QUEBEC REGION

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INTRODUCTION

A sudden resurgence of spruce budworm populations in a spruce plantation near Grand'Mère and a marked extension of the gypsy moth infested areas in Chateauguay and Huntingdon counties were the most important insect records of the year. Forest tent caterpillar and eastern tent caterpillar infestations continued in southern Quebec and severe defoliation was again recorded on trembling aspen and wire birch. Jack-pine sawfly populations increased in known infested areas and aerial surveys revealed the presence of new infestation centres in western Quebec. The larch sawfly outbreak has extended to the Gaspé Peninsula but known infestation areas of the balsam woolly aphid and the beech scale remained unchanged. The birch casebearer and the amber-marked birch leaf miner were less abundant this year and the birch skeletonizer infestations of recent years have subsided. The insect situation in the maple-grove area was comparable to that of 1965.

The snow cover persisted longer than usual in most forested areas in eastern Quebec, despite fairly warm and sunny weather in early spring. A sudden drop in temperature in mid-May resulted in severe damage to some tree species in Quebec City and adjacent regions. This condition apparently favored the development of numerous cankers on ornamental trees. A top-dying of yellow birch, extensive in many regions, was also attributable to late frost. Prolonged drought periods were recorded in northwestern Quebec, but in the east, precipitation was near normal in June and July, and above normal in late summer and early fall.

Other records of importance in 1966 include a fast spreading *Polyporus tomentosus* infection in a white spruce stand and a high incidence of butt rots in balsam fir stands in areas northwest of Quebec City. A number of new hosts and disease records were taken and these are presented in this report.

The cooperation of the forest industry and the Quebec Department of Lands and Forests in carrying out field surveys in 1966 is gratefully acknowledged. A total of 2,718 collections were made in 1966, and their distribution amongst the various tree species was as follows:

Coniferous trees	Collections		Broad-leaved trees	Collections	
	Insect	Disease		Insect	Disease
Fir			Poplar		
Balsam fir	307	78	Trembling aspen	345	103
Pine			Balsam poplar	10	3
Jack pine	81	78	Lombardy poplar	1	2
Red pine	32	31	Eastern cottonwood	7	
White pine	9	19	Largetooth aspen	14	
Scots pine	14	16	Misc.	2	1
Mugho pine		1	Maple		
Misc.	4	5	Sugar maple	168	26

Coniferous tr

Spruce
White spruce....
Black spruce....
Norway spruce..
Red spruce.....
Misc.....

Larch
Tamarack.....
Misc.....

Cedar
Eastern white...

Hemlock
Eastern hemlock.

Misc. hosts.....

TOTAL.....

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Coniferous trees	Collections		Broad-leaved trees	Collections	
	Insect	Disease		Insect	Disease
Spruce			Maple—*Concluded*		
White spruce	140	38	Red maple	71	5
Black spruce	58	15	Mountain maple	10	3
Norway spruce	9	16	Misc.	10	7
Red spruce	2	4			
Misc.		3	Birch		
			White birch	129	8
Larch			Yellow birch	26	23
Tamarack	138	4	Wire birch	89	1
Misc.	6				
			Cherry		
Cedar			Pin cherry	49	3
Eastern white	9	12	Misc.	39	2
Hemlock			Elm		
Eastern hemlock		4	White elm	26	28
			Misc.		4
Misc. hosts		4			
			Beech	42	14
			Willow	41	13
			Basswood	24	4
			Ash		
			White ash	16	
			Black ash	9	
			Misc.	1	1
			Oak		
			Red Oak	10	4
			White Oak	3	
			Ironwood	11	1
			Misc. broad-leaved trees	92	80
TOTAL	809	328	TOTAL	1,245	336
GRAND TOTAL				2,718	

IMPORTANT FOREST INSECTS

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)—Surveys for the aphid were intensified in the Gaspé Peninsula and conducted for the first time along the Quebec-Vermont and Quebec-New Hampshire borders but no significant changes in infestation boundaries were recorded. As shown on the accompanying map, known infestation areas in Quebec are centred near the city of Gaspé and in the vicinity of Chandler.

