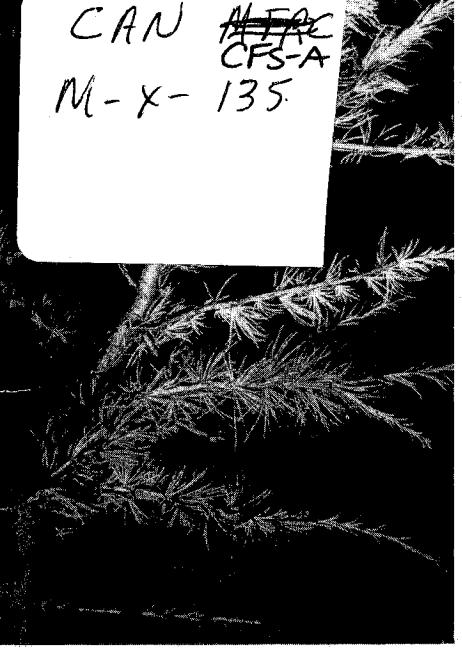

FOREST PEST CONDITIONS IN THE MARITIMES IN 1981

by
LASZLO P. MAGASI

MARITIMES
CANADIAN FORESTRY SERVICE

MARITIMES FOREST RESEARCH CENTRE

The Maritimes Forest Research Centre (MFRC) is one of six regional establishments of the Canadian Forestry Service, within Environment Canada. The Centre conducts a program of work directed toward the solution of major forestry problems and the development of more effective forest management techniques for use in the Maritime Provinces.

The program consists of two major elements - research and development, and technical and information services. Most research and development work is undertaken in direct response to the needs of forest management agencies, with the aim of improving the protection, growth, and value of the region's forest resource for a variety of consumptive and non-consumptive uses; studies are often carried out jointly with provincial governments and industry. The Centre's technical and information services are designed to bring research results to the attention of potential users, to demonstrate new and improved forest management techniques, to assist management agencies in solving day-to-day problems, and to keep the public fully informed on the work of the Maritimes Forest Research Centre.

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Maritimes Forest Research Centre

Fredericton, New Brunswick

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Canadian Forestry Service

Environment Canada

1982

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ABSTRACT

This report reviews the status of forest insects and tree diseases in the Maritimes Region in 1981, including damage related to forest inventory data, and forecast of conditions for 1982, when appropriate. Twelve economically important insects and diseases are discussed in detail; information on other organisms is listed in tabular form. A list of forest-pest related publications and reports is included. More detailed information is available on request from the Maritimes Forest Research Centre.

RESUME

Ce rapport fait le bilan des insects forestiers et des maladies des arbres dans la région des Maritimes en 1981, y compris les dégâts de nature économique, et donne un aperçu des conditions prévues pour 1982. L'auteur traite en détail de 12 insectes et maladies d'importance et énumère les autres organismes sous forme tabulaire. Il y inclut également une compilation de rapports et de publications traitant de ravageurs forestiers. De plus amples renseignements sont disponibles sur demande au Centre de recherches forestières des Maritimes.

INTRODUCTION

Some of the objectives of the Forest Insect and Disease Survey are to monitor insect and disease conditions, determine their effect on the forest, and report on the status of the important and most common pests. In the Maritimes, this information is disseminated to interested agencies and individuals through periodical reports such as: Seasonal Highlights; Technical Notes; Information Reports; and the Annual Report of the Forest Insect and Disease Survey.

In this report, pest conditions in 1981 are described and, where appropriate, related to provincial forest inventory data; operational control programs against the spruce budworm are summarized; and a list of reports and publications relating to forest-pest conditions is included.

The report aims to provide forest managers with information on pest conditions in the Maritime Provinces, early enough to be considered in management decisions before the start of the 1982 field season. Insects and diseases that were widespread and caused considerable concern in 1981 are discussed in detail, others are presented in tabular form. More information on these and on other specific conditions will be provided upon request from the Maritimes Forest Research Centre.

Two maps are included to help the reader locate areas mentioned in the report. Fig. 16 shows the counties of the three provinces, and Fig. 17 indicates the provincial forest services' forest inventory subdivisions.

In recent years, efforts towards collecting and reporting information in quantitative terms have been emphasized, but for a variety of reasons, it will never be possible to express all observations quantitatively. Throughout this report, the terms "severe, moderate, light, and trace" are used to describe the level of defoliation and, in some cases, other injury, or insect population levels. Unless otherwise stated, the terms have the following percentage ranges:

Trace	up to 5%
Light	6 - 29%
Moderate	30 - 69%
Severe	70 - 100%

IMPORTANT AND CONSPICUOUS FOREST PESTS

SPRUCE BUDWORM

The information presented on the spruce budworm, Choristoneura fumiferana (Clem.) is summarized from various sources: New Brunswick Department of Natural Resources; Forest Protection Limited; the Nova Scotia Department of Lands and Forests; the Prince Edward Island Department of Agriculture and Forestry, and the Maritimes Forest Research Centre.

NEW BRUNSWICK

Defoliation of balsam fir and spruce stands occurred over 1 356 000 ha. Defoliation was severe on 839 000 ha, moderate on 382 000 ha and light on 135 000 ha (Fig. 1). The area of severe and moderate defoliation increased significantly in 1981 from 447 000 ha and 226 000 ha, respectively, recorded in 1980. The area of severe defoliation in 1981 equals the area of defoliation in all categories recorded in 1980.

Damage - An estimated 1.4 million m^3 of balsam fir and 800 000 m^3 of spruce died in New Brunswick in 1981 as a result of repeated severe and moderate defoliation by the spruce budworm. About 5% of this loss occurred in immature stands. The estimated annual growth loss, that is growth in volume that should have materialized but did not because of spruce budworm damage, was 300 000 m^3.

The loss of nearly 2.2 million m^3 of wood from the living forest inventory in 1981 occurred throughout the Province over the almost 5 million ha of forests with a measurable softwood component. About half of this area (2.2 million ha) contains stands in which tree mortality is more than 25% by volume.

Control operations against the spruce budworm in New Brunswick were conducted by Forest Protection Limited over 1.9 million ha in 1981. The chemical fenitrothion was used at a dosage of 210 g/ha. It was applied as a water-based spray over 1 551 000 ha and as an oil-based spray over 349 000 ha. An area of 1 781 000 ha was sprayed twice while 119 000 ha received one application of the insecticide. Aerial assessment of the efficacy of the treatment showed that 83% of the treated area suffered no detectable defoliation in 1981. Some current defoliation occurred over 320 000 ha in the treated areas.

Forecast - Egg-mass surveys indicate moderate to severe spruce budworm infestations over most of the forested area of New Brunswick in 1982. The area of infestation is expected to be about 4 million ha. It is predicted that within the Protection Zone, in 1982, infestations will be significantly higher than in 1981, in the eastern half of New Brunswick, about the same in the northwestern and central-western parts of the Province, and substantially lower in the northwestern area. An expanded egg-mass survey showed that within "buffer zones", where only limited protection has been practiced for various reasons, infestations of the spruce budworm are higher than elsewhere, with the exception of the southwestern part of the Province. Most of the susceptible forests in both protection and buffer areas of New Brunswick are rated in the high or moderate hazard categories for 1982.

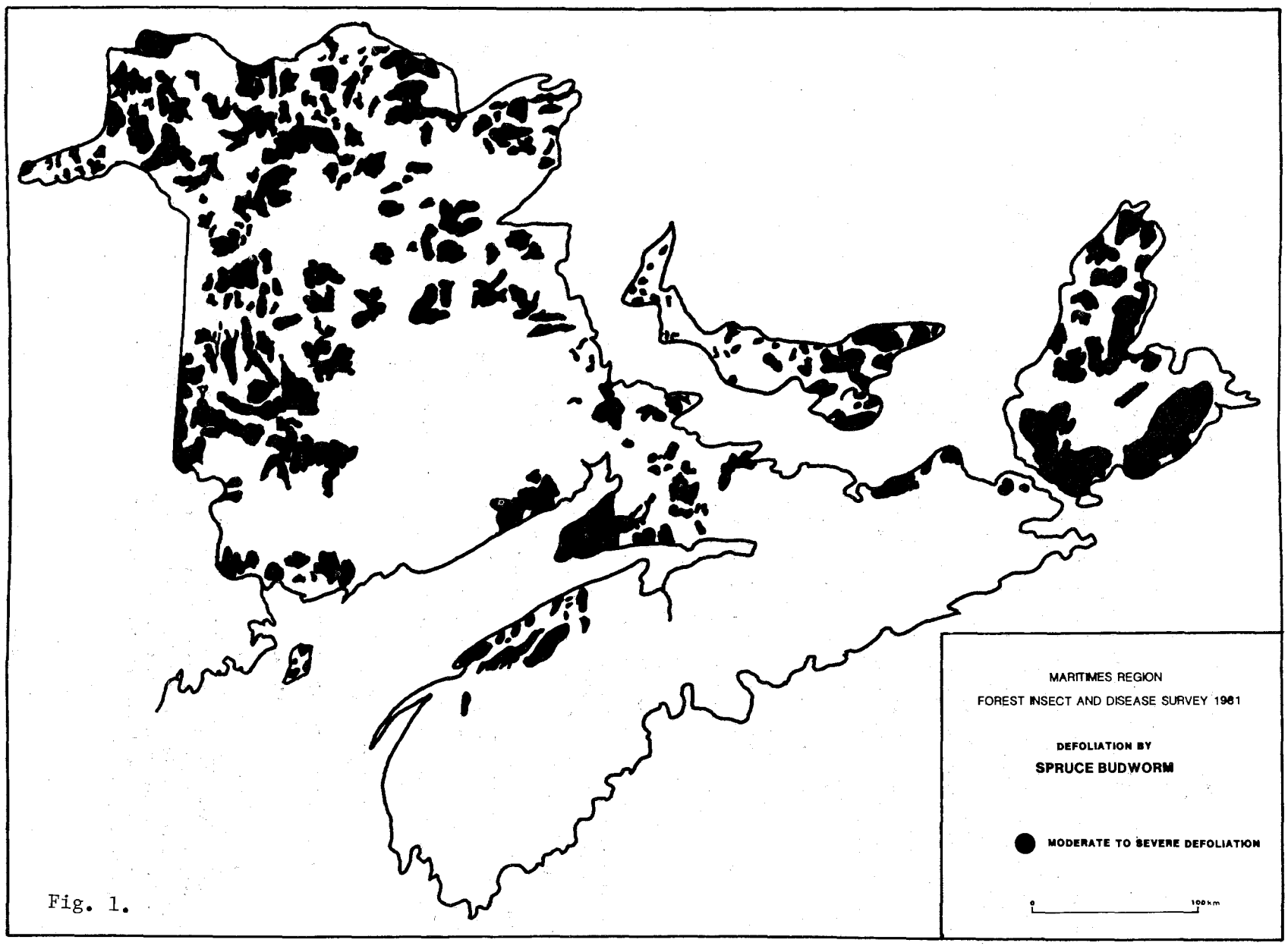

MARITIMES REGION
FOREST INSECT AND DISEASE SURVEY 1981
DEFOLIATION BY
SPRUCE BUDWORM
MODERATE TO SEVERE DEFOLIATION
0
100 km

Fig. 1.

NOVA SCOTIA

Defoliation of balsam fir and spruce stands caused by the spruce budworm occurred over 700 000 ha. Defoliation was severe on 410 800 ha moderate on 156 200 ha and light on 133 000 ha (Fig. 1). The area affected in 1981 is dramatically smaller than the almost 2.2 million ha defoliated in 1980. The reasons for this reduction are not known but parasites, diseases, and predators are not likely to have been major factors.

In spite of the more than four-fold decrease in the area defoliated in 1981, the Cape Breton Island outbreak still accounted for more than one-half of the total and almost two-thirds of severe and moderate defoliation in the Province. Defoliation was severe on 292 000 ha, moderate on 71 400 ha and light on 31 800 ha on Cape Breton Island. The reduction of this outbreak is no doubt partly due to extensive areas of dead and dying forests and the lack of food for the larvae.

The outbreak in Colchester-Cumberland counties, where the budworm has been causing severe and moderate defoliation on the Chignecto Peninsula for the past 11 years, decreased in size in 1981. Moderate and severe defoliation occurred on 100 800 ha, compared to 213 900 ha so affected in 1980.

On the Northumberland Strait coast area, severe and moderate defoliation occurred over 12 600 ha in 1981, a marked reduction from 64 800 ha recorded in those categories in 1980.

In the Annapolis Valley, the area of severe defoliation more than doubled in 1981. Defoliation was severe on 47 300 ha, moderate on 42 000 ha, and light on 46 500 ha in 1981, compared with 21 500 ha of severe, 36 000 ha moderate, and 40 100 ha light defoliation recorded in 1980.

Damage - An estimated 3 million m^3 of balsam fir and 600 000 m^3 of spruce died in Nova Scotia in 1981 as a result of repeated defoliation by the spruce budworm. About 5% of this loss occurred in immature stands. The estimated annual growth loss, growth in volume that should have materialized but did not because of spruce budworm, was 1.2 million m^3.

The loss of 3.6 million m^3 of wood from the living forest inventory occurred over 1.2 million ha of the Province's 3.4 million ha of forests with a measurable softwood component, but was confined mainly to Cape Breton Island and to the outbreak area in Cumberland-Colchester counties.

On the Cape Breton Highlands, balsam fir mortality on permanent research plots reached 56.7% in 1981, an increase of 10.4% in the number of dead trees since 1980. A survey at preselected locations (Fig. 2) showed 54% mortality and an additional 24% of balsam fir dying in this area. On the Lowlands, balsam fir mortality averaged 32% in Richmond County and 21% in Cape Breton County. Mortality of spruce (Fig. 3) was confined mainly to Lowland areas and ranged from 15% in Inverness County to 34% in Cape Breton County. Only a part of spruce mortality is attributable to the budworm as extremely high populations of spruce beetle are believed to have killed most of the white spruce (see Spruce Beetle p. 7).

The incidence of Armillaria root rot, caused by Armillaria mellea (Vahl ex Fr.) Kummer, one of the organisms which contributes to the death of weakened trees, was assessed in a balsam fir plot on the Cape Breton Highlands. The trees have been subjected to severe defoliation annually since 1976 and mortality in the sample of 149 trees was 42.3% in 1981. The fungus was found in almost two-thirds of the dead trees (65%) but, more significantly, one-third (33%) of the living trees were also infected. All but one of the trees (12/13) in the 90-100% total defoliation class contained the disease and the fungus was identified in 12% of the 34 trees in the 50-75% total defoliation class. These figures indicate that Armillaria root rot indeed plays a role in "finishing off" spruce budworm-weakened trees.

In the Cumberland and Colchester counties outbreak area, the survey found 13% of balsam fir dead and an additional 1.5% dying (Fig. 4). Spruce mortality was 5%, again most of this was caused by spruce beetle attack (Fig. 5).

Control operations against the spruce budworm were conducted by the Nova Scotia Department of Lands and Forests over 31 194 ha, of which 20 666 ha was on the Cape Breton Highlands and 10 528 ha on the mainland. The target areas were high value spruce and fir stands. Commercial preparations of the biocide Bacillus thuringiensis Berliner, either Thuricide 16B or Dipel 88 were used.

All areas were treated once, with the exception of 374 ha which received two applications.

