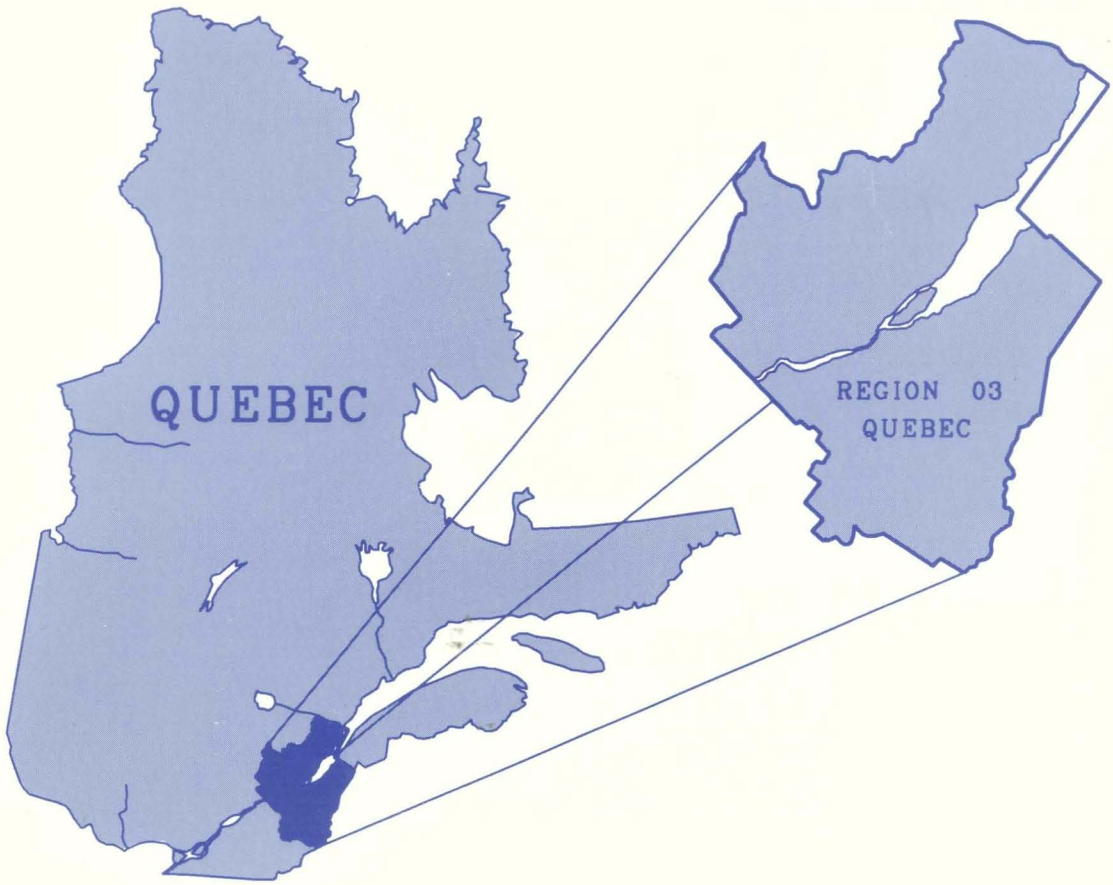
Forest insects and diseases in the Quebec region 1936-1988

Denis Lachance, Jean Thibault, and Claude Monnier
Quebec Region • Information Report LAU-X-97E



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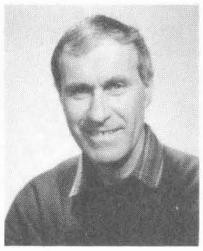
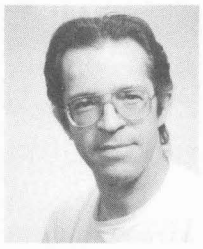


Denis Lachance

Dr. Lachance is head of a research project on the effects of environmental stresses on the forest. Previously, he was head of the F.I.D.S. unit, a pathologist for the unit, and a researcher studying rots on conifers and cankers on deciduous species. His involvement in studying maple decline led him to become the Canadian scientific coordinator of a joint United States-Canada project on maple decline, a project involving seven states and four provinces. Dr. Lachance's is a forestry engineer and obtained his doctorate in phytopathology from the University of Wisconsin.



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Mr. Monnier is a graduate of the Duchesnay forestry school. Most of his professional experience was at the LFC, where he was the head technician for the F.I.D.S. unit. He was responsible for the planning and administration of annual and special surveys, and his great interest in nature and the environment were still greatly in evidence when he retired from Forestry Canada in 1989.

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ABSTRACT

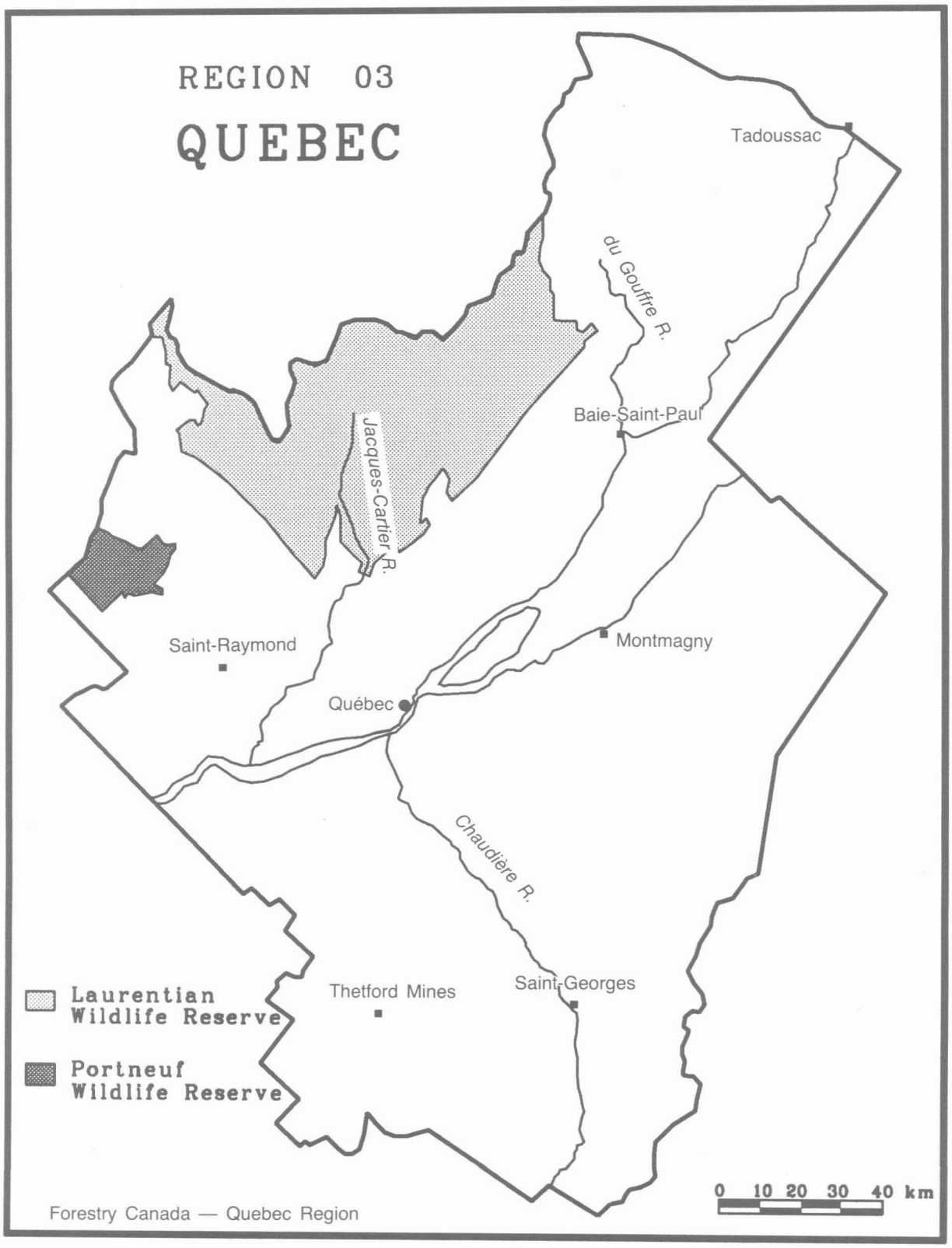
This is an exhaustive report of the forest insect and disease situation in the years between 1936 and 1988 for Quebec's Administrative Region 03. It presents an orderly synthesis of all observations made in the region. This report will enable foresters, researchers, and woodlot owners to better assess the importance of forest pests and the potential danger they represent, and to quickly find complete and precise information on problems that may appear in the region's forests.

The entomological and pathological problems are arranged in alphabetical order for each tree species, which are also in alphabetical order. There are nine maps indicating major problems, an alphabetical list of codes, and an index of both Latin and common names of pest species.

RÉSUMÉ

Ce rapport sur les insectes et les maladies des arbres couvre la région administrative de Québec (Région 03). Il résulte d'un examen exhaustif de la situation qui prévalait entre 1936 et 1988 et présente de façon ordonnée et synthétisée l'ensemble des observations récoltées dans la région. Ce document permettra aux forestiers, aux chercheurs et aux propriétaires de lots boisés de mieux évaluer l'importance et le danger potentiel que représentent les ravageurs forestiers, et de chercher rapidement une information complète et précise sur les problèmes qui peuvent se présenter dans les forêts de cette région.

Les problèmes entomologiques et pathologiques sont successivement regroupés par ordre alphabétique à l'intérieur des différentes essences, qui sont également présentées par ordre alphabétique. On retrouve de plus neuf cartes de la région qui illustrent les problèmes les plus importants rencontrés, une liste alphabétique des codes des essences et un index des noms communs et scientifiques (latin) des différentes espèces de ravageurs.


REGION 03
QUEBEC
Tadoussac
du Gouffre R.
Baie-Saint-Paul
Jacques-Cartier R.
Saint-Raymond
Montmagny
Québec
Chaudière R.
Thetford Mines
Saint-Georges
Laurentian Wildlife Reserve
Portneuf Wildlife Reserve
0 10 20 30 40 km
Forestry Canada — Quebec Region

INTRODUCTION

The forest has always been of great importance for Quebec; in the early days, the pioneers believed it was inexhaustible. Today, with the heavy demands made on it and the billions of dollars invested and generated as revenue, the forest is a natural resource which we must protect from many scourges. Among these are forest insects and diseases, many of which cause major damage. For example, during the current spruce budworm outbreak, more than 235 million cubic metres of wood have been destroyed in Quebec, resulting in losses that run into the billions of dollars.

In the late 1920s and early 1930s, vast expanses of spruce forest in eastern Canada were ravaged by insects. Reacting to these infestations, the Canadian government organized in 1936 a service known as the Forest Insect Inventory. The province of Quebec followed suit in 1938. Since then, innumerable surveys of both insects and diseases have been carried out in the forests, and the findings have been published in many annual or other reports.

After more than 50 years of forest insect and disease surveys, we believe that historical reports relating the entomological and pathological problems that have existed in the forests in various administrative regions of Quebec would be very useful to all who work in forest management and protection.

This report for Administrative Region 03 (Quebec) will enable foresters, researchers, and woodlot owners to better assess the importance of forest pests and the potential danger they represent, and to quickly find complete and precise information on problems that may appear in the region's forests. The ever-increasing use of trembling aspen and the reforestation of large areas in white spruce are two practices which will no doubt give rise to new protection problems.

This is an exhaustive report of the situation in the years between 1936 and 1988. It presents an orderly synthesis of all observations made in the Quebec Administrative Region. Our goal is to give readers an idea of the importance of the major pest organisms and the frequency with which they appear, and also to acquaint them with those that are relatively, or sometimes completely, harmless.

The chief source of data used in preparing this historical document was the data bank of the Forest Insect and Disease Survey unit (FIDS) at the Laurentian Forestry Centre (LFC). This bank has been accumulating data since 1952 when the Forest Biology Division of Agriculture Canada opened an entomology and forest pathology research laboratory in Quebec.

The chief publication consulted, in which FIDS results were reported, is the *Annual Report of the Forest Insect and Disease Survey*, a national publication first prepared by Agriculture Canada, beginning in 1936, and then by the Canadian Forestry Service from 1960 (note that the Canadian Forestry Service was replaced by Forestry Canada in 1988). From 1938 to 1951, the Government of Quebec Protection Service was the only source of information in Quebec for preparing this annual report. From 1952 to 1965, FIDS-LFC wrote this report with the cooperation of the Quebec Department of Lands and Forests. Subsequently, from 1966 to 1970, FIDS-LFC prepared the national report practically on its own. Since 1971, there has existed a regional annual report - Insectes et maladies des arbres Quebec -which was produced at first in cooperation with the Quebec Ministère de l'Énergie et des Ressources (MER), but which has been published jointly by FIDS-LFC and the MER's Insect and Disease Protection Service since 1976. This publication is now the chief source of information for preparing the national report.

To add to the historical value of this report and to its intrinsic value as a reference on insects and diseases in the region, we have included, when possible, data published before 1952 in various technical reports as well as other, more recent data that might complement our own.

EXPLANATORY NOTES

Presentation

The information is presented by species in order to facilitate consultation. When a species is secondary or uncommon, it has been included among the generic headings "Other coniferous species" or "Other deciduous species." In the same way, when a reported organism affects several species indiscriminately without showing any noticeable preference, it will be found under one or the other of the above headings, or under "Coniferous and/or deciduous species."

The entomological and pathological problems are arranged one after the other in alphabetical order for each tree species. Depending on the relative importance of a given pest, we have either dealt with it separately, introducing it with a few biological notes or some pertinent information, or else included it with other organisms in a table. Under each pest name in the tables, the years for which no information is given are those for which the data were not significant enough to be mentioned or for which we had no information. Each table is followed by a list of entomological and pathological organisms that have only been reported occasionally in the region or that cause little or no damage. On the other hand, in the case of certain organisms of major importance or special interest, we present maps showing the areas attacked in certain years.

The names of places mentioned in the text are drawn from recent road maps of the province of Quebec. Place names that appear in brackets "[ ]" are the names of municipalities that do not appear on the road maps, names that have changed since the time of the survey, or names of municipalities that no longer exist. Lakes and rivers, as well as certain communities, are identified by the census division to which they belong. Sometimes the census division is abbreviated ("CD") or simply placed in parentheses.

Damage assessment

The **damage assessment** terms used frequently in this report generally have the following meanings:

- For problems affecting tree foliage, i.e., insect infestation and defoliation, disease and climatic damage, the **damage assessment levels** are as follows:

low or light: when 10 to 25% of the foliage of the trees or the stand is affected;
moderate: when 26 to 65% of the foliage of the trees or the stand is affected;
high, or severe: when 66% or more of the foliage of the trees or the stand is affected.

- For problems relating to **insect populations**, the **same levels** are used, according to the potential defoliation or damage if their development is not interrupted by a natural cause.

- For problems affecting tree trunks, the damage or infestation **assessment levels** are:

low or light: when 2 to 5% of the trees in a stand are affected;
moderate: when 6 to 25% of the trees in a stand are affected;
high, or severe: when 26% or more of the trees in a stand are affected.

For further information on these damage assessment levels, contact the staff of the FIDS unit at the Laurentian Forestry Centre.

Nomenclature

All names of entities used in this document (municipalities, parishes, wildlife reserves, conservation parks, lakes, rivers, etc.) are drawn from the *Répertoire toponymique du Quebec 1987*. In the tables and lists, forest species names are abbreviated, with a few exceptions, in accordance with the codes suggested in *Forest Inventory Terms in Canada*. The abbreviations used appear in the appendix.

Tree names are drawn from *Native Trees of Canada* and insect names from the *Nomenclatura insectorum canadensium*, published by the LFC in 1985. For disease names, we have referred to *Names of plant diseases in Canada* and the *Compendium of plant disease and decay fungi in Canada.* Where these two differ, it is the latter that has been considered as the definitive source.

CONIFEROUS SPECIES

BALSAM FIR

INSECTS

Balsam twig aphid, *Mindarus abietinus* Koch

This aphid, which deforms new shoots and needles on balsam fir, has no significant effects on the forest. Steps must be taken, however, to control it in Christmas tree plantations.

Year	Remarks
1965	Relatively common on fir at Saint-Augustin (Portneuf).
1966	Insect common in the region.
1967	Decrease in populations in the region.
1972	Moderate to severe infestation in the Laurentian Wildlife Reserve and in the triangle between Saint-Sébastien (Frontenac), Saint-Ferdinand (Mégantic), and Saint-Pamphile (L'Islet). This was the first infestation of this size reported in Quebec.
1973	Populations returned to normal levels; however, insect still relatively abundant at Launière River (Montmorency).
1974	Decline continues in the region.
1975	Low population north of Disraëli (Wolfe).
1976	High populations at Lake Malbaie (Charlevoix-Ouest) and low populations at Saint-Julien (Wolfe).
1977	Population reduced to trace at Lake Malbaie, populations low at Lac des Neiges (Montmorency) and high at Saint-Julien.
1978	Highly localized and relatively uncommon in 1977, this aphid spread throughout the region, at levels varying from low to high. On the north shore, increase throughout the area, with up to 30% of shoots affected in certain locations. On the south shore, the percentage of shoots affected varied from 7 to 58% at Sainte-Agathe (Lotbinière), Saint-Méthode (Frontenac), Montmagny on Highway 283, and Saint-Aubert (L'Islet).
1979	Populations declined to near zero throughout the region.
1983	Sharp upsurge in populations to moderate and high levels in areas in the southern part of the region. Christmas tree plantations severely affected in Frontenac CD. Attacks varying from 20 to 100% with an average of 60% of shoots affected mainly in Lotbinière, Beauce, and Dorchester CDs.

BALSAM FIR

1984 Populations of this aphid declined in 1984. Only 2% of trees inspected were affected.

1985 Populations remained relatively stable compared to 1984. Major damage (moderate or severe) was present on as little as 3% of trees inspected. High populations were observed in Wolfe CD.

BALSAM FIR

Reddening of fir

In 1986, several foresters mentioned the presence of numerous reddened fir (Stillwell syndrome) scattered throughout the province. To determine the exact nature of this problem, the Forest Insect and Disease Survey unit of the Laurentian Forestry Centre surveyed 50 balsam fir stands throughout the province and established three study plots.

The results of this research have shown that the reddened fir, in most cases, were located in stands where the trees had experienced stress in recent years, particularly from the **spruce budworm**.

The main cause of the reddening of these fir is "secondary" insects that attack the stressed trees. Chief among these are the **whitespotted sawyer, the balsam fir bark beetle, the conifer ambrosia beetle, the striped ambrosia beetle, the balsam bark weevil,** and the **horntails** - all are xylophagous species that often proliferate in the wake of various scourges which strike the forests.

Galleries made by several of these species were observed on 97% of the reddened fir in the stands surveyed. One disease, **Armillaria root rot,** was also observed on 68% of the trees examined, but in most cases it did not seem to be the main cause of the problem. These data are for all stands surveyed in the province, but they are also valid, except for a few cases, for the Quebec region, where 11 sites were examined.

We anticipate that damage by the above insects and disease will continue in some decadent stands, especially those that have recently been attacked by the **spruce budworm**.

Insects reported:

Whitespotted sawyer	*Monochamus scutellatus* (Say)
Balsam fir bark beetle	*Pityokteines sparsus* (Lec.)
Conifer ambrosia beetle	*Trypodendron rufitarsis* (Kby.)
Striped ambrosia beetle	*Trypodendron lineatum* (Oliv.)
Balsam bark weevil	*Pissodes dubius* Rand.
Horntails	*Sirex* sp.

Fungus reported:

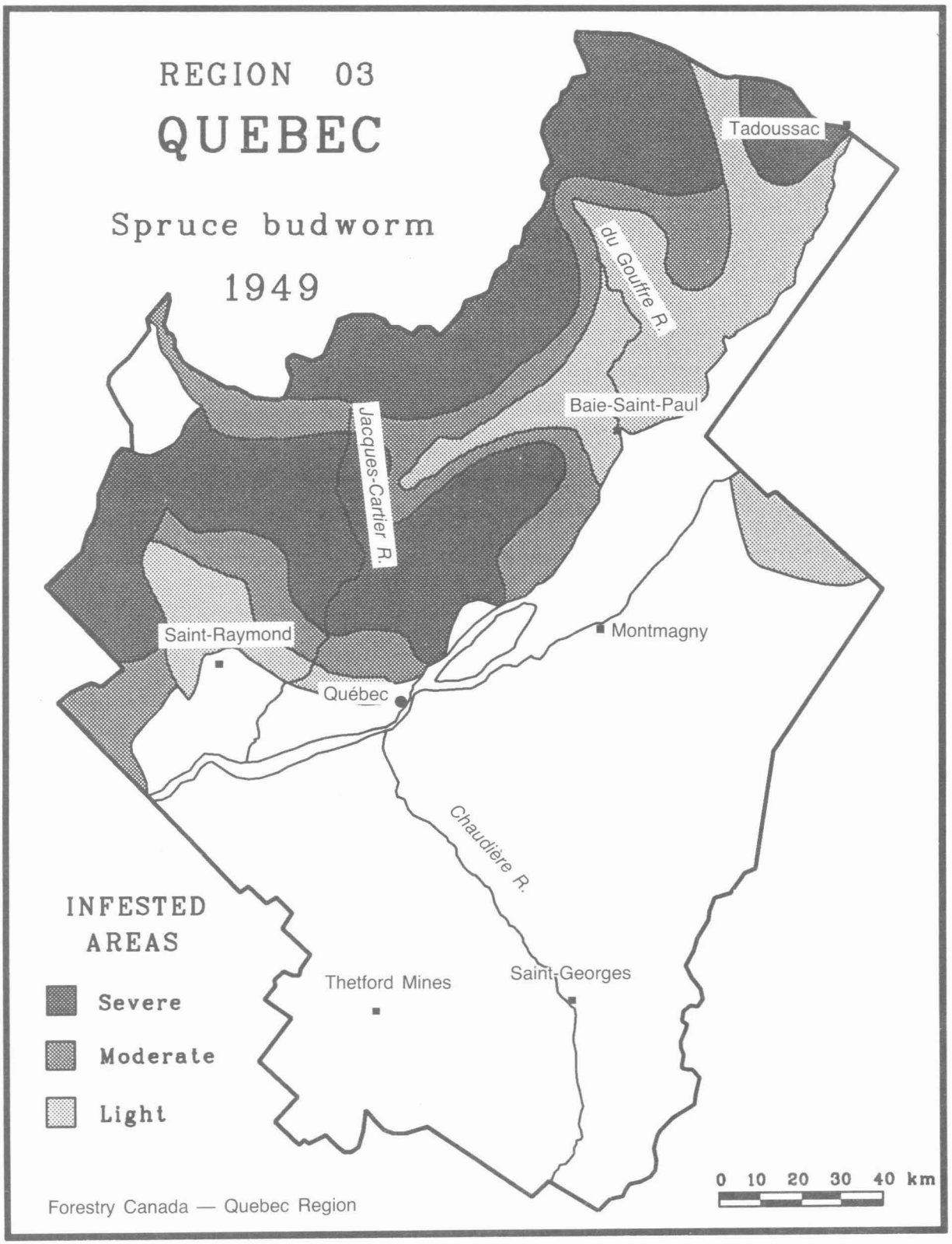
Armillaria root rot	*Armillaria* sp. complex

BALSAM FIR

Spruce budworm, *Choristoneura fumiferana* (Clem.)

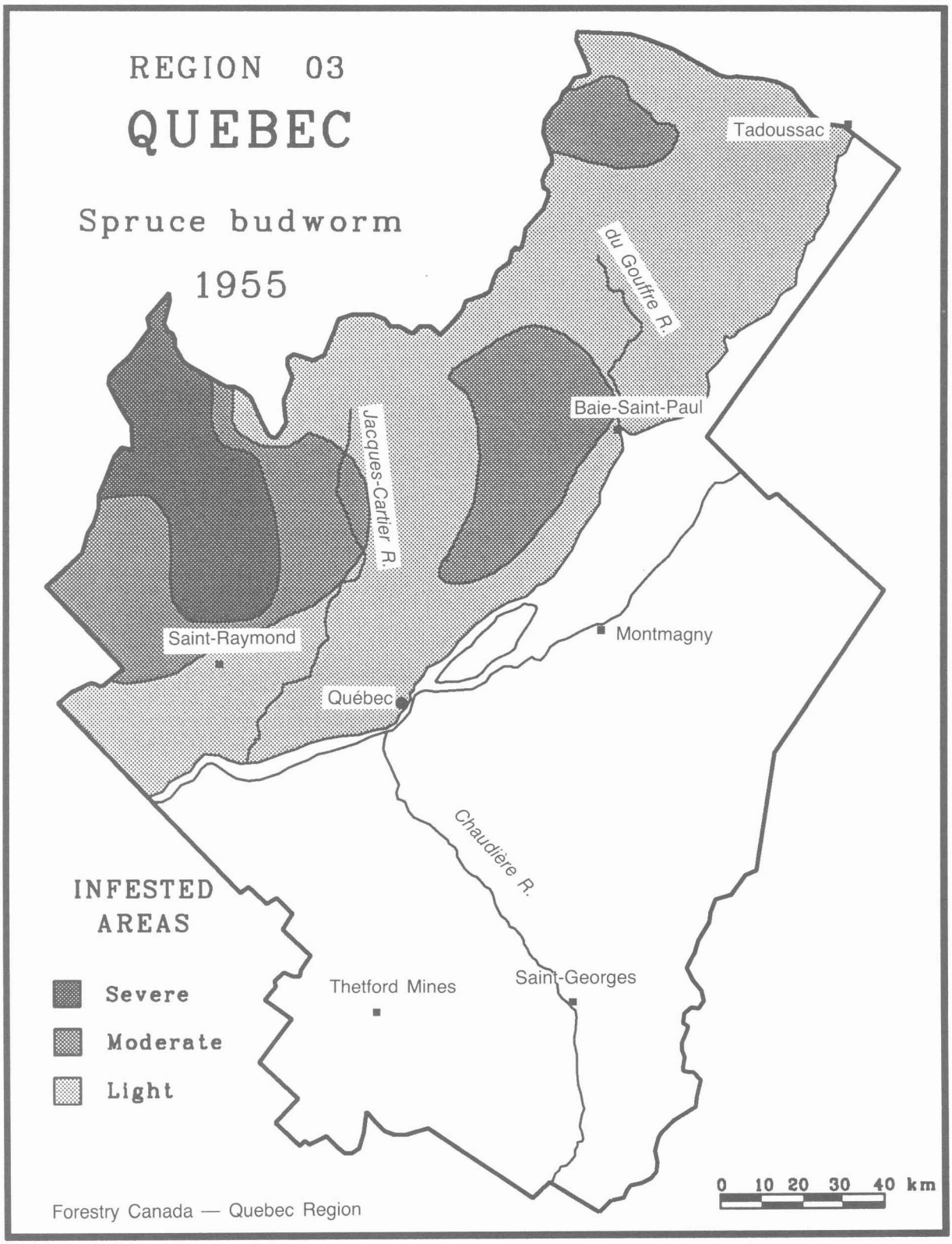
This indigenous insect is the most common pest in the forests of eastern North America. It has probably always caused severe defoliation and damage at different times in balsam fir and spruce stands. The populations of this budworm must be monitored constantly to prevent them from reaching an epidemic level.

Year	Remarks
1944	Low levels observed for the first time this year in the Laurentian Wildlife Reserve.
1945	Light infestation in all CDs on the north shore of the St. Lawrence.
1946	Sharp drop in intensity of infestation in the western part of the region.
1947	Populations at low levels in the northern part of the north shore of the St. Lawrence.
1948	Noticeable increase in population along the entire north shore. Moderate to severe infestation in the Laurentian Wildlife Reserve. Infestation beginning in L'Islet CD.
1949	Centre of epidemic extended to all CDs on the north shore. In this area, centres of contamination increased considerably and severe defoliation occurred, particularly in the Laurentian Wildlife Reserve and Portneuf and Quebec CDs. Early stages of infestation reported in L'Islet CD in 1948 again with moderate to high population levels (see map p. 11).
1950	Reduction in population in southern Portneuf and Quebec CDs. Considerable increase in remainder of the north shore area. Increase in natural death rate of insect before maturity, as well as the percentage of parasitization. A noticeable decrease in populations predicted for 1951. The south shore was almost completely spared.
1951	For the first time in 12 years, overall decline in infestation in the region, particularly on the north shore; however, severe defoliation and a certain degree of mortality was observed on fir in the Laurentian Wildlife Reserve.
1952	Noticeable reduction in population throughout the region. However, the percentage of mortality increased on the north shore.


REGION 03
QUEBEC
Spruce budworm
1949
Tadoussac
du Gouffre R.
Baie-Saint-Paul
Jacques-Cartier R.
Saint-Raymond
Montmagny
Québec
Chaudière R.
Thetford Mines
Saint-Georges
INFESTED AREAS
Severe
Moderate
Light
0 10 20 30 40 km
Forestry Canada — Quebec Region

BALSAM FIR

1953	Distribution of the insect approximately the same as in 1952. Population remained stable, except in a few sectors where a slight increase was reported, particularly in the far western part of the north shore.
1954	In general, conditions changed little in the course of the year except for a marked increase in populations in the northwestern part of the region with one sector of moderate to high level populations.
1955	A few centres of severe infestation continued to persist on the north shore of the St. Lawrence (especially in the northwestern part of the region). In former areas of infestation in the Laurentian Wildlife Reserve, mortality of fir continued to rise (see map p. 13).
1956	Infestation extended westward with moderate to high levels, remaining stable in the northern part of the region.
1957	Epidemic appeared to be declining throughout the region and moderate to severe infestation was only reported in the northern tip of the region.
1958	Significant reduction in population. Only slight defoliation was noted in the region.
1959	Regression begun in 1957 continued in the region.
1960-1966	Population endemic.
1967	Noticeable increase in distribution and population levels. Samples were taken from the following CDs: Portneuf, Lotbinière, Bellechasse, and Charlevoix-Est and Ouest.
1968	Samples were taken in Lotbinière CD, but no infestation was apparent. Early stages of epidemic nevertheless forecast for 1969.
1969	Light defoliation even though population seemed relatively high in certain locations. Beginnings of an epidemic suspected at Clermont (Charlevoix-Est).
1970	Population generally increasing. Limited centre of infestation near Cap-à-l'Aigle (Charlevoix-Est), where major defoliation forecast for 1971. Elsewhere, defoliation varied from trace to light.
1971	Overall increase in population. Spots of low to moderate infestation noted in the lower part of Gouffre, Malbaie, and Noire river basins (Charlevoix-Est and Ouest).
1972	Number of centres of infestation increased along the St. Lawrence River between Baie-Saint-Paul and Saint-Siméon (Charlevoix-Est and Ouest), where low population levels were found.
1973	Epidemic again progressing. New pockets of infestation appeared in far northern parts of Montmorency and Quebec CDs. Many egg masses found in


REGION 03
QUEBEC
Spruce budworm
1955
Tadoussac
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Severe
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the Sainte-Anne River basin (Portneuf). No noticeable increase in the Laurentian Wildlife Reserve. Slight increase at La Malbaie.

1974 Insect proliferated during this season with an unprecedented increase in defoliated areas observed throughout the region and elsewhere in Quebec. Moderate and severe defoliation in Portneuf CD as well as in a few isolated spots in the Laurentian Wildlife Reserve, at Valcartier, Sainte-Brigitte-de-Laval, Saint-Siméon, La Malbaie, and Saint-Hilarion. Defoliation from trace to light observed in Quebec, Montmorency, and Charlevoix-Ouest CDs. On the south shore, the highest population was in L'Islet CD.

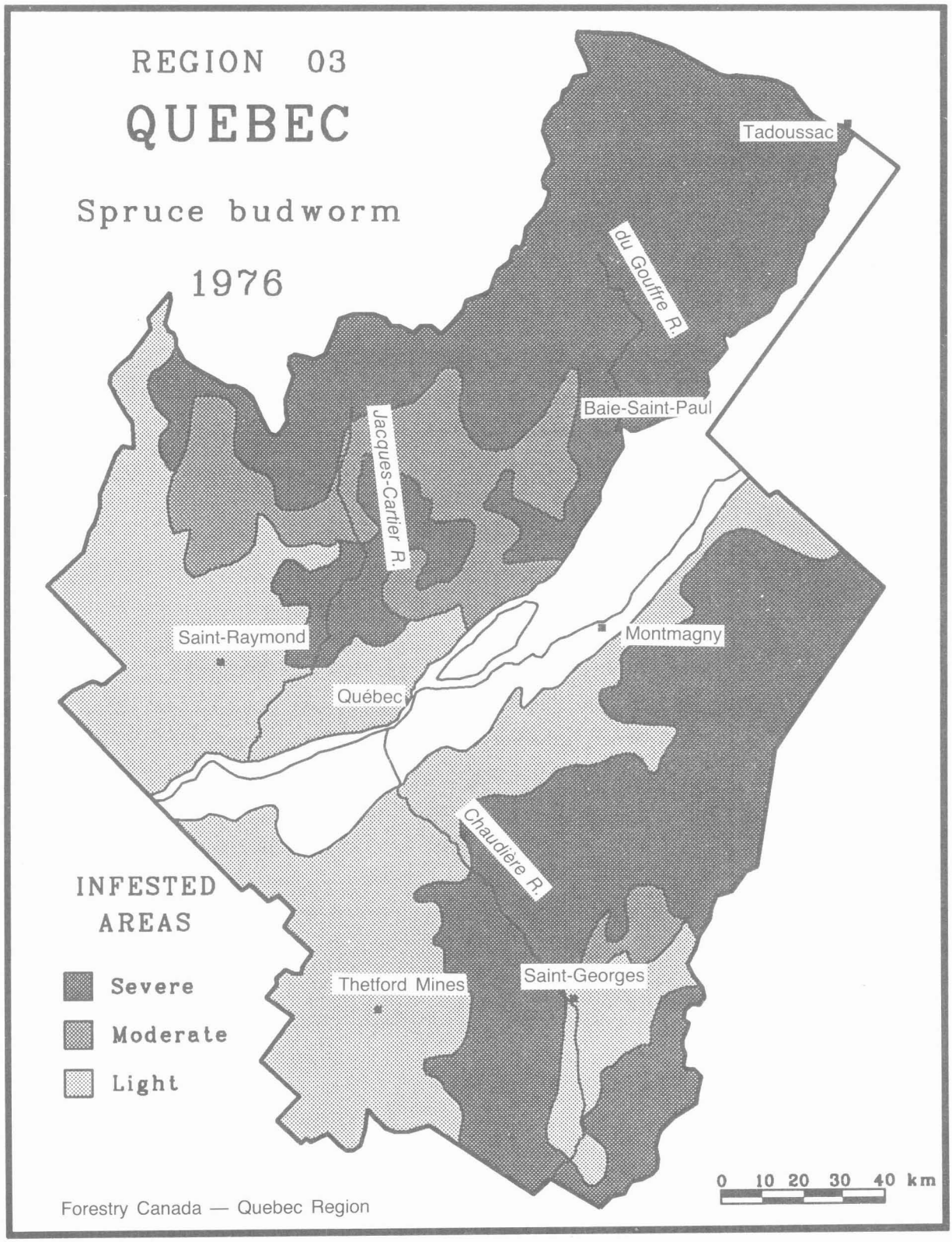
1975 Insect more abundant than ever before in the region. In certain sectors, larval population was so dense that some of them died of starvation. Widespread severe defoliation throughout the region. Major increase in populations in Montmorency Forest in the Laurentian Wildlife Reserve. Less abundant population forecast for 1976, but nevertheless expected to cause severe defoliation in the majority of locations.

