 1985 and continued in 1988 with emphasis on black spruce, white spruce, balsam fir and larch in Labrador. All collections were processed and identified at Memorial University of Newfoundland.

Possible vectors of this nematode were sampled this summer with insect traps placed near woodpiles in several areas of the Province and near chip piles near the Grand Falls and Stephenville paper mills. Trap contents were sent to Memorial University for nematode extraction and identification.

Birch Casebearer
Coleophora serratella

Surveys conducted during the summer of 1988 showed that the casebearer caused severe defoliation of white birch from St. John's to the Baie Verte Junction. Isolated pockets of moderate and severe defoliation of young white birch occurred along the Stephenville Road from the Trans Canada Highway to Stephenville Crossing. The remainder of the west coast of the Island was generally light.

Satin Moth
Leucoma salicis

Defoliation by this pest was more common and widespread throughout the Island. Severe defoliation of poplars occurred at various locations throughout St. John's, Harbour Grace and Carbonear. Severe defoliation was recorded throughout central Newfoundland as high population levels were collected from Gander to Badger.

Severe defoliation to ornamental silver poplars, balsam poplar, willow and trembling aspen was also recorded at Deer Lake and Pasadena.

Uglynest Caterpillar
Archips cerasivorana

Several patches of nests caused by this insect occurred along the Lower Humber River and along Deer Lake between Little Rapids and the

town of Deer Lake. This insect usually attacks cherry, birch, alder and other hardwood species by webbing together several branches in the form of a nest and feeding from within.

Poplar Serpentine Leafminer
Phyllocnistis populiella

High population levels caused light to moderate leaf mining of poplars throughout most of the Island. Leaf mining and premature dropping of foliage occurred near Clarenville, North Pond, Terra Nova National Park, Gander to Pasadena, Deer Lake to the Gros Morne National Park, and at Codroy Pond. Damage was also visible on the Baie Verte Peninsula wherever the host trees occurred.

This insect also occurred in high numbers throughout the Churchill River Valley, Goose Bay - Happy Valley area, Northwest River Road, Goose River Road and south of Winokapau Lake. Infested foliage ranged from 20% to 100% on up to 100% of trees affected. This outbreak has been active for the past six years.

Scleroderris Canker
Gremmeniella abietina

All Sitka spruce plantations on the Island were surveyed in 1988 for Scleroderris canker and suspected trees were sampled for the disease. Only the plantation near Roddickton, where the disease was first recorded in 1985, had typical symptoms of infection.

The canker was recorded on Austrian pine in and around St. John's in three new locations in 1988 and also recorded for the first time in a Scots pine plantation at Colliers Ridge. The infection of Scots pine recorded in 1987 in an old forest nursery on the Salmonier Line was confirmed this year (Fig. 11).