In the Gaspé area the infestation extends through seven townships and covers an area of approximately 400 square miles. Through Fox, Cap-des-Rosiers and Baie-de-Gaspé-Nord townships the heaviest damage occurs along the Rivière-au-Renard and Cap-des-Rosiers watersheds particularly in inaccessible areas that were missed in early cutting operations. In these areas older fir trees have severely gouted tops and some mortality is evident. The absence of red tops and heavy stem attack suggests that the infestation has been present for 15 years or more. Through Baie-de-Gaspé-Sud, York, Douglas and Malbaie townships old gouted trees are less common but there is heavy

current stem attack particularly along "Anse-à-Brillant" bush road. A tally of 50 trees in this area showed that 32% of the trees were gouted and 46% had heavy stem attack.

In the Chandler area the infestation covers about 200 square miles through Newport and Port-Daniel townships. The mature balsam fir stands of the lower section of Grand-Pabos, Grand-Pabos-Ouest and Port-Daniel watersheds are the most severely affected. Although gout is relatively rare on the first two watersheds, a good proportion of balsam fir tops show typical flat or ball-type appearance and some of the trees are dead. Some dead trees have typical red crowns but most are grey in color although recently killed. On the Port-Daniel watershed, the insect is less abundant but some of the older trees have heavy stem populations.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)—The spruce budworm has been at an endemic level since 1963 in Quebec, but a local infestation of this insect was reported by the provincial Bureau of Entomology in a 30-year-old spruce plantation of the Consolidated Paper Corporation in the St-Maurice watershed. Development of a spruce budworm infestation restricted to a spruce plantation was observed for the first time in Quebec. Annual sampling of 10 to 20 trees in several 15- to 25-year-old spruce plantations in central Quebec over the last decade never yielded more than one specimen per tree. The current infestation extends over a partly reforested area of approximately 60 square miles east of Grand'Mère, Quebec. Defoliation was observed both on white and Norway spruces. The attack started in 1965 and moderate to severe defoliation of the 1966 growth was found in several localities. Egg-mass counts on mid-crown branches of spruce at 25 locations in the infested and surrounding areas indicate that, in 1967, severe defoliation will again occur in the infested stands with a possible extension to the north. In other regions no defoliation was observed and the budworm population remained low.

Swaine Jack-pine Sawfly, *Neodiprion swainei* Midd.—The aerial survey of jack-pine stands undertaken in 1965 to determine the distribution and intensity of attack of this sawfly was continued in February and March 1966. A total of 60 hours flying time was spent covering 2,700 square miles of pure and mixed jack-pine stands scattered over an area of 7,600 square miles in the Upper Ottawa, Upper Gatineau, Lièvre and Mattawin watersheds, and in the Lake St. John region. This project was implemented in cooperation with the same agencies as in 1965 using the same general infestation criteria.

A total of 45,000 acres supported moderate to severe infestations and about 5% mortality of jack pine was recorded (see accompanying map). The infestations were distributed in various watersheds. On the upper Ottawa River several foci of moderate to severe infestation with some jack pine mortality were found between Camachigama and Landron lakes in Montcalm County, and in the vicinity of Ottawa Lake. On the Upper Gatineau, four small moderately infested centers were located in the vicinity of Shingle Lake. In the Lièvre watershed, two medium sized infestations were found, one of moderate to severe intensity southwest of Rouillé Lake, Maskinongé County and the other, of moderate intensity, west of Belisle Lake, Berthier County. On the Mattawin River several pockets of moderate infestation occurred in Arcand, Badeau, Creguy, Laviolette, Maisonneuve and Charland townships.

In the Lake St. John Region, a severe infestation has been active since 1962 on the Ouiatchouanish River and the 1965 decline in population levels is attributed largely to severe jack pine mortality. In 1966 a severe infestation developed in a 20-year-old jack pine stand in the vicinity of Lac-aux-Sables. An increase in population was recorded in the Rivière-à-Mars infestation active since 1963.