1976 Signs of a weakening of the infestation beginning to be reported, and this exceptionally severe infestation appeared to have peaked the previous year. In general, population moderate to high all along the north shore, except in the southern part of Portneuf CD, where population was low, and on the southeastern part of the south shore (see map p. 15).

1977 Current infestation showed no significant change in 1977. Population remained moderate to high on the north shore except in Portneuf CD, and the northwestern part of Quebec and Montmorency CDs, where populations were low. On the south shore, stands situated in a strip approximately 60 km wide along the Maine border suffered generally severe defoliation.

1978 Overall decline in populations continued in 1978. The situation in the region had not changed significantly, compared to 1977. On the north shore, decrease in population in Portneuf CD, the northwestern part of Quebec and Montmorency CDs, but noticeable increase north of Saint-Raymond in the Laurentian Wildlife Reserve, where defoliation was very severe. Decline in the centre of the Laurentian Wildlife Reserve. On the south shore, population low to high in most of the area except in Lotbinière and Lévis CDs and in the extreme north of Bellechasse, Montmagny, and L'Islet CDs, where the insect was merely present.

1979 Major decline in populations in eastern part of the region in 1979 although damage increased in the Laurentian Wildlife Reserve. Defoliation moderate to high in a rectangle between Shannon, Lake Sainte-Anne (Quebec), Lac des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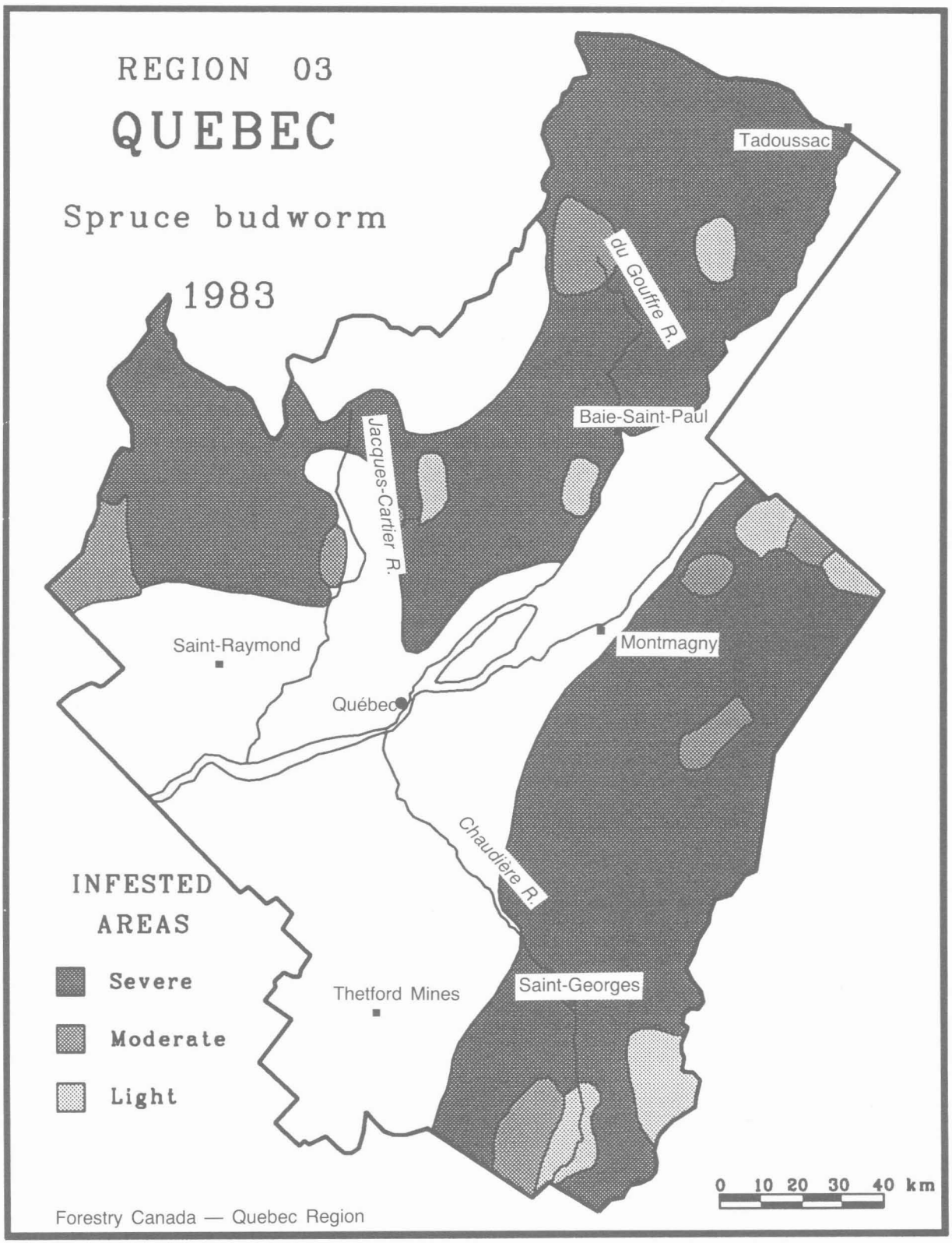
Alliés (Montmorency), and Saint-Tite-des-Caps, as well as in Saint-Hilarion area. The most affected area was that stretching from Lambton to the eastern tip of L'Islet CD along the slopes of the Appalachians near the Maine border.

1980 Populations were still regressing. Intensity of attacks remained severe in all of the area west of the Jacques-Cartier River. The eastern sector to the Saguenay River was less affected, although a strip approximately 30 km wide on the north shore of the St. Lawrence, between Saint-Tite-des-Caps and the Saguenay River, was severely attacked. In the south, low-level damage was observed west of the Chaudière River. The area along the Maine border as far as the eastern tip of L'Islet CD was again severely defoliated.

1981 Increase in populations in the eastern part of the region. Light defoliation in the western part of the Laurentian Wildlife Reserve, but moderate to severe in the eastern part and in a 30-km wide strip along the river between Mount Sainte-Anne and the mouth of the Saguenay. On the south shore of the St. Lawrence, starting at the Chaudière River, infestation decreased in intensity, but the infested area spread considerably eastward, as far as the Parke Reserve. A band of severe defoliation persisted further south, along the U.S. border, between the Chaudière River and the eastern tip of L'Islet CD.

1982 Spectacular regression of insect between Lake Saint-François and the Chaudière River in Beauce and Frontenac CDs. Intensity of attacks increased starting in Bellechasse CD and as far as the eastern boundary of L'Islet CD. On the north shore of the St. Lawrence, severe infestation in the Quebec region and mortality increased between Stoneham and Mount Sainte-Anne. In general, damage observed in 1982 was comparable to that of 1981 in the Laurentian Wildlife Reserve and in Charlevoix CD; however, a slight decline was observed at Saint-Féréol-les-Neiges and Saint-Tite-des-Caps (Montmorency) and at Baie Saint-Paul and Saint-Urbain (Charlevoix-Ouest).

1983 Another increase in populations in basically the same locations as last year and increased damage in the entire region. On the north shore of the St. Lawrence, the insect gained considerable ground between the western boundary of Portneuf CD and the Laurentian Wildlife Reserve, where infestation was at a high level. In the Laurentian Wildlife Reserve, only the central part and the area around the Malbaie River at the eastern tip had some relief. In the Quebec City area, the infestation was also more pronounced from l'Ange-Gardien on the Beaupré coast, taking in areas that escaped infestation in 1982: Saint-Féréol-les-Neiges, Saint-Tite-des-Caps, Baie Saint-Paul and Saint-Urbain. On the south shore of the St. Lawrence, almost all forest areas between


REGION 03
QUEBEC
Spruce budworm
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INFESTED AREAS
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Forestry Canada — Quebec Region

BALSAM FIR

Lake Saint-François and the Chaudière River were again infested by this insect, which caused major damage particularly around the Saint-François and Aylmer lakes. The insect also infested a number of private woodlots between the Chaudière and Etchemin rivers that so far had not been affected. No forest sector between the Chaudière River and the eastern tip of L'Islet CD escaped infestation (see map p. 17).

1984 Despite an overall decline in infestation, the budworm remained the single most serious insect problem of central Quebec. Populations remained high and the insect continued its invasion of farming areas on the north shore of the St. Lawrence between Saint-Casimir and Quebec City. In the Laurentian Wildlife Reserve, the insect spread to some extent, but damage was much less severe than in the previous year. The budworm was reported this year as far as the northern boundaries of Sainte-Catherine and the cities of Val Bélair, Charlesbourg, and Boischatel (Quebec). In the areas north and east of the Laurentian Wildlife Reserve as well as in forest areas located along the north shore of the St. Lawrence, between the municipalities of Ange-Gardien and Baie-Sainte-Catherine, damage was less severe than in 1983, with intensity decreasing from severe to moderate. West of the Laurentian Wildlife Reserve, the epidemic remained extremely virulent. Remarkable drop in populations all along the south shore from the Chaudière River as far as L'Islet CD. No defoliation in Montmagny and L'Islet CDs. Small centres of light to moderate infestation in Lotbinière, Beauce, and Mégantic CDs. Major damage on either side of Highway 20, between Val-Alain and Bernières. Moderate defoliation in Dorchester and Bellechasse CDs.

1985 Damage again severe over vast areas of the Laurentian Wildlife Reserve. However, the epidemic continued to regress south and east of the Laurentian Wildlife Reserve: sharp declines in population were reported along the north shore of the St. Lawrence, from Quebec City to Baie-Sainte-Catherine, and damage was less severe than in 1984, dropping from high to light intensity. Light infestation in the southern and western parts of Portneuf CD while the northern part experienced more serious damage. Grands-Jardins Park and areas along Highway 381 were under extremely virulent attack with stands of black spruce severely defoliated. Populations continued to regress on the south shore of the St. Lawrence, from Frontenac CD to the western boundary of L'Islet CD.

1986 Infestation continued to regress throughout the Quebec region. East of the Saint-Maurice River, the insect continued its regression in the Laurentian Wildlife Reserve; however, a major area of moderate defoliation was reported

in areas located south of lakes Batiscan and Sainte-Anne in the Laurentian Wildlife Reserve. The drop in populations was also particularly marked in Charlevoix CDs. On the south shore, sharp declines in populations of the insect were observed from the Eastern Townships to the Gaspé Peninsula. Damage was insignificant. Estimates of hibernating populations completely replaced egg mass surveys in 1986 as a means of forecasting population and damage levels for the following year.

1987 Major regression of spruce budworm in all of the region where a decrease in infestation has already been reported in 1986. Only a few pockets of defoliation were observed. Centres where the insect caused significant damage were located northwest of Baie-St-Paul. The drop in populations also continued in 1987 in the few pockets of light to moderate defoliation which had persisted in 1986 on the south shore of the St. Lawrence, between St-Jean-Port-Joli and the eastern tip of L'Islet CD. No defoliation was reported in this area in 1987.

BALSAM FIR

INSECT	YEAR	HOST	REMARKS
Balsam fir sawfly *Neodiprion abietis* (Harr.)	1947	BF	Decline in population in the region.
	1952	BF	Light defoliation at Sainte-Anne River near Quebec City.
	1953	BF	Light defoliation at Saint-Joachim (Montmorency).
Balsam gall midge *Paradiplosis tumifex* Gagné	1940	BF	Entire stands affected at Duchesnay.
	1976	BF	Population low at Kinnear's Mills (Mégantic) and at Sainte-Rose-de-Watford (Dorchester). Insect frequently observed in Beauce CD.
	1977	BF	Population moderate in nurseries and plantations at Baie-Saint-Paul.
Balsam shoot boring sawfly *Pleroneura brunneicornis* Roh.	1960	BF	Insect common on new fir shoots at Charlesbourg.
Common june beetle *Phyllophaga anxia* (Lec.)	1985	BF	Larvae destroyed a bed of young fir over ± 1 ha at Sainte-Clothilde (Beauce).
Hemlock looper *Lambdina f. fiscellaria* (Gn.)	1936 1987	BF	Populations endemic in the region.

BALSAM FIR

DISEASES

Needle cast, *Lirula mirabilis* (Darker) Darker

This disease of the foliage causes yellowing and then premature shedding of infected needles.

Year	Remarks
1959	Generalized infection on young balsam fir in a partially open stand at L'Épaule Lake (Montmorency). Mature trees were also infected in the vicinity.
1961	Infection on 100% of needles on annual growth on several 50-foot balsam fir along the Sainte-Anne River (Montmorency).
1965	High-level infections on a number of fir trees along the Sainte-Anne River (Montmorency).
1968	Low-level infection on balsam fir at Saint-Hilaire-de-Dorset and high levels at Lake Chartier in the Laurentian Wildlife Reserve.
1974	Low to high-level infection in Portneuf and Frontenac CDs.
1987	This disease, observed in natural forest, was infrequent but affected up to 75% of foliage of trees at Lake Valois (Montmorency).

BALSAM FIR

Needle rust, *Pucciniastrum epilobii* Otth

This disease affects only the needles of the current year. Balsam fir is the common host of this pathogen. White and black spruce are occasional hosts. The infected needles turn yellow and drop prematurely. Fructifications of the fungus (aecia) appear in the spring on the underside of the needles. It is at that time that the disease, which is at times significant, is most readily visible.

Year	Remarks
1966	Moderate infection in a small stand of balsam fir at Duchesnay.
1973	Moderate level on balsam fir foliage in Portneuf and Montmorency CDs.
1974	Rust causing light fall of needles, more active towards the southwest, in Montmorency, Dorchester, Lévis, and Wolfe CDs. In the latter, at Saint-Julien, over an area of 2 ha planted with fir, 30% of trees could not be used as Christmas trees because of this rust. This pathogen caused light damage on foliage of fir north of Saint-Raymond (Portneuf) and at l'Ange-Gardien (Montmorency). Moderate level of damage in Dorchester, Bellechasse, and Beauce CDs and at Saint-Raphaël (Bellechasse) and Sainte-Rose (Dorchester).
1975	Moderate level at Saint-Flavien (Lotbinière), Saint-Raphaël (Bellechasse), and Sainte-Rose (Dorchester).
1976	Noticeable decrease of this rust in 1976. Low levels at Sainte-Rose.
1980	Low-level infection in a natural forest developed for Christmas tree production at Saint-Jules (Beauce).

BALSAM FIR

Yellow witches'-broom, *Melampsorella caryophyllacearum* Schroet.

This disease results in the formation of witches' brooms, i.e., the localized proliferation of numerous small, thick twigs in the crowns of balsam fir. It is also found, though rarely, on white and red spruce. The disease is more spectacular than important.

Year	Remarks
1966	High-level infections, with over 20 brooms per tree, observed in a large proportion of balsam fir over ± 4 ha near Baie-Saint-Paul (Charlevoix-Ouest).
1970	No significant concentration detected in the region. Collections were mainly from Montmagny and L'Islet CDs.
1975	1 to 6% of trees affected in Beauce CD.
1976	Low level in Dorchester, Beauce, Frontenac, and L'Islet CDs
1977	Twigs affected by this disease in Dorchester, Bellechasse, Frontenac, and Beauce CDs.
1982	Light damage 41 km N.W. of Saint-Aimé-des-Lacs (Charlevoix-Est).
1983	In an 8 000-tree plantation of 7-year-old Christmas trees at Disraëli (Frontenac), 10% of trees had an average of two brooms per tree.

BALSAM FIR

ORGANISM	YEAR	HOST	REMARKS
Aleurodiscus canker *Aleurodiscus amorphus* (Pers.:Fr) Schroet.	1974	BF	Damage on 6% of saplings at Portneuf.
	1976	BF	Low to moderate-level infection in Montmorency CD.
Calicioposis canker *Caliciopsis pinea* Peck.	1977	BF	26% of trunks affected in a sample plot in the Jumeau area of the Laurentian Wildlife Reserve.
	1978	BF	6% of trees affected 30 km northeast of Sainte-Brigitte-de-Laval (Montmorency).
Dermea canker (crown death) *Dermea balsamea* (Peck) Seaver	1974	BF	Observed at Saint-Julien (Wolfe) and at Saint-Honoré (Beauce).
	1975	BF	Observed at Sainte-Rose (Dorchester).
	1976	BF	10 to 20% of trees affected at Lake Saint-Charles (Quebec), L'Épaule Lake (Montmorency), Saint-David (Lévis), and Sainte-Clothilde (Beauce). Most centres of infection of lesser importance were observed in Montmorency and Charlevoix CDs.
Needle cast *Bifusella faullii* Darker	1952	BF	Observed on young trees in the Quebec City area.
Needle cast *Isthmiella faullii* (Darker)	1968	BF	Low-level infection on 80% of regeneration at the Stoneham Darker gate and Lake Chartier in the Laurentian Wildlife Reserve.

BALSAM FIR

ORGANISM	YEAR	HOST	REMARKS
Needle cast *Lirula nervata* (Darker) Darker	1959	BF	Generalized infection on young trees at L'Épaule Lake. Mature trees were also infected in the area.
	1965	BF	Generalized infection on young trees near Lake Malbaie in the Laurentian Wildlife Reserve.
	1966	BF	Low-level infection on young trees in the Laurentian Wildlife Reserve.
	1968	BF	Low-level infections at Valcartier and several locations in the Laurentian Wildlife Reserve.
Needle cast *Lirula punctata* (Darker) Darker	1965	BF	Generalized infection on young trees near Lake Malbaie in the Laurentian Wildlife Reserve.
Needle cast *Phaeocryptopus nudus* (Pk.) Petr.	1978	BF	Low-level infections reported almost everywhere in the region.
Needle rust *Melampsora abieti-caprearum* Tub.	1986	BF	A number of plantations of Christmas trees in the region 75 to 100% affected at levels varying from trace to high.
Needle rust *Pucciniastum epilobii* Otth	1970	BF	Observed on almost all trees in small experimental plantations at Saint-Julien (Wolfe).
	1977	BF	Low-level infection at Saint-Isidore (Dorchester).

BALSAM FIR

ORGANISM	YEAR	HOST	REMARKS
Needle rust *Pucciniastrum geoppertianum* (Kuehn) Kleb.	1960	BF	Low to moderate levels of infection at Saint-Urbain and Saint-Étienne.
Needle rust *Uredinopsis osmundae* Magn.	1981	BF	Over 80 reports of light damage in Quebec and Portneuf CDs.
Snow blight *Phacidium abietis* (Dearn.) J. Reid & Cain	1963	BF	Fairly high incidence observed in Montmorency and Charlevoix CDs.
	1965	BF	Observed around Mont Bleu (Montmorency).
	1966	BF	High-level infestation on regeneration at a number of locations along the Sainte-Anne River (Montmorency).
		RS	Common on young trees at Duchesnay.
	1973	BF	30% of foliage affected on low branches of saplings in Portneuf CD.
	1977	BF	30% of foliage affected on regeneration at [Saint-Achillé] northwest of Sainte-Anne-de-Beaupré (Montmorency).
	1979	BF	Trace levels in Duchesnay nursery.
Snow blight *Phacidium infestans* Karst.	1956	BF	25% of trees infected out of a total of 2 617 in the southwestern section of the Laurentian Wildlife Reserve.
	1957	BF	25% of trees infected out of 4 830 in the same area.
	1959	S	Observed on seedlings in Valcartier nursery.

BALSAM FIR

ORGANISM	YEAR	HOST	REMARKS
Scleroderris canker	1966	BF	Observed at two locations in the Laurentian Wildlife Reserve.
Brunchorstia pinea (Karst.) Höhnel	1978	BF	30% of trees affected in a fir plantation in the Laurentian Wildlife Reserve.
Thyronectria canker	1974	BF	Observed at Saint-Julien (Wolfe), Saint-Honoré (Beauce), and Lake Larocque (Charlevoix-Ouest).
Thyronectria balsamea (Cooke & Peck) Seeler	1975	BF	Observed on another centre of infection at Sainte-Rose (Dorchester).
	1976	BF	Low-level infection in Montmorency Forest in the Laurentian Wildlife Reserve.
Twig canker	1968	BF	Frequent in Bellechasse and Dorchester CDs. In the latter, 60% of trees were affected in stands of 35- to 40-year-old balsam fir at Saint-Cyprès.
Fusicoccum abietinum (Hartig) Prill. & Del.			

EASTERN WHITE CEDAR

INSECT	YEAR	HOST	REMARKS
Brown cedar leafminer *Coleotechnites thujaella* (Kft.)	1968	EWC	Moderate browning of foliage in Montmagny and L'Islet CDs.
	1970	EWC	A few areas of moderate to severe browning were observed at Saint-Sébastien (Frontenac).
	1971	EWC	Population declining in the region.

EASTERN WHITE CEDAR

ORGANISM	YEAR	HOST	REMARKS
Needle blight	1964	EWC	Abundant on a few trees in plantations at Beaupré.
Didymascella thujina (Durand) Maire	1966	EWC	Infestation moderate on several trees at Stoneham and Pont-Rouge.
Phomopsis blight	1977	EWC	Trace to light damage on ornamental trees in the region.
Phomopsis juniperovora Hahn			

PINE

INSECTS

Northern pitch twig moth, *Petrova albicapitana* (Bsk.)

Damage from this insect is fairly severe in young Jack pine plantations. It causes deformation of the trees, but rarely leads to mortality.

Year	Remarks
1964	Population low in the region.
1966	Insect common throughout the region; recorded in plantations for several years. Many plantations were severely infested in Portneuf CD, for instance, at Sainte-Christine, in a number of 5 to 10-year-old plantations where 50% of trees to a maximum of 80% were affected.
1967	In all sectors, insect common in young plantations of Jack pine. One-year nodules less abundant than previous year.
1968	Moderate to severe infestations on young Jack pine in plantations at Neuville, Sainte-Catherine, and Sainte-Christine.
1969	Population steady at approximately the same level as in 1968. For the first time, the insect was reported on red and Scots pine at Lake Tremblant and north of Saint-Jovite.
1970	Distribution of insect general with populations high locally.
1971	Sampled in plantations in Beauce CD.
1972	In Jack pine distribution area in the region, severe local infestations were observed in both young and old stands. Major damage on up to 100% of trees reported in certain plantations.
1973	Samples of this pitch moth were collected in Portneuf CD.
1974	Light to moderate infestation in Portneuf and Quebec CDs; light attack in a plantation at Saint-Aimé-des-Lacs and at Saint-Zacharie (Dorchester).
1975	Less abundant than in 1974 with low-level populations on the north shore of the St. Lawrence.
1976	Presence of active nodules on branches at only two locations on the north shore of the St. Lawrence.
1980	Several trees affected in two plantations totalling 4 000 trees at Saint-Zacharie.

PINE

1982 General increase in population in plantations in Portneuf, Quebec, and Montmorency CDs. Level high in a plantation of 500 twelve-year-old trees, with an average of more than one nodule per branch at Pont-Rouge.

PINE

Pine needleminer, *Exotelia pinifoliella* (Cham.)

As its name indicates, this insect mines pine needles, particularly Jack pine. It may cause sporadic or localized damage on trees.

Year	Remarks
1961	Moderate to severe infestations in plantations of Jack pine south of the St. Lawrence River.
1964	Decline in population in the region south of the St. Lawrence River valley.
1968	Severe damage in plantations of Jack pine at Sainte-Christine (Portneuf).
1979	70% of needles affected on 70% of trees in a plantation of 20 000 Jack pine. A number of other plantations with low to high-level infections in Saint-Gilles sector (Lotbinière).
1980	Low-level infestation in a plantation of 1 500 trees at Saint-Gilbert (Portneuf). Infestations light to severe in plantations at Neuville (Portneuf). Severe infestation at Lyster (Mégantic).
1981	Major decrease in populations in many plantations affected in 1980 including those at Saint-Gilbert and elsewhere in the southern part of the region.

PINE

Pine wood nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle

Nematodes are tiny worms which are found nearly everywhere in the soil and water. Certain species can cause plant diseases and even kill trees. The **pine wood nematode** is generally found on moribund trees, often on trees that have been infested by insects such as the **whitespotted sawyer**, which is thought to be one of its vectors. The **pine wood nematode** especially parasitizes pines, but it may also attack any other coniferous species.

In 1985, after an embargo was imposed by European countries on our exports of logs and chips because of this nematode, Forestry Canada, then the Canadian Forestry Service, organized a special survey of the problem. This survey concentrated on balsam fir, mainly in northern and southeastern Quebec.

In 1986, another survey, dealing especially with pines, was expanded throughout Quebec. Both surveys demonstrated that the **pine wood nematode** is present in two forms in Canada: the so-called "mucronate" form, which is found chiefly on fir trees, and the "round" form, which usually occurs on pine.

The "mucronate" form has been found in several locations scattered throughout central and southern Quebec region while the "round" form has been collected from Scots pine at La Pocatière.

Studies are in progress in Canada on insect vectors of this nematode and on its biology in general.

PINE

Redheaded Jack pine sawfly, *Neodiprion rugifrons* Midd.

This native insect prefers Jack pine but may also attack red and white pine. Defoliation occurs mainly on the older needles of young pines. Infestations are generally short-lived and local.

Year	Remarks
1957	Low-level to high infestation at Saint-Hilarion (Charlevoix-Ouest).
1958	Significant decline in population in Settrington Township near Saint-Hilarion (Charlevoix-Ouest). Larvae severely parasitized.
1959	Noticeable increase in population in Settrington Township. Insect very common and causing light defoliation on Jack pine in neighboring sectors. Level of parasitization generally high.
1960	Noticeable decrease in population in Settrington Township (Charlevoix-Ouest). Level of parasitization high.
1961	Noticeable decrease in population at Saint-Urbain.
1963	Population lower, no major defoliation in Charlevoix-Ouest CD.
1966	Population steady at low level at Valcartier.
1967	Population generally low northwest of Quebec City and at Valcartier.

PINE

INSECT	YEAR	HOST	REMARKS
Eastern pine shoot moth *Eucosma gloriola* Heinr.	1967	JP	Light infestation in one plantation with 25% of annual growth affected at Sainte-Christine.
European pine needle midge *Contarinia baeri* (Prell)	1975	SP	Low-level infestation in Frontenac CD.
	1976	SP	Light defoliation on the south shore of the St. Lawrence.
	1977	SP, RP	Light defoliation at Sainte-Marguerite (Dorchester).
European pine sawfly *Neodiprion sertifer* (Geoff.)	1974	SP	One colony detected at Charlesbourg. First report in the region.
European pine shoot moth *Rhyacionia buoliana* (D. & S.)	1954	MP	First report in Quebec City and vicinity.
	1955-1966	MP	Population remained at a relatively low level due to severe parasite activity and unfavorable winter conditions in Quebec City and vicinity.
	1963	MP	Population relatively low at Plessisville.
Introduced pine sawfly *Diprion similis* (Htg.)	1977	EWP	Defoliation light to moderate on several large isolated trees at Saint-Antoine-de-Tilly.
Jack pine midge *Cecidomyia piniinopis* O.S.	1968	JP	Population low at Neuville, Sainte-Catherine, and Sainte-Christine. First report in the region.

PINE

INSECT	YEAR	HOST	REMARKS
Jack pine resin midge *Cecidomyia resinicola* (O.S.)	1968	JP	Moderate to severe infestation at Neuville, Sainte-Catherine, and Sainte-Christine. First report in the region.
	1978	P	Very common in plantations at Sainte-Anastasie (Mégantic), Val-Alain (Lotbinière), and Abénakis (Dorchester).
	1979	JP	Low populations in a few localities on either side of the river throughout the region. Damage common in many plantations and a few natural stands in Portneuf and Quebec CDs.
	1980	JP	Up to 10% of shoots reddened in a number of young plantations on the north shore of the river. Light damage on shoots but only in a few plantations on the south shore of the St. Lawrence.
Jack pine sawfly *Neodiprion pratti banksianae* Roh.	1959	JP	Infestation in a new location at Loretteville.
	1962	JP	Infestation at Saint-Urbain. First report from eastern Quebec.
	1964	JP	New distribution reported at Saint-Urbain and elsewhere in Charlevoix-Ouest CD.
	1965	JP	Population at trace level at Saint-Hilarion.
	1966	JP	Trace population at Valcartier and Saint-Hilarion.

PINE

INSECT	YEAR	HOST	REMARKS
	1983	JP	Light defoliation on several trees in a small plantation at Saint-Patrice-de-Beaurivage.
Northern pine weevil *Pissodes approximatus* Hopk.	1966	RP	Observed in young plantations
		JP	at Sainte-Christine and Saint-Basile.
	1975	RP	Population low in one plantation at Armagh.
	1976	RP	Level high in a plantation at Pont-Rouge.
	1977	RP	Light attack in a small plantation at Notre-Dame-des-Monts (Charlevoix-Est).
Nursery pine sawfly *Gilpinia frutetorum* (F.)	1966	SP	Low-level infestation at Saint-Gilles.
Pine bark adelgid	1960	EWP	Insect observed at Cap-Rouge.
Pineus strobi (Htg.)	1977	EWP	Average population on ornamental trees at La Guadeloupe (Frontenac).
	1978	EWP	Population low at Saint-Aimé-des-Lacs, Port-au-Saumon, Port-au-Persil (Charlevoix-Est). Almost half of trees were covered with adelgids at the rest stop at Inverness (Mégantic).
	1980	EWP	Level high at Saint-Adalbert (L'Islet).
Pine needle sheath miner *Zelleria haimbachi* Bsk.	1977	JP	Damage light to moderate in nurseries and plantations at Pont-Rouge. In one plantation at Neuville, 5 to 10% of shoots affected.

PINE

INSECT	YEAR	HOST	REMARKS
	1981	JP	25% of needles destroyed in a plantation of 2 000 trees at Sainte-Agathe (Lotbinière).
Pine rosette mite *Trisetacus gemmavitians* Styer	1977	RP	20% of branches on 80% of trees showing some bud spreading caused by this mite for several years now, at the Port-au-Saumon Centre Ecologique (interpretation centre) (Charlevoix-Est).
Pine tortoise scale *Toumeyella parvicornis* (Ckll.)	1950	JP	Severe attacks causing major damage north of Saint-Urbain.
	1968	JP	5% of trees affected at Sainte-Christine.
Redheaded pine sawfly *Neodiprion lecontei* (Fitch)	1973	RP	Insect observed more frequently than in 1972 in plantations in Beauce CD.
	1976	RP	A few attacks in plantations near Lake Saint-François (Frontenac).
	1980	RP	1 477 plantations visited by MER to determine health status; 67 were infested.
Swaine Jack pine sawfly *Neodiprion swainei* Midd.	1951	JP	Infestation decreasing in intensity in the Laurentian Wildlife Reserve.
	1971	JP	Low population levels in Charlevoix-Ouest CD.
White pine sawfly *Neodiprion pinetum* (Nort.)	1978	EWP	High population on a few isolated trees at Saint-Apollinaire.

PINE

DISEASES

Needle rust, *Coleosporium asterum* (Diet.) Sydow.

This disease especially affects young pines with clusters of two or three needles. The cream-colored fructifications of the fungus appear on infected needles in late spring or early summer. This is the characteristic stage of the disease, leading to early dropping of the infected needles, but apparently having little effect on tree growth.

Year	Remarks
1961	Infection of 100% of needles in a 6.5-ha plantation of Jack pine at Saint-Étienne (Lévis). Moderate infection in a 6-ha plantation of red pine and Jack pine at Saint-Édouard (Lotbinière). Low-level infection in a plantation of red pine and Jack pine at Valcartier and on Jack pine at Saint-Urbain (Charlevoix-Ouest).
1966	Low-level infection in plantations of red pine or Jack pine in Portneuf, Lotbinière, Lévis, and Beauce CDs.
1968	Low-level to moderate infection in plantations of red pine in Frontenac and Portneuf CDs.
1969	Moderate infection in plantations of Jack pine at Breakeyville (Lévis) and Linière (Beauce).
1971	Low intensity on Jack pine and red pine in Portneuf, Beauce, Dorchester, Montmagny, Frontenac, and Charlevoix CDs.
1972	Low-level infection varying from 10 to 30% of foliage in Portneuf CD.
1973	Severe damage in a plantation of Jack pine at Sainte-Marguerite (Dorchester).
1975	Infection on up to 10% of needles in several plantations of red pine and Jack pine in Beauce and Lotbinière CDs.
1976	Weather conditions in the summer of 1975 and in June 1976 contributed to lower occurrence of this rust, but the cool humid weather in the summer of 1976 may have resulted in an increase in the frequency or the intensity of this pathogen the following year.
1977	As expected, an upsurge in this disease was reported in the region. Moderate to severe infection in a plantation of red pine at Saint-Ludger (Beauce). 10% of

	foliage affected in a plantation of Jack pine at Saint-Raymond. Low-intensity occurrence on needles of Jack pine in Lotbinière, Mégantic, Beauce, Frontenac, Dorchester, and Bellechasse CDs. Two plantations of red pine infected, at Saint-Benjamin (Dorchester) with 8% of needles affected and at Saint-Gilles (Lotbinière) with 10% of needles affected.
1978	Marked decline in the number of infections, which varied from trace to low.
1979	Stable level comparable to 1978.
1980	Observed in a plantation of 3 000 eight-year-old Jack pines with 10% of foliage affected on 9% of trees at Saint-Placide (Charlevoix-Ouest). On the south shore, general infection with 3 to 40% of needles affected.
1981	Light damage on red pine and Jack pine.

PINE

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

This disease is widespread among pines, especially red, Scots, and Jack pine. Significant damage can be caused in plantations either through reduced growth or through mortality, especially among trees that are less that 10 years old. Infection generally occurs on the lower branches. Dead terminal buds with their supporting twigs also dead, denuded, or with reddened needles permit identification of the disease. Strains of the fungus were not differentiated in the surveys reported below. The European strain has been reported occasionally since 1986, but only when special tests were carried out.

Year	Remarks
1967	In red pine plantations totalling 20 ha at Saint-Raymond and Chute-Panet (Portneuf), over 60% of young trees were dead or dying 1 to 3 years after infestation. The same severity was observed in plantations of red and Jack pine at Sainte-Christine (Portneuf), at low to high levels at Saint-Sévérin, and low level at Vallée-Jonction.
1968	Fungus causing some mortality in a few plantations of red and Jack pine, but with little apparent effect in natural stands. Infestation varied from trace to moderate in plantations of red pine and Scots pine in Frontenac and L'Islet CDs.
1969	New report in plantations of red and Jack pine at Sainte-Christine and Chute-Panet with damage varying from slight to severe.
1970	Moderate to severe damage in a plantation of red pine at Pont-Rouge and south of Saint-Raymond [Bourg-Louis]. Another centre of infection south of Portneuf CD, where a large number of plantations of Jack pine, red pine, and Scots pine were affected. In this region, a young plantation of red pine had a mortality level of 80%. Light infection at Saint-Anges (Beauce).
1971	Infection varying from light to moderate at Chute-Panet, Clermont, and Saint-Hilarion.
1972	Portneuf CD one of the most severely affected by the disease in pine plantations with moderate to high damage levels at Pont-Rouge, Chute-Panet, and Sainte-Catherine.