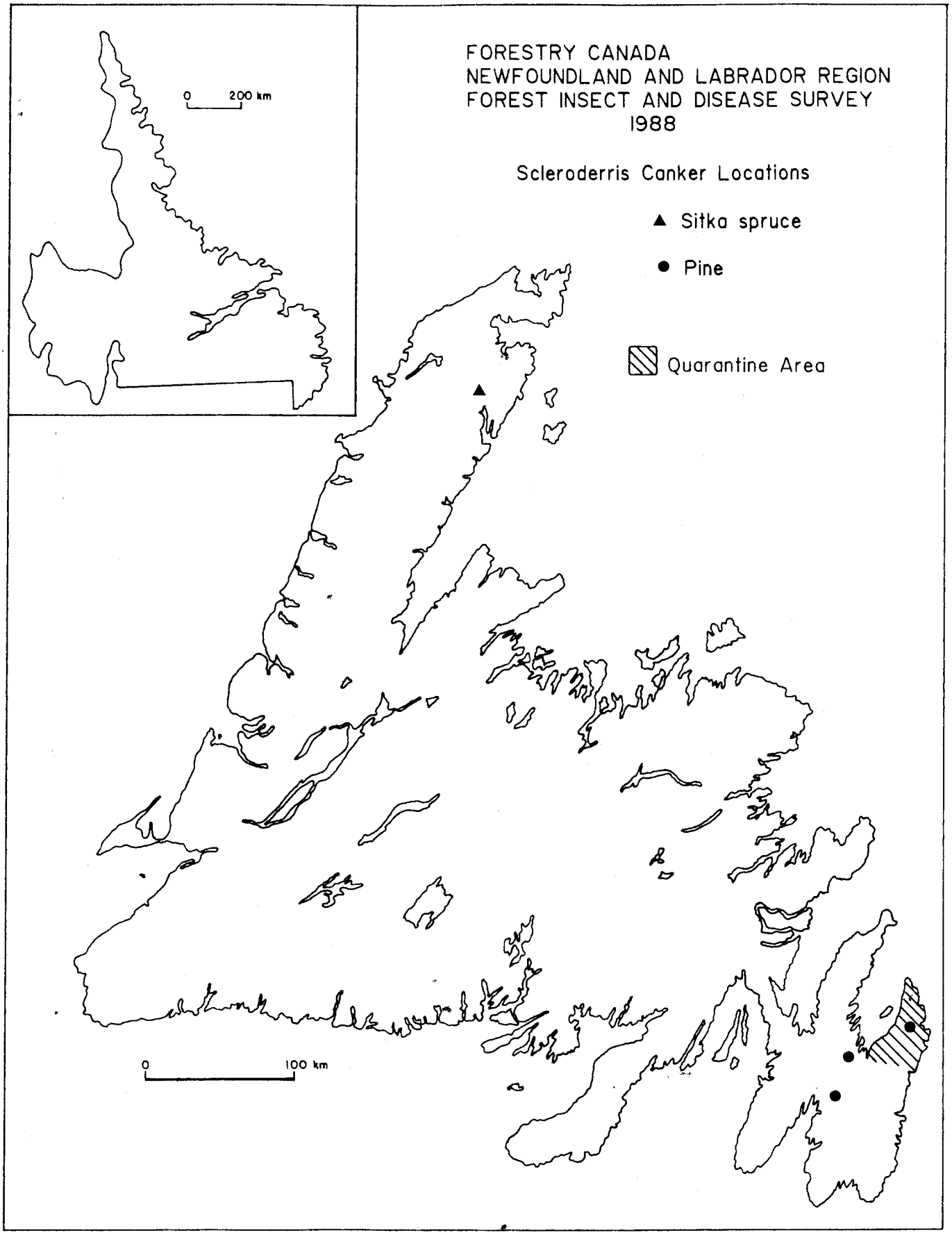

Figure 11. Scleroderris canker locations and quarantine area.

Staff of the Newfoundland & Labrador Region organized a field trip to assess the status of Scleroderris canker in Newfoundland. Personnel from the Newfoundland Department of Forestry, Agriculture Canada and the Laurentian Forestry Centre of Forestry Canada participated. Many of the plantations were inspected by the group for the symptoms of the canker.

Armillaria Root Rot
Armillaria Species

In 1988 root washings to detect Armillaria were carried out in the former black spruce decline plots first established in 1983 near Northwest Gander River near the Bay d'Espoir Road. These black spruce stands had been damaged by the spruce budworm prior to 1983. Armillaria root rot affected about 25% of the surviving black spruce trees in 1988 that had been classed as light and moderate damage in 1983. Nearly 70% of the surviving trees in the severe category had root rot. Hylobius was recorded on 45% of all trees examined and frequency of damage was not related to damage category.

The root rot was also recorded on many Sitka spruce plantations throughout the Province with up to 5% of the trees dead or dying. The disease was recorded in planted red pine in Northern Arm near Botwood and on young jack pine in a stand on the Goose River Road in Labrador.

Eastern Dwarf Mistletoe
Arceuthobium pusillum

Surveys have shown that in the last six years about 23% of the black spruce trees in a plot near Gambo were affected by dwarf mistletoe. This plant parasite is forecast to continue to affect healthy trees in the area.

Broom Rust of Balsam Fir
Melampsorella caryophyllacearum

A high incidence of broom rust of balsam fir was recorded at Pinware River Provincial Park in Labrador where brooms were very noticeable and up to 30% of the trees were infected. In the Red Bay area brooms were scattered throughout the stands of fir. A low incidence of the disease was recorded in several areas along the Northern Peninsula.

Needle Rust of Conifers
Pucciniastrum epilobii

A high incidence of needle rust was recorded on blue spruce in a commercial nursery at Markland where up to 80% of the foliage was affected on 100% of the trees. A moderate incidence of the disease occurred near Mobile where up to 20% of the foliage of Sitka spruce was affected on 100% of the trees.

The rust also occurred near North Pond where up to 90% of the foliage of Sitka spruce had infection.

Winter Drying

Moderate to severe damage occurred throughout most of the Island in 1988. Young balsam fir growing in open exposed coastal areas on the Northern Peninsula from Sally's Cove to River of Ponds and in the East Arm area of Gros Morne National Park were severely damaged. Severe damage in the St. Anthony area extended from Raleigh to Ship Cove and on the south side of Pistolet Bay from the junction of the St. Anthony Highway to Shallow Bay. Approximately 95% of the fir trees in exposed areas had dead tops and branches. A moderate incidence of winter drying occurred on Pinchgut Lake Road where up to 30% of the old foliage on balsam fir regeneration was affected.