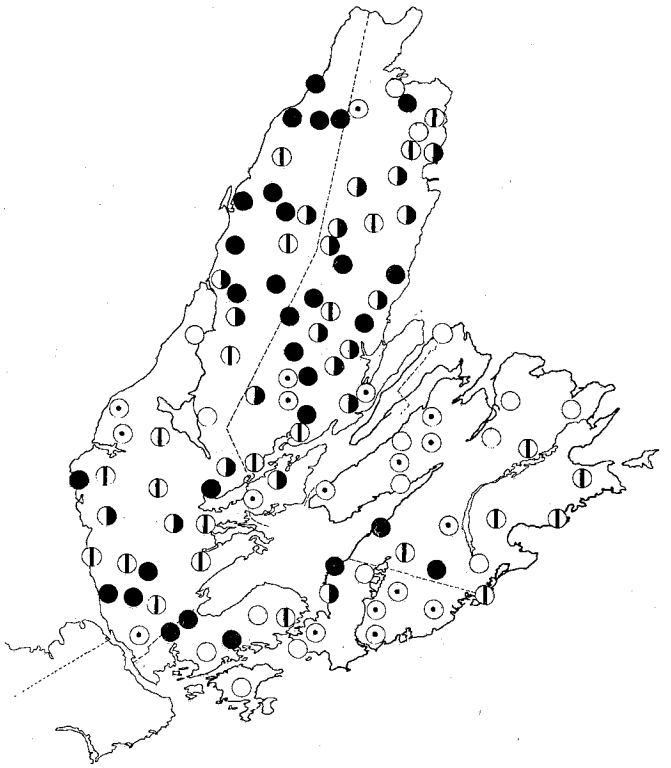
Forecast - Egg-mass surveys indicate a significant reduction in infestations for most of the outbreak areas in Nova Scotia in 1982. Only the Chignecto Peninsula of Cumberland County is expected to suffer moderate or severe defoliation over large areas. The infestation there will be only slightly lower than in 1981. On Cape Breton Island, a few small areas will be moderately or severely defoliated, although it must be remembered that the forecast refers only to 1982 "current" defoliation.

PRINCE EDWARD ISLAND

Defoliation of balsam fir and spruce stands caused by the spruce budworm was moderate or severe over 133 000 ha (Fig. 1), a considerable increase from 22 000 ha detected in 1980.

Damage--Mortality of both balsam fir and spruce occurred throughout the Province where repeated defoliation in previous years had weakened trees. No mortality figures are available, pending completion of the Province's new forest inventory.

The area within which trees are dead or dying from spruce budworm attack is estimated at 25 000 ha.



MARITIMES REGION

FOREST INSECT AND DISEASE SURVEY 1981

BALSAM FIR MORTALITY

ON CAPE BRETON ISLAND, N.S.

○ 0–10%

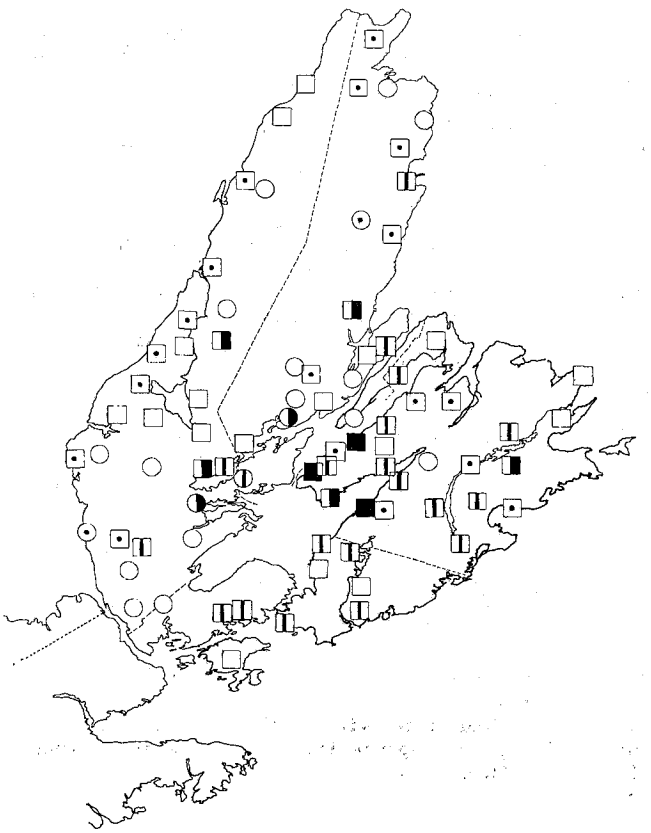
⊙ 11–20%

◐ 21–40%

◑ 41–60%

● 61–100%

Fig. 2.



MARITIMES REGION

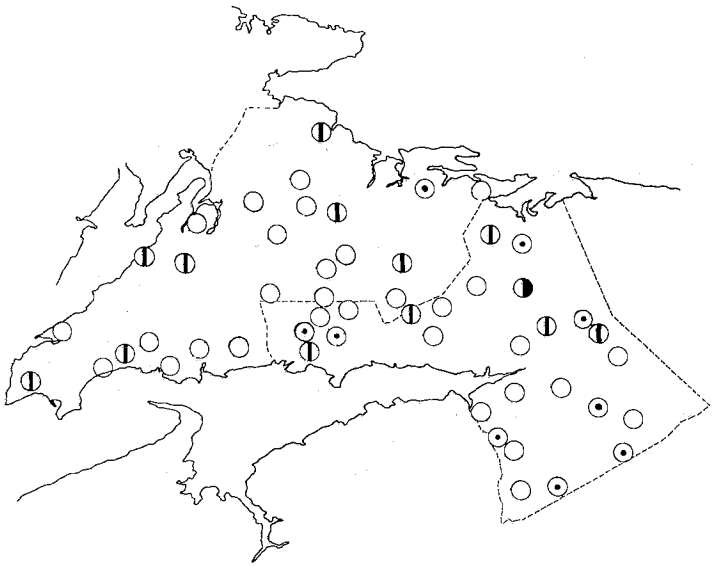
FOREST INSECT AND DISEASE SURVEY 1981

SPRUCE MORTALITY

ON CAPE BRETON ISLAND, N.S.

RED/BLACK SPRUCE	WHITE SPRUCE	
○	□	0–10 %
⊙	⊡	11–20 %
◐	◧	21–40 %
◑	◨	41–60 %
●	■	61–100 %

Fig. 3.



MARITIMES REGION

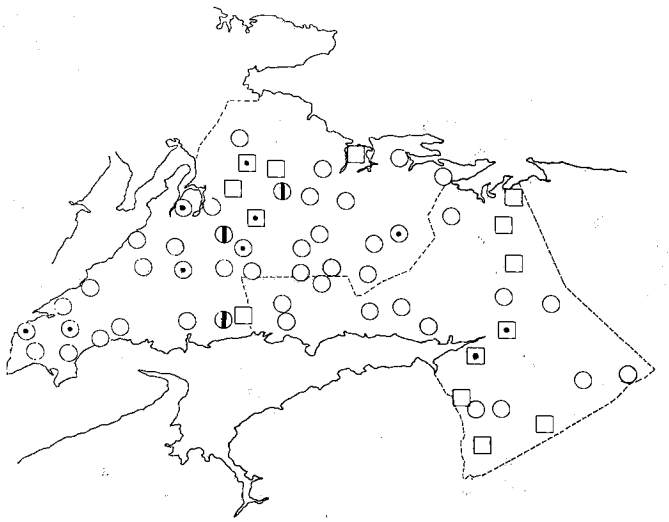
FOREST INSECT AND DISEASE SURVEY 1981

BALSAM FIR MORTALITY

IN CUMBERLAND AND COLCHESTER COUNTIES, N.S.

○	0–10%
⊙	11–20%
◐	21–40%
◑	41–60%
●	61–100%

Fig. 4.



MARITIMES REGION

FOREST INSECT AND DISEASE SURVEY 1981

SPRUCE MORTALITY

IN CUMBERLAND AND COLCHESTER COUNTIES, N.S.

RED/BLACK SPRUCE	WHITE SPRUCE	
○	□	0–10%
⊙	⊡	11–20%
◐	◫	21–40%
◑	◨	41–60%
●	■	61–100%

Fig. 5.

Control--No control measures on a commercial scale were carried out against the spruce budworm in Prince Edward Island.

Forecast. Egg-mass surveys indicate that the spruce budworm infestation will continue at the same level as in 1981, and about 100 000 ha will suffer moderate or severe defoliation in 1982.

SPRUCE BUD MOTH

Spruce bud moth, Zeiraphera canadensis Mutuura & Freeman, caused considerable defoliation in white spruce plantations in the Black Brook area of Victoria County, New Brunswick, in 1981. Prompted by the discovery of this outbreak, a survey to establish the distribution and levels of infestation of spruce bud moth was conducted in the Region, mostly in natural stands of white spruce (Fig. 6).

In New Brunswick, the insect was found widespread and attacked from 21 to 60% of the current shoots of white spruce trees in 25% of the areas examined. In general, the southwestern and eastern part of the Province sustained the least damage. In Nova Scotia and in Prince Edward Island only isolated minor infestations were detected.

The damage potential of spruce bud moth is uncertain and is under investigation. High levels of defoliation are certain to affect trees. Also, the characteristic feeding habit of the larvae may cause terminal shoots to twist, making them more susceptible to breakage. This could result in poorly formed trees, which in the long term may surpass the significance of growth loss caused by defoliation.

The number of species of Zeiraphera present in the Maritimes is in some doubt, but the most common and destructive species is Zeiraphera canadensis which in spite of its name, was introduced from Europe. All species, however, characteristically attach the bud cap to the tip of the growing shoot and spend the greater part of their larval development under the protection of the cap.

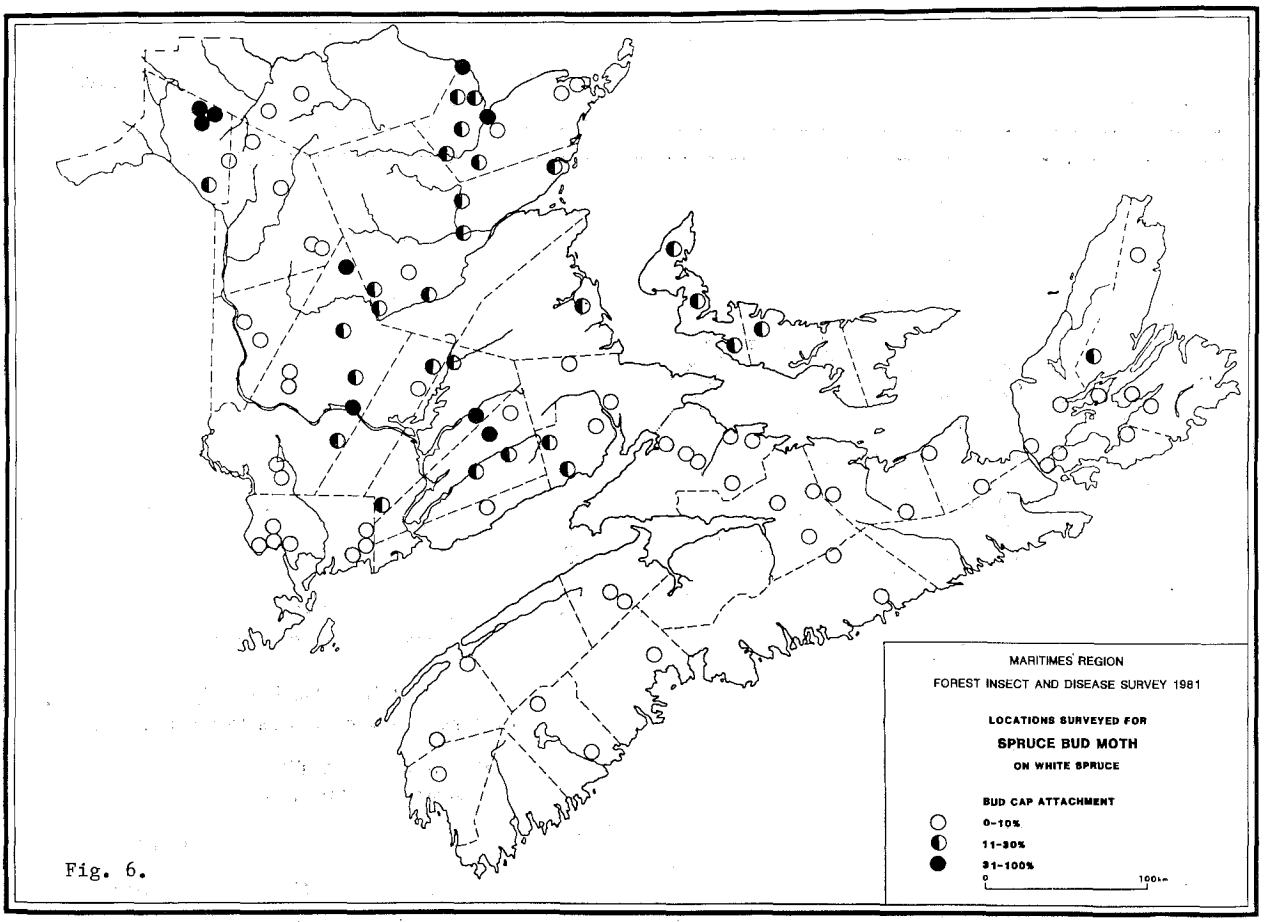


Fig. 6.

SPRUCE BEETLE

The spruce beetle, Dendroctonus rufipennis (Kby.), continued its devastation in Nova Scotia and Prince Edward Island and was found in additional locations in New Brunswick, in 1981.

In Nova Scotia, 9% of the Province's total white spruce volume has been killed by the insect during the present outbreak. A survey in 1981 in Cape Breton Island found 17.7% of white spruce and 2.4% of other species of spruce trees dead or attacked by the beetle. In some of the Lowland areas the spruce beetle ranks in importance with the spruce budworm and is believed to account for killing most of the white spruce. Further mortality is almost a certainty, as beetle-infested trees were found in 74% of the stands examined. In Cumberland-Colchester counties, 4.6% of the white spruce trees were dead or beetle attacked and 0.7% of other species of spruce were affected. An estimated 2 055 700 m^3 of white spruce and 752 000 m^3 of red/black spruce have been killed by the beetle. More than one-half (57%) of the total dead white spruce volume is on Cape Breton Island, representing 16% of the local inventory, while a further 25% of the dead white spruce is in Colchester and Cumberland counties, representing 15% of the total white spruce volume in that area.

In Prince Edward Island, more than half of the white spruce stands were killed by the spruce beetle. In infested stands average tree mortality has reached 16%. It is estimated that about 25% of the merchantable white spruce volume has been killed by the spruce beetle in the Province.

In New Brunswick, the spruce beetle was found for the first time in 50 years in a white spruce stand at Sackville, Westmorland County. Twelve of the 100 trees examined were killed by the insect and some of the living trees were infested. Tree mortality continued at Castalia, on Grand Manan Island where the beetle was first found in 1980, and infestations were also reported near North Head and Beech Hill.

EASTERN LARCH BEETLE

A population build-up of eastern larch beetle, Dendroctonus simplex Lec., was first observed in the Maritimes in Nova Scotia in 1976. This increase in beetle populations followed several years of severe defoliation of larch by the larch sawfly, Pristiphora erichsonii (Htg.). Since then the beetle has become widespread in all three provinces and has caused serious tree mortality.

A survey in 1981, of areas where the beetle was detected in 1978, found a significant increase in infestations throughout the Region. The distribution of larch beetle is presented in Fig. 7; new infestations, locations where the beetle was not found in 1981, and areas where infestations were observed between 1977 and 1980 are indicated.

In New Brunswick, infestations have increased by 32% since 1978; 8% of the merchantable larch volume became infested in 1981; mortality from beetle attack was 24%, representing 314 400 m^3 of dead larch.

In Nova Scotia, infestations have increased by 40% since 1978; 5% of the merchantable larch volume became infested in 1981; mortality from beetle attack was 64%, representing 972 000 m^3 of dead larch.

In Prince Edward Island, infestations have increased by 25% since 1978; 6% of the merchantable larch volume became infested in 1981; mortality from beetle attack was 13%, representing 11 600 m^3 of dead larch.

Larch beetles normally attack only weakened or damaged host material, usually mature or overmature trees. However, when populations are very high, healthy trees are also attacked and can be killed. Moreover, in areas of extremely high insect populations younger trees have also become infested.