PINE

1973 New centres of infection detected at Les Éboulements and mortality on seedlings and saplings noted at Saint-Siméon (Charlevoix-Est) as well as severe damage at Saint-Raymond, Valcartier, Sainte-Catherine, Saint-Siméon, Saint-Urbain, and Sainte-Marguerite.

1974 New centres of infection detected on young Jack pine in natural forest in Portneuf, Charlevoix, and Montmorency CDs. Reduced frequency noted in several plantations in Portneuf CD when lower branches pruned. Serious damage in 13 out of 14 plantations visited and the percentage of trees affected varied from 70 to 100% in the majority of these plantations of young red pine and Jack pine in Portneuf CD. In the same region, a young plantation of red pine had mortality of 85%. Serious damage on over 70% of Jack pines at Saint-Féréol-des-Neiges (Montmorency), Sainte-Agnès and Saint-Siméon (Charlevoix-Est).

1975 New centres of infection detected in plantations of red pine near Armagh (Bellechasse) and at Rivière-à-Pierre (Portneuf). Mortality from 5 to 50% in pines in a plantation near Sainte-Catherine. High-level infection in eight plantations in Portneuf CD and in two others at Saint-Féréol-des-Neiges and Notre-Dame-des-Monts (Charlevoix-Est).

1976 Significant increase in the disease in the region since 1973. In Portneuf CD, young plantations of red pine, Jack pine, and Scots pine continued to deteriorate with occasionally over 50% of trees affected over several hectares at a time, but the area affected did not increase significantly. In the southern part of the province, more and more plantations showed signs of the canker's presence. New centre of infection detected in a plantation at Saint-Elzéar (Beauce). Severe damage in two plantations of Jack pine in Portneuf and Montmorency CDs.

1977 Overall distribution of disease in Quebec changed little since 1976. Moderate to severe damage in several plantations in the region, particularly in Portneuf and Charlevoix CDs. Serious damage at Saint-Elzéar, Saint-Léonard, Saint-Raymond, and Duchesnay; moderate at Saint-Raphaël; and light at Thetford Mines, Saint-Irenée, and Saint-Placide.

1978 Disease still active in Portneuf and Charlevoix CDs on red pine, Jack pine, and Scots pine. At the Duchesnay nursery, the fungus was found on red pines forming a wind-break. Level high in a plantation of 450 Jack pines and onset of mortality at Saint-Elzéar. In an 8-ha plantation of Scots pine at Saint-Magloire (Bellechasse), 13% of foliage affected.

PINE

1979 Damage still considerable in many young plantations of Jack pine and red pine, since up to 100% of trees were affected in some of them in Portneuf, Quebec, and Charlevoix CDs. In a plantation of 150 red pine at Saint-Lambert (Lévis), 27 trees were affected.

1980 Nearly 100% of trees affected (4 000 Jack pine) in three plantations about 10 years old at Saint-Gilbert and Sainte-Christine. In two plantations at Saint-Zacharie and Saint-Elzéar totalling 3 750 Jack pines, 145 trees were affected out of 200 trees observed. In a plantation of 5 500 red pines at Saint-Lambert, 20 trees affected out of 150 sampled, some of which were dead. In a plantation of 12 500 Scots pines at Thetford Mines, 22% of trees attacked. In a plantation of 500 Scots pines at Saint-Apollinaire (Montmorency), 52% of trees affected.

1981 In a special survey carried out over an area bordered by the Chaudière and St. Lawrence rivers and the U.S. border, a total of 1606 plantations were inspected by the S.E.P. The disease was detected in 77 plantations of red pine, 10 of Scots pine and 8 of Jack pine with average infection levels of 10.4, 5.7 and 6.4%, respectively. In the affected plantations, the number of pines potentially vulnerable to attack by the disease totalled nearly 345 000 trees. On plantation species other than Jack pine, red pine, and Scots pine. *G. abietina* was found only on white pine at Chute-Panet and Saint-Raymond.

1982 The Quebec region was one of those most affected in terms of both frequency of occurrence of the disease and the extent of damage with 44% of pine plantations infected by this canker. The pine plantations most severely damaged by this canker were in Charlevoix-Est and Ouest and Montmagny CDs. The proportion of trees affected was often over 75% as in the plantation of Jack pines at Saint-Placide (Charlevoix-Ouest) where 100% of trees were infected. Near Notre-Dame-des-Monts (Charlevoix-Est), a small plantation of white pine underwent major damage on over 10% of trees. In natural forests of Jack pine, the disease was encountered relatively frequently and damage observed was generally light. Exceptionally, 40% of Jack pines at Saint-Hilarion showed symptoms of the disease on 10% of shoots. The disease was encountered only rarely in natural forests of white pine but was positively identified on this species near the lake at La Mine (Charlevoix-Ouest). This stand of white pine was near a plantation of red pine severely infected by the disease.

1983 The number of plantations reported with moderate and severe damaged was relatively large in the region. One young plantation of 3 000 red pine at Sainte-Catherine 38% infected. At the Valcartier nursery, 11% of young pines

were affected. Light damage in a plantation of 500 white pine at Saint-Gilbert.

1984 In a natural forest of red pine at Sainte-Justine, 100% of trees were affected. Moderate infection in a plantation of 4 500 red pine at Pont-Rouge.

1985 Considerable variance was found in contamination rates from one region to another; one of the most severely infested regions was the Quebec region (8.3%), in particular Portneuf CD. Other sites were Pont-Rouge, Sainte-Christine, Saint-Basile, Saint-Raymond, Lac Sergent, Saint-Augustin, and Saint-Léonard where the severity varied from low to high in pine plantations. One centre of high infection found in a plantation of Jack pine at Saint-Paul-de-Montminy (Montmagny).

1986 Disease stable in the region. Level of infection high on red pine at Sainte-Christine, moderate at Pont-Rouge, and trace at Duchesnay and Sainte-Foy.

1987 Damage severe on red pine at Sainte-Christine and East Broughton, moderate at Pont-Rouge, and light on Scots pine at East Broughton.

1988 In the region, 5.19% of pines were affected and were found in moderately affected plantations. The 1988 average is greater than that of 1987. In plantations visited this year, 5.55% of trees were affected compared to 0.43 in 1987. Disease detected in 117 plantations out of 256 visited. The European variety of the fungus was identified in 61 of them.

PINE

Western gall rust, *Endocronartium harknessii* (J.P. Moore) Y. Hirat.

This disease is characterized by the presence of round galls on the branches and sometimes on the trunk of Jack pine and Scots pine. It leads to reduced growth and occasionally the death of branches. It especially affects seedlings and saplings in plantations and natural forest.

Year	Remarks
1954	Approximately 15.5% of Jack pine in a plantation of 3 500 36-year-old trees near Valcartier had galls on branches.
1960	A number of young Jack pine were killed or seriously infected in stands at Saint-Hilarion and Saint-Siméon (Charlevoix-Est). Light to severe infection on a number of Scots pine in plantations at Shannon and Sainte-Catherine (Portneuf).
1966	Infection on 8 to 12-year-old Scots pine in plantations at Saint-Jules and Linière (Beauce).
1968	Young lodgepole pine were infected in a plantation at Valcartier as were young Jack pine in natural forest. Damage was at a low level. Light infection at Saint-Siméon.
1969	Damage severe at Saint-Siméon and light at Saint-Urbain and Disraeli.
1970	Moderate to severe damage on Jack pine at Saint-Siméon and light at Saint-Anges.
1971	Low-level infection at Saint-Siméon.
1972	Low-level infection at Saint-Siméon.
1973	Moderate damage at Saint-Urbain.
1974	Moderate infection at Saint-Siméon.
1975	Several new centres of infection in natural forest located around Port-au-Saumon (Charlevoix-Est). One centre of moderate infection near Saint-Siméon and a high-level centre at Port-au-Saumon.
1976	The greatest concentrations of this gall rust in natural forest were mainly along the north shore of the St. Lawrence, between Baie-Saint-Paul and Baie-Comeau. In these areas, 2 to 10% of Jack pines were affected.
1977	Moderate to high infection in Charlevoix CD. Moderate to severe damage on Scots pine in Beauce CD.

PINE

1978	A number of light to moderate infections on Jack pine in Montmorency, Quebec, and Charlevoix CDs.
1979	Trace infections at Saint-Gilbert, Les Saules, and La Malbaie.
1980	8% of trees with active galls on the trunk or on over 25% of branches in a plantation of 15 000 twelve-year-old Jack pines at Saint-Aimé-des-Lacs (Charlevoix-Est).
1981-1982	Stable level in the region.
1983	Moderate infection at East Broughton.
1984-1987	Damage caused by this gall rust was minimal and varied from trace to light in the region.

PINE

White pine blister rust, *Cronartium ribicola* J.C. Fischer

This disease, introduced into Canada early in the century, brought the cultivation of white pine to an end. This pathogen infects the needles, spreads along the branch, and can reach the trunk, where it produces an elongated canker and heavy resinosis. This canker can kill the upper part of the tree. A dead branch with reddened needles is a distinctive symptom of this disease. Wild or cultivated currant and gooseberry bushes (*Ribes* sp.) are an alternate host necessary to the propagation of the disease.

Year	Remarks
1953	On 987 white pine inspected over an area of 0.5 ha at Valcartier Forestry Station, 15% had a canker at the base of the trunk.
1958	Of 903 trees inspected in a plantation of 15-year-old white pine at Saint-Odilon (Dorchester), 15 were dead, 52 dying, 288 seriously attacked and 190 lightly attacked.
1966	10% of white pine 15 to 20 years old were infected over an area of 35 ha at Saint-Gilles (Lotbinière). The disease continued to intensify in a number of 15 to 20-year-old plantations in Beauce CD, particularly in a 80-ha plantation where a number of centres of infection at Saint-Sévérin (Beauce) had up to 100% of trees affected.
1967	Low-level infection at Vallée-Jonction.
1968	Observed at a number of locations in the western part of the region.
1969	Disease common throughout the distribution area of white pine and its presence detected in the majority of mature stands. Moderate infection on ornamental trees at Loretteville and Saint-Romuald.
1970	Infections observed on white pine in plantations and in natural forest at various locations in Portneuf and Beauce CDs.
1971	Over 50% of white pine affected at Linière and Saint-Georges (Beauce).
1972	Over 25% of white pine affected in Beauce and Charlevoix CDs. Less than 10% of trees affected in Portneuf, Charlevoix, Quebec, and Lotbinière CDs.
1973	Infection moderate at Saint-Victor and low-level at Saint-Raymond, Sainte-Marie, and Saint-Jules.
1974	Moderate infection at Valcartier and low-level infection at Saint-Martin.

PINE

1975	A survey of this disease was carried out in all CDs along the south shore of the St. Lawrence between Verchères and Montmagny. On the whole, only 2 to 10% of trees were affected. One concentration observed in natural forest in Montmorency CD.
1976	Centres of moderate infection in plantations at Sainte-Sophie-de-Léonard (Lotbinière), Abénakis (Bellechasse), Pont-Rouge (Portneuf), Beaupré (Montmorency), and Saint-Siméon (Charlevoix-Est). Low-level infection at two locations in Portneuf CD.
1977	Light damage at Sainte-Marguerite.
1978	Moderate damage at Saint-Aimé-des-Lacs, Saint-Féréol, and Loretteville. Light damage at Portneuf.
1979	High-level infection at Inverness and low-level infection at Saint-Gilbert.
1980	10% of trees with active canker on trunk in a young stand at Saint-Raymond. 30% of trees affected at Inverness.
1981	Rust present throughout the distribution area of white pine in the region.
1982	Light damage in a former cutting at Clermont (Charlevoix-Ouest), Portneuf, and Chute-Panet.
1983	Light and moderate damage in natural forest in Portneuf CD.
1984	Level of infection moderate at Leclercville and low at Sainte-Christine, Pont-Rouge, and Saint-Nicolas.
1985	Level of infection moderate at Valcartier, Saint-Malachie, and Saint-Magloire.
1987-1988	Averages of infected trees infected in plantations of white pine sampled in 1987 and 1988 were 3.24 and 9.35%, respectively.

PINE

ORGANISM	YEAR	HOST	REMARKS
Comandra blister rust *Cronartium comandrae* Peck	1965	JP	Damage on branches and on trunks observed on over 10% of young trees over a number of hectares at Saint-Urbain.
	1966	JP	Common on young trees at Saint-Hilarion.
Cytospora canker *Valsa pini* Alb. & Schw.: Fr.	1976	JP	Light attack in a natural stand at Pont-Rouge.
Dermea canker *Dermea pinicola* Groves	1980	EWP	Over nearly 1 ha in natural regeneration at Pont-Rouge, 4% of trees dead or dying from this canker of the collar.
Needle blight *Pestalotiopsis funerea* (Desm.) Stey.	1972	JP	Light damage on 200 000 seedlings at Duchesnay nursery.
	1973	RP	Damage on 25% of seedlings at Pont-Rouge nursery.
	1974	JP	Damage on 20% of seedlings at Pont-Rouge nursery.
	1976	RP	Damage on 50% of seedlings at Duchesnay nursery.
Needle cast *Davisomycella ampla* (J.J. Davis) Darker	1960	JP	Pathogen abundant at Saint-Urbain.
	1966	JP	Low-level infection at Clermont.
	1977	JP	8 to 10% of foliage affected on 25% of trees at the Port-au-Saumon Centre Ecologique (interpretation centre) (Charlevoix-Est).

PINE

ORGANISM	YEAR	HOST	REMARKS
Needle cast	1965	JP	Low-level infection at Saint-Hilarion.
Lophodermella concolor (Dearn.) Darker	1966	JP	Low-level infection at Saint-Urbain.
Needle cast	1969	EWP	Severe infestation on several trees at Sainte-Christine.
Meloderma desmazierii (Duby) Darker			
Potebniamyces canker	1968	RP	Damage on young trees in a natural
Potebniamyces coniferarum		JP	stand and in plantations in
(Hahn) Smerlis			Lotbinière and Quebec CDs.
Rust gall	1965	JP	Several diseased trees observed at Saint-Urbain.
Cronartium stalactiforme Arthur & Kern			
Scoleconectria canker	1978	EWP	Observed on 2 to 6% of trees.
Scoleconectria	1982	EWP	Low level in a former cutting
cucurbitula (Tode: Fr.) Booth			at Clermont.
Shoot blight	1978	JP	Low level in a plantation southeast of Abénakis (Dorchester).
Sydowia polyspora (Bref. & Tav.) Mueller		RP	Low level in a plantation southeast of Saint-Gilles (Lotbinière).
Sweet fern blister rust	1962	LP	Reported on 10% of trees at Valcartier.
Cronartium comptoniae Arthur			

SPRUCE

INSECTS

European spruce sawfly, *Gilpinia hercyniae* (Htg.)

This insect, which was introduced into Canada accidentally, began its ravages in the Gaspé about 1930. It then spread rapidly throughout northeastern North American. Fortunately, a viral disease that appeared around 1938 seems to be controlling this sawfly at present. It may attack any species of spruce.

Year	Remarks
1936-1937	Insect very common in the Bellechasse and Montmagny CDs on the south shore and in all the CDs on the north shore of the St. Lawrence.
1938	Beginning of moderate to high levels of infestation from Bellechasse CD to L'Islet CD. Low levels elsewhere in the region.
1939	Significant increase in population to moderate levels in Portneuf, Quebec, Montmorency, and Charlevoix on the north shore of the St. Lawrence and from Lotbinière to L'Islet CDs, while high infestation levels were recorded in the southern part of the Beauce, Dorchester, Bellechasse, Montmagny, and L'Islet CDs along the U.S. border.
1940	Infestation generally remained at moderate levels in the entire region except in parts of the Lotbinière and L'Islet CDs and in parts of the Laurentian Wildlife Reserve, where high levels were recorded. Fortunately, a viral disease fatal to larvae was recorded throughout Quebec.
1941	Infestation persisted but seemed to be declining noticeably throughout the region except in the Laurentian Wildlife Reserve, where the viral disease was rare. Some parts of the Laurentians appeared less affected, in the area of Croche and Charité lakes (Quebec), Jambon, Vert and Belle Fontaine lakes (Montmorency), and at Cold Creek (Charlevoix-Ouest). The micro-organism that attacked larvae of this insect was gaining ground.
1942	Infestation continued but populations declined even more dramatically than in 1941. Populations remained moderate in the Laurentian Wildlife Reserve and the Charlevoix and Beauce CDs as far as L'Islet CD.

SPRUCE

1943	Significant reductions in populations of this insect were noted throughout the region. Viral disease gradually increased in virulence, covering the entire province.
1944	Populations continued to decline this year, the viral disease remaining the most important contributor to this decline.
1945	Populations of this sawfly further decreased as viral disease continued to progress; however, the insect remained a potential threat in many areas if the disease were to disappear.
1946	Populations remained basically stable although this insect was still common in the entire region. There were two areas of moderate infestation, one in the Portneuf CD and the other in the Frontenac CD.
1947	This sawfly was less and less common in the region as a whole although moderate populations remained in the Portneuf and Frontenac CDs.
1948	Populations continued to decline in the entire region, with low levels in the Charlevoix, Portneuf, Lotbinière, and Quebec CDs.
1949	Low-level infestation persisted in Charlevoix, Montmorency, and Portneuf CDs.
1950	Average population remained at the same level as in 1949 throughout the region. The scarcity of the insect accounts for the lightness of defoliation observed.
1951	This insect again very common in the entire region. Low population levels were noted in Charlevoix, Portneuf, and Dorchester CDs.
1952	No major changes reported in distribution or proliferation of this insect; only a few moderate peaks in Portneuf and Beauce CDs.
1953	Population remains scattered across the region.
1954	After declining for the past few years, populations of this insect rose slightly, with a large number collected at Thetford Mines (Megantic).
1955	Populations at low levels throughout the region.
1956	Population levels more uniform than previous year. Considerable numbers of sawfly larvae were found at Saint-Nicolas, Sainte-Agathe, and Saint-Sylvestre.
1957	No change in populations in the region. Viral disease causing mortality among larvae.
1958	Slight increase in number of insects in the region, with viral disease still present.
1959	Insect more evident this year. Slight increase in populations at Saint-Féréol, Saint-Nicolas, Saint-Sylvestre, and Sainte-Agathe. Viral disease still present.
1960	Larval numbers the same as in 1959. Viral disease present.

SPRUCE

1961	Lowest population level recorded since 1955.
1962	Widespread throughout the region, but numbers remained low.
1963	Insect widespread throughout the region, but populations still low. Highest insect count, with 4.8 per tree, at Sainte-Agathe (Lotbinière). No evidence of viral disease in 1963.
1964	Populations of this insect generally higher than in 1963. Viral disease present.
1965	Populations not at infestation levels since the early 1940s due to the action of parasites and a viral disease.
1966	Insect still widespread throughout the region. The highest count was obtained in the Bellechasse and Beauce CDs. The most important control factors seemed to be the viral disease and parasites.
1967	Insect still very common. Population levels were comparable to those of 1966, and no major changes were observed in the distribution of this sawfly.
1968	Lowest population recorded since early 1960s. Viral disease still in evidence.
1969-1976	Population endemic.
1977	Populations higher locally in two stands at Saint-Hilarion (Charlevoix-Ouest), but at trace levels elsewhere.
1978-1980	Population endemic.
1981	Populations of this insect again on the rise in the region, in stands at Saint-Bernard (Dorchester), Sainte-Anastasie (Mégantic), Sainte-Agathe (Lotbinière), and Saint-Fabien-de-Panet (Montmagny).
1982	Slight increase in populations observed in 1981 fell again in 1982 due to action of virus.
1983-1986	Population endemic.
1987	Damage observed in several stands in the region and elsewhere in Quebec. Calculation of the average number of larvae collected per tree allowed us to conclude that populations were rising.
1988	Insect present throughout the region, but little defoliation attributable to it.

SPRUCE

Spruce budmoth, *Zeiraphera canadensis* Mut. & Free.

This budmoth can cause severe damage, especially in white spruce plantations, but it also attacks other spruces.

Year	Remarks
1966	Severe defoliation of new shoots on white spruce near Sainte-Foy and Saint-Roch-des-Aulnaies.
1969	Low to moderate infestation in Mégantic and Charlevoix CDs.
1970	Insect present locally at Sainte-Agathe (Lotbinière).
1977	Low populations at Pont-Rouge and Saint-Raymond (Portneuf).
1979	Populations rising in the region.
1986	Insect reported at scattered locations in the region.
1987	Insect reported in several white spruce plantations.
1988	A count shows 1.18 % of white spruces to be infested by the spruce budmoth.

SPRUCE

Spruce budworm, *Choristoneura fumiferana* (Clem.)

Although this insect has a preference for balsam fir, white and red spruce are also hosts. In severe infestations, mortality among spruces is lower than in balsam fir, but defoliation is nevertheless high. See **balsam fir**, pages 11, 13, 15, and 17.

SPRUCE

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

This coneworm sometimes causes severe defoliation on balsam fir and spruce and also damages cones. It is often associated with the **spruce budworm.**

Year	Remarks
1948	Low population levels on pine and spruce, particularly on the north shore of the St. Lawrence in Portneuf, Montmorency, and Charlevoix-Ouest CDs.
1949	Population generally low on pine and spruce north of the St. Lawrence except in a few areas of the Charlevoix CD, where levels were moderate.
1950	Low to high populations with an average of 4.7 insects per sample taken on the north shore of the St. Lawrence. Presence more pronounced in the Charlevoix-Ouest CD.
1951	Insect much less abundant than in 1950 except in Montmorency and Sainte-Anne river basins in Montmorency and Charlevoix-Ouest CDs, where up to 9.3 insects per sample were found.
1952	Populations lower on host species throughout the region.
1976	This insect, very common for several years, was more abundant on spruce and pine in 1976. In a swarm of spruce budworms at Saint-Simeon (Charlevoix-Est), the proportions were one coneworm moth to nine spruce budworm moths. Collections throughout the province were 2.5 times those of 1975, and population levels rose by 60%.
1977	Overall, defoliation by the spruce coneworm was less serious than in 1976.

SPRUCE

Yellowheaded spruce sawfly, *Pikonema alaskensis* (Roh.)

This sawfly can cause mortality in spruce that are in regeneration or in plantations.

Year	Remarks
1941	Less severe damage at Mauriceville (Montmorency). Light defoliation in the Saint-Raymond (Portneuf) area.
1942	Local defoliation of spruce west of the Laurentian Wildlife Reserve and south of the Chaudière River in the Beauce and Frontenac CDs.
1943	Significant decrease but severe defoliation of young ornamental spruces in Bellechasse, Dorchester, Frontenac, and Beauce CDs.
1944	Same location as in 1943, but numbers much reduced.
1945	Severe defoliation on young spruces in the Jacques-Cartier sector.
1946-1947	Population endemic.
1948	Larvae more abundant than in 1947, causing severe defoliation on white spruce hedges in the Jacques-Cartier sector.
1949-1951	Population endemic.
1952	Insect widespread throughout the region on ornamental spruces with a population surge in the Jacques-Cartier sector.
1953-1954	Population endemic on spruce.
1954-1961	No reports for the region.
1962	Limited areas of low to moderate infestation on white spruce in Lotbinière county and near Quebec City.
1963-1965	No reports for the region.
1966	Insect present in a number of localities, but populations relatively low.
1967	Population generally low; no severe defoliation observed.
1968	Low to high infestation on white and black spruce in scattered localities in southern Montmagny CD.
1969	Populations reached moderate levels in several locations.
1970	Population generally low in many localities.
1971	Population generally low although high enough to cause severe defoliation on spruce in several localities.

1972	Populations declining throughout the region.
1973	Population very low except in a few localities including Duberger and Neufchâtel, where fairly large quantities of larvae were found.
1974	Populations low to moderate on spruce in Lévis, Mégantic, Beauce, Lotbinière, and Frontenac CDs.
1975	This species still sufficiently abundant locally to cause moderate defoliation in a plantation near Audet (Mégantic).
1976	No reports for the region.
1977	Trace populations in Quebec and Montmorency CDs.
1978	No reports for the region.
1979	Local defoliation of between 20 and 50% of foliage on black spruce at Saint-Raymond (Portneuf). Between 30 and 80% local defoliation in a plantation of red spruce at Sainte-Christine (Portneuf).
1980	Light defoliation on black spruce in Portneuf, Quebec, and Montmorency CDs. Local defoliation of from 30 to 60% on twenty 7-year-old trees at Sainte-Christine. Local defoliation on several trees at Saint-Raphaël (Bellechasse) at 25 % level.
1981	Slight rise in populations observed throughout the region. Populations high on black spruce southwest of Shannon (Portneuf). Damage was minimized by insecticide spraying. Marked decrease in population in a plantation at Sainte-Christine, where 5 to 10% of foliage was destroyed on a dozen 8-year-old spruces.
1982	Population high in a 2-ha plantation of white spruce at Saint-Paul de Montmagny.
1983-1988	No reports for the region.

SPRUCE

INSECT	YEAR	HOST	REMARKS
Aphid *Pachypappa tremulae* (L.)	1983	WS	Very active on roots of stock at Duchesnay Grafting Centre. In several cases, attack appears severe enough to endanger the vitality of grafts.
Eastern spruce gall adelgid	1941	S	Populations increasing throughout the the region.
Adelgis abietis (L.)	1943	S	Ornamental and plantation spruces increasingly affected on north shore and in Dorchester, Bellechasse, Montmagny, and L'Islet CDs.
Greenheaded spruce sawfly	1940	S	Abundant at Lake Crapaud (Portneuf) north of Saint-Raymond.
Pikonema dimmockii (Cress.)	1948	SS	light defoliation on a few spruces at Stoneham.
	1962	WS	Common in stands of white spruce in Lotbinière CD.
Pitch mass borer *Synanthedon pini* (Kell.)	1978	NS	Low population in a small plantation near Shannon.
Purplestriped shootworm *Zeiraphera unfortunana* Powell	1960	WS	Common with low to moderate infestation zones in Charlevoix-Est and Ouest CDs.
	1970	WS	Common at Sainte-Agathe (Lotbinière).

SPRUCE

DISEASES

Needle rust, *Chrysomyxa ledi* (Alb. & Schw.) de Bary var. *ledi*

This disease of the current year's needles affects black, white, and even red spruce. It especially affects young trees and the lower branches of older trees, chiefly those growing near bogs and clearings. The disease is found throughout the region. The two fungi that cause this disease (*C. ledi* var. *ledi* and *C. Ledicola*) are impossible to differentiate in the field and often occur on the same tree. A laboratory examination is needed to accurately identify the pathogen.

Year	Remarks
1972	Trace to moderate attack but on limited areas in Montmorency and Frontenac CDs.
1973	Reported on black and white spruce in Charlevoix, Montmorency, and Quebec CDs.
1980	Decline in severity of infection, which varied from trace to low on young black spruce.
1982	Infection on 10% of foliage in black spruce saplings at Saint-Raymond.
1984	Observed in the region.

SPRUCE

Needle rust, *Chrysomyxa ledicola* Lagherh.

This disease of the current year's needles affects black, white, and even red spruce. It especially affects young trees and the lower branches of older trees, chiefly those growing near bogs and clearings. The disease is found throughout the region. The two fungi that cause this disease (*C. ledicola* and *C. ledi* var. *ledi*) are impossible to differentiate in the field and often occur on the same tree. A laboratory examination is needed to accurately identify the pathogen.

Year	Remarks
1956	Very common on black spruce in Laurentian Wildlife Reserve.
1960	Moderate to high levels of infection on black spruce in the southeastern part of the Laurentian Wildlife Reserve, at Rivière-Sainte-Anne, Saint-Tite-des-Caps, and Saint-Hilarion and on red spruce at Saint-Etienne.
1961	Moderate infection near Saint-Urbain (Charlevoix-Ouest).
1962	Infection on 40 to 75% of new needles at Duchesnay and at Lake Juneau in the Laurentian Wildlife Reserve.
1963	High level of infection at Saint-Hilarion (Charlevoix-Ouest).
1965	Considerable decline in symptoms. Minor attack near Lake Malbaie in the Laurentian Wildlife Reserve.
1969	Low level at Pont-Rouge.
1970	Moderate intensity at Saint-Etienne.
1972	Observed in the Charlevoix region and at Saint-Elzéar (Beauce).
1973	Frequently observed in Charlevoix CD as a result of favorable weather conditions.
1974	High infection levels on white spruce over several hectares of natural forest at Saint-Elzéar.
1975	Light attack at Saint-Hilarion.
1976	Reduction in severity of damage.
1977	Infection of 40-50% of foliage north of Saint-Féréol-des-Neiges (Montmorency). Moderate damage at Thetford Mines and Saint-Camille (Bellechasse). Light damage on 10-25% of needles in Frontenac, Beauce, Mégantic, and Lotbinière CDs.

SPRUCE

1978	Significant increase over preceding 4 years. Moderate damage at Dosquet (Lotbinière), Thetford Mines (Frontenac), and Saint-Camille. Damage on 5 to 18% of needles in Lotbinière, Lévis, Beauce, and Frontenac CDs.
1979	Populations high in forests. Infection on 50 to 75% of foliage over 1 ha at Saint-Raymond. Infection on 5 to 80% of foliage on the south shore in general.
1980	High levels maintained. Trace to light damage, with on average 50% of trees affected over 12% of their foliage in the Charlevoix region. Infection on 50 to 75% of foliage over several hectares at Saint-Raymond for the second consecutive year. Infection on 5 to 40% of foliage in natural forest on the south shore in general.
1981	Light infection north of Saint-Urbain. Slight decline in infection at Saint-Raymond with 30% of foliage affected over 1 ha.
1982	Complete decline in infection at Saint-Raymond.
1984	Observed in the region.
1985	Infection on 100% of annual growth on all white spruce in a plantation at Saint-Sévérin (Beauce).

SPRUCE

Red butt rot, *Inonotus tomentosus* (Fr.) Gilbn.

This fungus is one of the major root rots (root blight) in Canada. It affects most conifers, both in natural forest and in plantations, slowing growth significantly and causing mortality, particularly on spruce.

Year	Remarks
1965	Pathogen found on two dead white spruce trees in a plantation at Shannon (Portneuf).
1966	20 to 90% of white spruce were affected in a young stand at Vallée-Jonction (Beauce).
1969	This blight killed white spruce in groves and red pine in a plantation at Vallée Jonction. The plantation was near a young stand of white spruce, site of a major centre of infection found in 1966. Observed in a natural stand of white spruce at Saint-Augustin (Portneuf) and at Saint-Jacques-de-Leeds (Mégantic).
1970	Observed on white spruce at Pont-Rouge and Rivière-à-Pierre (Portneuf).

SPRUCE

Snow blight, *Lophophacidium hyperboreum* Lagerb.

This disease mainly affects spruce, whether in natural forests, plantations, or nurseries. This fungus infects one-year-old needles on branches still covered with snow at the spring thaw.

Year	Remarks
1967	Moderate infection in a young white spruce plantation at Saint-Séverin (Beauce). Moderate infection on several blue spruce at Sainte-Foy.
1969	High level of infection on a hundred or so young Norway spruce at Buckland (Bellechasse) and in a small stand of black spruce at Montmagny. Low infection on a few blue spruce at Lake Beauport. Trace infection in a stand of black spruce at Saint-George-de-Beauce.
1978	High level of infection with 100% of Norway spruce affected on over a hectare at Saint-Gilbert (Portneuf).
1979	Trace infection in Duchesnay nursery on white, red, and Norway spruce.
1981	Slight damage in Duchesnay nursery.

SPRUCE

Tip blight, *Sirococcus strobilinus* (Desm.) Petr.

This disease often results in mortality on the current year's growth and occasionally on year-old twigs. It is often encountered on spruce although pine, particularly red pine, is also likely to be infected.

Year	Remarks
1964	Observed for the first time north of Lake Jacques-Cartier in the Laurentian Wildlife Reserve on black and white spruce. Over half the terminal shoots were dead on 30% of black spruce, while 20% of white spruce showed infestation at branch tips.
1968	Found on blue spruce at Lake Beauport.
1970	Symptoms on 20% of 1 000 Norway spruce at Saint-Jean-de-Brébeuf (Mégantic) and Thetford Mines and on white spruce at Vallée-Jonction (Beauce).
1971	Symptoms observed on plantations of Norway spruce at Linière (Beauce) and on black spruce near Lake Malbaie and on white spruce at Saint-Malachie (Dorchester).
1972	On black spruce in the Laurentian Wildlife Reserve over a 320 km^2 area.
1973	Infection of 10 to 35% of shoots on black spruce in the Laurentian Wildlife Reserve.
1974	Tamarack first recognized as host of this tip blight at entrance to Juneau trail in Laurentian Wildlife Reserve. Light to moderate damage in five sectors of the Laurentian Wildlife Reserve.
1975	Centre of infection varying from trace to moderate in central southern part of Laurentian Wildlife Reserve.
1976	Light attack on shoots 12 km south of L'Étape in the Laurentian Wildlife Reserve.
1977	Moderate attack on Noire River Road and south of Lake des Neiges, in Laurentian Wildlife Reserve.
1987	Found in Duchesnay nursery.

SPRUCE

ORGANISM	YEAR	HOST	REMARKS
Cone rust *Chrysomyxa pirolata* Wint.	1960	BS	Severe infection on cones of several trees at Sainte-Agnès (Charlevoix-Est).
	1984	BS WS	Local, minimal damage throughout the region.
Dermea canker *Dermea piceina* Groves	1968	BS	Light infection at Saint-Urbain.
Gray-mold blight *Botrytis cinerea* Pers.	1967	TL	Over 60% of seedlings infected in a greenhouse at Duchesnay.
Needle cast *Isthmiella crepidiformis* (Darker) Darker	1975	BS	Decrease in frequency and severity of damage, compared to 1974, in the region.
	1976	BS	Situation basically the same as in 1975. Levels of infection varied from 6 to 25%.
Needle cast *Lophomerum darkeri* Ouellette	1966	WS	Sampled at Baie-Saint-Paul. First report in North America.
Needle cast *Lophomerum septatum* (Tehon) Ouellette	1963	WS	Sampled at Baie Saint-Paul. First report au Canada.
Needle cast *Rhizosphaera kalkhoffii* Bubak	1983	NS	Severe damage on a hundred trees whose foliage was almost destroyed, in a young 10-year-old plantation with 3 600 trees.

SPRUCE

ORGANISM	YEAR	HOST	REMARKS
Pseudophacidium canker *Pseudophacidium piceae* Mueller	1964	BS WS	First report in region. Infection of 43% of young trees with the terminal shoot dead on 44% of black spruce and 67% of white spruce north of Lake Jacques-Cartier in the Laurentian Wildlife Reserve.
	1965	BS	Light infection 16 km south of Lake Jacques-Cartier. Collected on dead low branches in groves of black spruce in a number of other localities of the Laurentian Wildlife Reserve.
Root rot *Cylindrocladium floridanum* Sobers & Seymour	1985	S	Detected for the first time in 1984, this pathogen that attacks the roots and crowns of seedlings causes rapid chlorosis of foliage. Damage observed on up to 20% of trees in certain lots of the Duchesnay nursery.
	1986	RS	Damage, which appeared after transplanting, on 36% of 4.3 million seedlings at the Duchesnay nursery.
Scleroderris canker *Gremmeniella abietina* (Laberg.) Morelet var. *balsamea*	1978	BS	See text in "Other conferous species" pg 85.
Smothering disease *Thelephora terrestris* Ehrh. Fr.	1978	NS WS, EWP	Damage reported at Duchesnay. Damage reported at Valcartier Experimental Station nursery.