In Sitka spruce plantations near Chapel Arm and Come-by-Chance on the Avalon Peninsula trees were severely damaged by winter drying on exposed sites. Height growth was very poor in 1988 and multiple stems occurred on many of the trees from past damage. Moderate damage was recorded on black spruce in the St. John's area. In Labrador about 30% of young jack pine trees had up to 80% of the foliage affected in a stand along the Goose River Road.

Frost Injury and Frost Cracks

Sitka spruce trees were severely damaged by frost in a plantation near Stag Lake in western Newfoundland. Moderate frost damage of balsam fir was recorded along the Burnt Berry Road near West Lake and along the Highlands River Road where up to 10% of the foliage was affected on 30% of the trees. Frost cracks of maples were common throughout the early part of the summer in St. John's and Kilbride with the bark splitting and breaking away from the stems. Warm weather in late May induced rapid growth and cold weather in early June caused the damage.

Leaf and Shoot Blight
Venturia macularis

This blight remains a disease problem with young trembling aspen trees throughout most of central Newfoundland. It was also common and widespread on young aspen trees along the Churchill River, Goose River Roads and the Goose Bay - Happy Valley area. Repeated infections can cause growth losses and stunting.

Marssonina Leaf Spot
Marssonina brunnea

This leaf spot of poplars continued to increase on hybrid poplars in several areas on the Avalon Peninsula. Lower foliage is usually first affected causing the leaves to prematurely drop, then the upper foliage becomes susceptible. Repeated infections can predispose trees to other diseases.

European Poplar Canker
Dothichiza pupulea

A high incidence of this canker has been responsible for most of the mortality of Lombardy poplars across the Island. Most of the disease has occurred in towns and cities where the poplars have been planted as ornamental trees.

OTHER INSECTS AND DISEASES

Insect or Disease	Host(s)	Location	Remarks
Alder leafminer *Fenusa dohrnii* Tischb.	Speckled alder	Central Newfoundland	Low populations and light defoliation.
Anthracnose *Kabatiella apocrypta* (Ell. & Ev.) Arx	Red Maple	Western Newfoundland	Low incidence. 5% of the foliage affected on a few trees.
Balsam fir sawfly *Neodiprion abietis* Complex	Balsam fir	Western Newfoundland Eastern Labrador	Low populations and no significant defoliation.
Balsam twig aphid *Mindarus abietinus* Koch.	Balsam fir	Throughout Newfoundland	Low to high numbers. Light damage.
Birch leafminer *Fenusa pusilla* (Lep.)	White birch	Western and central Newfoundland	Low to high populations.
Black knot *Apiosporina morbosa* (Schw.) Arx	Pin cherry Domestic cherry Damson plum	Throughout Newfoundland	Common and widespread.
Blister rust *Cronartium ribicola* J.C. Fischer	Bristly gooseberry	Eastern Newfoundland Avalon Peninsula	High incidence on alternate host on Avalon Peninsula.
Broom rust *Melampsorella caryophyllacearum* Schroet.	Balsam fir White spruce	Northern Peninsula Eastern Labrador	Scattered throughout eastern Labrador with 1 to 2 brooms, on up to 30% of the trees in some localities.
Cone rust *Chrysomyxa ledicola* Wint.	Black spruce White spruce	Eastern Newfoundland Avalon Peninsula	Less than 1% of the cones affected on approximately 15% of the black spruce examined.

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OTHER INSECTS AND DISEASES (Cont'd.)

Insect or Disease	Host(s)	Location	Remarks
European spruce sawfly *Gilpinia hercyniae* (Htg.)	White spruce Black spruce	Western and central Newfoundland	Low to moderate populations. Trace of current defoliation in pre-commerical thinned area in central Newfoundland.
Fall webworm *Hyphantria cunea* (Drury)	Speckled alder	Western Newfoundland	Nests were common again this year throughout the Black Duck - Stephenville area.
Gray mould blight *Botrytis cinerea* Pers.	Lodgepole pine Japanese larch	Western Newfoundland	Up to 10% of the seedlings of lodgepole pine affected and up to 15% of Japanese larch affected in a private tree nursery.
Ink spot *Ciborinia whetzelii* (Seav.) Seav.	Trembling aspen	Central Newfoundland Eastern Newfoundland	Low incidence. Up to 25% of the foliage affected in eastern Labrador.
Leaf and shoot blight *Pollacia elegans* Serv.	Balsam poplar Silver poplar	Eastern Newfoundland Avalon Peninsula	Up to 30% of the foliage on seedlings in a commercial tree nursery affected.
Leaf spot *Entomosporium mespili* (Dc. ex Duby) Sacc.	Hawthorn	St. John's	100% of the foliage affected in a private garden.