EUROPEAN LARCH CANKER

The European larch canker is one of the most recent additions to the list of forest pests of the Maritimes Region. The disease was first discovered in 1980, and, during surveys in 1981 to establish its distribution, was found widespread on native larch in southeastern New Brunswick and at five locations in Nova Scotia (Fig. 8., Table 1).

European larch canker, caused by Lachnellula willkommii (Hartig) Dennis, has been a serious disease in many parts of Europe. The fungus is considered by most to be a primary pathogen and its presence in Europe has resulted in the exclusion of larch from plantation programs. In North America, the fungus was found in Massachusetts in the 1920's in European larch plantations. Periodic concentrated eradication attempts appear to have been successful as the disease was not found in 1965 during the most recent survey of the area.

The fungus infects mostly young trees, therefore, future wood supplies will be affected. Tree mortality reduces stocking, branch mortality reduces growth, and cankers reduce wood quality. Because of the increasing emphasis on forest renewal and larch tree improvement programs, the role of the disease will have to be considered. The extent to which the disease will cause damage in the Maritimes is not yet known but the potential for damage is there and work will commence in 1982 to determine its importance.

In 1981, in New Brunswick, the disease was widespread in the south-central and southeastern part of the Province, east of a line from Fredericton to St. Andrews and southeast of a line from Fredericton to Richibuctou, Kent County. Within this area, the disease was found at 37 locations, 62% of the stands examined. Tamarack, up to 25-cm diameter, was cankered. From 3 to

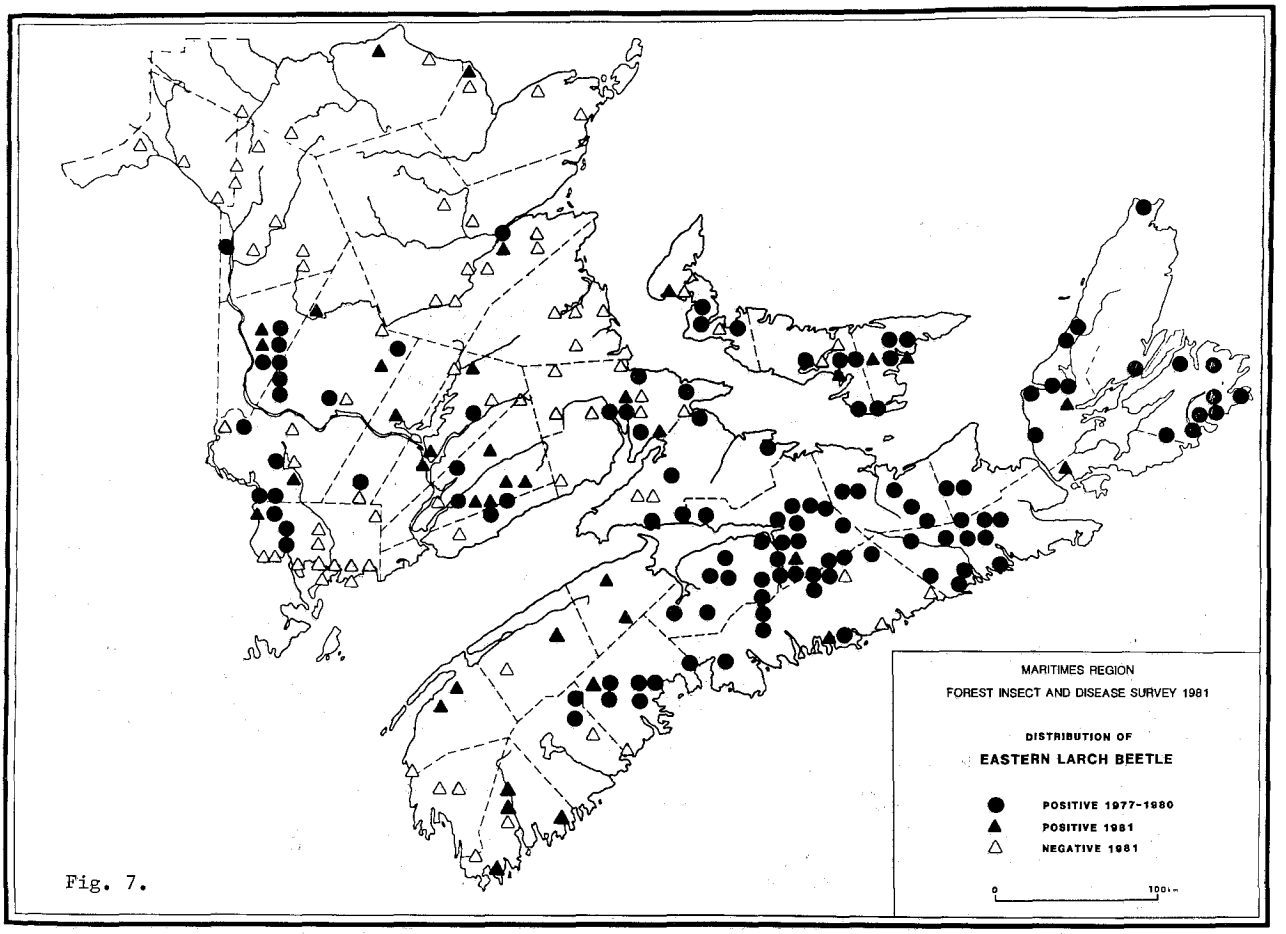

MARITIMES REGION
FOREST INSECT AND DISEASE SURVEY 1981
DISTRIBUTION OF
EASTERN LARCH BEETLE
POSITIVE 1977-1980
POSITIVE 1981
NEGATIVE 1981
0
100 km

Fig. 7.

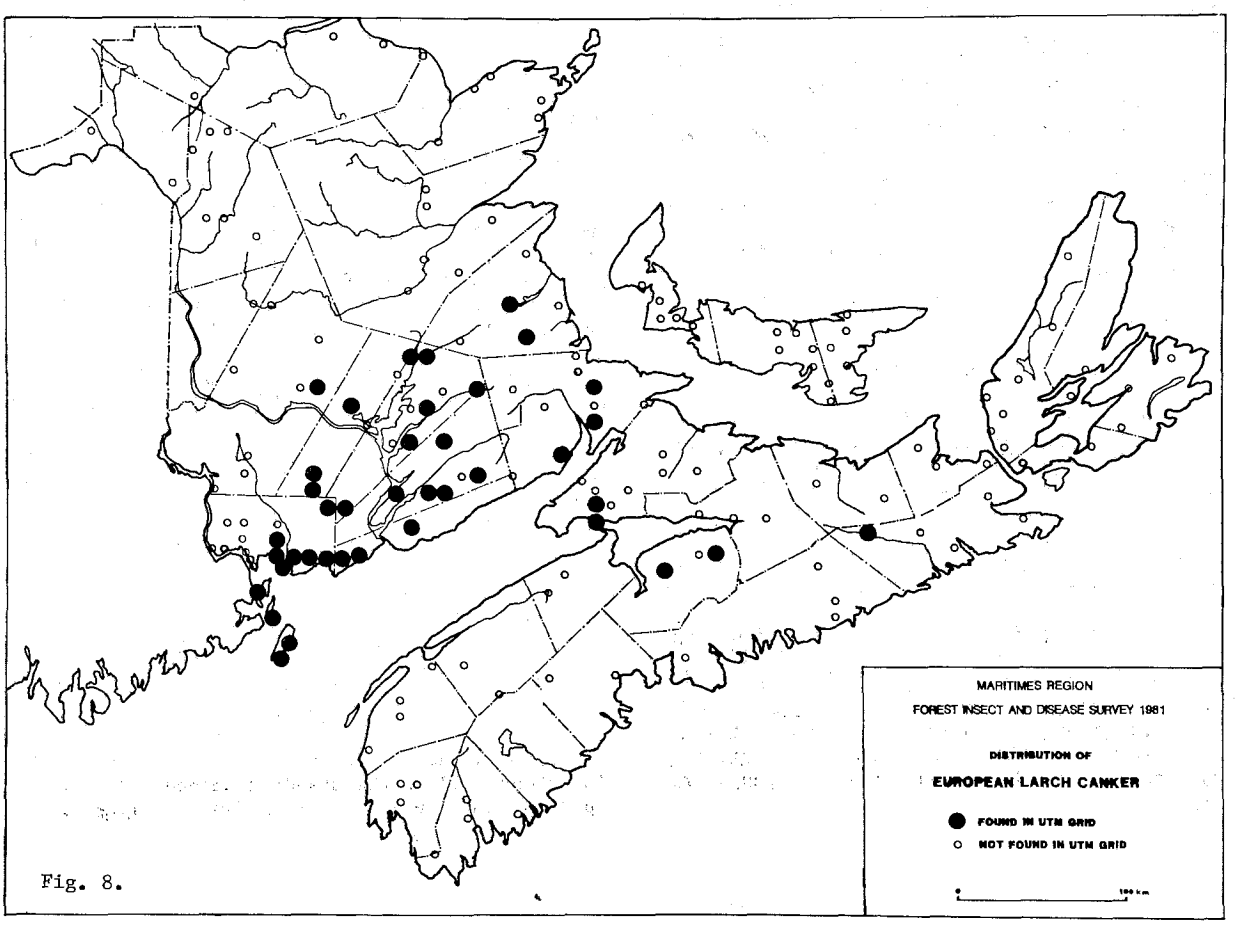

MARITIMES REGION
FOREST INSECT AND DISEASE SURVEY 1981
DISTRIBUTION OF
EUROPEAN LARCH CANKER
FOUND IN UTM GRID
NOT FOUND IN UTM GRID
0
100 km

Fig. 8.

Table 1. The European larch canker in the Maritime Provinces in natural stands of tamarack, 1980-1981

Location	Stands Examined	Stands Infected	Percent of infected stands	Incidence in infected stands Range %	Incidence in infected stands Mean %
New Brunswick					
- southeastern	60	37	62	3-100	58.9
- remainder	44	0	-	-	-
Nova Scotia	61	5	8	5-93	30.6
Prince Edward Island	24	0	-	-	-
Total	189	42	-	-	-

100% of the trees were affected in areas where the disease was found, and in 45% of the infected stands examined the incidence was more than 80%. Tree mortality was observed at two locations. Both branch and stem cankers were common. They occurred alone or in groups of as many as 20 cankers on a single branch or on a stem section. The oldest canker found to date was 5 years old.

In Nova Scotia, the disease is known to occur at five locations: near Parrsboro and Diligent River in Cumberland County, Stanley and Doddridge in Hants County, and west of Caledonia, Guysborough County.

The disease has not been found in Prince Edward Island.

Plantations of non-native larch, mostly European (Larix decidua) and Japanese (L. leptolepis) and their hybrids, were examined at Acadia Forest Experimental Station near Fredericton, near the northwestern limit of the known range of the disease. The only cankers found in 13 plantations were on the stem of a native larch (L. laricina) planted as a border tree separating provenances.

Another type of canker, discovered during the surveys, is as yet unidentified and its possible importance has not been assessed.

SCLERODERRIS CANKER

First found in the Maritimes Region in 1971, Scleroderris canker, caused by Gremmeniella abietina (Lagerb.) Morelet, has been the object of several large-scale surveys, the latest in 1979 in New Brunswick. The disease has serologically distinct races with different damage potentials. They are discussed separately.

North American race - A disease of young pines, it infects and can kill trees up to 3-4 m high. Although this race is widespread in New Brunswick, mostly in jack pine and red pine plantations, over 80% of the infected plantations in 1979 were in the northern half of the Province. Symptom expression in 1980 was almost totally lacking, likely due to weather conditions. In 1981, the disease was found in only two new areas, each near plantations already known to be infected.

In Nova Scotia, where the disease was first found in 1972, a few plantations of red, jack, and Scots pine suffered limited branch mortality during the mid-1970's. The disease was last found in that Province in 1978, and appears to have died out.

In Prince Edward Island, the disease has never been found during repeated surveys.

The distribution of the North American race of Scleroderris canker during the period 1971-1981 is shown in Fig. 9. Each circle represents identification of the disease within a UTM grid (10 x 10 km). No attempt was made to differentiate grids with single infected locations from those where numerous plantations or natural stands were diseased.

European and other races - The European race of Scleroderris canker is capable of killing pine of any age, and also of infecting other coniferous species. It was first found in the Region in 1978 at two locations, in a forest nursery in western New Brunswick and in a red pine plantation in the northeastern part of the Province.

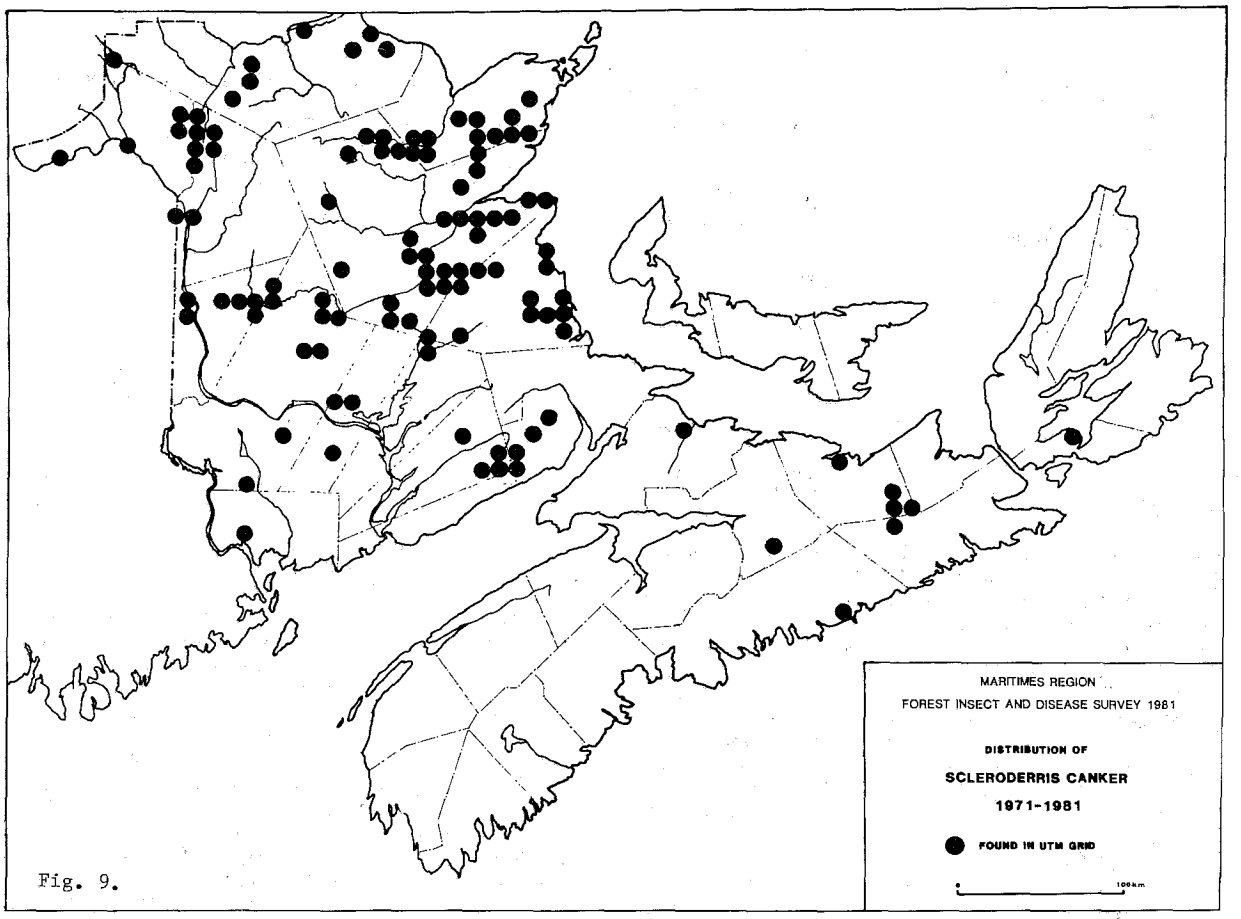


Fig. 9.

Eradication and quarantine measures appear to have controlled the disease. In 1979, it was found and promptly eradicated from a small red pine plantation by the removal of the one infected tree.