SPRUCE

ORGANISM	YEAR	HOST	REMARKS
Snow blight *Phacidium* sp.	1977	WS	Moderate infection in plantations in Portneuf, Charlevoix, and Lotbinière CDs.
Yellow Witches'-broom *Chrysomyxa arctostaphyli* Diet.	1964	WS BS	Observed at various locations between Baie-Saint-Paul and Baie-Sainte-Catherine.

TAMARACK

INSECTS

Larch casebearer, *Coleophora laricella* (Hbn.)

Major defoliation by this casebearer results in decreased growth. Infestations, however, last only a few years.

Year	Remarks
1945	Total defoliation of tamarack at Saint-Agapit (Lotbinière). Release of two species of parasite.
1946	Insect observed in same areas as preceding year, with same rate of abundance.
1947	Insect less common than in recent years.
1948	Fairly rare, with a decline in average population in the Chaudière River valley.
1950	Moderate defoliation in Beauce and Frontenac CDs.
1958	Only low-level infestations observed in the Quebec City area.
1959	Low-level infestation in St. Lawrence Valley.
1960	Slight decline in population observed in the St. Lawrence Valley.
1966	Insect common in the region in general.
1969	Insect population at a very low level in region as a whole.
1970	Population low in practically all of the region.
1971	Population seems to have increased in 1971, causing moderate to severe defoliation in many south-shore localities.
1972	Decrease in populations.
1973	Slight increase throughout the region. Infestations moderate to severe in majority of localities in Bécancour and Chaudière river valleys.
1974	Population again declined to a very low level in entire region, except in two localities, one near Kinnear's Mills (Mégantic) where the level of defoliation was moderate and the other at Saint-Agapit where the level was high.
1975	Population again declined despite already low levels throughout the region. Infestations moderate at Bernières and low at Saint-Joseph (Beauce).
1976	Population levels low at Pont-Rouge, Bernières, and Thetford Mines and trace elsewhere in the region.
1977	Light damage at Breakeyville.

TAMARACK

1978	Population steady at a low level with 15% of foliage attacked at Breakeyville, Saint-Martin (Beauce), and Saint-Prosper (Dorchester).
1979	Marked increase in populations no cause yet for alarm. A few light, scattered infestations seen in Portneuf CD. Local defoliation from 9 to 40% per tree in all CDs except L'Islet.
1980	Major increase in population causing moderate to severe defoliation over small areas. Infestations varied from light to moderate in the western part of the region on both sides of the St. Lawrence, including Portneuf, Quebec, Lotbinière, Mégantic, Frontenac, Beauce, Lévis, Dorchester, and Bellechasse CDs. Outside this area, only trace populations of the insect or slight damage were found in Montmorency, Quebec, and Charlevoix CDs.
1981	Complete decline of all infestations reported in 1980, throughout the region.
1982-1984	Population endemic.
1985	Increasingly visible and frequent damage. At Sainte-Agathe (Lotbinière) and La Guadeloupe (Frontenac), 25 to 50% of foliage attacked.
1986	Populations declining south of Saint-Georges (Beauce) and at Saint-Prosper (Dorchester).

TAMARACK

Larch sawfly, *Pristiphora erichsonii* (Htg.)

Persistent high-level infestations of this sawfly, which lives in colonies, can lead to the mortality of a large percentage of trees in larch stands.

Year	Remarks
1936-1938	Insect present in entire region causing moderate infestations except in Charlevoix-Est CD where light infestation was found.
1939	Infestation decreased in intensity and continued at low levels throughout most of the region except north of Charlevoix-Ouest, Montmorency, and Quebec CDs, where populations were average. It was noted that Lotbinière and Mégantic CDs were almost completely free of this sawfly.
1940	Epidemic seemed to be undergoing slight increase in population with average levels covering the central and western part of the region including Portneuf, Quebec, Montmorency (southern part), Lévis, Lotbinière, and Mégantic CDs. Elsewhere in the region, infestation was light.
1941	Significant decline in infestation in central and western parts of the region. Only a few zones of moderate damage including one north of Montmorency CD, one in the Laurentian Wildlife Reserve near Long Lake, and another near Saint-Raymond (Portneuf). Population steady at low levels in the rest of the region.
1942	Population declined to low levels throughout the region.
1943	For the preceding three years, the epidemic of this insect was gradually declining in the region.
1944	Epidemic completely on the decline in the region.
1945-1950	Population endemic.
1958	Increase in population in the Quebec City area and in the Laurentian Wildlife Reserve.
1959	Apparent increase in population. Insect common in the region. In the Quebec City area and in the Laurentian Wildlife Reserve, infestations were light.

TAMARACK

1960 Larch sawfly the most common forest insect in this region and elsewhere in Quebec. Significant increase in populations in infested areas in central Quebec. Severity of attack irregular, but severe defoliation very common in the Laurentian Wildlife Reserve and in the Quebec City area.

1961 For the second consecutive year, a major increase in population was noted throughout the region. At many locations, defoliation was complete and larval population dying, mainly of starvation, in the Laurentian Wildlife Reserve and in the Quebec City area.

1962 Overall situation similar to 1961.

1963 Insect still abundant and fairly common in the region. Decrease in population observed in the Quebec City area, while the situation remained stable in Charlevoix CD and in the Laurentian Wildlife Reserve where a marked dieback of larch stands was noticed.

1964 Noticeable decline in population although still broadly distributed throughout the region. Moderate infestations at Sainte-Catherine and Saint-Patrice-de-Beaurivage. Severe infestation at Saint-Étienne.

1965 Population continued to decline. In most localities, intensity was the same or lower than in 1964 except at Sainte-Agathe (Lotbinière) where population was observed to have declined.

1966 Population comparable to that of 1965 in entire region. Infestation declining and varied from light to moderate.

1967 Infestation light to moderate at Lake Jacques-Cartier and Lake Sainte-Anne, in the Laurentian Wildlife Reserve; at Saint-Romain, Sainte-Cécile, and Stornoway, all in Frontenac CD; and at Sainte-Agathe (Lotbinière). Light infestation in other localities.

1968 Defoliation less than predicted due to significant mortality in early larval stages, caused by abnormal foliage conditions due to dry weather in July. Average egg populations at Lac-aux-Sables and Notre-Dame-des-Anges (Portneuf), Sainte-Agathe (Lotbinière), and Saint-Côme (Beauce).

1969 Insect population still declining; stable at a very low level. In the six locations sampled in the Laurentian Wildlife Reserve, tamarack mortality was determined to be at an average of 52%.

1970 Low populations in the Laurentian Wildlife Reserve, at Saint-Raymond and Sainte-Catherine (Portneuf), Saint-Étienne (Lévis), Sainte-Anastasie (Mégantic), and Saint-Victor and Saint-Ephrem (Beauce).

TAMARACK

1971	Distribution general in the region with generally small populations in the Laurentian Wildlife Reserve, at Saint-Ephrem (Beauce), Saint-Paul-de-Montminy (Montmagny), and Tourville (L'Islet).
1972	Low populations in the Laurentian Wildlife Reserve, at Saint-Étienne, Saint-Ephrem, and east of Montmagny.
1973	Distribution general in the region. Low populations in the Laurentian Wildlife Reserve and at Saint-Étienne.
1974	Insect populations which had been declining for the past two years increased slightly in 1974. Moderate to severe infestations found at Mare-du-Sault in the Laurentian Wildlife Reserve. Other low-level populations were found at Pont-Rouge, north of the Saint-Urbain gate, at Baie-Sainte-Catherine, and in almost all CDs on the south shore of the St. Lawrence.
1975	Population continued to rise slightly in the region. At Mare-du-Sault, moderate infestation spread to the head of Lake Jacques-Cartier to the north and Lake Sainte-Anne to the east. Low-level infestation at Saint-Féréol-des-Neiges (Montmorency) and at Saint-Raymond (Portneuf).
1976	Slow but steady increase in spread and intensity since 1973. Distribution general in the region. Population low in Chaudière and Bellechasse CDs; however, infestation in the Laurentian Wildlife Reserve decreased from moderate to light.
1977	Population seemed to have stabilized in 1976 at low levels. Small, light infestation in a radius of 40 km of Quebec and in the Laurentian Wildlife Reserve. Population low at Breakeyville, Dosquet, Saint-Raphaël, and Saint-Lazare.
1978	Marked decrease in population levels and frequency of this sawfly, which remained common at Mare-du-Sault, in the Laurentian Wildlife Reserve, and at Saint-Raphael (Bellechasse).
1979	Population stable at a low level at Mare-du-Sault in the Laurentian Wildlife Reserve, Breakeyville, Saint-Raphaël and northwest of Saint-Prosper (Dorchester).
1980	Population steady at a low level at Marc-du-Sault in the Laurentian Wildlife Reserve, Saint-Raphaël, and Saint-Raymond.
1981	Population low 32 km north of Saint-Urbain (Charlevoix-Ouest).

TAMARACK

INSECT	YEAR	HOST	REMARKS
Chainspotted geometer *Cingilia catenaria* (Drury)	1974	TL, Ericaceae	Severe infestation in peat bogs in Lotbinière and Lévis CDs.
Eastern larch beetle *Dendroctonus simplex* LeC.	1980	TL	10% mortality on 50 trees attacked at Valcartier.
Green larch looper *Semiothisa sexmaculata* (Pack.)	1940	TL	Light defoliation at Lake Willie (Portneuf) [Northwest of Saint-Raymond].
Larch budmoth *Zeiraphera improbana* (Wlk.)	1975	TL	Population observed at Mare-du-Sault (Montmorency). First report in this area.
	1976	TL	Moderate defoliation north of the Saint-Urbain gate in the Laurentian Wildlife Reserve.
	1977	TL	Drop in population at Saint-Urbain. Average population at Saint-Hilarion.
	1978	TL	Average population causing minor defoliation at Saint-Hilarion.
	1979	TL	Average population on several trees at Saint-Hilarion.
Threelined larch sawfly *Anoplonyx luteipes* (Cress.)	1977	TL	Common locally in Portneuf CD as far as Quebec CD.

TAMARACK

DISEASES

Scleroderris canker, *Gremmeniella laricina* (Ettl.) O. Petrini et al.

This diseases causes tip blight on branches less than two metres from the ground. It occasionally causes severe damage and even death on exotic tamaracks in plantations.

Year	Remarks
1968	Damage very frequent on branches and trunks in regeneration. Crowns dead on most infected trees at Lake Jacques-Cartier in the Laurentian Wildlife Reserve. First report in Quebec.
1969	Moderate infection in the Laurentian Wildlife Reserve.
1978	Light infection in a young stand in the Laurentian Wildlife Reserve.
1979	Infection varying from light to severe on saplings in the Laurentian Wildlife Reserve.
1981	Damage trace to moderate in natural stands in the Laurentian Wildlife Reserve.
1982	Infection varying from light to severe in the Laurentian Wildlife Reserve.
1983	Moderate infection in the Laurentian Wildlife Reserve.
1987	Trace infection in the Laurentian Wildlife Reserve.

TAMARACK

ORGANISM	YEAR	HOST	REMARKS
Gray-mold blight *Botrytis cinerea* Pers.	1967	TL	Over 60% of seedlings infected in a greenhouse at Duchesnay.

OTHER CONIFEROUS SPECIES

INSECTS

White pine weevil, *Pissodes strobi* (Peck)

The preferred hosts of this native North American insect are pines and spruces. The insect attacks the terminal stem of trees causing major damage by reducing height growth and the volume and quality of wood produced. For the past twenty years, both the number of species affected and the number of infestations have increased significantly.

Year	Remarks
1945	Insect reported at Pont-Rouge (Portneuf) but did not appear to have caused any appreciable damage.
1974	Low-level infestation in Portneuf CD.
1975	Light damage at Saint-Raymond (Portneuf).
1976	Light damage on white pine at Pont-Rouge (Portneuf) and on Norway spruce at Armstrong (Beauce). Trace damage on white pine at Leclercville (Lotbinière).
1977	22% of terminal shoots affected in a plantation of Norway spruce at Pont-Rouge. Other pockets located at Woburn (Frontenac) and Armagh (Bellechasse) on white pine, white spruce, and Scots pine.
1978	12% of terminal shoots affected in a plantation of Norway spruce at Pont-Rouge (Portneuf). Less than 10% of trees affected on regeneration of white pine near Pont-Rouge.
1979	20% of Norway spruce affected on 1 700 trees at Pont-Rouge. 24% of Norway spruce affected on 150 trees at Saint-René (Beauce). Low-level populations on white pine in the southwestern part of the St. Lawrence River Valley between Lake Saint-Pierre and Pont-Rouge.
1980	62% of Norway spruce affected on 4 700 trees at Armstrong (Beauce). Cumulative damage.
1981	Light damage in a plantation of 1 700 Norway spruce at Pont-Rouge (10%) and in two other plantations, one at Sainte-Christine (3%) and the other at Saint-Juste de Montmagny (5%) with 10 000 and 2 000 white pines, respectively. Also light damage in natural regeneration of white pine at Pont-Rouge (6%) and Sainte-Catherine (4%).

OTHER CONIFEROUS SPECIES

1982	Overall increase in damage particularly in young plantations of Norway spruce and white pine southwest of Portneuf CD. Light damage in two plantations of Norway spruce, one at Pont-Rouge (14%) and the other at Saint-Basile (4%) with 1 700 and 600 trees, respectively. Moderate damage in natural regeneration of white pine at Pont-Rouge (16%).
1983	Three plantations of Norway spruce totalling 5 900 trees had 2, 12, and 14% of trees affected at Saint-Basile, Pont-Rouge and Saint-Léonard (Portneuf), respectively.
1988	Damage observed on over 3% of Norway spruce located in nearly 40% of plantations in the region.

OTHER CONIFEROUS SPECIES

INSECT	YEAR	HOST	REMARKS
Eastern blackheaded budworm *Acleris variana* (Fern.)	1947	S, BF	Major defoliation in several localities of the north shore of the St. Lawrence from Quebec City to Baie-Sainte-Catherine.
	1948	S, BF	Light defoliation in a number of localities on the north shore of the St. Lawrence.
	1949	S, BF	Moderate population near Baie-Saint-Paul. Almost total disappearance in all other areas probably due to a viral disease.
	1972	S, BF	Low-level populations in the balsam fir and spruce distribution area.
Fir coneworm *Dioryctria abietivorella* (Grt.)	1944	BF,S, P	Insects observed in all CDs on the north shore of the St. Lawrence.
Large spruce weevil *Hylobius piceus* (Deg.)	1954	SP, EWP, NS	Insect observed in plantations at Valcartier.
Pine needle scale *Chionaspis pinifoliae* (Fitch)	1943	P	Damage on young ornamental pines at Lévis.
	1959	P, WS	Fairly common in Quebec City.
	1960	WS	Observed throughout the region.
Spruce spittlebug *Aphrophora parallela* (Say)	1977	P, S, BF, TL	Populations moderate to high at Saint-Vallier, Saint-Urbain, and Cap-Tourmente. Populations high on mugho pine and moderate on tamarack at Sainte-Foy. First report of such great abundance in the region.

OTHER CONIFEROUS SPECIES

INSECT	YEAR	HOST	REMARKS
Strawberry root weevil *Otiorhynchus ovatus* (L.)	1984	WS, BS	Major damage on 10% of white and black spruce in Duchesnay nursery.
Whitespotted sawyer *Monochamus scutellatus* (Say)	1978	S, BF	Insects observed in several localities in Bellechasse and Dorchester CDs.

OTHER CONIFEROUS SPECIES

Partial list of other insects
encountered in the region

English name	Latin name	Preferred host(s)
Bagworm	*Thyridopteryx ephemeraeformis* (Haw.)	EWC
Green spruce looper	*Semiothisa granitata* Gn.	BF,WS
Saddleback looper	*Ectropis crepuscularia* (D. & S.)	TL
White pine fungus scale	*Matsucoccus macrocicatrices* Rich.	EWP

OTHER CONIFEROUS SPECIES

DISEASES

Bark splitting on conifer trees

This phenomenon is noted occasionally and locally in coniferous trees at the beginning of the growing season. Strips of bark are detached from the trunk, starting at the base of the tree, and remain hanging. This phenomenon is most common on dominant and co-dominant trees with a large crown exposed to the wind. It apparently occurs when heavy winds shake solidly rooted trees that are full of sap when their stumps are still firmly frozen into the ground, especially when the soil is rocky. This phenomenon has been observed in many places in the region.

Year	Remarks
1976	Phenomenon observed on balsam fir and red spruce near Rivière-à-Pierre in Portneuf CD.
1977	A study site established near Rivière-à-Pierre to monitor progress of damage.
1983	Wind split bark and caused the death of 20% of tamarack at Shannon (Portneuf).

OTHER CONIFEROUS SPECIES

Cytospora canker, *Leucostoma kunzei* (Fr.) Munk

This fungus is the pathogen of the cytospora canker commonly found on ornamental spruces, particularly blue spruce. It may infect almost all coniferous species, but does not cause severe damage to forests.

Year	Remarks
1966	Observed on dead branches of ornamental European larch at Lyster (Lotbinière).
1974	Moderate to high infection in a plantation of white spruce at Valcartier.
1976	Centres of low-level infection on tamarack in Quebec CD.
1978	4% of fir trees affected south of the Boileau gate in the Laurentian Wildlife Reserve (Charlevoix-Ouest).
1982	Moderate damage in two plantations of European larch at Saint-Isidore (Dorchester) and Orsainville, where over 60% of trees were affected over nearly 20% of their crown. 3% of tamarack affected in a young stand at Saint-Alban (Portneuf).

OTHER CONIFEROUS SPECIES

Needle cast, *Lophodermium pinastri* (Schrad.) Chev.

This disease affects pines, causing premature senescence of needles one year old or older, which then fall off.

Year	Remarks
1968	Infections varying from trace to high on 90% of red pine in natural stands at Valcartier. Low-level infections in natural stands of red pine in Frontenac CD.
1974	The most severely affected red pine plantations were in Portneuf CD.
1976	Up to 30% of needles affected in a young plantation north of Saint-Raymond. Low-level infection at Saint-Elzéar.
1977	During a systematic inventory of plantations in the region, this disease was frequently observed on red pine and Jack pine, causing moderate to severe damage.
1978	Between 5 and 15% of needles affected in two plantations of Jack pine in Lotbinière and Mégantic CDs.
1980	Eleven out of 20 trees affected at Saint-Zacharie (Dorchester).
1982	Moderate infection in a plantation of red pine at Saint-Placide (Charlevoix-Ouest).

OTHER CONIFEROUS SPECIES

Scleroderris canker, *Gremmeniella abietina* (Lagerb.) Morelet var. *balsamea* Petrini et al.

The disease typical of scleroderris canker is found on pine. On balsam fir and spruces, G. *abietina* var. *balsamea* causes small cankers often followed by twig mortality. For the sake of simplicity, we have combined the data on these two tree species.

Year	Remarks
1966	Low to moderate infection on fir in the Laurentian Wildlife Reserve (Montmorency).
1968	High-level infection on fir and 95% of regeneration in clear cuttings in the Laurentian Wildlife Reserve.
1978	Low-level infection in two stands of black spruce at Lake Beaudin (Montmorency) in the Laurentian Wildlife Reserve.
1979	Low-level infection on black spruce in a number of locations in the Laurentian Wildlife Reserve. Infections varying from low to high on balsam fir in the reserve.
1981	Low to high infection on balsam fir at a number of locations in the Laurentian Wildlife Reserve. Low-level infection on black spruce and white spruce in the reserve.
1982	Infection light on black spruce and moderate on balsam fir in the Laurentian Wildlife Reserve.
1983	Infections varying from low to high on balsam fir and moderate infection on black spruce in the Laurentian Wildlife Reserve.
1984	Moderate infection on balsam fir in the Laurentian Wildlife Reserve.
1985	Moderate infection on black spruce and balsam fir in the Laurentian Wildlife Reserve.
1987	Two trace infections and one moderate on balsam fir in the Laurentian Wildlife Reserve and trace infection on black spruce.

OTHER CONIFEROUS SPECIES

Snow breakage

This is a relatively common type of damage which consists in breakage of branches due to a heavy accumulation of snow. Pines are most often affected and the damage is especially apparent in young plantations. Some cases are described below by way of example.

Year	Remarks
1969	Damage considerable, especially in several plantations of pine in Mégantic, Lotbinière, Lévis, and Portneuf CDs.
1970	Branches and trunks broken on a number of resinous species in Charlevoix CD.
1971	Breakage of trunks with 3.5" DBH on red pine and Jack pine over small areas in plantations in Beauce and Dorchester CDs. Branches broken on over 50% of trees in 18 plantations of red pine and Jack pine in Portneuf, Lévis, and Dorchester CDs.
1972	Trunks and branches broken in several red pine plantations in Portneuf CD.
1973	Branches broken on 20 to 45% of red pine in plantations at Saint-Basile, Sainte-Christine, and Saint-Raymond (Portneuf) and at Sainte-Germaine (Dorchester).
1974	Damage on over 10% of red, Jack, Scots, and white pine in plantations in Portneuf, Quebec, Charlevoix, and Montmorency CDs. Damage light to severe on red spruce, white pine, and red pine in Lotbinière, Beauce, Frontenac, Dorchester, and Bellechasse CDs.
1975	Severe damage on red pine at Saint-Méthode (Frontenac), Saint-Elzéar (Beauce), Sainte-Marguerite, Sainte-Catherine, and Les Éboulements (Charlevoix-Ouest). Moderate damage on balsam fir, Jack pine, and red pine at Saint-Adrien-d'Irlande (Mégantic), Saint-Henri, Saint-Honoré (Beauce), Saint-Nazaire (Dorchester), and Saint-Lambert. Light damage on balsam fir and red spruce at Saint-Apolline (L'Islet) and at Joly (Lotbinière).
1976	Moderate damage on red pine at Saint-Elzéar. Light damage on red pine at Sainte-Marguerite, Saint-Méthode, and Thetford Mines. 10 to 45% of branches broken in 45 young plantations of red pine, Jack pine, and Scots pine in Portneuf CD.

OTHER CONIFEROUS SPECIES

1977	Moderate to severe damage on red pine and Jack pine in plantations in Portneuf, Charlevoix, Frontenac, and Lotbinière CDs. Severe damage on Norway spruce at Baie-Saint-Paul.
1978	Severe damage on red pine over an area of 5 ha at Thetford Mines. Moderate damage on red pine in plantations in Charlevoix-Ouest CD. Light damage on red pine in plantations in Charlevoix-Ouest, Montmagny, and Portneuf CDs.
1979	Light damage on red pine in plantations along the St. Lawrence River Valley. Frequent damage in young plantations of Jack pine in Charlevoix-Ouest CD.
1981	Damage observed in pine plantations along the south shore of the St. Lawrence.
1984	Damage observed in pine plantations in Montmagny, Bellechasse, and Montmorency CDs.

OTHER CONIFEROUS SPECIES

Winter drying injury

This problem is characterized by drying followed by reddening or browning of the needles (especially the older ones) on coniferous trees. This occurs in late winter and early spring when the needles dry out in warm winds on sunny days. In plantations, the symptoms are often observed on young trees where they protrude above snow level when the phenomenon occurs. The symptoms gradually clear up with the onset of the new growing season; buds are rarely affected.

Year	Remarks
1957	Discoloring of the crowns of conifers was particularly noticeable on balsam fir in the Laurentian Wildlife Reserve and on ornamental cedars in several other parts of the region. In the Laurentian Wildlife Reserve, a study on 1 034 balsam fir and 56 black spruce reported that parts of crown on 39% of firs and 59% of spruces were dead.
1958	The effects on balsam fir and spruce of a late winter and poor spring weather conditions were again observed in sample plots established the previous year in the Laurentian Wildlife Reserve. All trees with reddened needles and dead terminals nevertheless produced new growth.
1961	Damage observed on many ornamental conifers, particularly on red pine and Eastern white cedar in Quebec City. A number of red pine in a 15-year-old plantation were slightly damaged at Beaupré.
1962	Pronounced yellowing of 1961 shoots on white spruce observed along the St. Lawrence between Beaupré and Baie-Sainte-Catherine.
1963	Considerable browning of foliage on balsam fir observed in several areas north and southeast of Quebec City. Damage severe on red pine, white spruce, and Norway spruce at Saint-Féréol (Montmorency).
1965	Considerable browning observed on young plantations of white spruce at Scott (Dorchester). This browning was also observed at several locations in the Laurentian Wildlife Reserve on $\pm$ 15% of branches of black spruce.
1966	Considerable browning and, in several cases, mortality of ornamental juniper and Eastern white cedar observed in the Quebec City area.
1967	A number of ornamental trees, including white spruce and Norway spruce, moderately to severely damaged in Bellechasse CD.

OTHER CONIFEROUS SPECIES

1968 Light damage on a number of red pine, balsam fir, and white spruce in several locations in Frontenac and Wolfe CDs.

1969 Noticeable browning of needles on 1968 shoots on conifers at Saint-Urbain and Quebec City.

1970 Less severe damage observed on red spruce, Jack pine and red pine at Saint-Elzéar, Saint-Anges (Beauce), and Saint-Édouard; on Scots pine and Eastern white cedar at Saint-Romuald and Notre-Dame-des-Anges.

1971 Over 50% of red pine damaged in a plantation in Portneuf CD.

1972 Reddening of needles on 50% of crown observed on at least 70% of young red, Scots, and white pine in plantations in Mégantic and Portneuf CDs.

1973 Reddening of 40% of crown on 30% of red pine in plantations in Lotbinière CD. Red spruce showed symptoms of drying in Mégantic, Lotbinière, Bellechasse, and Montmagny CDs as did white spruce in Bellechasse and Dorchester CDs.

1974 Variable damage on white spruce in natural forest and on Scots pine in plantations in Beauce and Mégantic CDs.

1975 Moderate damage in five plantations of red pine in Lotbinière, Bellechasse, and L'Islet CDs. Variable damage on balsam fir and Jack pine in natural forest, on red pine in plantations and on ornamental cedars. Light damage on Norway spruce and red spruce at Petite-Rivière-Saint-François (Charlevoix-Ouest), Sainte-Christine, and Cap-Saint-Ignace, on cedar at Saint-Patrice, and on red pine at Saint-Apollinaire and Thetford Mines. Moderate damage on Norway spruce and red pine at Sainte-Christine, Saint-Alban, Baie-Saint-Paul, Saint-Célestin, and Saint-Gilles.

1976 Moderate damage on red pine in plantations at Saint-Agapit and elsewhere in Lotbinière and Bellechasse CDs. Light damage on white spruce in Montmorency and Charlevoix-Ouest CDs.

1977 Light to moderate damage in the region. On white pine southeast of Pont-Rouge, 40% of old foliage reddened on 95% of saplings. Light damage on ornamental mugho pine at Charlesbourg. On white spruce, 10, 60, and 75% of trees affected at Saint-Sévérin, Saint-Benjamin and Saint-Anges, respectively.

1978 15 to 80% of foliage reddened on cedar at La Malbaie, Cap-aux-Oies, Saint-François, and Montmorency. On white pine, 60% of foliage reddened on about a hundred trees at Neufchâtel. On red pine, 10 to 50% of foliage reddened on 50 to 100% of trees in four plantations in Portneuf CD and in a plantation of 1 000 trees in Quebec CD. On Norway spruce, 30 to 40% of foliage reddened on over 95% of saplings in a plantation of 500 trees northwest of Pont-Rouge.

OTHER CONIFEROUS SPECIES

On white spruce, 15% of foliage reddened on 5 000 of 10 000 trees in a plantation east of Saint-Casimir. On Jack pine, 15% of foliage reddened on 20% of 1 000 trees in a plantation north of Saint-Irénée. On mugho pine, moderate damage on ornamental plants at Charlesbourg.

1979 Decrease in extent and intensity of damage caused by drying. Damage was light and concentrated on the south shore of the St. Lawrence.

1980 Light damage on 40% of 2 000 Norway spruce saplings in a plantation at Saint-Léonard; 8 to 20% of needles affected in four plantations at Saint-Méthode (Frontenac). On red pine, 50% of foliage affected on 2 000 fifteen-year-old trees; between 20 and 25% of needles affected in a plantation of 800 trees. On white pine, 40% of trees affected in a plantation at Saint-Évariste (Frontenac). Light attack on balsam fir twigs at Leeds, Saint-Évariste, and Saint-Benoît.

1981 An 8-ha plantation at Petite-Rivière-Saint-François had moderate-level infection on white spruce. At Saint-Léonard (Portneuf), 30% of old foliage reddened on 2 600 Norway spruce saplings.

1982 On the south shore of the St. Lawrence, 50 to 100% of trees in seven plantations composed of Norway spruce, white spruce, red pine, Scots pine, and balsam fir, had 10-30% of their crowns affected. On the north shore, 35% of foliage reddened on 80% of 1 600 red pines at Rivière-à-Pierre. On Norway spruce, 20% of foliage reddened on 80% of 3 600 trees. On red spruce, 20% of foliage reddened on 70% of 2 500 trees. On white pine, 15% of foliage was reddened on 85% of 5 000 trees.

OTHER CONIFEROUS SPECIES

ORGANISM	YEAR	HOST	REMARKS
Animal damage			
American red squirrel	1968	BF	Light damage at Saint-Cyprien (Dorchester) and Sainte-Euphémie (Montmagny).
		WS	Variable damage in young plantations in Montmagny and L'Islet CDs.
	1975	BF	Moderate to severe damage at Saint-Léonard and Saint-Raymond.
	1982	JP	Light damage northwest of Saint-Aimé-des-Lacs and north of Saint-Siméon.
Porcupine	1967	TL	Mortality of 50 young trees at Saint-Gilles.
		BF	Mortality of a number of trees at Saint-Tite-des-Caps (Montmorency).
	1970	RP,SP	Light damage at Saint-Anges (Beauce).
	1973	TL	60% of trees affected at Sainte-Agathe.
	1983	JP	5% of trees affected over 0.5 ha at Saint-Siméon.
Cytospora canker *Valsa abietis* Fr.	1968	WS,BS	Moderate infection at Clermont (Charlevoix-Est) and low-level infection at Les Éboulements (Charlevoix-Ouest).
	1977	BF	Low-level infection in Montmorency and Portneuf CDs.
Gray-mold blight *Botrytis cinerea* Pers.	1967	WS	Moderate infection on several small trees along a stand at Leeds (Mégantic).
		TL	Over 60% of seedlings infected in a greenhouse at Duchesnay.

DECIDUOUS SPECIES

ALDER

INSECT	YEAR	HOST	REMARKS
Duskyback leafroller *Archips mortuana* Kft.	1977	AL	15% defoliation at Deschambault (Portneuf) and low population level at Orsainville.
European alder leafminer *Fenusa dohrnii* (Tisch.)	1966	AL	Insect gathered locally at Sainte-Foy.
Woolly alder sawfly *Eriocampa ovata* (L.)	1957	AL	Moderate infestation at Saint-Augustin.
	1958	AL	Insect still as abundant in the same location.
	1959	AL	Slight decrease in population levels with ± 30% defoliation at Saint-Augustin.

ASH

ORGANISM	YEAR	HOST	REMARKS
Cytospora canker *Valsa cincta* Fr.	1961	AS	Reported on 35% of 150 trees in a nursery at Charlesbourg.

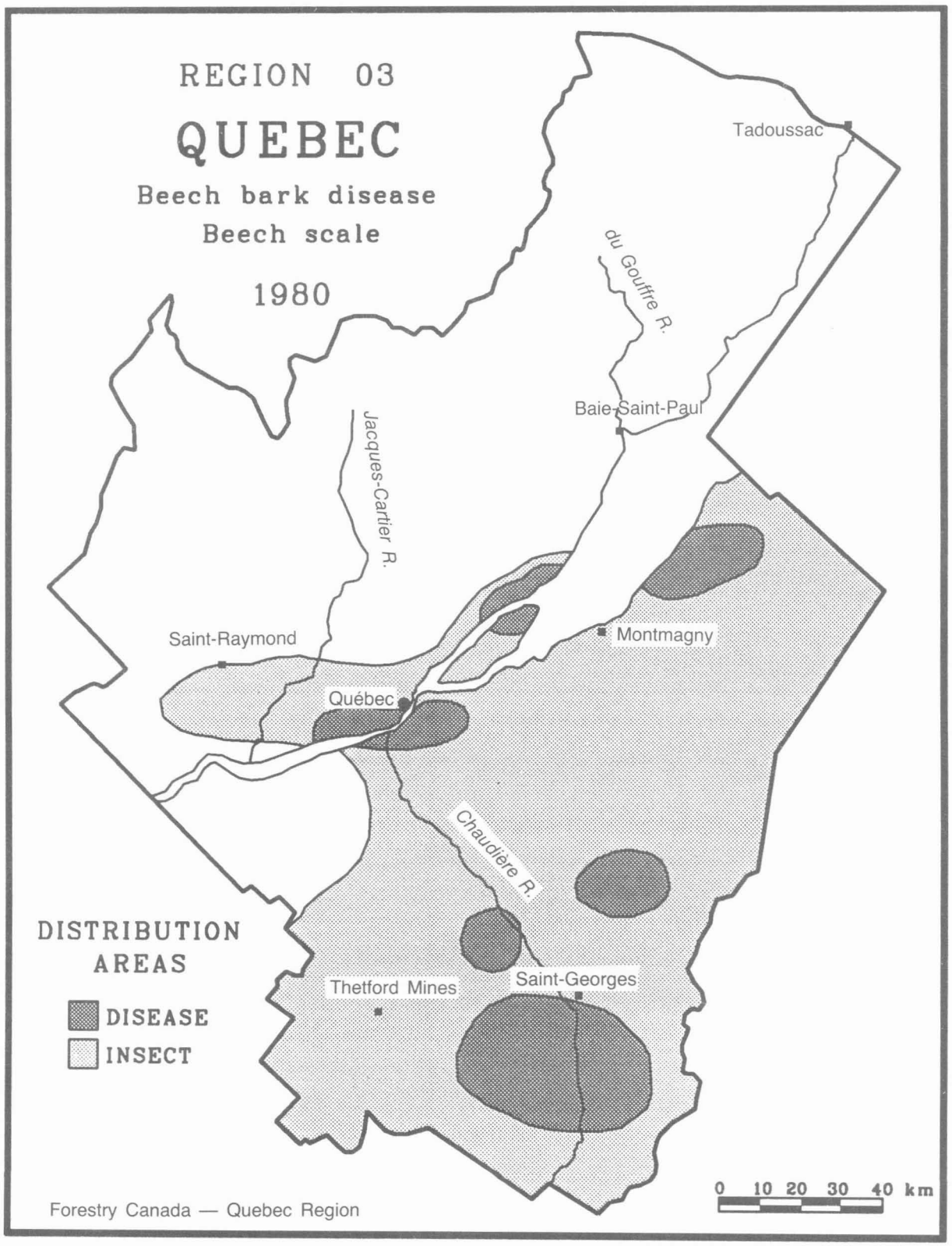
BEECH

INSECTS

Beech scale, *Cryptococcus fagisuga* Lind.