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OTHER INSECTS AND DISEASES (Cont'd.)

Insect or Disease	Host(s)	Location	Remarks
Septoria musira Peck.	Balsam poplar	Avalon Peninsula	Over 90% of the foliage affected, however, incidence was low.
Mountain-ash sawfly *Pristiphora geniculata* (Htg.)	American mountain ash	Western, central and eastern Newfoundland	Low to high populations. Severe defoliation in western and eastern Newfoundland.
Mourning cloak butterfly *Nymphalis antiopa* (L.)	Willow	Western Newfoundland	High larval count at one location.
Nectria canker *Nectria galligena* Bres.	Golden alder, Maple crab apple	Avalon Peninsula	Numerous stem and branch cankers on several maple trees in urban areas.
Needle blight *Didymascella thujina* (Durand) Maire	Eastern white cedar	Western Newfoundland	New record. 10% of the foliage affected on old and new foliage.
Needle cast *Hypodermella laricis* Tub.	Tamarack	Central and eastern Newfoundland	10% of the foliage affected on few trees.
Isthmiella faullii (Darker) Darker	Balsam fir	Eastern Labrador	Light damage in exposed areas.
Rhizosphaera kalkhoffi Bubàk	Colorado blue spruce	Avalon Peninsula	High incidence. 70% of the blue spruce seedlings affected in a commerical tree nursery.

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OTHER INSECTS AND DISEASES (Cont'd.)

Insect or Disease	Host(s)	Location	Remarks
Needle rust *Chrysomyxa empetri* Schroet. ex Cummins	White spruce	Central Newfoundland	Low incidence. 90% of the new foliage.
Chrysomyxa ledi deBary	White spruce Black spruce Blue spruce	Avalon Peninsula	High incidence in a commerical tree nursery at Markland, where up to 80% of the new foliage was affected on 100% of the blue spruce trees.
Chrysomyxa ledicola Lagerh.	Sitka spruce White spruce Black spruce Blue spruce	Western and central Newfoundland and Avalon Peninsula	Moderate incidence on the Avalon Peninsula where up to 20% of the new foliage was affected on 100% of Sitka spruce in a planting trial.
Phomopsis blight *Phomopsis juniperova* Hahn.	Northern white cedar	Avalon Peninsula	Low incidence on ornamentals in urban areas of St. John's.
Powdery mildew *Podosphaera clandestine* (Wallr. ex Fr.) Lév.	White birch	Central Newfoundland	Low incidence. 10% of the foliage affected.
Quince rot *Gymnosporangium clavipes* (Cke. and Pk.) Cke. and Pk.	Serviceberry	Western Newfoundland	Up to 10% of foliage affected on some trees.
Redlined conifer caterpillar *Feralia jocosa* (Gm.)	Balsam fir Black spruce	Western Newfoundland Eastern Labrador	Low numbers. No significant defoliation.

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OTHER INSECTS AND DISEASES (Concl'd.)

Insect or Disease	Host(s)	Location	Remarks
Rust gall *Gymnosporangium cornutum* Arth. ex Kern	American mountain ash	Avalon Peninsula	Low incidence.
Shot hole *Coccomyces hiemalis* Higgins	Pin cherry, European cherry	Avalon Peninsula Eastern Labrador	Over 90% of the foliage affected on European cherry in a commerical tree nursery.
Spruce budmoth *Zeiraphera canadensis* Mut. and Free.	White spruce	Western and eastern Newfoundland	Low numbers and light damage.
Striped alder sawfly *Hemichroa crocea* (Geoff.)	Speckled alder	Western and central Newfoundland	Numerous small infestations recorded throughout western Newfoundland.
Taphrina witches' broom *Taphrina cerasi* (Fekl.) Sadeb	Pin cherry Cultivated cherry	Avalon Peninsula	Low incidence. 100% of the foliage affected on some trees.
Tar spot *Rhytisma salicinum* (Pers.) Fr.	Willow	Eastern Labrador	Moderate incidence.
Whitemarked tussock moth *Orgyia leucostigma* (J.E. Smith)	Balsam fir	Western Newfoundland	Low numbers and light defoliation.
Willow blight *Fusicladium saliciperdum* (All. and Tub.) Lind.	Willow	Western Newfoundland Burin Peninsula St. John's	Up to 10% of the foliage affected on ornamentals in St. John's.