In 1980, the European race was identified in a red pine plantation at Eel River, Northumberland County and on jack pine near Black Brook, Victoria County. Trees at both locations were resampled in 1981 and race determination of these cultures is underway.

Gremmeniella abietina cultures were identified as "possibly European race" at two locations, and as a race "intermediate", between the European and the North American races, at two other locations.

Trees are under close surveillance for symptom expression at the six locations where a race of Gremmeniella abietina other than pure North American has been indicated and where no control measures have been carried out. To date, symptoms on infected trees are identical to those caused by the North American race.

Areas from where the non-North American race samples originated, their identifications, and the action taken are shown in Fig. 10.

FROST DAMAGE

Late spring frost in 1981 caused serious injury over large areas in the Region, mostly on balsam fir and spruce.

In New Brunswick, Christmas tree growers suffered severe financial setback. In many plantations frost either rendered balsam fir unmarketable or reduced the grade for the 1981 season. In some areas, the recovery of the affected trees to marketable grade is questionable. In some plantations all shoots were killed by the frost, in others, the few surviving shoots produced abnormal growth resulting in deformed trees.

Balsam fir and white spruce also suffered moderate or severe shoot-kill along roadsides, in plantations, in cut-over areas, and in natural stands. Hardwood foliage was also affected. In an area in central New Brunswick, 75% of the leaves on all hardwoods were killed up to the 1 metre level.

In Nova Scotia, light to moderate shoot damage occurred in balsam fir Christmas tree plantations in Annapolis, Queens, Kings, and Lunenburg counties. Young balsam fir and spruce

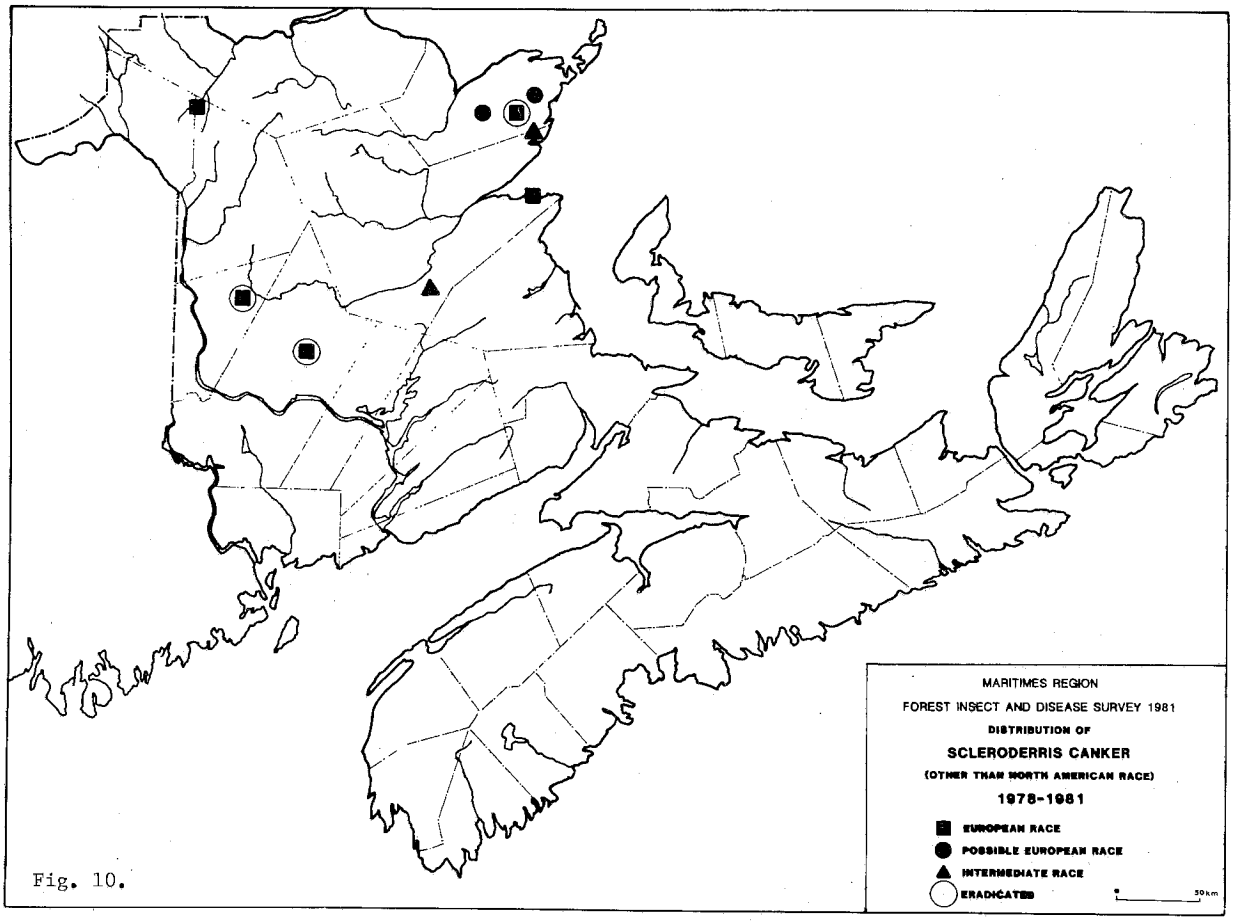


Fig. 10.

regeneration was affected in those and in Cumberland, Hants, Digby, and Yarmouth counties on the mainland, and in Inverness and Victoria counties on Cape Breton Island.

In Prince Edward Island, moderate shoot damage on balsam fir and white spruce was reported only in a few areas in Queens County.

FOREST TENT CATERPILLAR

The forest tent caterpillar, Malacosoma disstria Hbn., was again the most serious hardwood defoliator in New Brunswick in 1981. The number of insects was higher than ever recorded previously and the area of the outbreak increased dramatically from that of 1980. (Fig. 11).

Foliage of the hosts most affected in previous years - trembling aspen, birch, apple, oak, cherry and some ground cover - was completely consumed by early instar larvae, forcing the insect to migrate in search of food. Sugar maple was defoliated on a large scale for the first time during this outbreak. In addition, ash, Manitoba maple, alder, and larch were defoliated. Larvae were also observed feeding on current foliage of white spruce in an area of eastern New Brunswick and of white spruce and Colorado spruce in the western part of the Province. As the larvae grew and consumed all available food, the migration continued towards the perimeters of the infestation. In residential areas the nuisance aspect of vast numbers of larvae has reached its full potential. In many areas, mass starvation of larvae occurred or they pupated before reaching full size. The result of the migration and early pupation was that in numerous areas, especially in the St. John River Valley, completely defoliated stands were bordered by a strip of moderately or lightly defoliated trees.

The area of severe or moderate defoliation in 1981 was 775 300 ha, a more than four-fold increase from 177 500 ha in 1980. Isolated outbreaks of 1980 in central and eastern New Brunswick coalesced and were joined with the infestation in the St. John River Valley, forming a crescent shaped area of defoliation. The outbreak also expanded southward and trees were

defoliated in small areas as far south as Hoyt and Tracy in Sunbury County, McAdam and Oromocto Lake in York County, and South Oromocto Lake in Charlotte County.

The effects of three, and in some small areas, four years of severe defoliation by the forest tent caterpillar are not yet evident on the trees in New Brunswick. There is little doubt, however, that trees, forced to produce two complements of foliage each season, have lost at least some growth, and may have suffered damage which will become evident in future years.

Further stress on aspen was caused by the appearance of two species of poplar webworms in late summer. In many areas of New Brunswick, Tetralopha aplastella (Hlst.) and Meroptera provella (Grt.) occupied pupal sites of the forest tent caterpillar and caused moderate or light leaf browning of the residual foliage in stands already having suffered varying degrees of defoliation.

The fate of the outbreak is uncertain. Incidence of disease and of parasitism, the factors which usually play a significant role in the decline of populations, have increased in 1981 in the older parts of the infestation. Mass starvation in other areas prevented larvae from reaching maturity as was evidenced by fewer egg-masses than in 1980. It is expected that, unless unfavourable weather conditions destroy all or part of the early instar population in the spring of 1982, the outbreak will continue, the area may even expand somewhat over that of 1981, but the numbers of larvae and consequently the level of defoliation will be generally lower than in 1981. The most significant reduction is expected in the Woodstock area where the outbreak began.

In Prince Edward Island, a forest tent caterpillar outbreak has persisted in Prince County since 1973. At its peak, in 1975, defoliation of mostly trembling aspen occurred over 28 200 ha. The collapse of the outbreak has been expected for several years because of high levels of parasitism and disease in the population. However, 5000 to 7000 ha are defoliated each year but the affected patches change within the infes-

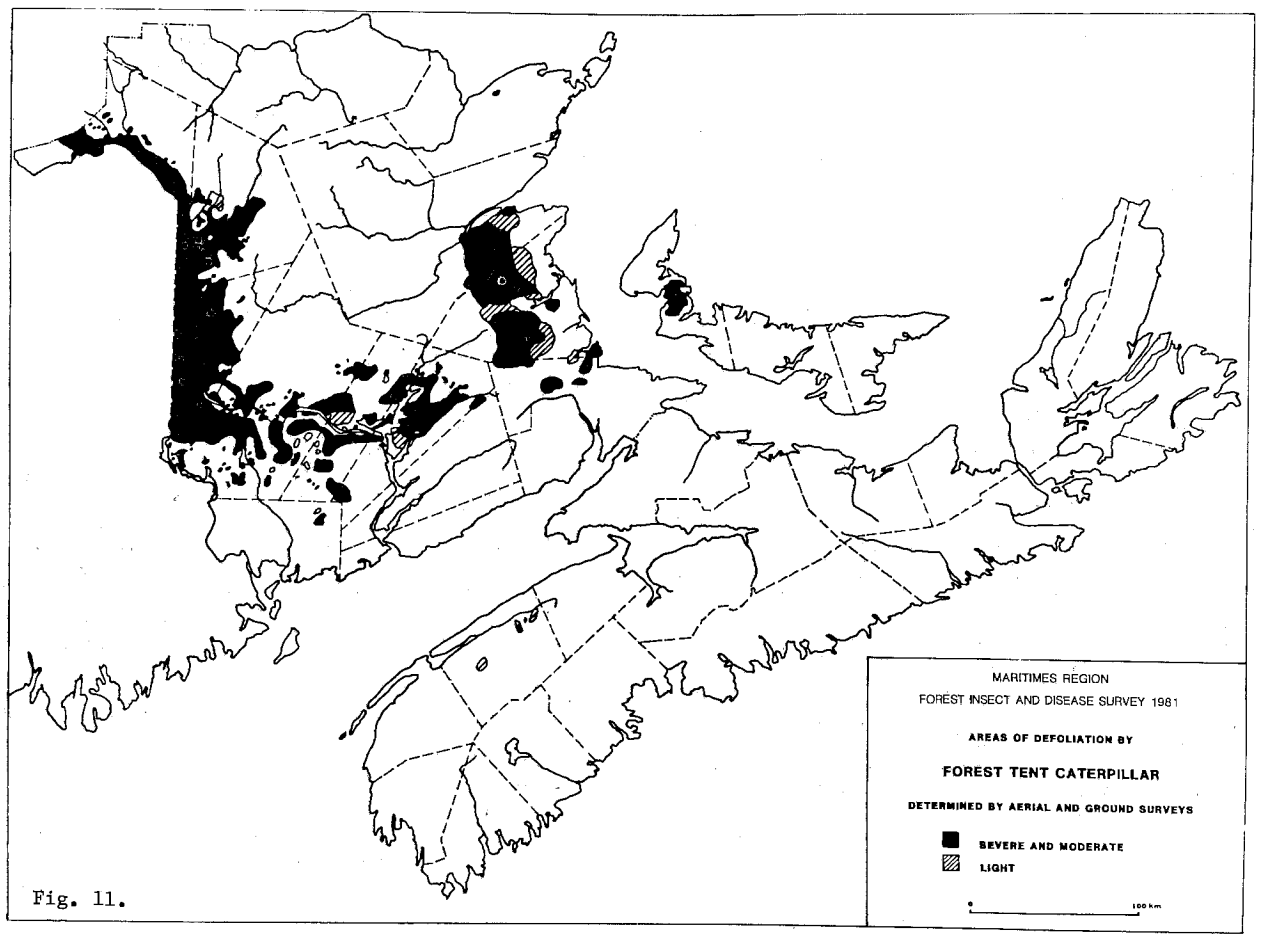


Fig. 11.

tation area. In 1981, there was considerable increase in the area of the outbreak. Defoliation was severe over 6700 ha and moderate over 7100 ha.

In Nova Scotia, "pockets" of trembling aspen were defoliated in a line between Lawrencetown, Annapolis County to Antigonish. Although none of these areas were large, they are an indication of a population build-up in that part of the Province.

DUTCH ELM DISEASE

Dutch elm disease, caused by the fungus Ceratocystis ulmi (Buism.) C. Moreau, continued to intensify within its known range in the Maritimes, except in Prince Edward Island. In 1979, when the disease was first found on the Island, the Provincial Government promptly carried out a sanitation program. Intensive scouting in 1980 and 1981 failed to locate further infection. The groups of suspect trees reported in 1980 were investigated in 1981 but all attempts to isolate the fungus failed.

In Nova Scotia, the disease was found for the first time in the town of Antigonish, extending the range further eastward on the mainland. In New Brunswick, the new locations (Fig. 12) indicate "gap filling" in the distribution rather than actual spread of the disease since last year. A special assessment will be conducted in 1982 in conjunction with a nation-wide survey to determine the status of the disease.

In Fredericton, New Brunswick, an analysis of records during the first 20 years (1961-1980) of the disease in the City showed that 19.7% of the elms became infected within the Dutch Elm Disease Management Area, which, in previous reports was referred to as the southside portion of the control zone. In 1981, the 195 elms lost here represented 5.3% of the current tree population. This is lower than the 7.8% lost in 1980. This is also the first time that the annual loss decreased rather than increased from the previous year. Losses to date amount to 23.2% of the original urban elm stand.