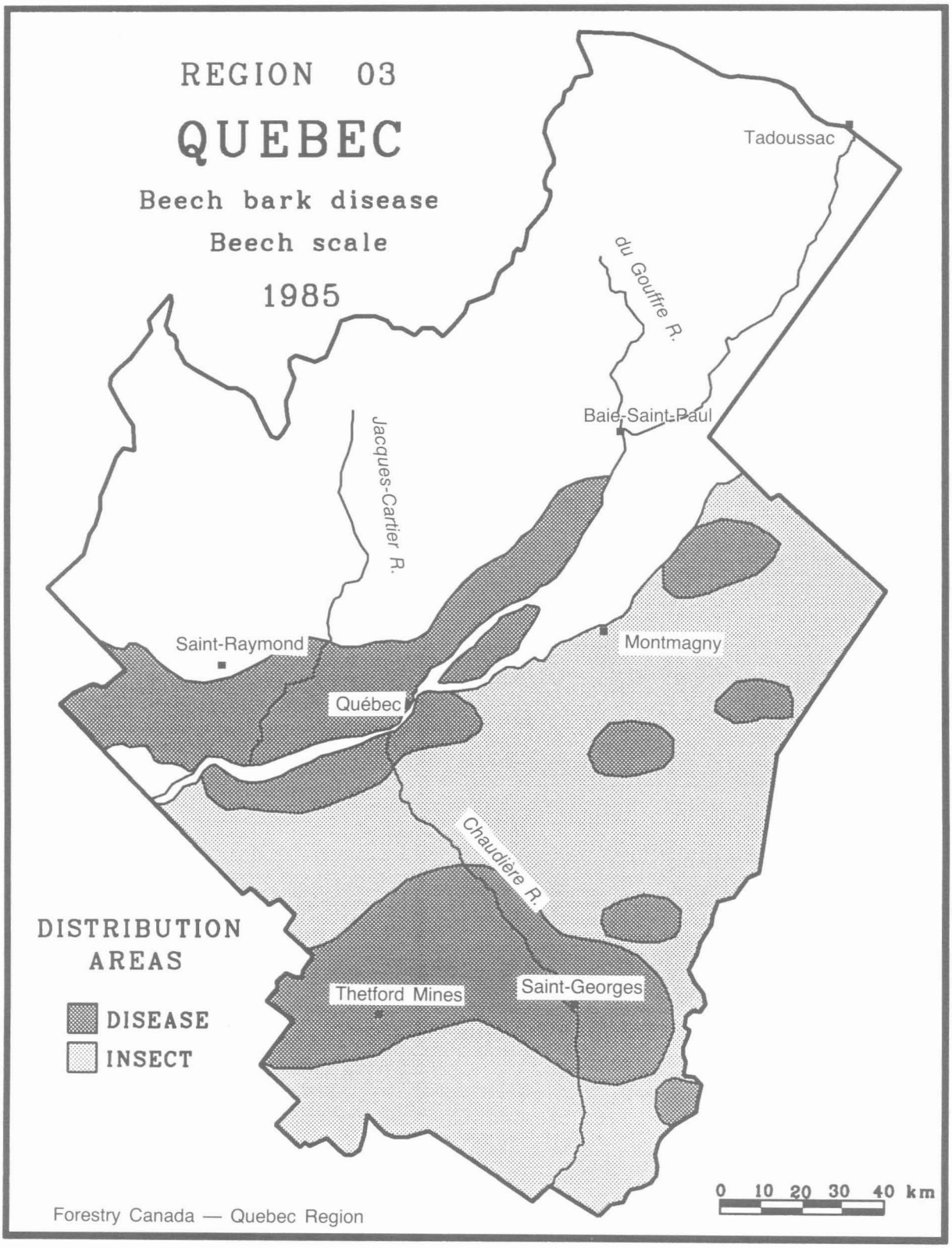
This insect, which affects beech, is becoming more and more widespread in Quebec. Major infestations are eventually followed by **beech bark disease.**

Year	Remarks
1969	First report in the region. Fairly recent moderate to severe infestation at Saint-Augustin (Portneuf).
1970	Some reduction in population in centre of infestation at Saint-Augustin, following treatment with Diazinon aimed at checking the infestation. New centres of infestation at Saint-Vallier, Cap-Saint-Ignace, Sainte-Foy, and La Guadeloupe.
1971	New centres of infestation at Saint-Hilaire-de-Dorset (Frontenac), Saint-Honoré (Beauce), Saint-Michel (Bellechasse), and Lake Trois-Saumons (L'Islet). Progress of insect slowed at La Guadeloupe, Cap-Saint-Ignace, and Lake Trois-Saumons by a predator, *Chilocorus stigma* (Say). Increase in population in the infested area at Saint-Augustin, despite treatment with Diazinon in 1970.
1972	New centres of infestation of this scale at Saint-Benoît and Saint-Frédéric (Beauce) and Duchesnay (Portneuf) with low to moderate infestations. At Cap-Tourmente (Montmorency), population of the insect high.
1973	Populations high at Cap Tourmente and moderate at Saint-Frédéric.
1974	Population high at Cap Tourmente since 1972. New centres of infestation with high population levels on Ile d'Orléans at Saint-François. Light infestation at Saint-Pétronille. The insect-disease complex was present at Saint-Augustin for the past few years.
1975	New centre of infestation at Château-Richer (Montmorency). At Saint-François and Sainte-Pétronille, Ile d'Orléans, Cap-Tourmente, and Saint-Frédéric, population of this insect on the increase for two years at a moderate to high level.
1976	Low population at Château-Richer. Moderate to severe infestation at Ile d'Orléans and Cap Tourmente. Light damage at Saint-Théophile and Saint-Philibert (Beauce). Severe damage at Saint-Vallier and Lake Trois-Saumons.


REGION 03
QUEBEC
Beech bark disease
Beech scale
1980
Tadoussac
du Gouffre R.
Baie-Saint-Paul
Jacques-Cartier R.
Saint-Raymond
Montmagny
Québec
Chaudière R.
Thetford Mines
Saint-Georges
DISTRIBUTION AREAS
DISEASE
INSECT
0 10 20 30 40 km
Forestry Canada — Quebec Region

BEECH

1977	Moderate to severe attack at Cap Tourmente, Ile d'Orléans and Lake Trois-Saumons.
1978	Sharp increase in population at Saint-François (Montmagny) with considerable extension westward as far as Inverness. Population rising at Saint-Augustin.
1979	Trace to high infestations from Ile d'Orléans to Cap-Saint-Ignace. Light attack at Sainte-Christine (Portneuf). Population low at Saint-Philibert and Saint-Théophile (Beauce). Population very high at Saint-François (Montmagny) and Saint-Eugène (L'Islet).
1980	Overall severity of infestations lower. Damage sporadic and intensity variable in almost the entire region south of the St. Lawrence. (See map p. 98).
1981	Population declined to a low level at Sainte-Famille.
1985	The boundary of this insect's range on the south shore lies slightly further west than that of the disease. Population of the insect stable. (See map p. 100).


REGION 03
QUEBEC
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Tadoussac
du Gouffre R.
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Québec
Montmagny
Chaudière R.
Thetford Mines
Saint-Georges
DISTRIBUTION AREAS
DISEASE
INSECT
0 10 20 30 40 km
Forestry Canada — Quebec Region

BEECH

INSECT	YEAR	HOST	REMARKS
Pale tussock moth *Halysidota tessellaris* (J.E. Smith)	1974	BE	Insect very common in metropolitan Quebec.

BEECH

DISEASES

Beech bark disease, *Nectria coccinea* (Pers. ex Fr.) var. *faginata* Lohm. Wats. & Ayers

This disease was introduced in 1890 at Halifax and then spread along the Northeastern U.S.A. An infestation of stands by the **beech scale** (*Cryptococcus fagisuga* Lind.) necessarily precedes the onset of the fungus by a few to several years. Tree mortality follows. At present the disease is found in isolated locations throughout southern and central Quebec with a few pockets in the Lower St. Lawrence.

Year	Remarks
1971	Fungus collected on beech bark at Lake Trois-Saumons, L'Anse-à-Gilles (L'Islet), Saint-Augustin, and Sainte-Lucie (Montmagny).
1972	Beech scale is a precursor and vector of the fungus responsible for the disease. The fungus was observed for the first time at Duchesnay.
1973	The insect-disease complex continued to spread (6 500 km^2 in eastern Quebec) slowly around areas infested in previous years.
1974	The insect-disease complex has been observed at Saint-Augustin for several years; the population of this insect was high and damage due to the fungus was moderate.
1975	Within the known range of the disease, new pockets were added near Saint-Ephrem and Saint-Théophile (Beauce). Low-level infection at Saint-François, Ile d'Orléans.
1976	No change in distribution or severity of disease.
1979	New centre of infection found on Ile-aux-Grues (Montmagny).
1980	Responsible for mortality from bark plaques and occasionally for death of the tree, the infection is usually found on large trees and especially those that have had a severe infestation of this scale. 12 and 18% of trees attacked in two stands at Saint-Benoît (Beauce), 8% at Saint-Hilaire-de-Dorset, and 4% at Saint-Ephrem (Beauce). For distribution of disease to date, see map p. 98.
1983	36% of trees affected with 5% mortality at Saint-Philibert (Beauce).
1985	On the north shore, the disease now extends over 60 from the known limit of 1980. On the south shore, the area known to be infected by the disease in

BEECH

1980, west of Saint-Georges, extending to the municipality of Victoriaville (see map p. 100). Light damage in a number of new centres at Sainte-Apolline (Montmagny) and Armagh (Bellechasse).

1987 Sites with high-level infection at Saint-Victor and Saint-Ephrem (Beauce).

BEECH

ORGANISM	YEAR	HOST	REMARKS
Bark necrosis *Asterosporum asterospermum* (Pers.) Hughes (Mégantic).	1978	BE	First report in the region at Bernierville [Saint-Ferdinand]
Leaf spot *Gloeosporium* sp.	1978	BE	20% of foliage affected on 30% of trees at Saint-François, Ile d'Orléans.

BIRCH

INSECTS

Ambermarked birch leafminer, *Profenusa thomsoni* (Konow)

Attacks by this leafminer occur towards mid-summer. They cause nearly total browning on white birch foliage, sometimes over wide areas.

Year	Remarks
1967	Trace populations along the road from Clermont to Saint-Siméon (Charlevoix-Ouest) and at Sainte-Louise (L'Islet).
1976	Insect seemed to regress this year with trace levels throughout the region.
1977	Trace level in almost entire region.
1978	Increase in population between Quebec City and Saint-Casimir. Levels low at Beaumont (Bellechasse) and trace elsewhere.
1979	Trace levels in almost entire region.
1980	Populations endemic but still very common on the south shore.
1981	Populations increased on the south shore. Approximately 30% of leaves mined at Saint-Urbain (Charlevoix-Ouest).
1982	Moderate level at Saint-Placide (Charlevoix-Ouest).

BIRCH

Birch casebearer, *Coleophora serratella* (L.)

Severe defoliation by this casebearer causes dieback and even mortality in white birch. During outbreaks, it can also cause severe damage to speckled alder.

Year	Remarks
1967	Moderate infestation reported at Saint-Lambert (Lévis). Elsewhere defoliation light.
1968	Increase in population with moderate to severe defoliation in lowlands in Charlevoix-Est and Ouest CDs and moderate defoliation in the north of L'Islet CD.
1972	Populations declined. Pockets of moderate to high infestation in Charlevoix-Est and Ouest CDs.
1973	Slight increase in population with a few pockets of moderate to severe defoliation at Grand-Fond (Charlevoix-Est), Lauzon, and Sainte-Foy.
1974	On the north shore, defoliation varying from trace to light from the western border of Montmorency CD to Saint-Siméon. Decline in defoliation at Grand-Fond and Saint-Siméon. On the south shore, population varied from trace to moderate, causing moderate defoliation in Dorchester and Bellechasse CDs.
1975	In general, increase over 1974. Moderate to severe infestation all along the south shore of the St. Lawrence from Lotbinière and Frontenac CDs towards the eastern edge of L'Islet CD. Trace to moderate defoliation around Pont-Rouge, Château-Richer, Baie-Saint-Paul, and La Malbaie.
1976	Major infestation south of the St. Lawrence, with a line stretching from Lake Mégantic to Leclercville (Lotbinière) as its western boundary, and extending to the eastern border of L'Islet CD. Elsewhere, variable local infestations along the north shore from Saint-Marc-des-Carrières to Baie-Sainte-Catherine.
1977	Infested area the same as in 1976. Moderate infestation in Charlevoix-Est and Ouest CDs and various degrees of defoliation in the rest of the area. Epidemic for a number of years all along the south shore.
1978	Area infested by this casebearer little changed since 1975. Infestations intensified somewhat in almost all areas with the most frequent severe defoliation reported in Beauce and Frontenac CDs, where it varied from 70 to 90%, and in Lévis and Mégantic CDs, where defoliation varied from 40 to 90%.

BIRCH

Defoliation varied from 10 to 50% in Lotbinière, Montmagny, and L'Islet CDs. Infestation remained stable in Charlevoix-Est and Ouest CDs.

1979 Insect present in entire region and elsewhere in Quebec. Infestations renewed at Saint-Féréol-les-Neiges and extended into the Charlevoix CDs. Damage varied from light to severe. On the south shore, damage was moderate to severe over the entire area, but sporadic.

1980 Frequency and intensity of this casebearer increased slightly in 1980. Light to moderate infestation in a strip along the river from Saint-Raymond to Baie Sainte-Catherine (Charlevoix-Est). On the south shore, severe defoliation west of the Chaudière River. Damage light to severe throughout the area, but sporadic.

1981 On the north shore, distribution remained the same as previous year, but degree of defoliation declined everywhere. The same was true on the south shore. Light defoliation varying from 6 to 15% at Charny and Armstrong.

1982 Populations declined throughout the area with damage varying from trace to light.

1983 Major increase in all of Region 03 with from 10 to 90% defoliation with an average of 30%. The most affected areas were Saint-Apolline, Saint-Nérée, Abénakis, and Saint-Lazare.

1986 Defoliation moderate to severe over a number of small areas in Portneuf and Charlevoix CDs.

BIRCH

Birch leaffolder, *Ancylis discigerana* (Wlk.)

Infestations of this leaffolder last only a few years, with the insect causing damage late in the season. Damage to trees appears negligible.

Year	Remarks
1943	Population abundant in Quebec, Montmorency, Charlevoix, Bellechasse, Montmagny, and L'Islet CDs.
1981	Unusual increase in populations with 10 to 50% of leaves folded over an area of ± 1000 km^2 between Rivière-à-Pierre (Portneuf) and Tewkesbury (Quebec).
1982	10 to 50% of leaves folded over an area 15 to 20 km wide by 125 km long between Tewkesbury and the south of the Saint-Maurice Reserve. This 2 000 km^2 area was double that of 1981 and resulted from extension of the insect westward.
1983	10 to 15% of foliage affected in Portneuf Reserve, a decrease from 1982.

BIRCH

Birch leafminer, *Fenusa pusilla* (Lep.)

The birch leafminer sometimes produces as many as three generations in a season. It occasionally causes browning of foliage on its preferred host, grey birch, which is common in the region. This leafminer is also frequently found on ornamental birches.

Year	Remarks
1942	Variable damage in Quebec and Bellechasse CDs.
1943	Significant population levels throughout the region but more specifically in the southern part of Portneuf and Quebec CDs and in Lotbinière and Lévis CDs.
1944	High population levels in various parts of the St. Lawrence River valley.
1947	Insect common in the region.
1948	Insect common on the south shore of the St. Lawrence.
1954	Variable damage in Portneuf CD.
1960	Insect common in entire region.
1961	Severe damage in the region.
1962	Very abundant on the south shore.
1963	Common in entire region with areas of severe infestation in Quebec and Bellechasse CDs.
1964	Very abundant on grey birch in the St. Lawrence River valley and particularly in Lévis and Lotbinière CDs, where severe damage was observed.
1965	Despite a decline in populations, areas of severe infestation were observed in Lotbinière, Beauce, and Mégantic CDs.
1967	Population very abundant in the vicinity of highway 20, from Villeroy to Quebec, and throughout cultivated areas in Portneuf, Quebec, Montmorency, Charlevoix-Est and Ouest, and L'Islet CDs.
1968	Defoliation varied from moderate to severe throughout the whole distribution area of grey birch in the region.
1973	Moderate to severe damage in metropolitan Quebec.
1974	Insect present in entire region and elsewhere in Quebec. Population levels generally low along the St. Lawrence.
1975	Presence of the insect reported throughout entire region. Trace to moderate damage at Lake Beauport, Les Éboulements, and Port-au-Persil (Charlevoix-Est). Moderate levels at Saint-Apollinaire and Saint-Lambert.

BIRCH

1976	Population levels moderate to high on the north shore in a 40-km strip along the St. Lawrence from Saint-Casimir (Portneuf) to Quebec City. Trace and low levels in the rest of the region.
1977	Leafminer reported in practically the entire region with damage varying from trace to light. 34% of leaves mined east of Cap Tourmente and 20% at Saint-François on Ile d'Orléans. Up to 55% of leaves mined in Lotbinière, Lévis, Mégantic, Beauce, Dorchester, and Bellechasse CDs.
1978	The majority of attacks varied from trace to light with 1 to 28% of leaves mined throughout the region.
1979	General decline in entire region and the rest of Quebec.
1980	Situation similar to that of 1979.
1981	Populations increased in the region.
1982	Populations increased on the north shore. Damage light to severe between Saint-Raymond and Saint-Casimir (Portneuf). Moderate damage at Saint-Achille (Montmorency) and Saint-Tite-des-Caps. Occurring sporadically over small areas throughout the region .
1983	Population declined in southern part of Portneuf CD and in Lévis and Lotbinière CDs.

BIRCH

Birch skeletonizer, *Bucculatrix canadensisella* Cham.

The larvae of this insect eat only the parenchyma of the underside of the leaf and between the veins. Heavily affected leaves are reduced to a skeleton. The insect also contributes to birch dieback, but fortunately its infestations only last a few years.

Year	Remarks
1962	On the south shore, moderate-level infestation in Thetford Mines area.
1963	In the Quebec City area, insect extremely abundant, and all trees showed signs of attack.
1964	Population a little lower than in 1963, but severe damage reported at Breakeyville (Lévis).
1965	Marked decline in populations. Moderate to high infestation persisted in Bellechasse and Charlevoix CDs. Low levels elsewhere.
1966	Population dropping steadily in the region.
1967	Population dropped to endemic level.
1968	Endemic level.
1971	Low-level populations in the Saint-Urbain area.
1972	Slight increase in population in entire region.
1973	Observable decrease in populations in the region.
1974	Light defoliation at Saint-Augustin. Trace to low infestation in Charlevoix CDs.
1975	Pockets of moderate and high infestation north of Charlevoix-Ouest CD. Very low population along the shores of the St. Lawrence, from Quebec City to Baie-Sainte-Catherine.
1976	Trace populations throughout the region, but severe defoliation at Saint-Magloire (Bellechasse).
1981	Small local pockets of light to moderate damage at Tewkesbury (Quebec) and elsewhere in the region.
1982	10 to 50% defoliation over a number of hectares in Portneuf and Quebec CDs.
1983	Numerous pockets with defoliation from 5 to 25% in entire region.

BIRCH

Early birch leaf edgeminer, *Messa nana* (Klug)

This miner, introduced fairly recently to Canada, causes damage similar to that of the birch leafminer. No major damage has as yet been reported.

Year	Remarks
1973	First report in Quebec.
1974	Found throughout entire region. Low levels at two locations on Ile d'Orléans and trace elsewhere. Range extending eastward to Cap Tourmente.
1975	Moderate levels at Saint-Aubert (Montmagny) and trace to low elsewhere in the region.
1976	Trace levels in almost the entire region.
1977	Trace levels in almost the entire region.
1978	Level low at Charny and trace elsewhere in the region.
1979	Overall decline in the region with trace level remaining.
1980	Populations declined but insect still very common.

BIRCH

INSECT	YEAR	HOST	REMARKS
Birch lace bug *Corythucha pallipes* Parsh.	1981	YB	Yellowing of foliage caused by the abundance of the insect at Saint-Raymond.
	1982	YB, WB	Yellowing of foliage between Tewkesbury and the western border of Portneuf CD.
	1983	YB	Yellowing of 10 to 40% of leaves at Stoneham and in the eastern part of the Portneuf Reserve.
Birch sawfly *Arge pectoralis* (Leach)	1941	B	25% defoliation over a small area in Des Aulnaies village.
	1943	B	Light defoliation in Montmorency and Charlevoix CDs.
	1944		
	1950	B	Severe defoliation northwest of La Malbaie and west of Saint-Siméon.
Birch tubemaker *Acrobasis betulella* Hulst	1963	WB, YB	Fairly common in the region since 1961.
	1965	WB,YB, GB	Common but less abundant than in 1964.
Late birch leaf edgeminer *Heterarthrus nemoratus* (Fall.)	1941	B	Insect more abundant in the region than in 1940.
Lintner scale *Chionaspis lintneri* Comst.	1964	B	First report at Lotbinière and in Montmorency CD.
	1976	WB	Moderate population levels in the Laurentian Wildlife Reserve.

BIRCH

INSECT	YEAR	HOST	REMARKS
Striped birch pyralid *Ortholepis pasadomia* (Dyar)	1962	WB	Insect less abundant at Quebec City and Tadoussac than previous year.

BIRCH

DISEASES

Birch dieback

Birch dieback is characterized by gradual mortality of the crown starting with the highest twigs; in time it can kill the tree. The precise causes of dieback have never been found despite the variety of hypotheses put forward, which include epidemics of insects, diseases, drought, and other factors. The earliest symptoms of the disease were observed in the late 1930s. The phenomenon first appeared in eastern Quebec, affecting the majority of white birch and yellow birch. Tree decadence became very significant in the Matapédia valley and in the Gaspé in 1943 and 1944. Renewed vigor of trees was, however, observed to some extent in both areas from 1946 to 1950, while elsewhere in the province, the disease spread westward. The problem of birch dieback practically disappeared around 1966; at that time there only remained a few infected stands in the Quebec City area and in the Gaspé.

Year	Remarks
1943	It was reported that birch dieback is not caused by *Agrilus anxius* but rather by periodic drought.
1945	Disease spread gradually towards the west of the province from the Gaspé Peninsula.
1947	Decadence rate decreased gradually toward the west, in the Laurentian Wildlife Reserve.
1948	Birch gradually disappearing in all regions of the province, as in Quebec City for example.
1949	Decadence of birch continued to rise although, in a number of locations, it was reported that trees had shown increased vitality.
1950	Birch continued to fall victim to a disease that was slowly killing it. In recent years, aspen and sugar maple in many locations also seemed to have shown similar symptoms of dieback, resulting from a complex of factors including rapid drying of soil and a lowering of the water table.
1953	Noticeable improvement in the health of trees in early summer, but subsequently a period of drought with very hot weather again jeopardized the health of birch, maple, oak, and beech in most regions of Quebec.

BIRCH

1954 Due to the cool, damp weather, the foliage of trees remained green throughout the season, indicating that the cause of this dieback had ceased to act. Older trees already severely affected did, however, continue to decline.

1955 The percentage of trees affected decreased but the rate of mortality was higher. Noticeable improvement in health of trees.

1958 The general health of deciduous trees was very good. In the Sainte-Anne River area (Montmorency), however, a new case of dieback on birch, aspen, and balsam poplar was reported during the fall.

BIRCH

ORGANISM	YEAR	HOST	REMARKS
Godronia canker *Godronia cassandrae* Peck	1976	YB	Mortality, attributed to *Godronia* sp., of 25 to 50% of trees in three young plantations of 7 000 to 15 000 trees each in the seigneury of Joly (Lotbinière).
	1981	YB	Visible damage on young trees 1.5 to 3 metres high over a distance of 6.5 km, and up to 20% of trees dying in certain locations at Duchesnay.
	1982	YB, WB	60% of regeneration affected over 2 ha and 10% of these saplings dead near Lake Jaune at Duchesnay. First report in Portneuf Reserve, where less than 10% of young trees were cankered. On white birch, 10% of regeneration affected near Lakes Lachance and Guérin in the Laurentian Wildlife Reserve.
	1983	YB	Rates of infection varied from 4 to 21% of trees 1 to 2 metres high in eight different stands in Portneuf CD.
Godronia canker *Godronia multispora* Groves	1970	WB	First report in the Laurentian Wildlife Reserve.
Leaf blister *Taphrina carnea* Johans.	1959	WB	Low incidence at Sainte-Foy.
	1975	YB	Reduction in frequency and severity in Beauce and Portneuf CDs.
	1984	YB	Observed at Saint-Philémon (Bellechasse).

BIRCH

ORGANISM	YEAR	HOST	REMARKS
Leaf rust *Melampsoridium betulinum* (Fr.) Kleb.	1958	B	High rate of infection on several birches at Sillery.
	1962	WB YB	Common on ornamental white birch at Sainte-Foy, on yellow birch near Duchesnay, and on white birch in large areas along the Sainte-Anne River (Montmorency).
	1970	GB	Moderate intensity on grey birch at Saint-Augustin.
	1983	B	Observed on young birches on the Université Laval campus.
Powdery mildew *Phyllactinia corylea* (Pers.) Karst.	1972	WB	Up to 80% of foliage attacked in Charlevoix CDs.
Septoria leaf spot *Septoria betulae* (Lib.) Westend.	1962	WB	Moderate infection in a few localities north of Quebec City.
	1968	WB	Low to moderate infection in Charlevoix CDs.
White spongy rot *Poria obliqua* (Pers.:Fr.) Karst.	1967	WB, GB	High rate of infestation on branches and stems in a small stand.

CHERRY TREES

INSECTS

Eastern tent caterpillar, *Malacosoma americanum* (F.)

This is the typical tent caterpillar. It mainly attacks cherry and apple trees, and may occasionally cause complete defoliation of these species. Fortunately, infestations are sporadic and local.

Year	Remarks
1965	Major increase in population in Quebec CD, particularly in the Sainte-Foy area.
1966	Moderate to high infestation in Quebec CD.
1967	Reduction in population this year. Low-level infestation in areas affected in 1966.
1968	Population low in practically the entire region, except in Montmorency, L'Islet, and Charlevoix CDs.
1969	Increase in population with broader distribution of the insect.
1970	Low population levels in the region.
1971	Endemic populations.
1972	Endemic populations.
1973	Trace population in Portneuf CD. On the south shore, many tents at Sainte-Marie.
1974	Trace population at Sainte-Catherine (Portneuf) and Ange-Gardien (Montmorency). Low-level infestation in Bellechasse, Dorchester, Montmagny, and L'Islet CDs.
1975	Presence of the insect in the region. Defoliation light at Chute-Panet (Portneuf) and trace at Sainte-Pétronille and Ange-Gardien.
1976	Population with several pockets of severe infestation at Saint-Anselme (Dorchester), moderate at Saint-Henri (Lévis), and low at Saint-Frédéric (Beauce) and Ange-Gardien.
1977	Moderate defoliation at Ange-Gardien (Montmorency). Light defoliation at Vallée-Jonction, Saint-Philibert, and Saint-Théophile, all three in Beauce CD, as well as in Portneuf and Charlevoix CDs.

CHERRY TREES

Uglynest caterpillar, *Archips cerasivorana* (Fitch)

This insect has no major economic impact. Its larvae can build tents that completely enclose a hedge of chokecherry, its preferred host, causing total defoliation.

Year	Remarks
1949	Population reported in Bellechasse, Montmagny, and L'Islet CDs.
1960	Moderate to high infestations in a number of localities in the Quebec City area.
1961	Tents of this caterpillar still numerous on the south shore of the St. Lawrence.
1962	Appreciable decrease in populations of the insect on the south shore of the St. Lawrence. Average number of tents per mile dropped from 131 in 1961 to 42 this year in Mégantic CD, with 52 tents in Portneuf CD.
1963	Populations declined on the south shore with a few tents occasionally observed.
1964	Population generally low, with an increase in some of the more recently infested areas on the south shore.
1965	Populations increased in entire region. Moderate to high infestations at Sainte-Foy. Infestations of lower intensity at Beaumont (Bellechasse).
1966	Insect still abundant in the same area as in 1965. Level high at Sainte-Foy and low at Beaumont.
1967	Considerable decrease in population. Moderate to high levels at Sainte-Catherine, Sainte-Foy, and Saint-Aubert (L'Islet).
1968	Slight increase in populations in entire region but level still relatively low. High levels of infestation at Saint-Victor (Beauce), Saint-Anselme (Dorchester), and Sainte-Catherine. Moderate infestation in Portneuf CD.
1969	Slight increase in population. Moderate to light infestations in part of Frontenac CD and in the southern sections of Portneuf and Montmagny CDs, stretching to the eastern border of L'Islet CD, along Highway 132. Low-level infestation south of Lake Etchemin (Dorchester).
1970	Considerable increase in population. Moderate to high infestations in Portneuf and Beauce CDs.
1971	Decline in population but insect still very common. Population high in Portneuf, Lotbinière, Beauce, and Dorchester CDs.
1972	Light to severe infestations in Portneuf CD.
1973	Population moderate at Saint-Raymond and Saint-Apollinaire; trace elsewhere.

CHERRY TREES

1974	Moderate to high infestations in an 80-km radius of Quebec City; trace to low elsewhere in the region. Level high at Kinnear's Mills (Frontenac), Sainte-Hénédine (Dorchester), Saint-Ephrem (Beauce), Berthier (Montmagny), L'Islet, and Saint-Aubert.
1975	Considerable increase in population. Insect commonly encountered in the entire sector between the Laurentians and the Appalachians. Moderate to high infestation over a 24-km strip along the St. Lawrence River, stretching from the western tip of the region as far as Quebec City, as well as within a triangle bounded by La Pocatière, Lambton, and Leclercville. Population levels high at Saint-Augustin and Sainte-Famille, moderate at Saint-Casimir and Saint-Raymond, and low at Saint-Irénée (Charlevoix-Est).
1976	Decrease in population in general. Local infestations high to moderate at Saint-Raymond and low at Lake Saint-Joseph. Population fairly large in Mégantic, Beauce, Dorchester, and Bellechasse CDs.
1977	Defoliation more severe in 1977. Local moderate to high infestations in Portneuf and Montmorency CDs. For the south shore, similar to 1976 but this time including Lotbinière and Lévis CDs.

CHERRY TREES

ORGANISM	YEAR	HOST	REMARKS
Black knot *Apiosporina morbosa* (Rathay) Mix	1975	CCH	Level high in Mégantic, Beauce, and Frontenac CDs.
	1976	CHE	Observed in the Quebec City area and in Beauce CD. Level high at Issoudun (Lotbinière).
	1978	CCH	Twenty trees affected along the road at Cap-Saint-Ignace (Montmagny).
Witches'-broom *Taphrina wiesneri* (Rathay) Mix	1959	PCH	Observed on a few trees in Quebec City.

HAWTHORN

INSECT	YEAR	HOST	REMARKS
Hawthorn leafmining sawfly *Profenusa candensis* (Marl.)	1964	HAW	First report at Sainte-Foy.
	1977	HAW	65% of leaves mined at Grondines (Portneuf).
Pear sawfly *Caliroa cerasi* (L.)	1965	HAW	Marked increase in population for the first time since the 1956-1957 infestation at Sainte-Foy.

MAPLE

INSECTS

Bruce spanworm, *Operophtera bruceata* (Hulst)

This spanworm can cause severe defoliation in sugar maple and trembling aspen stands. Fortunately, its outbreaks are of short duration because of a viral disease that controls the insect (see also **POPLAR**).

Year	Remarks
1953*	New infestations in maple stands near lakes Saint-François and Aylmer and at Lévis and Saint-Joachim (Montmorency), causing fairly severe damage.
1954*	Severe defoliation in maple stands of Frontenac and Mégantic CDs. Damage light to moderate in Beauce CD.
1960	Low-level infestation at Saint-Aubert (L'Islet).
1961	Trace population at Saint-Aubert.
1968	Increase in population in the region.
1969	Population low at Inverness (Mégantic) and Saint-Honoré (Beauce).
1970	Increase in population; light to moderate defoliation in several localities of Mégantic, Beauce, and Frontenac CDs.
1971	Increase in population with moderate to severe defoliation in Beauce, L'Islet, Mégantic, and Frontenac CDs. A number of maple stands completely defoliated. Signs of viral disease reported.
1972	Abundant with high-level infestations in Frontenac, Mégantic, Beauce, Dorchester, and L'Islet CDs. A viral disease appeared which became the main factor controlling this attack.
1973	Less abundant and decrease in pockets of infestation. Moderate to severe defoliation between Saint-Ephrem (Beauce) and Saint-Méthode (Frontenac) and between Saint-Adalbert and Saint-Marcel (L'Islet). Low-level defoliations at Saint-Raymond (Portneuf) and Saint-Laurent, Ile d'Orléans. Increase in viral disease in infested maple stands.
1974	Populations regressed; light defoliations in Mégantic, Beauce, and L'Islet CDs, and from Saint-Raymond to Duchesnay.
1975	Population regression continued. Trace infestation where insect was present.
1976	Almost complete collapse of populations in entire region.

MAPLE

1977-1982	Population endemic.
1983	Population on the rise, causing light to moderate infestations with 20 to 40% defoliation in Frontenac, Beauce, Dorchester, and L'Islet CDs with more extensive damage at Saint-Théophile (Beauce) and Saint-Hilaire-de-Dorset (Frontenac). 50% defoliation in maple stands over a 100-ha area at Saint-Benoit-Labre, Saint-Ephrem, and Saint-Honoré (Beauce).
1984	Populations increased again this year in maple stands in the south of the region. Severe defoliations between Lambton (Frontenac), and Saint-Pamphile (L'Islet), between Saint-Hilaire de Dorset and Saint-Sébastien (Frontenac), and between Saint-Marcel and Saint-Pamphile (L'Islet). Viral disease present in these sectors.
1985	Major decrease in populations. Light defoliation inside a rectangle bounded by Saint-Romain and Saint-Hilaire de Dorset (Frontenac) and Beauceville and Sainte-Clothilde (Beauce). 30 to 70% defoliation in five maple stands east of the Chaudière River. Viral disease increasingly reported.
1986	Decrease in population on the south shore between the Saint-François and Chaudière rivers.
1987	Almost complete collapse in all areas affected in 1986.

* N.B. In the literature, infestations were erroneously attributed to the species *Paleacrita vernata* (Peck) instead of *Operophtera bruceata* (Hulst).

MAPLE

Fall cankerworm, *Alsophila pometaria* (Harr.)

This native North American insect severely ravages deciduous forests, fruit trees, and ornamentals. Its preferred hosts are elm, red maple, basswood, and apple. Defoliation occurs in early spring, and infestations are generally short-lived.

Year	Remarks
1957	Light to moderate defoliation at Saint-Vallier (Bellechasse).
1958	Insect common at Sainte-Foy and Cap-Rouge.
1959	Decrease in population at Saint-Vallier.
1961	Very low incidence at Sainte-Foy.
1962	Insect abundant at Duchesnay and Saint-Henri. Species associated with linden looper and Bruce spanworm.
1963	Severe defoliation on basswood and red maple at Saint-Henri. Still associated with the above two species.
1964	Common in the Quebec City area.
1966-1967	Population very low.
1968	Population higher in entire region.
1969	Decrease in population.
1970	Population low.
1971	Low populations in only a few localities.
1972	Populations very low in several localities.
1973	Population at very low level.
1974	Population endemic except at Saint-Henri (Lévis), Saint-Pierre, and Saint-Jean on Ile d'Orléans, where light to moderate defoliation was observed.
1975	Moderate infestation at Saint-Jean, Ile d'Orléans, and Saint-Henri de Lévis. Low-level infestation at Berthier-sur-Mer.
1976	Increase in population. Severe infestation at Lauzon and Saint-Henri. Low-level infestation at Saint-Jean, Ile d'Orléans.
1977	Decline in populations with light defoliation at Berthier and Saint-Henri.
1985	Increase in population with light defoliation at Saint-Henri, Saint-Vallier, Sainte-Marguerite, Sainte-Claire, and Saint-Anselme (Dorchester).