Populations of the native elm bark beetle, Hylurgopinus rufipes (Eich.) were again lower in

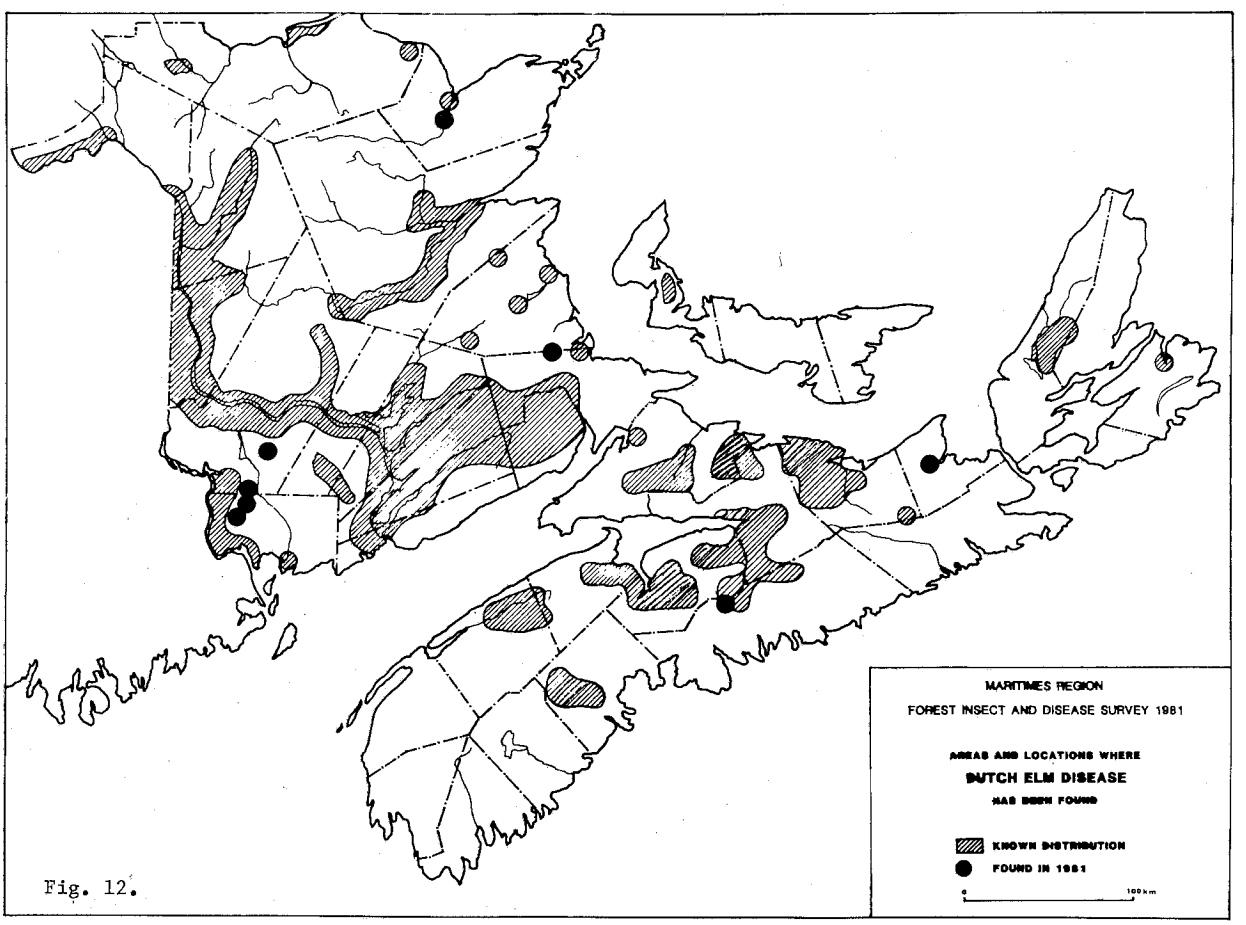


Fig. 12.

the City than in previous years, and significantly lower than in outside areas. The drastic decline in numbers of beetles near the area clearcut of elm in the winter of 1977-1978 continued as follows:

1977	300.2	beetles/10cm^2 trap
1978	120.2	"
1979	20.0	"
1980	5.5	"
1981	1.6	"

The smaller European elm bark Scolytus multistriatus (Marsh.), an important carrier of Dutch elm disease in the United States, and increasing in importance in parts of southern Ontario, was found on pheromone traps for the first time in Prince Edward Island, in 1981. One beetle was captured near Conway, Prince County, in the area where Dutch elm disease first occurred in the Province. The only other positive location in the limited trapping program in 1981, was at Upper Mills, Charlotte County, N.B., where 4 European elm bark beetles were captured. The insect was first found here in 1975.

The condition of the 6 healthy and 2 diseased elm trees, part of the Dutch elm disease resistance study began in 1967, was not assessed in 1981. Only one of the remaining trees had exhibited both good form and vigor in 1980.

GYPSY MOTH

The gypsy moth, Lymantria dispar (L.), is the most destructive insect on hardwoods and to a lesser degree on conifers in the northeastern United States where in 1981 it caused severe defoliation over more than 5 million hectares. The northern edge of the infestation in 1980 was less than 25 km from the New Brunswick border.

In 1981, gypsy moth egg masses and pupal remnants were found in the Maritimes for the first time in 45 years. This discovery raises concern that the gypsy moth could become an unwelcome addition to the list of forest pests in the Maritimes.

Egg masses were found in both New Brunwick and Nova Scotia (Fig. 13). In New Brunswick, all egg masses were found in Charlotte County: 6 near Milltown, across from a mill at Woodland, Maine; 1 near Pennfield; 1 near Beaver Harbour, and 1 on Grand Manan Island. In Nova Scotia, one egg mass was found in the town of Yarmouth. Egg-mass searching was a joint operation of the Forest Insect and Disease Survey of the Maritimes Forest Research Centre and the Plant Quarantine Division of Agriculture Canada. The search was widespread but the effort was concentrated in areas of high adult male catches.

An adult gypsy moth male pheromone trapping program, also a joint effort of the two organizations, has been conducted annually since 1971, when the insect was becoming a problem in neighboring Maine. Male moths have been trapped each year and generally in increasing numbers. The summarized results of catches in 1023 traps in 1981 are shown in Figure 14. Most of the moths were captured in southwestern New Brunswick and southern Nova Scotia. High catches in these areas have been common during the last five years. Despite high male catches, no defoliation has been observed nor egg masses found up to 1981, suggesting an outside source for the moths.

Although egg-masses may have been laid by "imported" females, the presence of pupal remnants at Yarmouth and near Milltown indicates that at least some larvae completed their development at those locations.

The absence of noticeable defoliation in the infested areas in southwestern New Brunswick and in western Nova Scotia indicates that local populations of gypsy moth, if they exist, are at very low levels. However, because of the importance of the insect elsewhere and because of its unknown potential in this region, detection and surveillance programs will be intensified and placed on a federal-provincial cooperative basis in 1982.

HARDWOOD DECLINE

The condition of hardwoods, especially maple and birch, has been declining throughout much of the Maritimes during the past two decades. Often, it is impossible to attribute this to a single organism, an insect, or a disease. However, the decline may have a serious impact in the Region, now facing impending wood shortages. Birch and maple, at present, constitute about 78% of New Brunswick's almost 179 million m^3 of hardwoods.

At times, the cause of twig, branch, or top dieback is obvious, such as after several consecutive years of severe defoliation of sugar maple by the saddled prominent, Heterocampa guttivitta (Wlk.), or of red maple by the greenstriped mapleworm, Dryocampa rubicunda rubicunda (F.). At other times, the cause can be deduced, e.g., root suffocation after addition of a thick layer of topsoil, or exposure and sunscald of the residual hardwood forest after the removal of the coniferous component during logging operations. In these cases, however, the trees affected are either single trees or part of a well-defined stand, over a limited area.

When a condition occurs over large areas or, in some cases, throughout the region, in the absence of a definite primary causal agent, the situation is no longer simple. The changes are subtle, almost imperceptible. There is nothing "wrong" with the trees, but they don't look "right". Investigations into the cause for the loss of vigor come up "empty". The leaves discolor early and fall prematurely, followed by dying of small twigs, then of small branches. At this stage, it is easy to find many organisms, both insects and disease, "associated with" the decline. The bronze birch borer, Agrilus anxius Gory, presently is killing thousands of birch trees each year in southern New Brunswick but it is not the primary cause of birch mortality. This insect at "normal" population levels is incapable

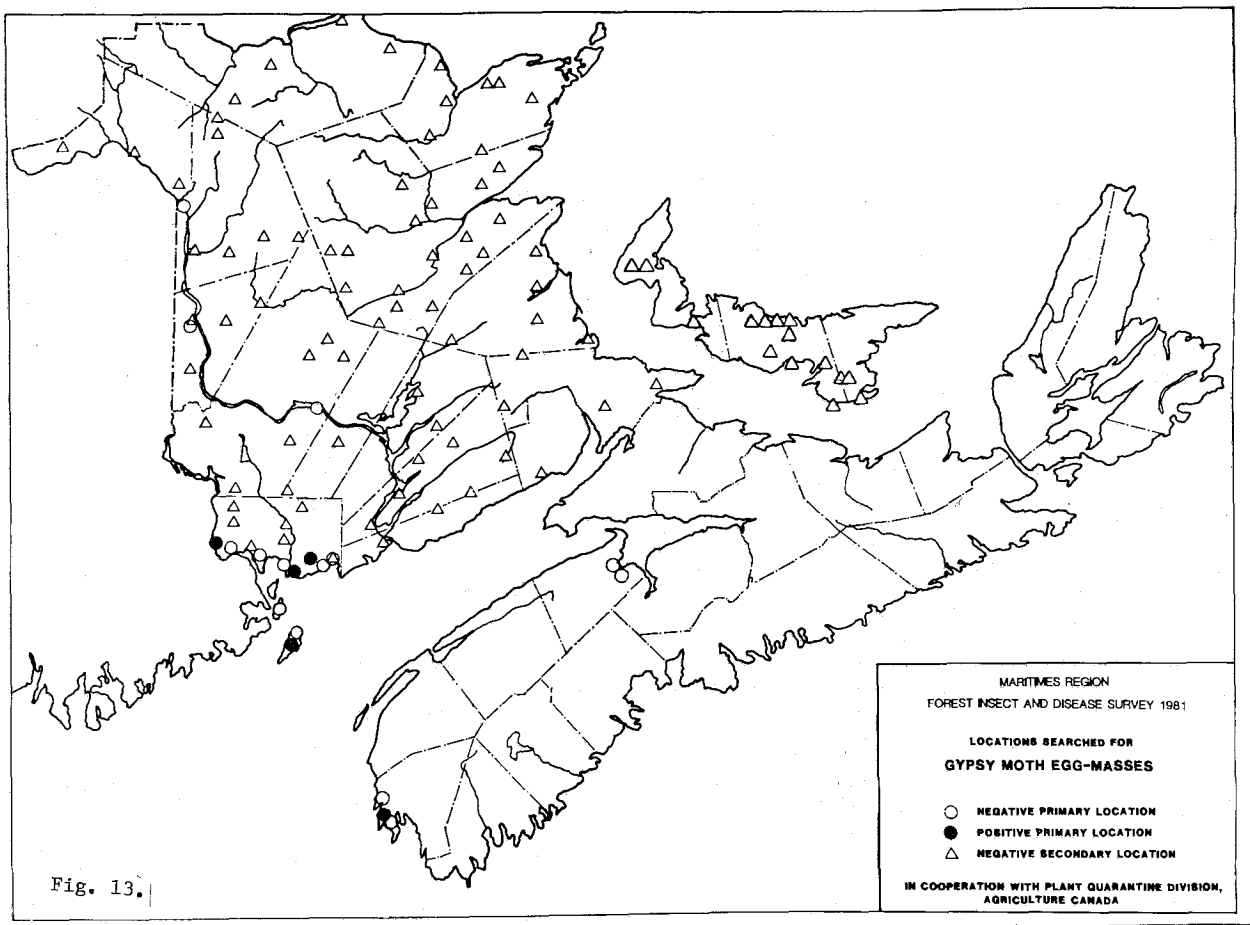

MARITIMES REGION
FOREST INSECT AND DISEASE SURVEY 1981
LOCATIONS SEARCHED FOR
GYPSY MOTH EGG-MASSES
NEGATIVE PRIMARY LOCATION
POSITIVE PRIMARY LOCATION
NEGATIVE SECONDARY LOCATION
IN COOPERATION WITH PLANT QUARANTINE DIVISION, AGRICULTURE CANADA

Fig. 13.

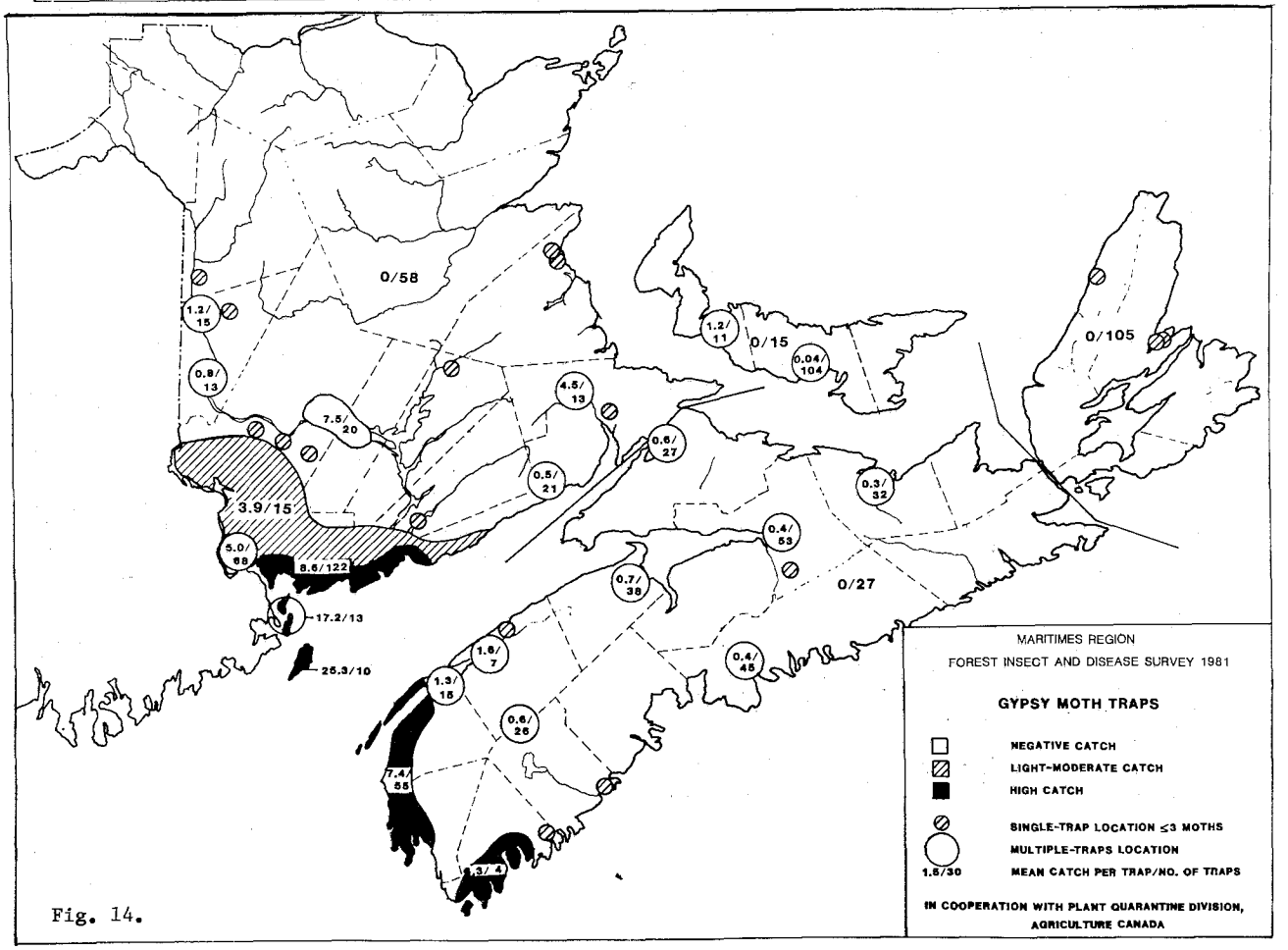

0/58
1.2/15
0.8/13
7.5/20
3.9/15
5.0/68
8.6/122
17.2/13
25.3/10
4.5/13
0.6/27
0.5/21
1.2/11
0/15
0.04/104
0/105
0.3/32
0.4/53
0.7/38
0/27
1.6/7
1.3/15
0.6/26
7.4/55
3.3/4
0.4/45
MARITIMES REGION
FOREST INSECT AND DISEASE SURVEY 1981
GYPSY MOTH TRAPS
NEGATIVE CATCH
LIGHT-MODERATE CATCH
HIGH CATCH
SINGLE-TRAP LOCATION ≤3 MOTHS
MULTIPLE-TRAPS LOCATION
1.6/30
MEAN CATCH PER TRAP/NO. OF TRAPS
IN COOPERATION WITH PLANT QUARANTINE DIVISION, AGRICULTURE CANADA

Fig. 14.

of successfully attacking healthy, vigorous trees. The build-up of its populations coincided with the noticeable increase in the number of white and wire birch trees suffering from some degree of decline.

Factors that play a role in reducing the health of the trees, thus rendering them susceptible or even attractive to attack, are subject to speculation. Most of these factors must be at low level, otherwise their effects would have been dramatic enough for recognition, chronic, otherwise the trees would have overcome them with only minor problems, and either widely present or combined, several factors working together.