MAPLE

Greenstriped mapleworm, *Dryocampa rubicunda* (F.)

Attacks by this mapleworm are observed mainly on red maple but also on sugar and silver maple. They take place in mid-summer. Although severe defoliation may result, infestations do not last.

Year	Remarks
1940	Damage light at Saint-Gédéon, Saint-Prosper, and Dosquet (Lotbinière). Population lower at Duchesnay than in 1939.
1973	Local defoliation reported for several years. Population at low levels in Charlevoix CDs. Population low in Portneuf CD; moderate to severe defoliation at Sainte-Christine and Saint-Gilbert.
1974	Noticeable decrease in population with low-level defoliation at Saint-Gilbert and Sainte-Christine. Major defoliation in Charlevoix CDs.
1976	Populations lower and more sporadic in the southwestern part of the region. Light defoliation at East-Broughton (Beauce).
1977	Low populations along the St. Lawrence River between Saint-Casimir (Portneuf) and Ile d'Orléans.
1978	Light defoliation east of Sainte-Christine.

MAPLE

Linden looper, *Erannis tiliaria tiliaria* (Harr.)

This looper, which is sometimes associated with the **Bruce spanworm**, causes major defoliation in sugar maple stands. During infestations, significant damage occurs on a number of deciduous species, including basswood, beech, and hop-hornbeam.

Year	Remarks
1942	Exceptionally abundant in deciduous forests of the region (associated with *Operophtera bruceata*).
1943	Defoliation more widespread and much more intense in the southern part of north-shore CDs and in Frontenac, Beauce, and Dorchester CDs (associated with *O. bruceata*).
1944	Very abundant but defoliation relatively low because of disease among larvae. Damage in the southern part of the region and at Duchesnay (associated with *O. bruceata*).
1945	Epidemic at lowest level (associated with *O. bruceata*).
1946	Endemic level.
1959	Insect common at Sainte-Foy and Cap-Rouge.
1961	Moderate to high infestation over a ± 1 500 square mile area concentrated near Thetford Mines and light infestation over the rest of the region. First report of a viral disease on this insect.
1962	Moderate to high infestation now covering almost all the south shore of the region. Light to moderate infestation in the rest of the area. Viral disease absent.
1963	Moderate to severe infestation in Quebec, Montmorency, Bellechasse, and L'Islet CDs. General decline in population because of two parasites and viral disease. Extremely low emergence.
1969	Slight increase in population in maple stands.
1970	Insect common but level of population low.
1971	Low population level west of the Chaudière River.
1972	Insect generally rare.
1973	Population low on the south shore.
1974	Not abundant but insect present in low levels in southern part of the region.

MAPLE

1975	Trace defoliation but with a slight increase in population.
1976	Significant increase in population on the south shore.
1977	Population trace.

MAPLE

Maple leafroller, *Sparganothis acerivorana* Mack.

This leafroller mainly damages red maple, but it can also be found on several other deciduous species. Defoliation is rarely total.

Year	Remarks
1975	Moderate population levels at Saint-Gilles, Saint-Bernard, and Saint-Henri. Population low at Sainte-Foy.
1976	Less abundant. A number of small low to high-level infestations in Lotbinière, Lévis, Dorchester, and Mégantic CDs.
1977	Infestation almost completely disappeared between Saint-Gilles and Saint-Henri. Moderate to severe defoliation at Saint-Jean-Chrysostome and Armagh (Bellechasse). Population low elsewhere in the region.
1978	Population moderate at Petite-Rivière-Saint-François (Charlevoix-Ouest). Population low at Buckland (Bellechasse) and Robertsonville (Mégantic).
1979	Populations generally at trace level with a decline at Petite-Rivière-Saint-François.
1980	Local population low at Saint-Apolline (Montmagny).

MAPLE

Orangehumped mapleworm, *Symmerrista leucitys* Franc.

Sugar maple is the preferred host of this worm, but other deciduous species may occasionally be attacked, with defoliation occurring in late summer. Infestations of this worm are short lived.

Year	Remarks
1950	Infestation began on the south shore.
1951	Defoliation severe at Duchesnay and East Broughton (Beauce).
1952	Widespread damage on the south shore and severe levels in maple stands at East Broughton, Thetford Mines and Inverness.
1962	Insect present at Saint-Ferdinand (Mégantic).
1969	Defoliation very severe in three maple stands at East Broughton.
1970	Defoliation very severe in four maple stands at East Broughton. Insect population dying prematurely due to action of a bacterial disease and a food shortage.
1984	Light to moderate defoliation over an 18-ha area at Saint-Basile (Portneuf).
1985	Severe defoliation over 30 ha in both Saint-Basile and East Broughton. Clear signs of disease in population.
1986	Spectacular drop in populations due to action of an insect egg parasite of the *Telenomus* sp. type. 5 to 10% defoliation in the same stands as previous year.
1987	Insect disappeared from Saint-Basile. Trace level elsewhere.

MAPLE

Saddled prominent, *Heterocampa guttivitta* (Wlk.)

This caterpillar can easily be recognized by its characteristic coloring and by the presence of a brownish-red spot in the middle of its back. The almost total defoliation it causes in mid-summer leads to the death of certain trees if repeated for several consecutive years.

Year	Remarks
1976	A number of areas of moderate to high infestation in Bellechasse, Montmagny, and L'Islet CDs, particularly near the river. High population level at Saint-Jean, Ile d'Orléans.
1977	Populations dropped to trace level in Portneuf, Montmorency, and Charlevoix CDs. Moderate population level at Saint-Eugène (Montmagny). Population low at Saint-Raphaël (Bellechasse).
1978	Decline in populations.

MAPLE

INSECT	YEAR	HOST	REMARKS
Cottony maple scale *Pulvinaria innumerabilis* (Rathv.)	1964	SM	Reported in L'Islet CD.
Lesser maple spanworm *Itame pustularia* (Gn.)	1974	RM	Very common on Ile d'Orléans.
Maple bladdergall mite *Vasates quadripedes* Shimer	1961	SIM	Insect fairly common near Quebec City.
Maple leafblotch miner *Cameraria aceriella* (Clem.)	1975	SM	Severe attack on regeneration at Sainte-Croix.
	1977	SM	10% of leaves affected on regeneration at Lotbinière. Low level at Saint-Édouard.
	1978	SM	Level low at Saint-Michel, (Bellechasse) and at Saint-Édouard.
Maple petiole borer *Caulocampus acericaulis* (MacG.)	1963	SM	Fairly abundant in Dorchester and Lévis CDs.
	1964	SM	Relatively common in the region.
	1966	SM	Over 10% of foliage affected at Saint-Agapit and Saint-Raphaël.
	1970	SM	Population low in Beauce CD.
Maple trumpet skeletonizer *Epinotia aceriella* (Clem.)	1963	SM	More abundant than normal in 11 localities in Beauce, Frontenac and Lévis CDs.
	1983	SM	10 to 15% of foliage attacked in a number of localities in the region including Donnacona and Saint-Thuribe (Portneuf).

MAPLE

INSECT	YEAR	HOST	REMARKS
Norway maple aphid *Periphyllus lyropictus* (Kess.)	1976	NM	Population low in two localities in the Quebec City area.
Sugar maple borer *Glycobius speciosus* (Say)	1983	SM	On 13 000 trees examined, 830 had old and recent borer tunnels and an average of 1.2 tunnels per tree.

MAPLE

DISEASES

Anthracnose, *Kabatiella apocrypta* (Ell. & Ev.) Arx

This disease is characterized by an overwhelming, rapid browning of foliage. It normally develops during warm, damp weather in the spring. Symptoms, timing and severity of infestations are highly variable.

Year	Remarks
1972	Increase in intensity of the disease in Mégantic CD. Frequently observed in Portneuf CD.
1974	Moderate to trace damage observed on foliage of sugar maple in Portneuf, Quebec, Montmorency, and Charlevoix-Ouest CDs.
1975	Frequency and distribution stable compared to 1974.
1978	Moderate damage in two locations in Quebec CD.

MAPLE

Eutypella canker, *Eutypella parasitica* Davidson & Lorenz

This trunk canker is commonly found on sugar maple and occasionally on other maples. It causes mortality on stems 10 cm or less in diameter and pronounced deformation on the trunks of larger trees. It thus becomes an important factor in loss of quality in affected stems, and raises the risk of trunk breakage at attack points.

Year	Remarks
1968	Low to moderate infestation on sugar maple at Saint-Malachie (Dorchester), Lake Saint-Joseph, and Lake Sergent (Portneuf).
1971	Moderate to high frequency 10 km west of Sainte-Anne-de-Beaupré [Saint-Achille] (Montmorency).
1972	Present in most locations but with a fairly low percentage of trees affected except in Portneuf and Dorchester CDs, where a greater frequency of cankers was noted.
1973	Moderate damage on sugar maple at L'Islet.
1974	Light damage reported at Saint-Alban, Deschambault, and Duchesnay (Portneuf), Sainte-Famille and Ange-Gardien (Montmorency), Sainte-Rose de Watford (Dorchester), and at Saint-Charles (Bellechasse). Moderate to high frequency at Saint-Prosper (Dorchester), Sainte-Christine, and Portneuf and Sainte-Famille, Ile d'Orléans. Present on over 25% of trees at Saint-Adrien-d'Irlande (Mégantic).
1975	Level moderate to low in general in the region.
1976	Frequency low at Duchesnay. Level high at Saint-Adrien-d'Irlande. Increase in reports compared to 1975.
1977	Frequency low southwest of Tourilli gate (Montmorency).
1978	12% of trees affected (cumulative over a number of years) at Donnacona (Portneuf).
1980	8% of trees with new cankers since 1976, a total of 18% with 2% mortality at Duchesnay.

MAPLE

Maple decline

This complex disease is characterized by gradual dieback of trees with symptoms appearing first at the top of crowns. The phenomenon is generally due to the combined effect of a number of stress factors.

Year	Remarks
1965	Poor winter conditions and periods of drought in early summer were probably responsible for the rapid deterioration and death of trees along Highway 2 from Trois-Rivières to Rivière-du-Loup and along Highway 3 from Quebec City to Nicolet. Stunting and early fall of leaves, raising of bark on large branches, and death of trees were particularly severe at L'Islet and Saint-Augustin, where over 50% of trees in several stands were affected.
1966	A number of trees affected in 1965 were dead this year, but damage was less severe on affected trees at Lyster (Mégantic) and Saint-Ephrem (Beauce).
1977	In the area of Robertsonville-Pontbriand (Mégantic), severe dieback was observed in a number of maple stands. However, these stands were close to and in the direction of dominant winds from an asbestos mine. The relation between the presence of asbestos dust and dieback has yet to be demonstrated.
1981	Maple decline observed at a number of locations in Frontenac, Beauce, Dorchester, and Bellechasse CDs. A combination of several causes is suspected, the main one being the abnormal thaw in February followed by a period of severe cold in March.
1982	Maple decline observed in a 3-ha mixed stand north of Saint-Raymond. Both young and older trees were dead.
1983	Moderate to severe damage in Frontenac and Beauce CDs. The survey to assess the extent of decline was conducted mainly in these CDs, with 42% of 257 sites visited showing abnormal health conditions.
1984	Reassessment of level of maple decline, with an increase in damage observed in Frontenac, Beauce, and Mégantic CDs.
1985	Maple decline became the single most important pathological condition in Quebec's hardwood forests. The sectors most severely affected by this phenomenon were the south shore of the Quebec City (03) and Trois-Rivières

(04) administrative regions and the entire Eastern Townships region (05). The north shore of the St. Lawrence was also affected in a strip running from Sainte-Anne-de-Beaupré to Louiseville. The most affected area was in a triangle bordered by the municipalities of Victoriaville, Saint-Joseph-de-Beauce, and Lac Mégantic.

1986 Decline remained the major problem in Quebec's hardwood forests. After eliminating a number of hypotheses as the main cause of dieback (tapping methods, grazing, defoliation), researchers identified air pollution as the principal cause of dieback. Areas of light to moderate damage were noted in the Duchesnay area and south of Valcartier. On the south shore, light damage was observed between Leclercville, Saint-Gilles, and Beaumont. Areas of moderate to high intensity dieback were concentrated between the municipalities of Lyster and Saint-Gilles, and between Thetford Mines and Saint-Georges. In the rest of the region, damage was light to moderate.

1987 For all study plots designated by the Quebec Ministère de l'Énergie et des Ressources (MER) between 1983 and 1986, the percentage of foliage missing rose from 23.8% in 1986 to 28.1% in 1987. The number of trees affected rose from 76 to 84.7% during the same period.

1988 The MER reported that the percentage of trees affected rose from 84.7 in 1987 to 88.9 in 1988. However, the percentage of foliage missing declined from 28.1% in 1987 to 26.5% in 1988.

MAPLE

ORGANISM	YEAR	HOST	REMARKS
Leaf blister	1952	M	First report of the disease,
Taphrina dearnessii			found near Quebec City.
Jenkins	1958	RM	Reported near Quebec City.
	1957	RM	Low level infections near Quebec City and in Beauce CD.
	1975	RM	Reduction in severity and frequency in Bellechasse CD.
Leaf rust	1978	SM	First report in the region.
Stegonsporium acerinum Peck			
Leaf spot	1975	SM	Level low to moderate between Sept-Iles Lake and Rivière-à-Pierre (Portneuf).
Gloeosporium sp.	1976	SM	8 to 10% of foliage affected in 11 localities in Quebec and Frontenac CDs.
	1982	SM	Nearly 10% of foliage affected on regeneration at Portneuf.
	1986	SM	Phenomenon spectacular but damage limited at Sainte-Marguerite and Saint-Zacharie (Beauce).
Leaf spot	1958	SM	Several trees seriously affected
Gloeosporium apocryptum			at Quebec City.
E. & E.	1961	M	Moderate infection on red maple at Saint-Étienne and on sugar maple at Quebec.

MAPLE

ORGANISM	YEAR	HOST	REMARKS
	1965	M	High infection on a number of sugar maples and red maples at Quebec.
Leaf spot *Phyllosticta minima* (B. & C.) Underw. & Earle	1961	RM	Moderate infection at Saint-Etienne (Lotbinière).
	1962	RM	Infection high on a number of ornamental trees at Thetford Mines.
	1972	M	Damage light on red maple and sugar maple in Quebec CD.
	1977	SM	Several maple stands died back in the area of Robertsonville-Pontbriand (Mégantic).
Leaf spot *Septoria aceris* (Lib.) Berk. & Br.	1962	SM, MOM	Common in some localities of Beauce and Mégantic CDs.
Powdery mildew *Uncinula circinata* Cooke & Peck	1975	MOM	Moderate infection at Port-au-Saumon (Charlevoix-Est).
Reddening	1964	SM	In Quebec City and vicinity and from Montmorency to Rivière-du-Loup. Probably due to strong winds in June and July.
Speckled tar spot *Rhytisma punctatum* (Pers.) Fr.	1962	RM	Common at Stoneham.
	1974	MOM	Moderate infection north of Saint-Aimé-des-Lacs (Charlevoix-Est).
	1975	M	50 to 75% of foliage affected in several locations in Charlevoix CD.

MAPLE

ORGANISM	YEAR	HOST	REMARKS
Tar spot *Rhytisma acerinum* (Pers.) Fr.	1976	RM	Light attack at Saint-Aubert. (L'Islet).

MOUNTAIN-ASH

INSECTS

Mountain-ash sawfly, *Pristiphora geniculata* (Htg.)

Damage to forests by colonies of these sawflies has no economic significance, but on ornamental mountain-ash trees, they are a pest. In the last few years, the species seems to have been well controlled by the action of a European parasite typical to the species that was introduced into Quebec by Dr. F.W. Quednau of the Laurentian Forestry Centre.

Year	Remarks
1935-1949	First report of the insect in Quebec in 1935. Distributed in all areas where mountain-ash grows, causing more or less extensive local defoliation in all locations, particularly on ornamental trees.
1950	High infestations in Charlevoix CDs.
1951-1953	Insect widespread throughout the region.
1954	Severe defoliation in Quebec City.
1963-1964	Severe defoliation in a number of localities in the region.
1965	Populations lower.
1966-1967	Insect common in the region.
1968	Local low to moderate infestations.
1969	Local low to high-level infestations.
1970-1971	Insect present in all locations causing more or less severe local defoliation.
1972	Population low in the Chaudière River valley.
1973	Insect common locally in the region.
1974	Population moderate at Saint-Urbain, low at Saint-Raymond and Sainte-Catherine.
1975	Populations low to high causing severe defoliation at Saint-Raymond, Saint-Féréol-les-Neiges, and Saint-Urbain.
1976	Moderate defoliation in the Portneuf Reserve and light defoliation at Rivière-à-Pierre.
1977	Moderate to high population levels at l'Épaule Lake (Montmorency), Baie-Saint-Paul, Saint-Fidèle, and Port-au-Saumon (Charlevoix-Ouest). Low to trace levels elsewhere in the region.
1978	Low populations causing 5 to 25% defoliation in the Portneuf Reserve.

POPLAR

INSECTS

Aspen petiole leafroller, *Ectoedemia argyropeza downesi* W. & S.

This insect has little effect on trembling aspen even when it attacks a large percentage of the leaves.

Year	Remarks
1966	Insect reported from Portneuf CD to L'Islet CD. High local infestations at Valcartier, Saint-Prosper and Saint-Luc (Dorchester), Saint-Marcel, Saint-Cyrille and Saint-Pamphile (L'Islet), and Beaupré (Montmorency).
1967	High local infestations at Beaupré, Sainte-Catherine, Cap-Rouge, Saint-Étienne, Saint-Gilles, and Linière (Beauce).
1968	Moderate to high infestations at Saint-Raymond, north of Stoneham, Saint-Jean-de-Brébeuf (Mégantic), Leeds, La Guadeloupe, Saint-Honoré (Beauce), Pintendre (Lévis), and in Charlevoix (Est and Ouest), Montmagny, and L'Islet CDs.
1969	Moderate to high infestations were slightly more numerous than in 1968 and were located along the north shore of the river, from Portneuf CD to Montmorency CD, and on the south shore, at Dosquet, Saint-Narcisse, Saint-Frédéric, Saint-Lambert, Saint-Martin, and in Dorchester, Bellechasse, Montmagny, and L'Islet CDs.
1970	No reports received.
1971	Infestation lower than in 1969. Moderate damage north of Saint-Urbain.
1972	Moderate, scattered infestations on the south shore in several localities.
1973	Pronounced decrease in population with only one high-level infestation reported at Saint-Eugène (L'Islet) and a moderate one at Saint-Hilaire-de-Dorset (Frontenac).
1974	Fewer localities affected. Moderate to high infestations south of Portneuf, Quebec, and Montmorency CDs and in Dorchester, Beauce, Bellechasse, and Montmagny CDs. Populations trace to low in Charlevoix CDs.
1975	Moderate-level population west of the region, decreasing in intensity towards the east from Baie-Saint-Paul. Moderate-level populations at Saint-Gilles,

	Saint-Hénédine (Dorchester), and Lake Trois-Saumons (L'Islet). Population low at Saint-Sébastien (Frontenac).
1976	Decrease in infestation. Population low at Val-Alain (Lotbinière) and Sainte-Hénédine.
1977	Population low at Saint-Aubert (L'Islet).
1978	Moderate-level population at Sainte-Claire (Dorchester).

POPLAR

Forest tent caterpillar, *Malacosoma disstria* Hbn.

This tent caterpillar periodically defoliates trembling aspen stands, bringing about reduced tree growth. It can also attack maple stands. Natural factors such as parasitism curb its populations after a few years.

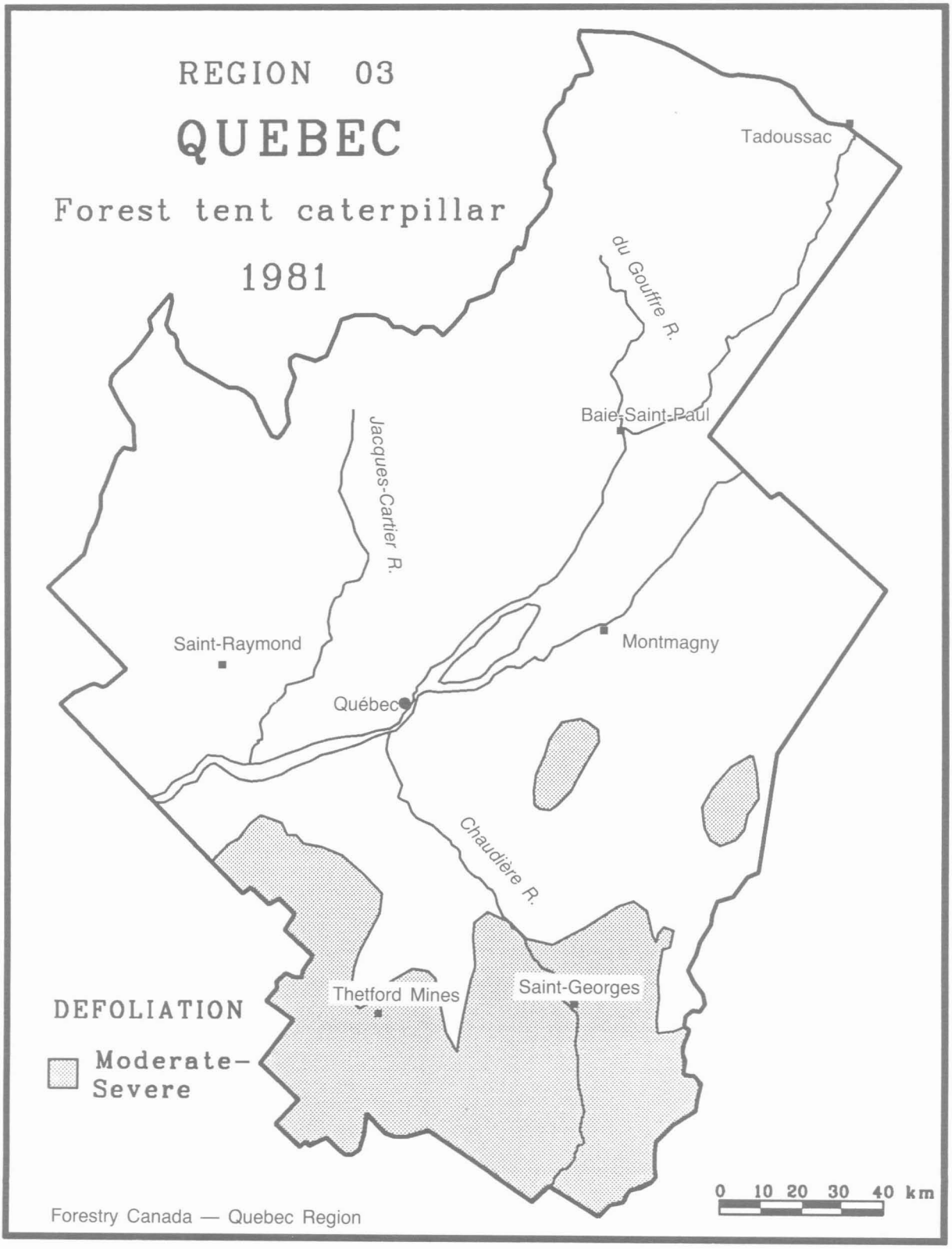
Year	Remarks
1938	High-level infestation at Breakeyville. Parasites very numerous.
1943	Common in L'Islet, Montmagny, and Bellechasse CDs.
1949	A number of Quebec City locations were affected by the presence of this insect.
1950	Considerable defoliation in Quebec City.
1951	Several small centres of infestation north of Charlevoix-Ouest CD and south of the Chaudière River. Spectacular swarm of moths observed at Quebec City.
1952	Infestation by this insect covering the entire north shore of the St. Lawrence with population levels high in the northwestern part of Portneuf, Quebec, and Montmorency CDs, moderate in the southern part of Portneuf CD, in the centre of Quebec CD, and in the north of Montmorency CD, and low in the remainder of this sector.
1953	Invasion extending along the south shore of the St. Lawrence and covering all of Region 03, but intensity of infestation lower than in 1952.
1954	The epidemic was much less severe. A moderate to high level infestation in the area bounded by Mautauban, Rivière-à-Pierre, and Saint-Raymond (Portneuf). Infestation moderate in Lotbinière CD and low in the southeastern part of the region.
1961	Major infestations at Saint-Sylvestre, Sainte-Foy, Saint-Ferdinand, and Saint-Jean-Port-Joli. Highest incidence reported since the decline of the last infestation in 1954.
1962	Insect fairly common in a number of parts of Sainte-Foy and Sillery but no damage observed.
1963	Population stable.
1964	Insect more common than in previous years.

POPLAR

1965	Major active infestations in the region. The main infestation occurred in a 50-km wide strip along Highway 20 from the western tip of Lotbinière CD to Laurier Station. Defoliation varied from moderate to severe.
1966	For the second consecutive year, the insect was very abundant and caused moderate to severe defoliation in Lotbinière, Portneuf, and Mégantic CDs.
1967	Decrease in population. Moderate to severe defoliation in Lotbinière and Mégantic CDs.
1968	A number of centres of moderate to severe infestation were reported in Lotbinière, Beauce, Frontenac, and Mégantic CDs. A virus and parasites caused significant insect mortality.
1969	Population declined considerably in the southwestern part of the region.
1970	Insect population at lowest level since 1962.
1971	Population endemic.
1972	Slight increase in populations causing low-level infestations in Portneuf, Montmorency, Charlevoix, Montmagny, and L'Islet CDs.
1973-1978	Population endemic
1979	High population levels on both banks of the Chaudière River close to Saint-Martin (Beauce). Moderate-level populations between Lambton and Disraëli (Wolfe) and at Lake Etchemin.
1980	The epidemic increased in intensity. Widespread infestation on poplar with areas of severe defoliation in maple stands in Mégantic, Wolfe, Beauce, and Frontenac CDs. Light defoliation a number of maple stands on two slopes of the mountains (2.5 km^2) north of Pont-Rouge.
1981	The infestation seemed to have peaked, particularly in Beauce, Mégantic, Frontenac, and Lotbinière CDs, with severe defoliation in many maple stands. A number of small, moderate to severe centres between Saint-Casimir and Quebec City. West of Sainte-Catherine, 50 ha of maple stands were up to 60% defoliated. More sporadic defoliation with a slight drop in population further east as far as Montmagny CD (see map p. 148).
1982	The intensity of infestation decreased considerably in the region. Major infestations in Lotbinière and Mégantic CDs. Light to severe defoliation in a 10 to 20 km wide strip 100 km long between Lake Mégantic in the south and Lake Etchemin to the north. A number of maple stands severely defoliated in this area.
1983	Almost complete collapse of the infestation that had raged for the past few years in the entire area south of the river.

POPLAR

1988 Scattered defoliation reported from the western tip of the region to the vicinity of Saint-Michel on the south shore and Clermont on the north shore of the St. Lawrence. These observations led to fear of a new infestation in the entire southern part of the province in the coming years.


REGION 03
QUEBEC
Forest tent caterpillar
1981
Tadoussac
du Gouffre R.
Baie-Saint-Paul
Jacques-Cartier R.
Saint-Raymond
Montmagny
Québec
Chaudière R.
Thetford Mines
Saint-Georges
DEFOLIATION
Moderate-Severe
0 10 20 30 40 km
Forestry Canada — Quebec Region

POPLAR

Large aspen tortrix, *Choristoneura conflictana* (Wlk.)

Defoliation by this tortrix, which mainly attacks trembling aspen, is rarely total and does not lead to tree mortality.

Year	Remarks
1969	Low-level infestation over an area of 4 000 km^2 comprising two medium-sized zones located at the mouth of the Saguenay in Charlevoix CDs.
1970	Decrease in population in areas infested in 1969. Moderate defoliation reported at Saint-Urbain. Trace populations at Notre-Dame-des-Anges and Saint-Raymond (Portneuf).
1971	Insect more abundant. Moderate to high infestation over a number of square kilometres in Charlevoix and Montmorency CDs.
1972	Population even higher than in 1971. Moderate local infestations in Charlevoix, L'Islet, Dorchester, Beauce, and Frontenac CDs.
1973	Noticeable decline in population of the insect but distribution still widespread in the region. Moderate to severe defoliation at Sainte-Anne-de-Beaupré, Baie-Saint-Paul, Clermont, La Malbaie, Port-au-Persil, and Baie-des-Rochers (Charlevoix-Est).
1974	Infestation declined along the St. Lawrence from Sainte-Anne-de-Beaupré to Baie-des-Rochers. Moderate infestation at Saint-Urbain and Saint-Siméon. Low-level infestation at Saint-Aimé-des-Lacs (Charlevoix-Est).
1975	In general, the population remained at the 1974 level. Population low at Saint-Urbain. Moderate to high level population at Kinnear's Mill (Mégantic) and Saint-Gérard (Wolfe).
1976	Population reduced to trace level in the region.
1987	Light defoliation over an area of 2 340 ha near Clermont (Charlevoix-Est).
1988	Detection of a small 850-ha centre, of which 675 ha were moderately affected, near Clermont.

POPLAR

Satin moth, *Leucoma salicis* (L.)

In general, this insect defoliates ornamental willows and poplars. Occasionally, trembling aspen stands may be affected as well. Large populations of this insect are usually quickly curbed by natural factors.

Year	Remarks
1939	Newly discovered invasion on Lombardy poplar at Quebec City extending from Beauport to Cap-Rouge.
1942	Defoliation of Lombardy poplar in the Quebec City area.
1944	Major defoliation in Quebec City.
1952	Centre of infestation at Sainte-Foy.
1953	Local infestation at Sainte-Foy.
1958	Population low causing light defoliation at Quebec City and Sainte-Foy.
1959-1961	Population endemic at Quebec City and Sainte-Foy.
1962	Light defoliation at Baie-Saint-Paul on Carolina poplar.
1965	Severe defoliation on Lombardy poplar at Sainte-Foy and Champigny (Quebec City) and on cottonwood at Saint-Michel and Baie-Saint-Paul.
1966	Insects common in the Quebec City area.
1968	High-level infestations on cottonwood, Lombardy poplar, and willow, with severe defoliation at Sainte-Croix, Pointe-au-Pic (Charlevoix-Est), and Baie-Saint-Paul. In the latter location, a similar infestation was observed on the same trees in 1962.
1971	Local infestation in the Charlevoix CDs.
1978	Moderate to severe defoliation on balsam poplar at Saint-Flavien (Lotbinière).

POPLAR

INSECT	YEAR	HOST	REMARKS
Aspen blotchminer	1964	TA	Reported in Beauce CD.
Phyllonorycter tremuloidiella (Braun)	1975	TA	Observed on the south shore of the St. Lawrence from Lotbinière CD to L'Islet CD.
Aspen serpentine leafminer	1966	TA	Reported at Sainte-Foy.
Phyllocnistis populiella (Cham.)	1980	TA	40% of foliage affected over a 1.5-km stretch at Saint-Siméon.
Balsam poplar leaf beetle	1981	BPO	Low-level infestations at Clermont and Notre-Dame-des-Monts (Charlevoix-Est).
Chrysomela walshi Brown			
False Bruce spanworm	1961	TA	Common at Saint-Aubert and Breakeyville.
Itame loricaria (Evers.)			
Gall aphid	1977	PO	Very common on petioles of several trees at Saint-Gabriel-de-Valcartier.
Pemphigus monophagus Max.			
Hairy poplar sawfly	1958-1962	PO	Populations remained at low levels and viral disease still present in Quebec City and vicinity.
Trichiocampus viminalis (Fall.)	1967	PO	Low-level infestation on several trees at Sainte-Foy.
Lombardy leafminer	1956	LPO	First report in Quebec City (insect originally from Europe).
Paraphytomyza populicola (Wlk.)	1958	PO	Abundant in a number of localities in a 50-km radius of Quebec City.

POPLAR

INSECT	YEAR	HOST	REMARKS
	1959	PO	The number of localities where this insect had been introduced increased considerably this year, notably at Baie-Saint-Paul.
	1960	PO	Insect present in a 160-km radius of Quebec City.
	1961	PO	50% of leaves severely mined near Quebec City, a slight increase over 1960.
	1977	LPO	10% of leaves affected at Sainte-Croix.
	1978	PO	Light attack on ornamental trees near Cap-Saint-Ignace (Montmagny).
	1979	PO	49% of foliage affected on ornamental trees at Cap-Saint-Ignace.
Poplar-and-willow borer *Cryptorhynchus lapathi* (L.)	1976	PO	Populations increasing but still low at Villeroy (Lotbinière).
Poplar catkin moth *Anathix puta* (G. & R.)	1967	TA	Low to moderate infestation on catkins, or flowers, in four localities in Lotbinière CD.
	1968	TA	Infestation declined in Lotbinière CD.
Poplar edgefolding sawfly *Phyllocolpa popuella* (Ross)	1964	PO	Reported in Quebec CD.
Poplar leafroller *Pseudosciaphila duplex* (Wlsm.)	1961	TA	More common than usual at Saint-Aubert, Sainte-Foy, Breakeyville, and Saint-Honoré.

POPLAR

INSECT	YEAR	HOST	REMARKS
Poplar petiolegall moth	1964	TA	Reported in L'Islet CD.
Ectoedemia populella Busk	1979	TA	65% of petioles attacked at Ste-Hénédine (Dorchester).
Poplargall saperda	1977	TA	Several moderate attacks on trunks and branches at Saint-Joseph-de-Beauce.
Saperda concolor Lec.			

POPLAR

DISEASES

Hypoxylon canker, *Hypoxlyon mammatum* (Wahl.) J.H. Miller

This pathogen mainly affects trembling aspen, but largetooth aspen and balsam poplar are also among its hosts. The cankers are characterized by bark mortality on the trunk that is at first yellow, then blackish, and eventually greyish when the fungus pathogen fructifies. The infection leads to the death of the tree within four to eight years. The canker is particularly abundant in low-density woodlots in farming areas, but may be encountered anywhere.

Year	Remarks
1966	Light to moderate symptoms observed at Frontière Lake (Montmagny), Saint-Patrice (Lotbinière), and Saint-Gédéon (Beauce).
1968	Trace to low levels on young aspen in Quebec City.
1972	Moderate to severe damage along with mortality reported in a number of farm woodlots in agricultural areas of Quebec. 14% of reports showed over 25% of trees affected in L'Islet, Bellechasse, and Montmagny CDs.
1973	Moderate damage in Beauce and Montmagny CDs. Light damage in Frontenac CD.
1974	Moderate to severe damage in farm woodlots south of Portneuf, Quebec, Montmorency, and Charlevoix-Ouest CDs. Moderate level in a number of locations south of the St. Lawrence.
1975	Increase compared to 1974. Several locations with moderate to high levels throughout the region. Moderate level everywhere on the south shore.
1976	Increase compared to 1975. A number of stands on the south shore were severely affected and had cankers on over 26% of trees. Moderate damage in Mégantic, Beauce, and Frontenac CDs. Severe damage in Dorchester, Bellechasse, Montmagny, and L'Islet CDs.
1977	Moderate level at Port-au-Saumon (Charlevoix-Est).
1978	Moderate level northwest of Saint-Gabriel-de-Valcartier.
1981	A special survey was carried out by FIDS in 1981 to get a better idea of wood losses. Fifteen study plots were chosen at random on the north shore and compilation indicated that this canker was present on 24% of trees, representing

2.5% of the standing volume. On the south shore, 43 plots showed the status of this canker: 7 negative reports, 7 reports of low levels (4% of affected trees), 29 reports of a moderate level (7 to 15% of trees), and 5.9% of volume affected by this canker.

POPLAR

Ink spot, *Ciborinia whetzelii* (Seaver) Seaver

This pathogen can affect nearly all poplars, but it is commonly found on trembling aspen. It first produces circular or ellipsoidal spots on the leaves, which subsequently turn brown but remain attached to the branch. The fungus produces a circular black sclerotium, which eventually becomes detached from the leaf, leaving a typical circular hole in it. Infections in stands are highly variable from place to place and year to year, but they may be very severe.

Year	Remarks
1962	Moderate to high infection levels at Saint-Urbain and Saint-Magloire (Bellechasse).
1966	Low to moderate infection at Quebec City and Montmagny.
1968	High-level infection in many localities of Dorchester CD including Saint-Malachie.
1973	Infection on several hybrid poplars in the Duchesnay nursery.
1974	Light to moderate damage with 20 to 30% of foliage affected at Sainte-Brigitte-de-Laval (Montmorency) and Saint-Aimé-des-Lacs (Charlevoix-Est). Low levels in Dorchester, Bellechasse, Mégantic, Beauce, and Frontenac CDs.
1975	Light to moderate damage in Charlevoix-Est CD.
1976	65% of foliage affected 25 km northeast of Saint-Siméon.
1977	Moderate to severe infections in Lotbinière and Mégantic CDs.
1978	Decline in infections in the region. Low levels in Beauce and Frontenac CDs.
1979	Widespread in Quebec. Average number of trees infected varied from 30 to 100%. 30% of foliage infected in affected stands.
1980	Widespread in Quebec. Several local moderate infestations in Charlevoix-Est CD. Observed on Lombardy poplar near Quebec City but rarely reported on this species.
1981	Infection low at Notre-Dame-des-Monts and Saint-Aimé-des-Lacs (Charlevoix-Est). Moderate infection at Sainte-Brigitte-de-Laval and Saint-Féréol-des-Neiges (Montmorency).
1982	From Saint-Tite-des-Caps westward, the disease was present over fairly large areas and at levels varying from trace to low.

POPLAR

1985	Significant reduction in the number of reports received. The percentage of foliage affected was rarely as high as 6% and the numbers of trees affected varied considerably, often as high as 100% in some observation areas.
1986	General decline
1987	Moderate level at Saint-Fidèle (Charlevoix-Est). This was the only location noted in the region.

POPLAR

Leaf blight, *Linospora tetraspora* G. Thompson

This foliar disease occurs in late summer on balsam poplar. The degree of abundance varies greatly from one year to the next; in most cases, it is limited to small areas of regeneration or young stands.

Year	Remarks
1952	Disease observed in a station near the Laurentian Wildlife Reserve.
1962	High-level infection on a number of trees at Beaupré.
1963	High-level infection on young trees at Beaupré.
1976	On balsam poplar, 50 to 70% of foliage affected at Portneuf and 10% affected at Saint-Casimir (Portneuf).
1977	15% of foliage affected on 20% of trees near La Malbaie.
1978	30% of foliage affected at Saint-Évariste (Frontenac).
1979	30 to 60% of foliage affected on 100% of trees at Neuville (Portneuf).
1980	Foliage 8 to 40% affected at Saint-Théophile (Beauce).
1981	50% of foliage affected over 1 ha at Neuville.

POPLAR

ORGANISM	YEAR	HOST	REMARKS
Catkin blister	1959	TA	Common at Loretteville.
Taphrina johansonnii	1972	TA	Common in metropolitan
Sadeb.		ECO	Quebec.
Ceratocystis canker	1964	TA	First report and first herbarium specimen collected in Quebec at Saint-Georges-de-Beauce.
Ceratocystis fimbriata			
Ellis & Halst.			
	1978	TA	First reports from Portneuf CD, Pont-Rouge, Rivière-à-Pierre, and Hervey-Jonction.
	1981	TA	The known range of this disease increased steadily since first detection in 1964. Damage moderate at Saint-Zacharie (Dorchester) and light at Saint-Edouard de Frampton (Dorchester).
Cytospora canker	1978	TA	Moderate outbreak at Saint-Apollinaire.
Valsa sordida Nits.			
Dothichiza canker	1958	HPO	Observed on Lombardy and Carolina poplar at Quebec City.
Cryptodiaporthe populea			
(Sacc.) Kleb.			
Leaf blister	1973	LPO	Observed in a radius of 160 km around Quebec City.
Taphrina populina Fr.			
	1976	LPO	Observed in the Quebec City area.
Leaf rust	1966	PO	Low to moderate infection at Daaquam and Lake Frontière (Montmagny), Saint-Gédéon (Frontenac), Sainte-Christine and Duchesnay (Portneuf), and Saint-Siméon (Charlevoix-Est).
Melampsora medusae			
Thuemen			

POPLAR

ORGANISM	YEAR	HOST	REMARKS
	1967	TA	Moderate to severe infections at Sainte-Christine (Portneuf) and Saint-Philibert (Beauce).
	1969	TA	Moderate to high intensity in Lévis and Beauce CDs and in a number of locations between Saint-Marc-des-Carrières and Saint-Féréol.
	1970	HPO	Damage less than in 1969. Moderate infection, causing premature leaf fall in a plantation at Saint-Étienne (Lévis).
	1973	HPO	Infection on various poplar clones in Duchesnay nursery.
	1977	HPO	Infection low on approximately 10% of foliage at Saint-Étienne.
	1978	AT	Infection on 20% of foliage at Armstrong (Beauce).
		HPO	Infection on 25 to 80% of foliage at Saint-Étienne.
	1979	HPO	Moderate infection on 60% of foliage and 100% of 10 000 one to 2-year-old trees at Saint-Étienne.
		TA	15 to 80% of foliage affected in Lévis, Lotbinière, Mégantic, and Beauce CDs. 70 to 80% of foliage blackened over 1 ha of saplings at Sainte-Christine.
Leaf spot *Marssonina brunnea* (E. & E.) Magn.	1973	HPO	Light to moderate damage at Duchesnay.

POPLAR

ORGANISM	YEAR	HOST	REMARKS
Leaf spot *Marssonina populi* (Lib.) Magn.	1959	ECO	High-level infestation in early June on damp sites at Berthierville.
	1967	TA	High level of infection on several trees at Saint-Joseph-de-Beauce.
	1982	HPO	Over 50% of foliage affected on 200 ornamental trees along Laurentian Blvd. in Charlesbourg.
Leaf spot *Mycosphaerella populicola* G. Thompson	1973	HPO	Over 75% of foliage affected at a number of locations in a plantation at Portneuf.
	1976	BPO	Moderate level at La Guadeloupe (Frontenac).
Leaf spot *Mycosphaerella populorum* G. Thompson	1962	TA	Relatively high-level infections along the Sainte-Anne River (Montmorency).
	1979	BPO	25% of foliage browned at Saint-Gilbert (Portneuf).
Leaf spot *Septoria musiva* Peck	1964	BPO	Abundant in several locations at Saint-Féréol.
Leaf spot *Septoria populicola* Peck	1967	BPO	Observed at Saint-Philibert (Beauce).
	1972	BPO, TA, HPO	Frequency and intensity of premature leaf fall varied from trace to moderate depending on the species or clone examined in various localities in Portneuf CD
	1976	BPO	Moderate level at Saint-Théophile (Beauce).

POPLAR

ORGANISM	YEAR	HOST	REMARKS
	1986	BPO	Disease spectacular but fairly little damage in Beauce CD.
Neofabraea canker *Neofabraea populi* G. Thompson	1959	HPO	Observed on trees growing on extremely dry sites at Duchesnay.
	1968	TA	Light to severe damage causing mortality of seedlings in Portneuf and Montmorency CDs.
Powdery mildew *Uncinula adunca* (Wallr.:Fr) Lév.	1978	BPO	80% of foliage affected on 90% of trees over 1 ha north of Saint-Urbain and 50% of foliage affected on 50% of trees over an area of 18 km^2 north of Saint-Hilarion (Charlevoix-Ouest).
	1979	LTA	50 to 60% of foliage affected at Clermont (Charlevoix-Est).
Powdery mildew *Uncinula salicis* (Dc.) Wint.	1962	BPO	High-level infection on several trees at Beaupré.
	1965	BPO	High-level infection on a number of young trees at Beaupré.
	1967	BPO	Common at Saint-Aubert (L'Islet).
Shoot blight *Pollaccia elegans* Servazzi	1984	TA	Frequently observed throughout the region.
Shoot blight *Pollaccia radiosa* (Lib.) Baldacci & Cif.	1962	TA	Moderate damage on young trees in small areas at Saint-Urbain.

POPLAR

ORGANISM	YEAR	HOST	REMARKS
	1963	TA	Moderate infection on young trees at La Galette in the Laurentian Wildlife Reserve.
	1973	TA	Observed in Portneuf and Frontenac CDs.
	1976	TA	Light to moderate damage on 6 to 25% of foliage of young trees throughout the region.
	1977	TA	85% of observations showed trace to low infection levels on the north shore, while on the south shore, the percentage was 75 and there were no reports of high levels.
	1983	TA	10% of foliage affected on trees along the roadside at Clermont (Charlevoix-Est).
	1984	TA	Observed throughout the region.
	1986	TA	Much more obvious and extensive this year, particularly in the Charlevoix CDs.

RED OAK

INSECTS

Oak leafshredder, *Croesia semipurpurana* (Kft.)

This insect often causes complete defoliation of oaks in early spring. Even though new foliage grows in such cases, the stress caused by this defoliation, which may be repeated for several years, may cause affected trees to die back. Red oak is the preferred host, but other species of oak are also potential hosts.

Year	Remarks
1957	Moderate to severe defoliation on red oak, on campus of Université Laval and near Cap-Rouge.
1958	Population less abundant in the region.
1960	Light to moderate defoliation at Sainte-Foy and Cap-Rouge.
1962	Major infestation at Sainte-Foy.
1963-1966	Major damage in Quebec City for several years. Insect abundant in 1962-1964, decreased in 1965, and increased in 1966.
1967	Decrease in population in the Quebec City area.
1968	Population on the rise with moderate to high infestations at Sainte-Foy.
1969	Moderate infestation at Cap-Tourmente and Saint-Augustin (Portneuf).
1971	Low to moderate infestations in metropolitan Quebec.
1972	Low-level infestation at Ile d'Orléans.
1973	Moderate to severe defoliation in Montmorency CD near the river.
1974	Moderate to high infestations in Portneuf CD and around Quebec City, low at Cap-Tourmente, and moderate at Sainte-Pétronille.
1975	Moderate to severe defoliation at several locations between Quebec City and Montmagny including Berthier, Sainte-Pétronille, and Sainte-Foy.
1976	Population lower but moderate to severe infestation at Quebec, Saint-Augustin, Cap-Rouge, and Ile d'Orléans.
1977	Populations declined. Moderate defoliation at Sainte-Foy and Cap-Rouge and light at several locations in Montmorency CD and in the southwestern part of Charlevoix-Ouest CD.

RED OAK

1978	Defoliation moderate at Cap-Rouge, light at Sainte-Foy and at several locations in Charlevoix-Ouest CD, and trace at Berthier (Montmagny).
1979	Populations remained stable at Sainte-Foy, Cap-Rouge, and Sainte-Pétronille.
1980	Increase in population. Moderate to severe infestation at Saint-Augustin, Sainte-Foy, Sainte-Pétronille, Saint-Jean-Chrysostome, and Saint-Vallier.
1981	Populations declined at Saint-Augustin, Sainte-Foy, and Ile d'Orléans.
1982	Little damage reported. Low-level defoliations at Sainte-Pétronille, Saint-Augustin, and Sainte-Foy.
1983	Severe defoliation at Sainte-Pétronille.
1986	Defoliation moderate at Beaupré and light at Ile d'Orléans.
1987	Decrease in population at Beaupré and Ile d'Orléans.
1988	Situation stable compared to 1987.

RED OAK

INSECT	YEAR	HOST	REMARKS
Oak skeletonizer *Bucculatrix ainsliella* Murt.	1966	RO	The population which was very abundant in 1958 at Sainte-Foy and Cap-Rouge declining steadily.
Oak webworm *Archips fervidana* (Clem.)	1979	RO	Nests on 15% of branches at Sainte-Foy.

RED OAK

DISEASES

Leaf blister, *Taphrina caerulescens* (Mont. & Desm.) Tul

This fungus infects buds in the spring then causes brownish spots or swellings (galls or blisters) on growing leaves. Leaf deformation may occasionally be severe; however, the disease has no effect on growth.

Year	Remarks
1952	Present near Quebec City.
1961	Twenty-five red oak out of 100 were severely infected in a nursery at Charlesbourg.
1962	Severe infection on red oak near Quebec City.
1965	Severe attack on a number of red oak in Quebec City and vicinity.
1971	Increase in damage in the Quebec City area.
1976	Light to moderate damage in metropolitan Quebec.
1984	Light damage on red oak throughout the southern section of Quebec City.

WHITE ELM

INSECTS

Smaller European elm bark beetle, *Scolytus multistriatus* (Marsh.)

The smaller European elm bark beetle, an introduced species, and the native elm bark beetle (*Hylurgopinus rufipes* Eichh.) are harmful because they are vectors for the fungus that causes Dutch elm disease rather than because of damage they themselves cause. The notes below refer to the distribution of the smaller European bark beetle; the native elm bark beetle is common in Quebec, but plays a relatively minor role is spreading the disease.

Year	Remarks
1975	Extension of the known infestation area eastward to Lotbinière CD.
1976	Captured in traps at Cap Tourmente, Leclercville (Lotbinière), and Montmagny, thus extending distribution of this beetle eastward.
1977	Several individuals captured at Cap Tourmente, Saint-Patrice (Lotbinière), Saint-Ludger (Frontenac), and Cap-Saint-Ignace. First report in Frontenac CD.
1978	Cap Tourmente still the most easterly known distribution point on the north shore of the St. Lawrence. Insect present at Saint-Gilles (Lotbinière) and Cap-Saint-Ignace.
1981	Insect vector of Dutch elm disease reported in Quebec City and vicinity.

WHITE ELM

INSECT	YEAR	HOST	REMARKS
Elm leafminer *Fenusa ulmi* Sund.	1961	WE	First report in Quebec. Reported at Saint-Rock-des-Aulnaies (L'Islet).
Woolly apple aphid *Eriosoma lanigerum* (Hausm.)	1960	WE	Insect very common in the region.

WHITE ELM

DISEASES

Dutch elm disease, *Ceratocystis ulmi* (Buism.) C. Moreau

This disease is generally fatal when it appears on a tree. It was observed for the first time in Canada at Saint-Ours, Quebec, in 1944. The pathogen is carried from a diseased tree to a healthy one by a vector insect, either the **native elm bark beetle** (*Hylurgopinus rufipes* (Eichh.)), a native insect, or by the **smaller European elm bark beetle** (*Scolytus multistriatus* (Marsh.)), an introduced insect. The disease is now found throughout Quebec.

Year	Remarks
1947-1951	Ten new cases of elm infection in Quebec City.
1952	The propagation rate of this disease stayed at a fairly high level until 1947, declined significantly during a 3- to 4-year period, and then rose to a new peak in 1951. There seemed to be a close link, with a lag of about a year or two, between upsurges of the disease and cool, damp summers.
1953	No change in the distribution area of this disease but four new cases of infection in Quebec City.
1959	The disease was found for the first time at Château-Richer and Saint-Charles-de-Bellechasse.
1970	Considerable mortality due to the disease. No change in known distribution.
1971	Damage less severe than in 1970. No change in distribution.
1973	Greater severity mainly due to warm, damp weather in the spring and a hotter summer. 12% of elms were killed by the disease over a semi-circular area in a 96-km radius south of Quebec City. Throughout this area, mortality was observed in localized pockets.
1974	Disease less active. Reports of mortality in Frontenac and Mégantic CDs.
1976	Over the distribution area of elm in Quebec, mortality was in the order of 3 to 4% of trees examined.
1977	A special survey showed 7% of elms to be affected in Quebec City. Increase in severity of the disease.
1978	Disease detected in 43% of 119 elms located in the Charlesbourg historical district.

WHITE ELM

1979	A reassessment of 130 elms in the Charlesbourg historical district showed that 12 additional trees showed symptoms of Dutch elm disease.
1980	Ornamental trees in 14 public areas were examined in the Quebec area. Elms were present on 10 of these sites and the disease affected trees at 7 of them, with 10 new cases of the disease in the Charlesbourg historical district.
1982	Nearly 10% of 8 000 elms identified in the areas of Sainte-Foy, Cap-Rouge, and Sillery as part of a "Summer Canada" project showed signs of the disease and 4% were dead. The disease was also reported at Stoneham and Saint-Joachim (Montmagny). Another survey by FIDS in Region 03 determined that 57% of the 490 trees observed were healthy.
1986	Extension of the disease along the Noire River south of Lake Deschênes (Charlevoix-Est). Mortality present.
1987	Moderate damage on 50% of trees in the Rivière-du-Moulin Ecology Reserve (Beauce).

WHITE ELM

ORGANISM	YEAR	HOST	REMARKS
Dothiorella wilt	1965	WE	Sampled on several dying trees at Sainte-Foy.
Dothiorella ulmi Verrall & May	1966	WE	Mortality on a number of trees at Saint-Gédéon (Beauce).
Leaf spot	1972	WE	Numerous symptoms but only slight damage in Portneuf and Quebec CDs.
Gnomonia ulmea (Schw.) Thuemen			

WILLOW

INSECT	YEAR	HOST	REMARKS
Imported willow leaf beetle *Plagiodera versicolora* (Laich.)	1965	WI	Defoliation reported at Saint-Gilles.
	1967	WI	Infestation noted at Sainte-Foy, Quebec, Charlesbourg, and Ile d'Orléans.
	1970	WI	Insect numerous in metropolitan Quebec.
	1973	WI	Severe defoliation in metropolitan Quebec.
	1974	WI	High population levels in metropolitan Quebec.
Willow flea weevil *Rhynchaenus rufipes* (Lec.)	1964	WI	Severe infestation for several years in Quebec CD.
	1976	WI	Severe infestation at Notre-Dame-des-Bois (Frontenac).
	1978	WI	75 to 95% defoliation on a number of trees at Saint-Nicolas.
	1980	WI	Damage observed in Lotbinière CD and metropolitan Quebec. 90% of foliage affected on 70 ornamental trees at Neuville.
	1981	WI	Damage observed in metropolitan Quebec. For the second year, severe browning of foliage on 70 trees at Neuville.
	1982	WI	Very common in the southern part of the region. For the third year, severe browning of foliage on 70 ornamental trees at Neuville.

WILLOW

INSECT	YEAR	HOST	REMARKS
	1983	WI	10 to 90% of foliage browned on ornamental trees throughout the region, particularly in the southern part of Portneuf CD between Grondines and Quebec and also on the south shore of the St. Lawrence.

WILLOW

ORGANISM	YEAR	HOST	REMARKS
Cryptodiaporthe canker *Discella carbonacea* (Fr.)	1966	WI	This canker, which caused the death of a number of trees following late frosts in April, was particularly widespread near Quebec City.
Cytospora canker *Valsa ambiens* (Pers.:Fr.) Fr.	1978	WI	Very common in a young transition stand southeast of Saint-Gilbert (Portneuf).
Leaf rust *Melampsora epitea* Thuemen	1967	WI	Observed on a number of willow species in certain localities of Beauce and Lotbinière CDs.
Powdery mildew *Uncinula salicis* (Dc.) Wint.	1972	WI	Up to 60% of foliage affected in Portneuf CD.
	1974	WI	Up to 60% of foliage affected at Cap-Tourmente.
Tar spot *Rhytisma salicinum* (Pers.:Fr) Fr.	1976	WI	Light to moderate damage reported in nine localities in Charlevoix CDs.
Willow scab *Pollaccia saliciperda* (Allesch. & Tub.) Arx	1962	WI	Severe damage on hedges at Saint-Romuald and Saint-Anne-de Beaupré.
	1966	WI	High-level infection on young nursery trees at Ancienne-Lorette.
	1973	WI	Mortality on ornamentals in Quebec, Lévis, Dorchester, and L'Islet CDs.

WILLOW

ORGANISM	YEAR	HOST	REMARKS
	1976	WI	Mortality on ornamentals in a number of municipalities around Quebec City. Rapid death of shoots and branches observed in several locations near Lac des Écorces (Montmorency). Low level at Beaumont (Bellechasse) and Rocher-Noir (Montmagny).
	1977	WI	Between 10 and 20% of leaves affected in Beauce et Frontenac CDs.
	1978	WI	Between 5 and 20% of leaves affected in Lotbinière, Lévis, Mégantic, and Beauce CDs.
Willow scab *Venturia saliciperda* Nuesch	1983	WI	95% of shoots affected on ornamentals at Saint-Aimé-des-Lacs (Charlevoix-Est).

OTHER DECIDUOUS SPECIES

INSECTS

Fall webworm, *Hyphantria cunea* (Drury)

Populations of this webworm mainly affect trees that are on the edges of stands or in clumps. It can attack several different species of deciduous trees, particularly birch, ash, alder, willow, and cherry. Sometimes the crown of a tree is almost totally invaded by the tents of this insect.

Year	Remarks
1946	Tents reported on various species along the roads around Quebec City.
1950	Abundant along roads throughout the region.
1960	Tents seen south of the St. Lawrence and west of the Chaudière River. The highest concentrations of tents were found in Lévis and Lotbinière CDs.
1961	No significant change in populations. Still abundant at the same locations. Severe parasitization of larvae.
1962	Almost complete collapse of population.
1967	Tents visible in Portneuf, Montmorency, Lotbinière, Frontenac, Dorchester, and L'Islet CDs.
1968	Noticeable increase in the number of tents in Portneuf and L'Islet CDs.
1969	Low populations reported in several localities.
1970	Increase in population in the region.
1971	Population comparable to 1970 in metropolitan Quebec.
1972	Increase in population in several localities.
1973	Population increased for the second year. Moderate to high infestations at Sainte-Foy and Saint-Lambert (Lévis).
1974	The main centre of moderate to high infection was located along both shores of the St. Lawrence, from the western tip of the region to Lévis, in an 80-km strip. Low to trace levels elsewhere.
1975	Distribution essentially the same as in 1974. Population levels high at Saint-Siméon and low to trace elsewhere. Population high on the south shore of the St. Lawrence but lower than in 1974.
1976	Population lower and distribution smaller than in 1975.
1977	Collapse of populations.

OTHER DECIDUOUS SPECIES

Gypsy moth, *Lymantria dispar* (L.)

This insect, accidentally introduced into North America in the nineteenth century, was seen for the first time in Quebec and Canada in 1924. Egg masses were destroyed at that time. The insect reappeared in southern Quebec in 1959, then gradually spread. The gypsy moth is a polyphagous insect, but prefers oak, poplar, and birch. The difficult weather conditions in our region appear to be a major deterrent to the spread of this insect. That male moths are captured in a particular area does not mean the insect is established there and will cause damage. It simply indicates its general presence in the region.

Year	Remarks
1976	The LFC used hormone traps for the first time. Of the many traps set, those at Leclercville (Lotbinière) yielded positive results. First capture of male moths in Region 03.
1977	Several hormone traps gave positive results at Sainte-Foy, Château-Richer, Lambton (Frontenac), south of Armstrong (Beauce), and at Deschambault. Egg masses found near Beaulac (Wolfe). The range of the insect had thus extended towards the southeast of the province.
1978	First report of male moths in the eastern part of the region, i.e. La Pocatière. Other positive traps at Fossambault (Portneuf), Château-Richer, and Saint-Rédempteur. Marked increase in number of captures and also extension of range eastward.
1979	Eleven positive traps mainly in Lotbinière and Lévis CDs.
1980	Several egg masses discovered for the first time at Tring-Jonction (Beauce).
1981	Fairly high, sustained frequency in capture of males in Lotbinière CD.
1982	An average of 1.6 adults collected per trap near Quebec City and an average of 7.4 adults captured between Stornoway and Disraëli. More extensive searches at Sainte-Foy and Bois de Coulonge yielded five egg masses, constituting a new centre located over 80 km from the infested area. These egg masses were destroyed.
1983	Light defoliation in infested areas. Egg masses were found at Lyster (Mégantic), Val-Alain (Lotbinière), and in Sainte-Foy and two masses were found near Gilmour Hill in the Parc des Champs de Bataille in Quebec City.

OTHER DECIDUOUS SPECIES

A new centre seemed to be forming near Portneuf, where six egg masses were found. These egg masses were destroyed (see map p. 180).

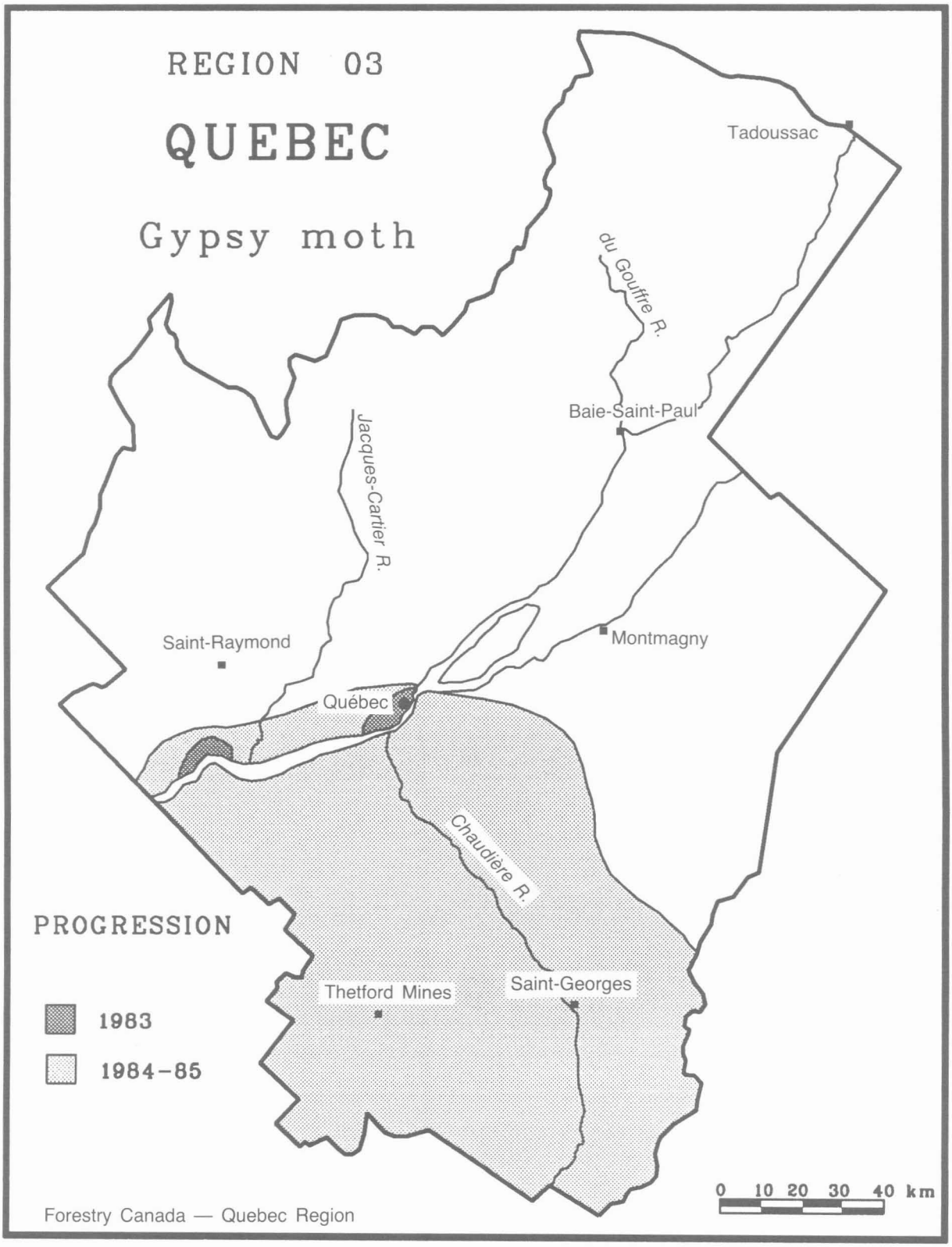
1984 No major damage. In the urban area of Quebec City, over 100 egg masses were discovered (see map p. 180).

1985 Several masses were found for the first time near Saint-Victor and Saint-Ephrem (Beauce), near Saint-Prosper, Sainte-Hénédine and Saint-Édouard de Framptom (Dorchester), and near Saint-Gervais (Bellechasse) (see map p. 180).

1986 A survey of male moths using pheromone traps was carried out in three areas: Saint-Antoine-de-Tilly, Inverness, and Lotbinière. A significant decline in captures was observed. Decrease in populations forecast for 1987.

1987 Decrease in capture of male moths observed at Saint-Antoine-de-Tilly, Inverness, and Lotbinière.

1988 The survey of male moths continued again this year in the region. Monitored areas extended from Saint-Antoine-de-Tilly to Inverness and from Victoriaville to Lotbinière; a decrease was reported in the number of male moths captured. Insect populations at a very low level throughout the region.


REGION 03
QUEBEC
Gypsy moth
Tadoussac
du Gouffre R.
Baie-Saint-Paul
Jacques-Cartier R.
Saint-Raymond
Montmagny
Québec
Chaudière R.
Thetford Mines
Saint-Georges
PROGRESSION
1983
1984-85
0 10 20 30 40 km
Forestry Canada — Quebec Region

OTHER DECIDUOUS SPECIES

INSECT	YEAR	HOST	REMARKS
Fruittree leafroller *Archips argyrospila* (Wlk.)	1978	TA,WB, RO	Steady increase in populations in the region since 1975.
Noctuid moth *Lithophane innominata* (Smith)	1962	SM,RO AH	Relatively common in Lotbinière and Lévis CDs.
	1963	SM,BA	Insect abundant in Lévis and L'Islet CDs.
Obliquebanded leafroller *Choristoneura rosaceana* (Harr.)	1962	SM,RO	Insect common in Lotbinière, Lévis, and Portneuf CDs.
	1964	SM,WB YB,AH	Population stable on the north shore of the region.
	1976	SM,WB, YB	Insect abundant this year and found throughout the distribution area of maple and birch in the region.
Redhumped caterpillar *Schizura concinna* (J.E. Smith)	1961	TA, WI	Low infestation at Sainte-Foy.
Spiny elm caterpillar *Nymphalis antiopa* (L.)	1944	TA	Common in Lévis, Lotbinière, and Portneuf CDs.
	1961	TA,WI	Very common but severely parasitized at Saint-Aubert (L'Islet).
	1965	ECO	Light to moderate defoliation at Baie-Saint-Paul.
	1978	LPO	Common at Montmagny.
	1979	TA,WI	Marked increase in the region.
White admiral *Basilarchia a. arthemis* (Drury)	1961	SM, HH	Occasionally encountered at Sainte-Foy.

OTHER DECIDUOUS SPECIES

Partial list of other insects encountered in the region

English name	Latin name	Preferred host(s)
Ash flower gall midge	*Aceria fraxiniflora* (Felt)	AH
Black maple shoot borer	*Olethreutes appendiceum* (Zell.)	SM
Casebearer sp.	*Coleophora sacramenta* Heinr.	BE,RM
Caterpillar	*Morrisonia confusa* (Hbn.)	SM
Dagger moth	*Acronicta raddiffei* (Haw.)	PCH
Elm sawfly	*Cimbex americana* Leach	WE,WI,PO,B
Leafroller	*Pandemis lamprosana* (Rob.)	TA,WB,WE
Locust borer	*Megacyllene robiniae* (Först)	BL
Maple-basswood leafroller	*Sparganothis pettinena* (Rob.)	BA
Noctuid moth	*Lithophane grotei* Riley	SM
North American fruit leucanium	*Lecanium cerasiflex* Fitch	RO
Oak sawfly	*Dimorphopteryx quercivora*	RO
Ocellate gall midge	*Acericecis ocellaris* (O.S.)	RM
Plum webspinning sawfly	*Neurotoma inconspicua* (Nort.)	PCH
Poplar dagger moth	*Acronicta leporina* (L.)	WB
Red leafeating caterpillar	*Orthosia rubescens* (Wlk.)	LTA,SM,WI
Sawfly	*Euura salicisnodus* (D.T.)	WI
Sawfly	*Nematus fulvicrus* Prov.	TA,WI
Sawfly sp.	*Macremphytus semicornis* (Say.)	Dogwood
Sawfly sp.	*Nematus erythrogaster* (Nort.)	AL
Smeared dagger moth	*Acronicta oblinita* (J.E. Smith)	WI
Spiny looper	*Phigalia titea* (Cram.)	RO
Yellowbanded underwing	*Catocala cerogama* Gn.	BA

OTHER DECIDUOUS SPECIES

DISEASES

Fire blight, *Erwinia amylovora* (Burr.)Winsl. & al.

This is one of those rare tree diseases caused by a bacteria. It mostly affects fruit trees and a few ornamentals such as the mountain-ash, flowering crab-apples, hawthorn, cotoneaster, and spirea. Infected foliage on part of the crown wilts suddenly, takes on a yellow to brown-black color, and quickly dies. It quickly spreads to the entire tree, which then dies.

Year	Remarks
1964	A number of ornamental apple trees affected at Saint-Romuald and in Quebec City.
1965	A number of mountain-ash trees severely affected in Quebec City and vicinity.
1970	Caused mortality on a number of mountain-ash at Saint-Augustin.
1976	Caused mortality of a number of mountain-ash in metropolitan Quebec and towards the east.
1977	Moderate damage on cotoneaster (Cotoneaster sp.) with 8 to 30% of plants infected at Charlesbourg.

OTHER DECIDUOUS SPECIES

Nectria canker, *Nectria galligena* Bres.

A relatively common canker on birch, this disease is occasionally found on maple and other deciduous species. In these cases, the fungus is often found on dead parts of the bark. The typical canker produces a target-shaped swelling on the trunk from which the bark is detached, leaving the central part of the wood bare.

Year	Remarks
1959	Present in a number of locations at Duchesnay and Portneuf on yellow birch. Mortality of a number of large trees.
1960	Observed on white elm at Saint-Gilles (Lotbinière) and on pin cherry at Saint-Étienne (Lévis).
1966	Observed on beech at Saint-Aubert (L'Islet) and Sainte-Germaine (Dorchester).
1976	High level with an average of six cankers per tree at Saint-Ubald (Portneuf). Moderate level at Saint-François on Ile d'Orléans and on sugar maple at Saint-Sylvestre and Saint-Henri. Low level on beech at Cap-Tourmente and Saint-Augustin and on red maple at L'Islet.
1977	3% of beech trunks affected southeast of Bélair (Quebec).
1979	One or two cankers on 8% of birch trunks at Grand Lac Sautauriski in the Laurentian Wildlife Reserve.
1981	Light damage on largetooth aspen in Portneuf CD.