Numerous hardwood defoliators fit this definition. Defoliators and most leaf diseases of hardwoods are not usually considered important forest pests because they do not kill trees outright. Also, unrealized growth potential (growth loss), especially of hardwoods until recently, has not been a concern, in our Region's overwhelmingly softwood based forest economy. The status of a few of these pests is discussed here in general terms, and that of others, in 1981, are mentioned in other sections of this report.

The maple leafroller, Cenopis acerivorana MacK., is a relatively new arrival to the Region. It was first found in New Brunswick in 1956, in Prince Edward Island in 1961, and in Nova Scotia in 1962. Originally, the insect was considered only a minor shade tree pest. However, it spread through the Maritimes and, apart from normal population fluctuations, it has persisted in high enough numbers that we now consider the maple leafroller as one of the significant factors in the general decline of maple.

At high populations, the birch casebearer, Coleophora serratella (L.), and the birch leafminer, Fenusa pusilla (Lep.), become serious pests and repeated attacks by the insects cause loss of growth and decline in vigor. In some cases, young trees may die but in all cases birch trees are weakened and predisposed to attack by other organisms.

Poplar leaf roller and leaf miner populations have been increasing in many areas of the Maritimes and have reached such proportions that now they are considered one of the major problems affecting the foliage of aspen and poplar. The insects, alone or in combination with several species, affect trees from small patches to stands up to 20 ha, and are being found in areas where they had not previously been noted. As a result of interference with the photosynthetic activities of the host, the vigor of the trees is lessened, the amount of wood produced is decreased, and predisposition to invasion of secondary organisms is increased. Aspen leaf rollers include the European leafroller, Archips rosanus (L.), fruit-tree leafroller, Archips argyrospilus (Wlk.), large aspen tortrix, Choristoneura conflictana (Wlk.), obliquebanded leafroller, Choristoneura rosaceana (Harr.), and several others (Acleris sp., Anacampsis innocuella Zell., Compsolechia niveopulvella Chamb., and Epinotia sp.).

Non-biological factors such as drought, global climatic changes, past and present large-scale logging operations, increased automobile emissions, road salting along highways and in urban areas, ocean salt spray in coastal regions, and, no doubt, others play their respective roles in changing the environment to which trees react.

Early foliage browning and premature leaf drop of white birch occurred for the third consecutive year along the Fundy coast of New Brunswick (Fig. 15). In 1981, the condition ranged inland from 1 to 15 km and extended from Charlotte County, including the islands of Campobello, Deer, and Grand Manan, to Dorchester, Westmorland County. Septoria sp., a fungus which causes leaf spots, was again the organism most commonly associated with the condition, and the bronze birch borer, continued to kill trees in the area.

The same symptoms were recorded for the first time this year in numerous areas in York, Kings, Victoria, Northumberland, Madawaska and Restigouche counties, N.B. and in Cumberland and Annapolis counties N.S. In some areas, but more particularly along the Fundy coast, a variety of other plants, including alder, mountain ash, mountain maple, also sustained foliage injury.

The cause of foliage discoloration and deterioration of white birch along the Bay of Fundy remains unknown. It is unlikely that all browning is due to the leafspot Septoria, although it is known to have caused severe browning elsewhere in the past, but not on such a large scale or over such an extended period. The fact that other vegetation was also affected and suffered browning without infection by Septoria suggests that other, probably abiotic, factors are also involved. White birch is highly sensitive to sulphur dioxide. The area affected is one of two in the Region with high emissions of SO_2. In addition, there is some tentative circumstantial evidence indicating that gypsy moth males are carried into the Maritimes by storm fronts from the outbreak areas in industrial United States. Storms are also implicated in the long-range transportation of industrial impurities. Is it only a coincidence that the area of browning so closely overlaps the area of the highest incidence (see Fig. 14) of presumably in-blown gypsy moth adults?

The factors that induced the decline of hardwoods may be very uncertain. The changes in tree conditions may proceed slowly and assessment of the changes may be a hard task. However, the fact that hardwoods in many areas in the Maritimes are in a state of decline is inescapable.

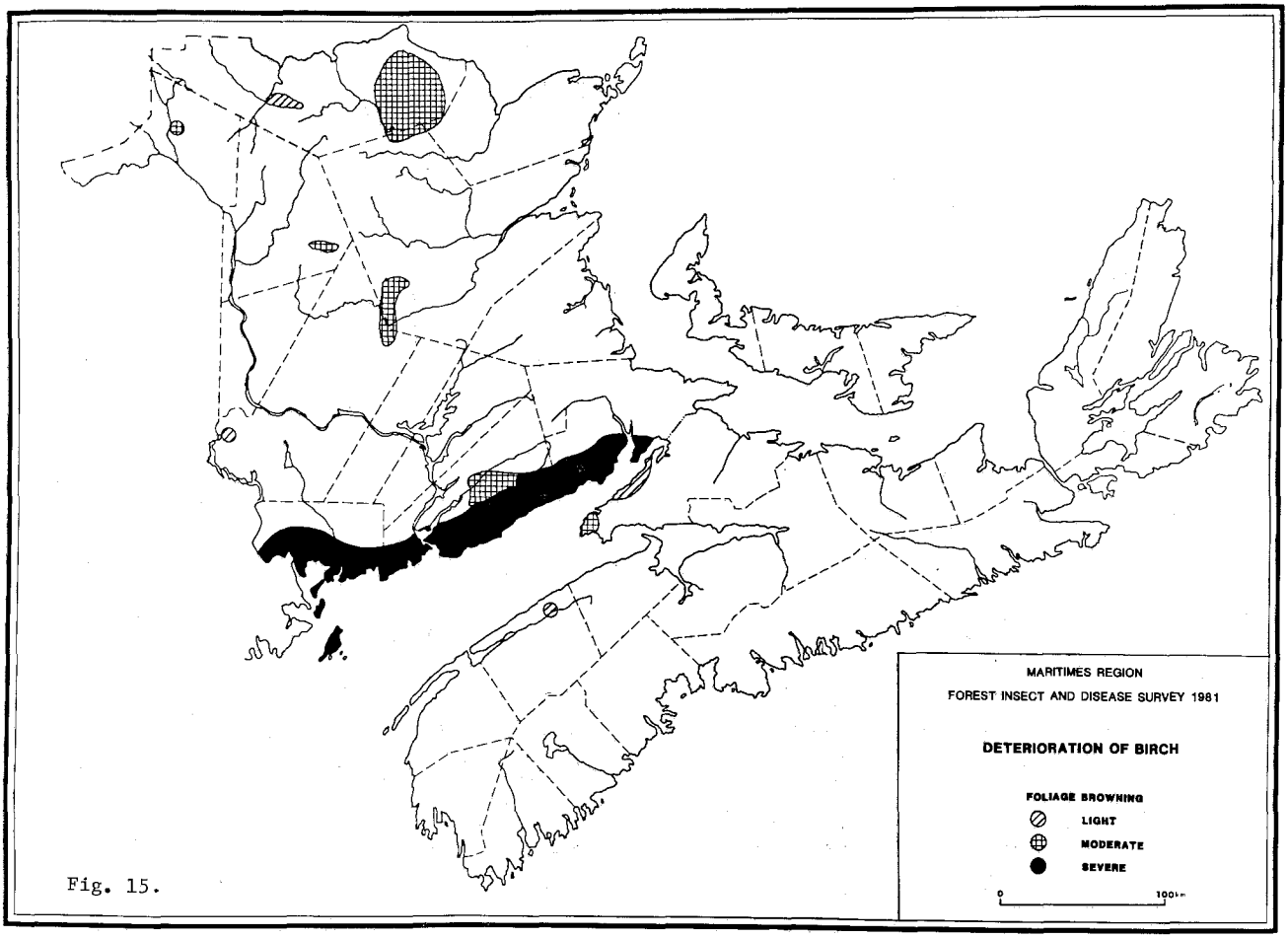


Fig. 15.

OAK DEFOLIATORS

Oak leaf shredder, Croesia semipurpurana (Kft.), and the oak leafroller, Pseudexentera cressoniana Clem., have been causing defoliation of oak since the early 1970's. At present, they are the most serious pests of oak in the Maritimes. While oak, by volume, represents a small percentage of the total hardwood inventory, its value per stem makes it a locally important tree species.

The two insects occurred together in 9 of the 10 stands examined in 1981, and in 8 of these, oak leafroller constituted from 70 to 89% of the mixed populations. The level of defoliation in these stands varied, and from 12 to 83% of the total available foliage was removed by feeding (Table 2).

In New Brunswick, moderate defoliation of scattered oak stands occurred from Woodmans Point, Kings County along the St. John River Valley through Cambridge Narrows, Queens County to Fredericton. Ornamental oaks were moderately defoliated at Dorchester, Westmorland County. Both leafroller and shredder were present from Fredericton to Woodstock, the effect of their feeding, however, was masked by the high populations of forest tent caterpillar which severely defoliated the trees, especially in the Nackawic and Woodstock areas. A similar situation occurred in a 50-ha stand near Cranberry Lake, Queens County, where the defoliation was moderate. Twig, branch, and crown mortality, the result of repeated defoliation since the outbreak began was observed in most areas. The deterioration is progressive, and as much as one-third of the number of trees in some stands are seriously weakened.

Table 2. The population ratio of oak leafroller and oak leaf shredder in selected stands in the Maritimes in 1981

Location	Percent of the population		Defoliation
	Oak leaf-roller	Oak leaf shredder	(% of leaf area removed)
Nova Scotia			
Pleasant River, Queens Co.	89	11	80
Middlefield, Queens Co.	88	12	49
Rossignol Lake Road, Queens Co.	89	11	58
Colpton, Lunenburg Co.	75	25	12
Pinehurst, Rte #10, Lunenburg Co.	88	12	83
Kejimkujik National Park, Annapolis Co.	86	14	75
New Brunswick			
Woodmans Point, Kings Co.	85	15	34
Central Cambridge, Queens Co.	80	20	46
Cranberry Lake, Queens Co.	0	100	52
Upper Queensbury, York Co.	15	85	41

In Nova Scotia, population levels fluctuated but, in general, remained as high as in 1980. The major oak stands affected were located in Lunenburg, Queens, Annapolis and Kings counties where moderate and severe defoliation occurred. Twig, branch, and crown mortality ranged up to 10% on individual trees. Oak stands are less extensive in Hants, Halifax, Digby and Yarmouth counties but these also sustained moderate to severe defoliation in 1981. Populations increased and caused moderate defoliation for the first time in Salt Spring and at Rocky Mountain, Pictou County. Defoliation of a few trees was severe at Debert, and ornamentals were affected to varying degrees at Truro, Colchester County and at Whycocomagh, Inverness County.

In Prince Edward Island, defoliation was severe at Orwell and Oyster Bed Bridge, Queens County, moderate on ornamentals at Montague, Kings County, and light and moderate near Milton Station, Queens County.

ACKNOWLEDGEMENTS

This report is the result of a combined effort of all members of the Forest Insect and Disease Survey: C.L. Burlock, L.J. Coady, C.M. Dobson, D.E. Elgee, K.J. Harrison, A.M. Jones, C.D. MacCall, A.W. MacKay, L.P. Magasi, O.A. Meikle, W.R. Newell, D.P. Ostaff, B.A. Pendrel, S.E. Pond and F.A. Titus. We wish to thank our summer students and the numerous staff members who contributed in many ways, especially E.G. Ketella, I. Millar, D.B. Marks, and T.R. Renault.

Much of the information on the status and control of the spruce budworm in New Brunswick is based on data from Forest Protection Ltd., Fredericton, N.B.; part of the information on mortality is from the Department of Natural Resources. The Nova Scotia budworm control information is based on Department of Lands and Forest data.

Information contributed by the Pest Detection Officers of the New Brunswick Department of Natural Resources, the Nova Scotia Department of Lands and Forests and the Prince Edward Island Department of Agriculture and Forestry is acknowledged and appreciated. Special thanks go to those who participated in the gypsy moth adult trapping program.

Parks Canada, the Department of Natural Resources of New Brunswick, the Department of Lands and Forests of Nova Scotia, and private individuals operated light traps during the summer months.

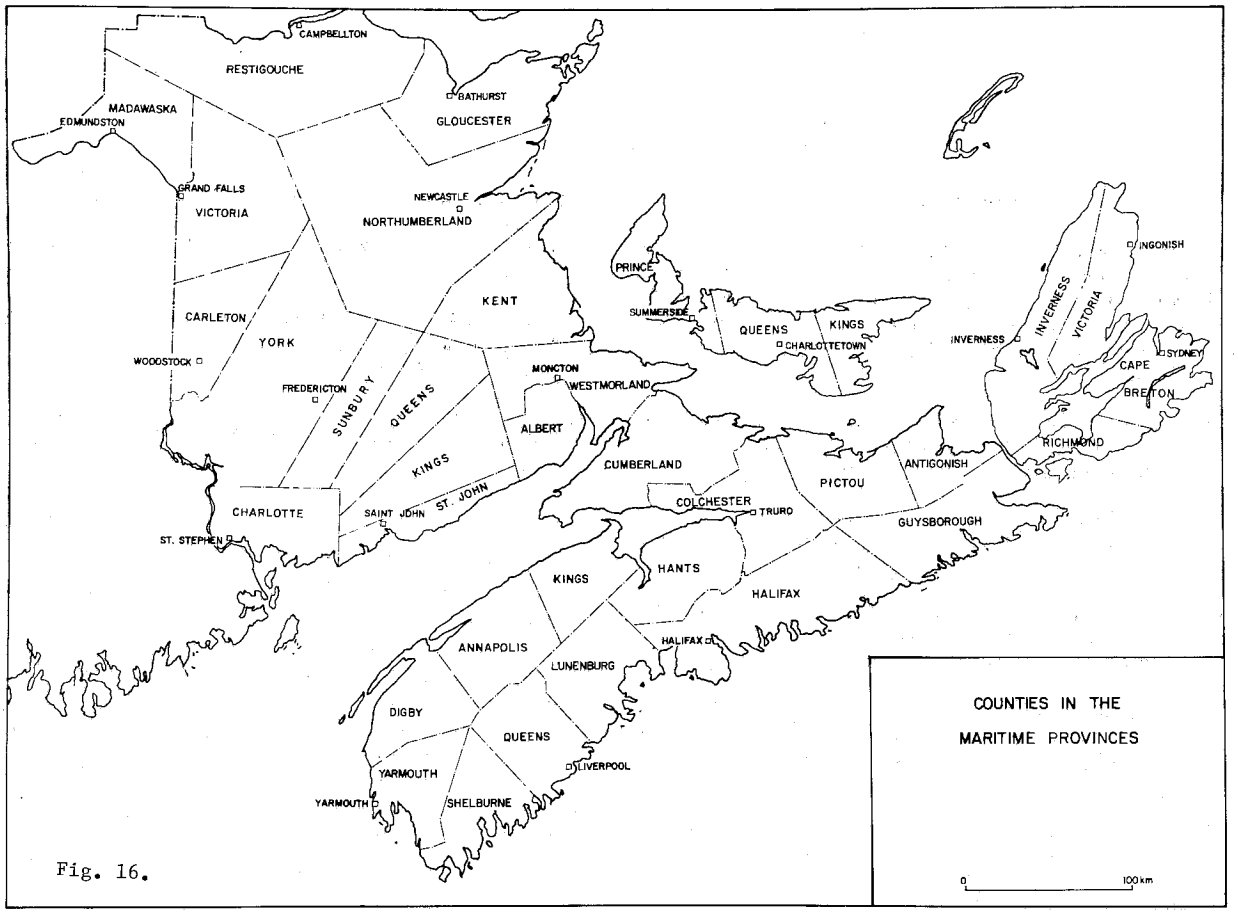

CAMPBELLTON
RESTIGOUCHE
BATHURST
MADAWASKA
EDMUNDSTON
GLOUCESTER
GRAND FALLS
VICTORIA
NEWCASTLE
NORTHUMBERLAND
PRINCE
INGONISH
KENT
SUMMERSIDE
QUEENS
KINGS
CHARLOTTETOWN
INVERNESS
VICTORIA
CARLETON
YORK
WOODSTOCK
MONCTON
WESTMORLAND
FREDERICTON
SUNBURY
QUEENS
KINGS
ALBERT
CAPE
BRETON
SYDNEY
CUMBERLAND
ANTIGONISH
RICHMOND
PICTOU
CHARLOTTE
SAINT JOHN
ST. JOHN
COLCHESTER
TRURO
ST. STEPHEN
GUYSBOROUGH
KINGS
HANTS
HALIFAX
ANNAPOLIS
HALIFAX
LUNENBURG
DIGBY
QUEENS
LIVERPOOL
YARMOUTH
YARMOUTH
SHELBURNE
COUNTIES IN THE
MARITIME PROVINCES
0
100 km

Fig. 16.

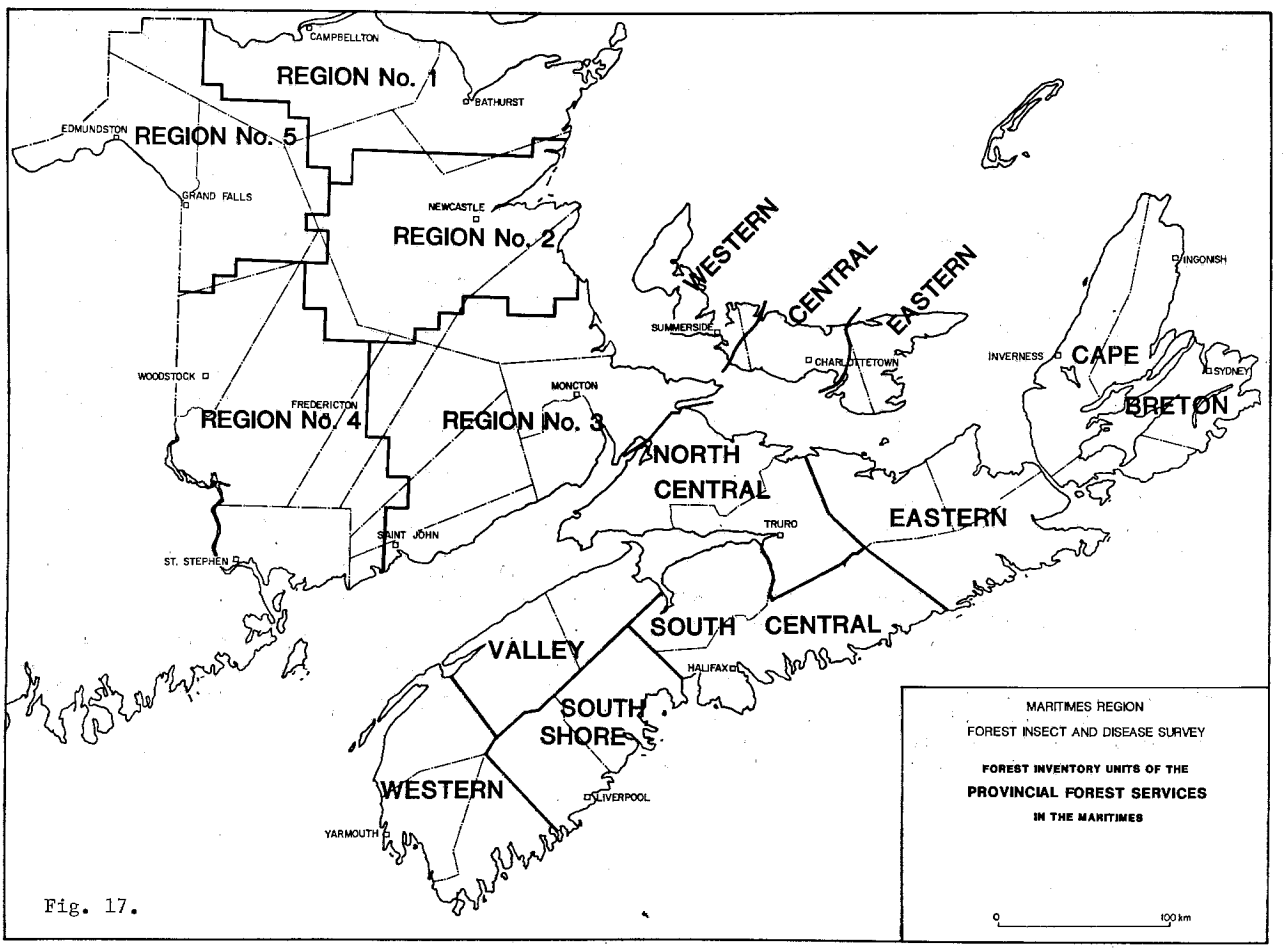

CAMPBELLTON
REGION No. 1
BATHURST
EDMUNDSTON
REGION No. 5
GRAND FALLS
NEWCASTLE
REGION No. 2
WESTERN
CENTRAL
EASTERN
INGONISH
SUMMERSIDE
INVERNESS
CAPE
BRETON
SYDNEY
CHARLOTTETOWN
WOODSTOCK
FREDERICTON
MONCTON
REGION No. 4
REGION No. 3
NORTH
CENTRAL
TRURO
EASTERN
SAINT JOHN
ST. STEPHEN
SOUTH CENTRAL
VALLEY
HALIFAX
SOUTH
SHORE
WESTERN
LIVERPOOL
YARMOUTH
MARITIMES REGION
FOREST INSECT AND DISEASE SURVEY
FOREST INVENTORY UNITS OF THE
PROVINCIAL FOREST SERVICES
IN THE MARITIMES
0
100 km

Fig. 17.

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van Raalte, G.D. 1981. What happened to all the trees (a postmortem on predictions of tree mortality on Cape Breton Island). M.F.R.C. Technical Note No. 41

OTHER INSECTS AND DISEASES

This table lists, alphabetically by common name, most insects and diseases encountered in the Maritimes in 1981 not discussed in detail. Inclusion in the table does not imply that the organism is necessarily of lesser economic importance than those discussed in the text. It may be that an organism, e.g., whitemarked tussock moth, is at an ebb of its cyclical activity and did not cause enough concern in 1981 to warrant detailed discussion. It may be that although "severe, an organism, e.g., balsam gall midge, was only of localized importance in 1981.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Alder flea beetle *Altica ambiens alni* Harr.	Alder	Maritime Provinces	In Nova Scotia, leaf browning was again moderate to severe in Kings, Hants, Queens, Lunenburg, Annapolis and Cumberland counties, but reduced in intensity and incidence in the remaining parts of the mainland. In Prince Edward Island, severe browning occurred in Kings and Queens counties. In New Brunswick, leaf browning was moderate in a 10-ha area in Charlotte County.
Ambermarked birch leafminer *Profenusa thompsoni* (Konow)	White Birch Wire Birch	New Brunswick	The insect, not recorded in recent years, in 1981 caused severe browning of up to 95% of white birch leaves near Union Brook, Restigouche County and up to 75% browning at Jardine Brook, Victoria County. It was also found on white birch at Trudel, Gloucester County and on wire birch at Aldouane, Kent County.
Anthracnose of maple *Kabatiella apocrypta* (Ell. & Ev.) Arx	Sugar maple Red maple	New Brunswick	Severe foliage discoloration occurred in several 250-300-ha sugar maple stands in Victoria County, often on hilltops. Sugar maple was also affected in Albert and Queens counties and red maple in southern York County.
Armillaria root rot *Armillaria mellea* (Vahl ex Fr.) Kummer	Balsam fir Jack pine Red pine White spruce	Maritime Provinces	The disease is becoming more common, associated with spruce budworm weakened trees (See: spruce budworm, Nova Scotia - Damage). The fungus was strongly implicated in an area of blowdown in Victoria County, N.B. (See: Secondary organisms after blowdown). Elsewhere the disease killed a few trees at scattered locations in plantations and in ornamental settings.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Ash rust *Puccinia sparganioides* Ell. & Barth	White ash	Nova Scotia	Moderate or severe infection occurred, associated with twig and branch mortality, on ornamental trees in the towns of Lunenburg and Shelburne. No ash rust was found in Prince Edward Island in 1981.
Aspen leaffolder *Phyllocolpa bozemani* (Cooley)	Trembling aspen	New Brunswick	Found widespread in areas of Kings and Northumberland counties.
Aspen leafrollers *Acleris nigrolinea* Rob. *Anacampsis innocuella* Zell. *Choristoneura conflictana* (Wlk.) *Choristoneura rosaceana* (Harr.) *Clepsis persicana* Fitch *Compsolechia niveopulvella* Chamb. *Epinotia nisella criddleana* Kft. *Epinotia solandriana* L. *Pseudexentera oregonana* Wlshm. *Sciaphila duplex* Wlshm.	Trembling aspen	Maritime Provinces	A group of species which, with other insects such as leaffolders, leaftiers and the forest tent caterpillar, contributed to stress on the trees in many parts of the Region. In New Brunswick, varying degrees of leaf rolling occurred throughout most of the Province. Up to 60% of the leaves were rolled in parts of Sunbury, Queens, Kings and Westmorland counties. Leaf rolling was much reduced from 1980 levels in both Nova Scotia and Prince Edward Island. *Pseudexentera oregonana* and *Sciaphila duplex* were the most commonly occurring species of the group in 1981.
Aspen webworm *Tetralopha aplastella* (Hlst.) and Lesser aspen webworm *Meroptera pravella* (Grt.)	Trembling aspen	Maritime Provinces	See: Forest tent caterpillar
Balsam bark weevil *Pissodes dubius* Rand.	Balsam fir	Maritime Provinces	The insect was common in dead and dying trees in many areas of the region (See also: Secondary insects and root rot after blowdown).
Balsam fir aphid *Cinara* sp.	Balsam fir	Nova Scotia Prince Edward Island	Populations were low in Christmas tree plantations throughout mainland Nova Scotia. A few insects were found in a small area of wild young trees in Queens County, P.E.I.
Balsam fir bark beetle *Pityokteines sparsus* (Lec.)	Balsam fir	Maritime Provinces	The insect was common in dead and dying trees in many areas of the Region (See also: Secondary insects and root rot after blowdown).

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Balsam gall midge *Paradiplosis tumifex* Gagné	Balsam fir	Maritime Provinces	The insect was present throughout New Brunswick with most of the localized high infestations in the central and eastern part of the Province. In some areas, up to 44% of the new needles were affected. Populations were generally low in Nova Scotia and Prince Edward Island.
Balsam twig aphid *Mindarus abietinus* Koch.	Balsam fir	Maritime Provinces	Populations, as expected, were low throughout the Region except for a few minor localized infestations, one in Queens County, N.B., another in Annapolis County, N.S.
Balsam woolly aphid *Adelges picea* (Ratz.)	Balsam fir	Maritime Provinces	Populations were generally low in Nova Scotia, Prince Edward Island, and eastern New Brunswick in natural stands. Serious damage occurred, however, in some balsam fir Christmas tree stands in areas of Nova Scotia. In Queens County, a 122-ha stand was moderately affected by "gouting"; in Lunenburg County, 25% of the trees suffered severe and 75% light to moderate shoot damage in a 25-ha area.
Birch casebearer *Coleophora serratella* (L.)	White birch	Maritime Provinces	Population levels and subsequent foliage browning was generally lower than in 1980 in the Region. Severe discoloration occurred in only two areas in New Brunswick, near Pennfield, Charlotte County and east of Woodstock, Carleton County. In Nova Scotia, discoloration was severe in small areas of Inverness and Cape Breton counties, moderate in patches in Antigonish, Pictou, Annapolis, Lunenburg, Inverness and Cape Breton counties. In Prince Edward Island, severe or moderate discoloration was common in "patches" throughout, except in southeast Queens County.
Birch leafminer *Fenusa pusilla* (Lep.)	Grey birch White birch	Maritime Provinces	Populations and discoloration were somewhat reduced from 1980 levels. Severe and moderate leaf browning of mostly grey birch occurred in many areas of southern New Brunswick and in Gloucester County in that Province, in the eastern half of the Annapolis Valley and in the northwestern mainland in Nova Scotia and in western Prince Edward Island. White birch was mostly affected in Kings County, P.E.I.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Bronze birch borer *Agrilus anxius* Gory	White birch	Maritime Provinces	The insect was common in areas of deteriorating white birch. Infested or dead trees were found in 1981 at several locations in all three provinces. In New Brunswick, 24% of trees in a group of 25 trees were killed by the beetle near Popple Depot, Northumberland County, 21% mortality occurred at Lisson Settlement, Kings County and infested trees were found on Campobello Island. Tree mortality was recorded in Queens and Prince counties, P.E.I. Infested trees were found in Pictou and Cumberland counties, N.S.
Bruce spanworm *Operophtera bruceata* (Hulst)	Apple Elm Linden Oak Red maple Sugar maple Trembling aspen	Maritime Provinces	The insect was present at very low population levels at scattered locations on aspen and maple in New Brunswick, on apple, elm, and oak in Nova Scotia, often in mixed populations with winter moth, and on elm and linden in Prince Edward Island, where it also occurred with the winter moth.
Cherry blight	Pin cherry	Maritime Provinces	Leaf browning was common throughout the region at variable levels of intensity.
Cherry casebearer *Coleophora pruniella* Clem.	Trembling aspen	Prince Edward Island	Noticeable leaf browning occurred only at one location in each of Kings and Queens counties, P.E.I. Elsewhere in the Province population levels were much reduced from 1980.
Cedar leafminers *Argyresthia aureoargentella* Brower; *Argyresthia freyella* Wlshm; *Argyresthia thuiella* (Pack.) *Pulicalvaria thujaella* (Kft.);	Cedar	Prince Edward Island Nova Scotia	In Prince Edward Island, the infestations near Muddy Creek and west of Miscouche, Prince County continued in essentially the same 2000-ha area as reported previously. Branch mortality increased and the deterioration of trees progressed in 1981. Ornamental trees suffered leaf browning, often associated with winter drying, in some communities in Colchester, Pictou, and Halifax counties, N.S.
Douglas fir needle blight *Rhabdocline pseudotsugae* Syd. and	Douglas fir	New Brunswick	First record in the Maritimes for both fungi. Severe needle discoloration, then needle drop occurred in all five plantations examined. Damage was caused by *R. pseudotsugae* at St. Davids Ridge (continued)