OTHER DECIDUOUS SPECIES

ORGANISM	YEAR	HOST	REMARKS
Reddening	1975	SM,RM, BE	Warm winds in early spring caused reddening of tender young leaves with moderate damage at Montmagny, L'Islet, Saint-Eugène, Saint-Damase, and Cap Saint-Ignace.
	1979	SM,RM BE,YB	A number of mountain sides exposed to the east showed browning on foliage on up to 20% of crowns south of Portneuf, Quebec, and Montmorency CDs.
Winter frost	1965	DEC	Sharp drops in temperature followed by periods of rain in January and February caused severe damage on a number of deciduous species. Mortality was observed on the roots of maples at Charny and Saint-Nicolas and on apples, oak, and elm in Quebec City.
	1981	M,B, PO,WI	A thaw in February followed by severe cold in March caused crowns to die back, as observed later in the season. Light to severe damage in Portneuf, Quebec, and Montmorency CDs and also on Ile d'Orléans and at Clermont.

CONIFEROUS AND/OR DECIDUOUS SPECIES

CONIFEROUS AND/OR DECIDUOUS SPECIES

DISEASES

Acid rain

For some years, numerous symptoms of dieback have been appearing in Canadian forests. In Quebec, this phenomenon seems to particularly affect maple stands. Among the possible factors damaging these forests, atmospheric pollutants are suspected; these include acid precipitation in the form of wet deposition; dry deposition; gases such as ozone and sulfur dioxide; heavy metals; etc. All these pollutants are often included in the common term "acid rain."

In 1984, Forestry Canada, then the Canadian Forestry Service, set up a study program aimed at detecting, if possible, the damage caused by such pollution. In Quebec, there are 24 observation plots distributed in several types of stands from the region north of Montreal to the Matapédia River valley (Bonaventure). This network monitors all changes that appear in the forests, such as insect damage, tree diseases, climatic damage, and any other symptoms that could be attributed to acid rain.

The program will be pursued for several years with various observations and analyses in order to see how the studied stands evolve and possibly to demonstrate that acid rain pollution is affecting the forests.

In the Quebec City area, three study plots were set up under this program and visited twice a year. They are located at Perthuis in Portneuf county, Saint-Hilaire-de-Dorset in Frontenac county, and Armagh in the Appalachian Crown forest. In 1987, we had to eliminate Plot #18 Saint-Sylvestre from our system because of major changes in the use of the area under study. To date, we have not observed any degradation in the studied stands that could be attributed to acid rain.

CONIFEROUS AND/OR DECIDUOUS SPECIES

Animal damage: meadow vole

Also known as field mice, these rodents feed off the bark at the base of the trunks of young trees during the winter when they begin to run short of food. In plantations, they can girdle and kill many trees in a single season.

Year	Remarks
1968	Damage at the base of 80% of young white spruce and 20% of red pine in a plantation at Saint-Pamphile and on 10% of white spruce in a plantation at Sainte-Euphémie (Montmagny).
1972	Damage at the base of young trees in plantations and on ornamental trees in metropolitan Quebec.
1977	Severe damage on various deciduous and coniferous species near Quebec and on the south shore of the St. Lawrence, from Lotbinière CD to Montmagny CD for example, and on sugar maple at Saint-Antoine-de-Tilly and Sainte-Croix.
1978	Same distribution as in 1977 but severity of damage decreased. Some 800 Jack pines out of 6 500 affected during the past two years at Ile-aux-Grues (Montmagny). Some 24 white birches out of 144 affected near Saint-Nicolas.
1979	Damage practically absent from locations mentioned in 1977-1978.

CONIFEROUS AND/OR DECIDUOUS SPECIES

Animal damage: snowshoe hare

Hares in search of food occasionally nibble terminal buds on low stems during the winter.

Year	Remarks
1967	Damage on a number of young fir trees in a mixed stand at Saint-Tite-des-Caps.
1968	Damage on terminal shoots of half the young fir trees in natural regeneration established after cutting. Damage to the lower part of crown on 70% of young black spruce and on 60% of balsam fir at Saint-Cyprien (Dorchester).
1969	Light to moderate damage in pine plantations at Vallée-Jonction and south of Saint-Raymond.
1970	Damage on the tips of low branches on a number of red pine at Saint-Anges (Beauce).
1971	Severe damage on terminal and lateral shoots of 3 000 white spruce in a plantation at Saint-Zacharie (Dorchester) and also in a plantation of Scots pine at Saint-Apollinaire.
1973	Moderate damage on black spruce shoots in a plantation near Sainte-Agathe (Lotbinière).
1976	Damage on white spruce over 1 ha at Jumeaux gate in the Laurentian Wildlife Reserve, where over 95% of saplings had between 10 and 15% of twigs nibbled.
1978	Damage on 100% of young white birch north of Stoneham gate (Montmorency). Damage on regeneration of white birch for the second consecutive year at Rivière-à-Pierre where nearly 7% of trees were dead following these attacks.

CONIFEROUS AND/OR DECIDUOUS SPECIES

Animal damage: Yellow-bellied sapsucker

This bird breaks the bark of trees and makes a line of holes along the trunk to drink the sap that seeps out and perhaps also to eat the insects that come and feed on it. It comes back regularly to its favorite trees.

Year	Remarks
1966	Damage observed on several red spruce at Duchesnay, and on nine Norway spruce in Quebec City.
1968	Light to severe damage on sugar maple, balsam fir, eastern hemlock, Jack pine, Scots pine, white spruce, and black spruce in several CDs east of Quebec City.
1969	Light damage in stands of fir at Saint-Augustin.
1970	Severe damage on Norway spruce at Thetford Mines. Light to moderate damage on white spruce and red spruce, red pine, Jack pine, and Scots pine and on sugar maple in several localities in Beauce and Dorchester CDs.
1972	Severe damage in a plantation of Norway spruce at Thetford Mines.
1980	Moderate damage on birch at Inverness and light damage at Montmagny.

CONIFEROUS AND/OR DECIDUOUS SPECIES

Armillaria root rot, *Armillaria* spp. complex

This fungus affects the roots and then the collar of trees of all species, but particularly those weakened by a stress of some kind. Occasionally it can lead to rapid death. The foliage of severely affected conifers takes on a characteristic reddish tinge which is particularly visible in plantations. The affected deciduous trees show signs of rapid dieback without any obvious outside cause. Recently, the incidence of the disease has increased on balsam fir as a result of infestation by the **spruce budworm** and **secondary insects** attacking the trunks.

Year	Remarks
1961	Mortality of 60 white birch out of 140 near Thetford Mines caused by armillaria.
1962	This disease found in a plantation of 10-year-old red and Jack pine at Saint-Édouard and in another Jack pine plantation at Beaupré, where a number of centres of infection were detected.
1965	Small centres of infection observed on young Scots pine at Saint-Jules (Beauce) and on balsam fir at Saint-Féréol (Montmorency).
1966	Infection observed on 10% of dead or dying Murray pine in a 1-ha plantation at Valcartier. Also observed on beech at Sainte-Germaine (Dorchester) and on red pine at Tourville (L'Islet).
1968	Observed in CDs on either side of the river to the east of Quebec City. Black ash, white birch, sugar maple, balsam fir, Jack pine, red pine, and Scots pine were affected and the extent of attack varied from light to moderate.
1969	Mortality of several fir trees in a high forest attributed to armillaria at Saint-Augustin. Trace infection on balsam fir at Saint-Lazare (Bellechasse) and Vallée-Jonction (Beauce). At the latter location, mortality was observed on a number of trees in plantations of Scots and red pine.
1970	Light damage on yellow and white birch at Sainte-Foy and on red spruce at Sainte-Marguerite and Saint-Sylvestre.
1971	Small centres of infection caused mortality on sugar maple at Neuville. Moderate attack on balsam fir and white spruce at Leeds (Mégantic). Also observed on balsam fir in Lotbinière and Portneuf CDs.
1972	Attack on 8% of young Norway spruce in a plantation at Valcartier. Scots pine showed signs of this root rot in Portneuf CD, but the number of trees affected

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was still low. Localized centre of infection in a mixed stand of white birch, sugar maple, and white pine near Pont-Rouge.

1974 Infection on 10% of balsam fir in natural stands near Saint-Honoré (Beauce).

1975 Moderate levels of infection on balsam fir at Saint-Adrien d'Irlande and Saint-Honoré; at the latter location, low level infection on beech as well.

1976 Moderate infection on balsam fir at Sainte-Perpétue (Montmagny) and on sugar maple at Saint-Benoît-Labre (Beauce). Occasional infection on red maple in metropolitan Quebec.

1978 High-level infection on balsam fir at Saint-Adrien (Mégantic). Moderate infection on balsam fir at Saint-Magloire (Bellechasse), near Montmagny, at Lake Sainte-Anne (L'Islet), and in the Montmorency Forest.

1979 Mortality on over 60% of 60-year-old fir trees in a 4-ha stand, near Black Lake (Mégantic). From 25 to 55% of fir trees affected near Montmagny, near Saint-Damien (Bellechasse), and at Lake Sainte-Anne (L'Islet).

1980 Root rot present on 15 to 55% of dead fir trees due to invasion of spruce budworm in the southern part of the Laurentian Wildlife Reserve. Between 20 and 35% of fir trees affected at Saint-Damien (Montmagny). Damage is cumulative.

1982 Low-level infection on fir near Saint-Aimé-des-Lacs.

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Cytospora canker, *Cytospora* sp.

This disease is common on spruce, producing resinosis and bark and branch mortality. The fungus produces small cankers and also mortality of stems and branches on other coniferous species and on several deciduous species. It is frequently encountered on trees already subjected to another stress.

Year	Remarks
1962	Infection on several Norway spruce in plantations at Shannon (Quebec).
1964	Observed on seedlings of Norway spruce and white spruce at Valcartier.
1965	Reported in association with trunk cankers on several dying willows in Quebec City. Trunk cankers were observed on 10% of white spruce, aged 15 to 40 years, in a natural stand of several hectares at Shannon (Portneuf). Cankers on branches were common on blue spruce in Quebec City.
1971	A number of cases of resinosis and marked deformation were observed on trunks of black spruce at Duchesnay.
1974	Moderate infection on fir and Eastern white cedar at Saint-Vallier (Bellechasse) and Saint-Lazare (Bellechasse).
1976	Light damage on white spruce at Ange-Gardien (Montmorency), on black spruce north of Saint-Urbain, northeast of Clermont, and northwest of Saint-Aimé-des-Lacs (Charlevoix-Est); on Scots pine in plantations southeast of Saint-Raymond.
1977	Light damage on sugar maple in Lotbinière, Lévis, Mégantic, Dorchester, Bellechasse, and L'Islet CDs.
1978	Damage on 6% of trunks of white spruce in a young plantation of 10 000 trees east of Saint-Casimir. Damage on 8% of red maple shoots at Ile-aux-Grues (Montmagny). Damage on 10% of foliage on hybrid poplar at Orsainville. For the second consecutive year, an elm hedge 2 km long was damaged over 50% of its height at Orsainville.
1980	Approximately 12% of Norway spruce at Pont-Rouge affected for the past few years.
1981	Severe damage on sugar maple in Beauce CD. Damage to 35% of the 5 000 tamarack trees planted along Highway 73 near Saint-Lambert.

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Cytospora canker, *Valsa friesii* (Duby) Fuckel

This disease is common but not significant on a number of coniferous species, particularly balsam fir.

Year	Remarks
1968	Moderate infection in a young stand of fir at Saint-Lazare (Bellechasse). Low-level infection in several localities of the Charlevoix CDs.
1970	Deformed Norway spruce trunks at Donnacona and Pont-Rouge.
1971	Light damage in young plantations of balsam fir, Jack pine, and red pine in Portneuf and Bellechasse CDs.
1972	Browning of the year's foliage observed at the tips of shoots on lateral branches of fir in several localities in Portneuf and Quebec CDs.
1973	Browning of foliage on 5 to 25% of fir needles at Lake Saint-Charles (Quebec) and Lake Pikauba (Montmorency).
1975	High-level infection on fir at Saint-Hilaire-de-Dorset (Frontenac), Sainte-Sabine, and Armagh (Bellechasse). Low-level infection in other locations in Bellechasse, Beauce, Frontenac, and L'Islet CDs.
1976	Severe damage on fir at Montmagny. Moderate damage on fir in Beauce and Frontenac CDs. Light damage on balsam fir at Vallée-Jonction (Beauce).
1977	Low-level infection on fir in several localities in Beauce, Frontenac, Montmagny, and L'Islet CDs.

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Frost crack

This common disease on tree trunks is characterized by deep longitudinal cracks in the bark and wood which often forms a large callus as it heals. These cracks are more common on trees exposed during the dormant season to sudden, wide variations in temperature. Several reports are cited below as examples.

Year	Remarks
1961	In January, following an extended period of severe cold, frost cracks appeared on Carolina poplar, maple, and other deciduous species near Quebec City.
1975	Moderate to severe damage on 15 to 60% of balsam fir, poplar, sugar maple, and white spruce at Saint-Benjamin (Dorchester), Saint-Lazare (Bellechasse), Saint-Benoît-Labre (Beauce), Saint-Sébastien (Mégantic), and Saint-Étienne (Lévis).
1976	A plantation of hybrid poplars at Lake Etchemin had many frost cracks on their trunks. Moderate damage on beech at Saint-Philibert (Beauce).
1977	In a plantation of poplars at Saint-Benjamin (Dorchester) 85% of trees had frost cracks on their trunk.
1978	Moderate to severe damage on red maple, a number of hybrid poplar, and fir at Saint-Étienne, Vallée-Jonction, Saint-Benjamin, Saint-Eugène, and Lake Etchemin.
1980	Moderate to severe damage in plantations of hybrid poplar at Lake Etchemin and Saint-Étienne.

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Hail

Hailstorms, may cause local, easily identifiable injury to thin-barked twigs on many tree species, particularly during periods of active growth.

Year	Remarks
1961	Serious damage observed in early July over small areas near Saint-Lambert (Lévis). Trembling aspen, white birch, and red maple were almost completely defoliated and had wounds 1.25 to 7.5 cm long on branches and trunks of less than 5 cm in diameter. Balsam fir, white pine, white spruce, and tamarack were also affected in the same areas.
1963	Major damage observed on foliage and/or branches of forest species around Quebec City and along the Sainte-Anne River. Severe damage on young firs at Saint-Damien and Saint-Malachie.
1964	Variable damage observed on a number of species in several localities near Quebec City.
1970	Variable damage on Jack pine and red pine at Saint-Anges (Beauce).
1972	Light to moderate damage on sugar maple at Sainte-Marguerite and East Broughton.
1973	Damage observed on 10% of 150 000 red pine seedlings in the Scott nursery (Dorchester).
1975	Light damage on red spruce at Cap-Saint-Ignace. Severe damage on balsam fir and Jack pine in Frontenac CD.
1977	Moderate damage on Jack pine, white spruce, and Norway spruce in plantations in the Charlevoix CDs.

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Ice storm damage

This is an unpredictable climatic phenomenon that occasionally produces very significant damage. Some species, however, withstand it better than others. Examples of situations encountered in the region are given below.

Year	Remarks
1959	Unusual cracking of bark on the underside of branches and severe reddening of needles observed on balsam fir in the Quebec City area. East of Lake Deschesnes, along the Noire River (Charlevoix-Est), this condition was common over an area of 87 km^2 on 10 to 50-year-old trees. Affected branches had southwest exposure and were at varying heights from the ground. The phenomenon was also observed in smaller areas, on trees 10 to 15 years old at Saint-Hilarion (Charlevoix-Ouest) and at two locations along the Sainte-Anne River.
1960	A considerable number of branches and crowns of deciduous species, particularly poplar, maple, white birch, and elm, broke under the weight of the ice. The Quebec City area was the most severely affected, particularly at Saint-Nicolas, Saint-Romuald, Quebec City, Ile d'Orléans, Lévis, between Saint-Henri and Sainte-Marie, and over a 12-km strip between Lauzon and L'Islet. Moderate to severe damage at Baie-Saint-Paul and over a 1.5-km strip between Quebec City and Beaupré. Light to moderate damage over an 8-km strip from Quebec City to Saint-Casimir (Portneuf) and also from L'Islet to the eastern edge of Montmagny CD.
1963	Cracking of bark under fir branches, similar in appearance to that of 1959, occurred over an area of several square kilometres in a 15-year-old stand 30 km northwest of Saint-Urbain [La Galette] (Charlevoix-Ouest).
1968	Severe damage in March 1968 to the majority of deciduous species south of the St. Lawrence between Sainte-Marie (Beauce) and the eastern tip of Montmagny CD.
1973	The first freezing rain at the beginning of the year caused moderate to severe damage with 30 to 80% of branches broken and a number of trunks broken on trembling aspen, balsam poplar, white elm, Manitoba maple, and white ash over an area of 1 600 km^2 near Quebec City. A second freezing rainstorm around

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the end of December caused moderate to severe damage east of Quebec City on trembling aspen, yellow birch, white birch, sugar maple, and white spruce over an area of 4 000 km^2. More details on damage in 1974.

1974 An area of over 5 600 km^2 was affected by freezing rain in the winter of 1973-1974 causing moderate-severe damage in woodlots in an 80-km radius of Quebec City including Ile d'Orléans. Broken trunks and crowns were observed on poplar, birch, maple, balsam fir, spruce, pine, and tamarack. The most severely damaged area was over a 24-km wide strip between Portneuf and Cap-Tourmente (Montmorency) and over a large strip between Leclercville (Lotbinière) and Saint-Rock-des-Aulnaies (L'Islet). On the north shore, repeated freezing rainstorms occurred in January 1974, causing moderate to severe damage on the above-mentioned species over a 1 550 km^2 area between Saint-Fidèle and Baie-Sainte-Catherine (Charlevoix-Est).

1976 Moderate damage on Jack pine and red pine in plantations at Saint-Odilon (Dorchester), Saint-Elzéar (Beauce), and several localities of Montmagny and L'Islet CDs.

1984 Freezing rain on December 13-15, 1983, caused light damage in maple stands in Beauce, Frontenac, and Mégantic CDs.

1985 Freezing rain on February 23-24 caused light damage in a number of maple stands over a 25-km strip between Val-Alain (Lotbinière) and Sainte-Marie (Beauce).

CONIFEROUS AND/OR DECIDUOUS SPECIES

Late frost injury

This is a relatively common phenomenon that occurs late in the spring. In conifers, it causes death and browning of new, very juvenile shoots, and in deciduous trees, it causes fading and falling of leaves that are developing or are just barely developed. Examples of this type of damage are given below.

Year	Remarks
1961	Severe damage in a plantation of Jack pine over approximately 4 ha at Valcartier. Serious damage to foliage, including deformation of leaves and formation of torn holes, on leaves of oak and maple in the Quebec City area.
1962	Damage observed on fir and black spruce in a large section of the Laurentian Wildlife Reserve and in a nursery at Beaumont on several thousand Engleman spruce plants aged 5 to 10 years. Severe distortion of shoots and needles on over 50% of Scots pine in a 1-ha plantation at Valcartier. Numerous perforated leaves on maples in the Quebec region.
1963	Shoots severely damaged on 10 to 15-year-old red and Scots pine in a plantation at Valcartier. Serious damage to fir and black spruce in a number of small areas in the Laurentian Wildlife Reserve. Deformation and marked perforation of leaves observed on white spruce and yellow birch in the Laurentian Wildlife Reserve and in large areas near Saint-Fidèle (Charlevoix-Est). Damage to foliage of deciduous species in the Quebec City area.
1964	Severe damage on buds of balsam fir and Norway spruce at Valcartier and Saint-Romuald. Moderate to severe damage on foliage of maple, ash, elm, and chestnut around Quebec City and in the Beauce area. Severe damage on all deciduous species over a very large area in the Laurentian Wildlife Reserve. In low areas, browning of leaves was observed and at high elevations, there was complete defoliation.
1965	Damage observed on fir growing at high altitude in the Laurentian Wildlife Reserve.
1967	Moderate to severe damage to balsam fir at Lac des Neiges in the Laurentian Wildlife Reserve. Deformation of leaves observed on white and yellow birch at Saint-Tite-des-Caps (Montmorency). Damage observed on red maple and sugar maple in a number of localities around Quebec City.

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1968 Damage to terminal shoots and the tips of branches on 80% of 15 to 20-year-old black spruce at Lake Jacques-Cartier. Annual growth on these spruces was dead in up to 80% of cases; damage observed on all young balsam fir and on many of them at Lake Chartier, in the Laurentian Wildlife Reserve, all annual growth was dead. Severe damage to balsam fir and white spruce in Montmagny and L'Islet CDs. Deformed foliage or injury around the edges of leaves observed on trembling aspen, white birch, and basswood in Quebec CD and also on bur oak in Lotbinière CD.

1970 Damage observed on white spruce, Eastern white cedar, Jack pine, red pine and Scots pine at Sainte-Cécile (Frontenac) and on trembling aspen and white birch at Saint-Siméon and Saint-Urbain (Charlevoix-Ouest).

1971 Mortality on buds and new shoots of conifers and deciduous trees in a number of localities north of Charlevoix and Montmorency CDs.

1975 Moderate damage on red maple at Saint-Eugène (L'Islet). Moderate damage on balsam fir at Saint-Honoré (Beauce).

1976 Moderate damage on balsam fir at Saint-Honoré and in several localities in Beauce CD. Light damage on hop-hornbeam at Saint-Charles de Grondines (Portneuf). Moderate damage on aspen in the Quebec City area.

1977 Damage observed on yellow birch at Saint-Damase, on beech and sugar maple at Saint-Eugène, and on red maple at Bernières. Moderate damage on 75% of ornamental balsam firs and on about twenty Norway spruce at the Sainte-Foy Cité Universitaire. Light damage on 26% of fir seedlings in a small plantation at Sainte-Christine. Light damage on sugar maple in a radius of 40 km of Quebec City.

1978 A fairly large area in the heights of the Laurentian Wildlife Reserve, including Montmorency Forest, Lake Malbaie, the Launière and Jumeaux sector, had 10 to 50% of shoots dead on balsam fir.

1979 Damage to 50% of young fir shoots at Cavée River in the Laurentian Wildlife Reserve. Between 10 and 15% of sugar maple crowns affected from Lake Beauport to Saint-Irénée (Charlevoix-Est).

1980 In early June, a late frost with snowfall caused considerable damage to balsam fir and black spruce. 75 to 100% of trees were affected, with an average of 50% of buds frozen north of Quebec, Montmorency, and Charlevoix-Ouest CDs. Severe damage also observed on close to 100% of sugar maple and 75 to 100% of foliage was affected over an area of 1 300 km^2. Damage noted in maple stands located in the southern part of the region, mainly on high ground in the

CONIFEROUS AND/OR DECIDUOUS SPECIES

Appalachians and other mountains over 500 m high. This zone extended from Frontenac CD northeastward to Montmagny CD.

1981 At Shannon (Portneuf), damage on 10 to 20% of annual growth on 500 spruces under 10 years old.

1982 Damage on 10% of shoots on 95% of 1 000 six-year-old firs at Sainte-Christine. Damage to 10% of the crowns of balsam fir in natural forest at Lac des Neiges (Montmorency).

1983 Light damage observed on natural conifer forests in the southern part of Portneuf and Quebec CDs. Damage on 40 and 25% of crowns of balsam fir at Kinnear's Mills (Mégantic) and Saint-Simon-les-Mines (Beauce). Damage on 30 and 50% of sugar maple crowns at Saint-Martin (Beauce) and Baie-Saint-Paul.

1986 Major damage observed on 25% and even up to 75% of the crown of trembling aspen and ash and moderate damage observed on 20% of balsam fir, Norway spruce, white spruce, and black spruce in the region.

1987 Damage on aspen in Beauce and Charlevoix CDs.

1988 Damage in several maple stands on the south shore of the St. Lawrence River.

CONIFEROUS AND/OR DECIDUOUS SPECIES

Summer drying injury

A very dry period during the summer may cause symptoms of summer drying injury on stands growing on sites with excessive drainage. A few examples of such situations are given below.

Year	Remarks
1960	Symptoms such as abnormal development, browning, and premature leaf fall were observed on a number of maples in areas around Quebec and Montmagny.
1963	Symptoms of wilting of part of foliage on several willows were observed at Saint-Urbain, caused by heat and dry weather at the end of July.
1978	Leaves dried or fallen on nearly 50% of aspen over approximately 3 ha north of Saint-Aimé-des-Lacs (Charlevoix-Est).
1983	Premature fall of leaves on yellow and white birch and beech around Rivière-à-Pierre and near Saint-Siméon on the north shore and in a number of south shore localities over several square kilometres. This phenomenon was particularly apparent on hilltops and rocky outcroppings.

CONIFEROUS AND/OR DECIDUOUS SPECIES

Windfall, windthrow

This is a relatively common and unpredictable climatic phenomenon. The observations given here are examples of situations encountered in the region.

Year	Remarks
1961	A tornado on June 28 in the Laurentian Wildlife Reserve broke, twisted, or partially uprooted almost all the trees in a strip nearly 1 km wide stretching approximately 100 km westward from Highway 54 to 50 km north of l'Étape.
1963	During the summer, a tornado broke and uprooted a number of trees in two sectors of the Laurentian Wildlife Reserve between Highways 54 and 56.
1973	Windfall of black spruce was observed over 3.5 km^2 near Relais (Montmorency) and over 2 ha near Lake Savane (Charlevoix-Ouest). Many trunks broken over 1.5 km^2 at Buckland (Bellechasse) on firs over 15 cm in diameter.
1974	A number of forest species blown down over an 8-ha area near Lake Trois-Saumons. Black spruce, balsam fir, and trembling aspen were affected over many areas of less than 1 ha in Montmagny, Bellechasse, Dorchester, Beauce, Lévis, and Lotbinière CDs.
1975	Balsam fir and white spruce blown down over stretches of ± 260 ha near Montmagny and around lakes Fortin (Montmagny) and Nicolet (Wolfe). Other less extensive windfalls were observed on balsam fir, red spruce, black spruce, Jack pine, eastern white cedar, sugar maple, and red maple in Lotbinière, Lévis, Mégantic, Beauce, Montmagny, L'Islet, Dorchester, and Bellechasse CDs.
1976	15 to 20% of trees blown down over 1 ha northwest of Pont-Rouge. Balsam fir, black spruce, Jack pine, tamarack, eastern white cedar, and trembling aspen were blown down over small areas in Montmagny, Frontenac, Beauce, Lévis, Mégantic, and Lotbinière CDs.
1977	Severe damage on fir with 86% of trees affected over 1.6 ha at Notre-Dame-des-Pins (Beauce). Black spruce, red spruce, and balsam fir were affected over small areas in Lévis, Mégantic, Beauce, Frontenac, Montmagny, and L'Islet CDs.
1978	Severe damage on balsam fir, with 86% of trees affected over 2 ha at Saint-Camille (Bellechasse). Severe damage on fir areas at Saint-Zacharie (Dorchester) and Ile-aux-Oies (L'Islet) but over smaller areas.

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1979	Nearly 75% of red spruce blown down over a 4-ha area at Saint-Camille (Bellechasse).
1980	Fir trees were blown down over 1.5 ha at Saint-Camille. Nearly 46% of trembling aspen were blown down over 6 ha at Lake Aylmer (Wolfe).

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Partial list of other diseases
and pathogenic agents
encountered in the region

English name	Latin name	Preferred host(s)
Black rib	*Ciborinia foliicola* (Cash & Davids.) Whet.	WI
Blue stain	*Kirchsteiniella thujina* (Peck) Pomerleau & Ether.	WS
Branch gall	*Diplodia tumefaciens* (Shear) Zalasky	TA
Brown cubical rot	*Fomes cajanderi* Karst.	PCH
Chlorotic needle spot	*Atichia glomerulosa* (Ach. ex. Mann) Stein	BS
Crown gall	*Agrobacterium tumefaciens* (E.F. Sm & Town.)	WI
Cryptospora dieback	*Cryptospora betulae* Tul.	WB
Cryptodiaporthe canker	*Cryptodiaporthe acerinum* J. Reid & Cain	SM, RM
Diaporthe canker	*Diaporthe dubia* Nits.	SM
Godronia canker	*Godronia fuliginosa* (Fr.) Seaver	TA, WI
Hypoxylon canker	*Hypoxylon cohaerens* Pers.: Fr.	BE
Leaf spot	*Cristulariella depraedens* (Cooke) Hoehnel	MOM
Leaf spot	*Cylindrosporella microsperma* (Peck) Petrak	WB
Leaf spot	*Cylindrosporium betulae* J.J. Davis	WB
Leaf spot	*Gloeosporium aridum* Ellis & Holw.	WAS
Leaf spot	*Gloeosporium betulae-luteae* Sacc. & Dearn.	YB
Nectria canker	*Nectria fuckeliana* (Booth)	WS, NS
Nectria canker	*Tubercularia vulgaris* Tode:Fr.	BA
Nectria dieback	*Nectria cinnabarina* (Tode: Fr.) Fr.	SM, DEC,
Needle cast	*Nothophacidium abietinellum* (Dearn.) J. Reid & Cain	BF
Needle rust	*Chrysomyxa weirii* Jacks.	BS
Needle rust	*Chrysomyxa chiogenis* Diet.	BS
Needle rust	*Pucciniastrum americanum* (Farlow) Arthur	WS
Needle rust	*Pucciniastrum vaccinii* (Wint.) Jorstad	EH SP, TL, EWC, CON

CONIFEROUS AND/OR DECIDUOUS SPECIES (cont.)

Pragmopora canker	*Pragmopora pithya* (Fr.: Fr.) Groves	EWP
Red heart rot	*Peniophora septentrionalis* Laurila	EWP, JP
Red ring rot	*Fomes pini* (Brot.:Fr.) Karst.	EWP, S
Shoot blight	*Coryneum kunzei* Corda	RO
Shot hole	*Coccomyces hiemalis* Higgins	PCH
Shot hole	*Coccomyces strobi* J. Reid & Cain	EWP
Snow blight	*Sarcotrochila balsamea* (J.J. Davis) Korf	BF
Trunk spot	*Dichaena faginea* (Pers.) Sacc. Conn	BE
Tubercularia dieback	*Tubercularia ulmea* Carter	WE, RAS
Twig blight	*Acanthostigma parasiticum* (Hartig.) Sacc.	RS
Twig blight	*Diaporthe alleghaniensis* R. Arnold	YB
Tympanis canker	*Tympanis hypopodia* Nyl.	RP
Verticillium wilt	*Verticillium albo-atrum* Reinke & Berth	RM, SM, WE
Verticillium wilt	*Verticillium dahliae* Kleb.	SM
White spongy rot	*Corticium laeve* Fr.	BF
White spongy rot	*Fomes connatus* (Weinm.) Gill.	SM, RM
White spongy rot	*Steccherinum septentrionale* (Fr.) Banker	SM
White trunk rot	*Fomes ignarius* (L.:Fr.) Fr.	BE, SM
Witches'-broom rust	*Melampsorella cerastii* (Pers.) Schroet.	BF

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N.B. Titles of annual reports repeated over several years have been abbreviated and inserted into a single reference.

SPECIES NAMES AND CODES

English name	Latin name	Code
Coniferous (resinous) species		CON
Balsam fir	*Abies balsamea* (L.) Mill.	BF
Black spruce	*Picea mariana* (Mill.) B.S.P.	BS
Eastern hemlock	*Tsuga canadensis* (L.) Carr.	EH
Eastern white cedar	*Thuja occidentalis* L.	EWC
Eastern white pine	*Pinus strobus* L.	EWP
Jack pine	*Pinus baksiana* Lamb.	JP
Mugho pine	*Pinus mugo* Turra	MP
Norway spruce	*Picea abies* (L.) Karst.	NS
Pine	*Pinus* sp.	P
Red pine	*Pinus resinosa* Ait.	RP
Red spruce	*Picea rubens* Sarg.	RS
Scots pine	*Pinus sylvestris* L.	SP
Spruce	*Picea* sp.	S
Tamarack	*Larix laricina* (Du Roi) K. Koch	TL
White spruce	*Picea glauca* (Moench) Voss	WS
Deciduous species		DEC
Alder	*Alnus* sp.	AL
Apple	*Malus* sp.	APP
Balsam poplar	*Populus balsamifera* L.	BPO
Basswood	*Tilia americana* L.	BA
Beech	*Fagus grandifolia* Ehrh.	BE
Birch	*Betula* sp.	B
Black ash	*Fraxinus nigra* Marsh.	BAS
Black locust	*Robinia pseudo-acacia* L.	BL
Cherry	*Prunus* sp.	CHE
Choke cherry	*Prunus virginiana* L.	CCH
Dogwood	*Cornus* sp.	---
Eastern cottonwood	*Populus deltoïdes* Bartr.	ECO
Grey birch	*Betula populifolia* Marsh.	GB
Hawthorn	*Crataegusp.*	HAW
Hop-hornbeam	*Ostrya virginiana* (Mill.) K. Kock	HH

Hybrid poplar	*Populus* L.	HPO
Large tooth aspen	*Populus grandidentala* Michx.	LTA
Lombardy poplar	*Populus nigra* var. *Italica* Muenchh.	LPO
Maple	*Acer* sp.	M
Mountain-ash	*Sorbus* sp.	MO
Mountain maple	*Acer spicatum* Lam.	MOM
Norway maple	*Acer platanoïdes* L.	NM
Pin cherry	*Prunus pensylvanica* L.f.	PCH
Plum	*Prunus* sp.	PL
Poplar	*Populus* sp.	PO
Red ash	*Fraxinus pennsylvanica* Marsh.	RAS
Red maple	*Acer rubrum* L.	RM
Red oak	*Quercus rubra* L.	RO
Silver maple	*Acer saccharinum*	SIM
Sugar maple	*Acer saccharum* Marsh.	SM
Striped maple	*Acer pensylvanicum* L.	STM
Trembling aspen	*Populus tremuloides* Michx.	TA
Willow	*Salix* sp.	WI
White ash	*Fraxinus americana* L.	WAS
White birch	*Betula papyrifera* Marsh.	WB
White elm	*Ulmus americana* L.	WE
Yellow birch	*Betula alleghaniensis* Britton	YB

ALPHABETICAL LIST OF CODES

Code	English name
AL	Alder
APP	Apple
B	Birch
BA	Basswood
BAS	Black ash
BE	Beech
BF	Balsam fir
BL	Black locust
BPO	Balsam poplar
BS	Black spruce
CCH	Choke cherry
CHE	Cherry
CON	Coniferous (resinous) species
DEC	Deciduous species
ECO	Eastern cottonwood
EH	Eastern hemlock
EWC	Eastern white cedar
EWP	Eastern white pine
GB	Grey birch
HAW	Hawthorn
HH	Hop-hornbeam
HPO	Hybrid poplar
J	Juniper
JP	Jack pine
LI	Lilac
LPO	Lombardy poplar
LTA	Largetooth aspen
M	Maple
MO	Mountain-ash
MOM	Mountain maple
MP	Mugho pine
NM	Norway maple
NS	Norway spruce
P	Pine
PCH	Pin cherry
PL	Plum
PO	Poplar
RAS	Red ash
RM	Red maple
RO	Red oak
RP	Red pine
RS	Red spruce
S	Spruce
SIM	Silver maple
SM	Sugar maple
SP	Scots pine
STM	Striped maple
TA	Trembling aspen
TL	Tamarack
WAS	White ash
WB	White birch
WE	White elm
WI	Willow
WS	White spruce
YB	Yellow birch

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