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Douglas fir needle cast *Phaeocryptopus gaumanni* (Rohde) Petr.	Douglas fir	New Brunswick	(2 ha) and Moores Mill (0.25 ha) in Charlotte County, Fawcett Hill (200 trees) Westmorland County and on a few ornamental trees in Moncton, by *P. gaumanni* at St. François (0.5 ha) Madawaska County and Kingston (100 trees) Kings County.
Eastern spruce gall adelgid *Adelges abietis* (L.)	White spruce	New Brunswick Nova Scotia	Galls caused by this insect were observed at several locations in Victoria, Sunbury, Kings, Westmorland and Kent counties. The frequency of galls varied by locality. Plantations, ornamentals, and wild trees were found affected. The insect was reported from only one location in Antigonish County, N.S.
Eastern tent caterpillar *Malacosoma americanum* (F.)	Pin cherry Apple Birch	Maritime Provinces	The insect was present in most of New Brunswick, with the exception of the northern counties, and caused varying degrees of defoliation, mostly on roadside bushes and on ornamental trees in populated areas. Nests were numerous especially in the southwestern part of the Province and in the Cumberland Bay area of Queens County. In Nova Scotia, the insect was widespread on the mainland but populations were lower than in 1980. The highest populations were observed in Lunenburg County. In Prince Edward Island, nests were seen at six widely separated locations.
Elm leafminer *Fenusa ulmi* Sund.	English elm	Maritime Provinces	Leaf browning was severe or moderate in many communities where exotic elms are prevalent on mainland Nova Scotia, in Prince Edward Island, and in Westmorland County, N.B. Twig and branch dieback occurred in all provinces as a result of repeated heavy attacks.
European pine sawfly *Neodiprion sertifer* (Geoff.)	Red pine	Prince Edward Island	First record of the insect in Prince Edward Island at Brookvale, Queens County. The only location in the Region where the insect was found in 1981.
European pine shoot moth *Rhyacionia buoliana* (Schiff.)	Scots pine Jack pine	Maritime Provinces	Extremely low temperatures caused high overwintering larval mortality almost eliminating the insect from many previously badly damaged plantations. As a result, good shoot growth occurred throughout the Region, including Lunenburg County, N.S., where larval survival was highest.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Fall cankerworm *Alsophila pometaria* (Harr.).	Elm Apple Oak Maple	Maritime Provinces	Present throughout the Region but the populations are generally low. Moderate or light defoliation occurred only in Fredericton, N.B. and in Inverness County, N.S.
Globose gall rust *Endocronartium harknessii* (J.P. Moore) Y. Hiratsuka	Jack pine	New Brunswick Prince Edward Island	Galls are common in some areas, numerous in many plantations and natural stands in New Brunswick, causing red flagging and branch mortality. This disease may be of some consequence in the future of plantation programs. One tree was reported infected at Woodbrook, Prince County, P.E.I.
Greenstriped mapleworm *Dryocampa rubicunda rubicunda* (F.)	Red maple	New Brunswick Nova Scotia	The populations of the insect were further reduced in 1981 in Westmorland County, in southern New Brunswick, and in Cumberland County, N.S. Defoliation of various levels occurred only on a few small scattered trees in these areas.
Ink spot of aspen *Ciborinia whetzelii* (Seaver) Seaver	Trembling aspen	New Brunswick Prince Edward Island	Leaf browning was common throughout southern and central New Brunswick in patches from a few trees to a few hectares. Intensity of browning was variable but in some areas in Sunbury and Queens County 75% of the leaves were infected. In Prince Edward Island, a few trees were infected in widely separated areas.
Jack pine budworm *Choristoneura pinus pinus* Free.	Jack pine	New Brunswick	Moderate and light defoliation occurred in some central and northeastern areas of New Brunswick. Over 2000 ha were affected in the Tracadie Artillery Range in Gloucester and Northumberland counties, over 100 ha west of Allardville, Gloucester County and south of Blackville, Northumberland County. A few insects were found in other areas in these and in Kings, Queens, St. John and Sunbury counties.
Larch casebearer *Coleophora laricella* (Hbn.)	Tamarack	Maritime Provinces	Populations were much reduced from 1980 levels and foliage browning was hardly noticeable even in areas where browning was severe or moderate in 1980. Moderate feeding occurred only at two locations in Prince Edward Island, in each case only a few trees were involved.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Larch sawfly *Pristiphora erichsonii* (Htg.)	Tamarack	Maritime Provinces	Populations were at the lowest level since 1958. No defoliation was observed even in the few areas of southwestern Nova Scotia where a trace of defoliation occurred in 1980.
Leaf and twig blight of aspen *Venturia macularis* (Fr.) E. Muell. & Arx.	Trembling aspen Largetooth aspen	Maritime Provinces	Both the incidence and severity of the disease was much higher than in 1980 throughout the region. Severe discoloration and shoot kill occurred on groups of young trees in Charlotte, York, Westmorland, Gloucester, Restigouche and Victoria counties, N.B. The disease was common but less intense in Nova Scotia and Prince Edward Island.
Leaf blotch of horse-chestnut *Guignardia aesculi* (Pk.) V.B. Stew.	Horse-chestnut	Maritime Provinces	Severe browning and premature leaf drop occurred in Shelburne, Digby, Yarmouth, Lunenburg, Hants, Colchester, Pictou and Cape Breton counties, N.S. Elsewhere in the region discoloration was light or moderate throughout the range of the host.
Leaf spot on maple *Phyllosticta minima* (Bert. & Curt.) Underw. & Earle	Sugar maple	New Brunswick	The severe browning reported in 1980 from Lawrence Station, Charlotte County did not reappear in 1981.
Maple leafroller *Cenopis acerivorana* MacK.	Red maple Sugar maple	Maritime Provinces	Leaf rolling by the insect increased markedly in Nova Scotia in 1981 on red maple and to a lesser degree on sugar maple. The highest infestations occurred in Victoria, Inverness and Pictou counties. As much as 50% of the leaves were rolled in some areas of Cape Breton Highlands National Park. Populations were reduced from 1980 levels in Prince Edward Island and, for a second consecutive year, in New Brunswick. The highest counts, on red maple, were 32% near Alberton, P.E.I. and 31% in Fundy National Park, N.B. Branch mortality is evident in many areas of heavy repeated leaf rolling in all three provinces.
Mountain-ash sawfly *Pristiphora geniculata* (Htg.)	Mountain-ash	Maritime Provinces	Varying levels of defoliation occurred throughout the region on single or on small groups of trees.
Nectria canker *Nectria cinnabarina* (Tode ex Fr.) Fr.	Norway maple	New Brunswick	The canker was associated with frost cracks or in some cases other wounds on most Norway maple trees planted about 8 years ago in some sections of Fredericton. Cankers were extensive and trees suffered crown dieback.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Needle cast *Lirula macrospora* (Hartig) Darker	Black spruce	New Brunswick	Up to 75% of the older needles were discolored on a group of about 50 trees in a plantation near Black Brook, Victoria County.
Needle rust *Pucciniastrum* spp.	Balsam fir	New Brunswick Nova Scotia	Needle discoloration occurred at scattered locations. Infections were usually light except in Fundy National Park, N.B. where moderate to severe yellowing of needles was common on young trees.
Needle rust *Coleosporium asterum* (Diet.) Syd	Jack pine	New Brunswick	Most older needles were infected and yellow in a plantation at Hectors Brook, Queens County.
Oak leaftier *Psilocorsis quercicella* Clem.	Red oak	New Brunswick Nova Scotia	Skeletonizing of oak leaves, with up to 20% of the leaves affected, was observed in Queens, Lunenburg and Annapolis counties, N.S. and in a small area north of Milltown, Charlotte County, N.B.
Pine tortoise scale *Toumeyella parvicornis* (Ckll.)	Jack pine Red pine	New Brunswick Nova Scotia	The infestation at Despres Lake, Northumberland County, N.B. first reported in 1978, continued in 1981. Jack pine tree mortality increased, tree vigor decreased from previous years. Red pine appears to have sustained less damage than in 1980. In Nova Scotia, a few red pines were seriously affected in a Christmas tree plantation near New Germany, Lunenburg County.
Poplar leafmining sawfly *Messa populifoliella* (Town.)	Carolina poplar Balsam poplar Lombardy poplar	New Brunswick	Severe or moderate leaf browning of Carolina, balsam, and Lombardy poplars occurred again in the Fredericton-Oromocto area and of balsam poplar at Glazier Lake, Madawaska County. Lesser discoloration also occurred in Charlotte, York, Northumberland, Gloucester and Restigouche counties. This insect is primarily a pest of ornamental trees and is reported here because of its aesthetic effect on trees.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Poplar serpentine leafminer *Phyllocnistis populiella* (Chamb.)	Trembling aspen	New Brunswick	A major infestation throughout northern and central New Brunswick caused leaves to turn a dramatic silver color in July. Large continuous areas of Madawaska, Restigouche, Gloucester, Northumberland and northern York counties were affected and in many locations 85 to 99% of the leaves were discolored. This was the second consecutive year of severe leaf mining over essentially the same areas.
Red pine sawfly *Neodiprion nanulus nanulus* Shedl.	Red pine	Nova Scotia	The infestation at Mt. William, Pictou County continued in 1981 and severe defoliation of red pine occurred in a 4-ha area. Moderate and severe defoliation of ornamental pines occurred at Truro. Elsewhere in the Region only a few larvae were found.
Roadside salt damage	Conifers	Maritime Provinces	Foliage reddening of varying degrees occurs perennially throughout the region as a result of winter salting operations along roads and highways. White pine is usually affected most.
Root collar weevils *Hylobius* sp.	Red pine Scots pine White pine White spruce	Maritime Provinces	The infestation at Brookvale, Prince County, P.E.I. continued, with about one-half of the number of trees in the less than 1-ha plantation affected. In Nova Scotia, 6% of white pine trees were affected in an area of Hants County and infested trees were found in Charlotte (Scots pine) and Carleton (white spruce) counties, N.B.
Satin moth *Leucoma salicis* (L.)	Silver poplar Carolina poplar Willow	Maritime Provinces	Severe or moderate defoliation of single or small groups of ornamental trees occurred throughout Nova Scotia and Prince Edward Island and in parts of Westmorland and Restigouche counties, N.B. The insect was not found in forest stands in the region in 1981.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Sawyer beetles *Monochamus* spp.	Balsam fir Jack pine	Maritime Provinces	Red flagging caused by adults feeding on balsam fir was common in areas of high insect populations. In a stand in Victoria County, N.B., 30-40 red flags were counted on some trees in a 2-ha area. Jack pine trees were under attack by the beetles, in Queens and Albert counties, N.B. Some tree mortality occurred in the latter area. (See also: Secondary insects and root rot after blowdown.)
Secondary insects and root rot after blowdown	Balsam fir	New Brunswick	A severe blowdown, resulting from a windstorm in October 1976 in Victoria and Restigouche counties provided the conditions for a build-up of beetle populations and subsequent damage to the remaining trees by these insects. Deteriorating balsam fir stands were examined in Victoria County, along the Plaster Rock - Renous Highway, in 1981. Counts showed that 42% of balsam fir trees (ave. DBH 16 cm) were dead and a further 23% were dying; 71% of the dead and 56% of the dying trees were infested by one or more species of insects (balsam bark weevil, sawyer beetle, balsam fir bark beetle). Shoestring root rot *(Armillaria mellea)* was present in 88% of the dead and 33% of the dying trees. (More information on these organisms can be found under their specific headings.)
Shoot blight *Sirococcus strobilinus* Preuss	Red pine	Nova Scotia	Trees in a 10-ha plantation at Debert, Colchester County suffered severe or moderate shoot mortality and the plantation was destroyed. The disease appears to be common in the Province in plantations but the spread and severity have not been determined. Only a few trees at one location were found infected in New Brunswick.
Spring cankerworm *Paleacrita vernata* (Peck)	Elm Apple	Nova Scotia	Moderate defoliation occurred only in parts of Kings County. The insect was found in association with the winter moth.
Spruce bud midge *Rhabdophaga swainei* Felt	White spruce Red spruce	Maritime Provinces	Populations of the insect were low in 1981. The insect was reported from 5 locations in New Brunswick, 3 in Prince Edward Island and from numerous locations in southwestern and central Nova Scotia but bud damage was very low.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Spruce coneworm *Dioryctria reniculelloides* Mut. & Mun.	White spruce Red spruce Black spruce Balsam fir	Maritime Provinces	Population levels remained low throughout the region in 1981. In New Brunswick, 18 of 22 collections were from Madawaska, Victoria, and Restigouche counties.
Spruce gall midge *Mayetiola piceae* (Felt)	White spruce	New Brunswick	At Tracyville, Sunbury County 25% of the trees in a 2-ha plantation suffered varying degrees of damage, and at Lower Little Ridge, Charlotte County most shoots were killed by the insect on a few trees in a 2-ha plantation.
Spruce spider mite *Oligonychus ununguis* (Jac.)	Red spruce Balsam fir White spruce	New Brunswick Nova Scotia	Severe foliage reddening, needle shedding, branch mortality, and 3% tree mortality occurred in two red spruce plantations at the Acadia Forest Experimental Station near Ripples, Sunbury County, N.B. as a result of sustained high populations of the insect in previous years. Moderate discoloration occurred in balsam fir Christmas tree plantations at Kincardine, Victoria County, N.B., at Tangier, Halifax County and at Piedmont, Pictou County, N.S. White spruce and red spruce were affected elsewhere to a lesser degree.
Summer storm	Hardwoods Conifers	Nova Scotia New Brunswick	Strong early summer winds, and possibly late frost caused severe foliage browning of hardwoods on mountain slopes in Inverness and Victoria counties, N.S. Storms occurred for the third consecutive year in this area. In New Brunswick, a severe windstorm in early July uprooted or broke pine, spruce, elm, and poplar trees in a 7-km^2 area at Cornhill, Kings County.
Twoleaf tier *Psilocorsis reflexella* Clem.	Trembling aspen	New Brunswick	Although the insect was present only at low populations and occurred along with other species, it did contribute to late summer browning of foliage which in many areas was the "second crop", following forest tent caterpillar defoliation. The insect occurred mostly in southcentral and eastern New Brunswick.
Whitemarked tussock moth *Orgyia leucostigma* (J.E. Smith)	Conifers Hardwoods	Maritime Provinces	The populations of this economically important forest insect remained extremely low throughout the region in 1981.

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
White pine blister rust *Cronartum ribicola* J.C. Fischer	White pine	Nova Scotia	In a 30-ha plantation by Perch Lake Road, Pictou County, on the site of a recent forest fire, 65% of the trees were either killed or infected by the fungus. Infection rate in a nearby plantation was only 2.2% in 1981.
White pine weevil *Pissodes strobi* (Peck)	White pine Norway spruce Jack pine Red pine Scots pine White spruce Red spruce	Maritime Provinces	Damage was widespread and serious, mostly on white pine and Norway spruce, but other species were also affected. In eastern New Brunswick, 35% of 370 white pine trees at 9 locations were damaged, at Gratton, Northumberland County, N.B., the incidence was 4%. The two most affected species are no longer planted in some areas because of the presence of the insect.
Willow blight *Venturia saliciperda* Nuesch	Willow	Maritime Provinces	Severe or moderate leaf browning occurred in all areas of New Brunswick, in 10 of 18 counties in Nova Scotia, and throughout Prince Edward Island. Both native and ornamental species, especially weeping willow, were affected.
Willow flea weevil *Rhynchaenus rufipes* (Lec.)	Bayleaf willow Hybrid poplar Lombardy poplar Silver poplar	Maritime Provinces	In New Brunswick, severe or moderate leaf browning occurred in Madawaska, Victoria, York, Charlotte, Sunbury, St. John, Westmorland, and Kent counties in 1981. Browning was significantly reduced in Victoria County from 1980 levels. In Nova Scotia, leaf browning was severe in Colchester, Hants, Halifax, Annapolis, Pictou, Antigonish, Guysborough, Inverness, and Cape Breton counties. In Prince Edward Island, browning was severe wherever bayleaf willow occurs.
Winter damage	Conifers Hardwoods	Maritime Provinces	The large-scale temperature fluctuation, an unseasonably mild February preceeded and followed by cold spells, caused extensive injury to some native and many exotic trees and shrubs. Late flushing of the foliage, bud kill, some twig mortality, and frost cracks were common on hardwoods and conifers (these also suffered reddening of the foliage from winter drying).

INSECT OR DISEASE	HOST(S)	LOCALITY	REMARKS
Winter drying	Conifers	Maritime Provinces	Low temperatures in December-January, followed by unseasonably mild weather in February and then a return to cold weather, undoubtedly contributed greatly to the wide occurrence of foliage reddening in the region. In Prince Edward Island, ocean salt spray compounded the discoloration.
Winter moth *Operophtera brumata* (L.)	Apple Elm Red oak Linden Norway maple Red maple	Nova Scotia Prince Edward Island	The insect was present at scattered locations throughout mainland Nova Scotia and in Prince Edward Island but in most places caused only light defoliation in 1981. Occasionally, it occurred in mixed populations with bruce spanworm, spring cankerworm, and fall cankerworm.
Winter storm	Scots pine	Nova Scotia	About 30% of the trees in two plantations in Pictou County were damaged by freezing rain and snow. Broken branches and broken tops were common and some trees were pushed over.
Yellowheaded spruce sawfly *Pikonema alaskensis* (Roh.)	White spruce Black spruce	Maritime Provinces	Populations were lower than in 1980. Small groups of trees suffered varying degrees of defoliation in Charlotte and Kings counties, N.B., Colchester, Pictou, Antigonish, Richmond and Inverness counties, N.S., Prince and Queens counties, P.E.I.