The cooperating agencies are now considering the possibility of an aerial application of insecticide to control the most active foci of infestation in 1967.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.—For the second consecutive year this defoliator was very abundant and caused moderate to severe defoliation throughout south-central Quebec. The main infestation occurred in the same general area as in 1965 with some extension to the southwest and the northeast (see accompanying map). It now covers 10 counties; St-Hyacinthe, Bagot, Shefford, Yamaska, Drummond, Nicolet, Arthabaska, Lotbinière, Mégantic and Portneuf. In some localities the larvae were so abundant that part of the population died from starvation. Defoliation of sugar and red maples was less evident in 1966. Refoliation occurred on trembling aspen but it was very irregular due to partial mortality of the twigs. In the 1965 moderate infestation area in Terrebonne, Montcalm, Joliette and l'Assomption counties the infestation was light. Light trap records for Ste-Foy and Valcartier at the eastern boundary of the infestation area indicate heavy moth flights during the second week of July with a daily maximum of over 900 captures at Ste-Foy. This may indicate an eastward extension of the outbreak in 1967. On the basis of rearing studies, the proportion of moth emergence was much lower than in 1965 and parasitism by *Sarcophaga aldrichi* Park increased markedly. Disease mortality was recorded in laboratory rearing only.

Egg counts made in the fall indicate that the population will be generally high in 1967 with some eastward extension of the area affected. A decline in numbers is expected in the area north of the St. Lawrence River.

Eastern Tent Caterpillar, *Malacosoma americanum* (F.)—This insect caused public concern owing to the abundance of conspicuous tents and serious defoliation of cherry and other deciduous trees in southern Quebec. Infestations were again recorded in the Ottawa River Valley, and south of the St. Lawrence River west of Quebec City. Moderate to severe infestations were recorded in Vaudreuil-Soulanges, Huntingdon, Rouville, Brome, Sherbrooke, Mégantic and Quebec counties. In other regions the infestation was light.

Larch Sawfly, *Pristiphora erichsonii* (Htg.)—Populations of the larch sawfly were comparable to those of 1965 throughout the Province with the exception of the Gaspé Peninsula. In western Quebec the insect has been at a low level for a number of years. In central Quebec the infestation is declining and now varies from light to moderate; some stands that have been infested in recent years are showing signs of twig and tree mortality. The outbreak that started around 1955 and gradually extended across the whole Province from west to east has now reached the few remaining larch stands of the Gaspé Peninsula. Severe infestation centers were recorded at Carleton and near New-Carlisle, Bonaventure County, in 1966 and further population increases are expected in 1967.

Gypsy Moth, *Porthetria dispar* (L.)—Egg surveys carried out by members of the Plant Protection Division, Department of Agriculture, in November 1965, revealed the presence of 25 egg masses at two locations, 2 miles north of Lacolle, St-Jean County. This led to the spraying of 300 acres of bushland and fencerows on May 27, 1966. The insecticide formulation, the same as in 1965, was applied at the rate of 1 gallon per acre. Check plots revealed that the spray pattern was not perfect since large areas had no visible spray residue. Although no gypsy moth larvae were seen on the ground, destruction of the population was probably not complete. Summer trapping of males was carried out at approximately 1000 localities. A total of 92 male moths were captured at 42 localities between Clyde Corners, Huntingdon County, and St-Armand, Missisquoi County. These counts were higher and covered a larger area than in past years. Two Quebec

Forest Insect and Disease Survey technicians participated in the egg-mass survey during the month of November. Eggs were found at 30 locations with the highest counts at St-Chrysostome, Chateauguay County. The aerial spray program in 1967 will cover approximately 20,000 acres in an effort to eradicate this insect.

European Spruce Sawfly, *Diprion hercyniae* (Htg.)—This insect was again widely distributed throughout the Province and common on open growing and plantation white spruce. Both the first and second generation larvae were again sampled. Counts of the second generation are usually higher and show a greater variation in abundance from year to year. This year the second generation sampling covered 40 white spruce plantations in southern Quebec where counts averaged over 6 larvae per tree. This is a little lower than the average recorded over the past 10 years. The highest counts were obtained in Bellechasse and Beauce counties; the largest number of larvae per tree was found in the Lac Mégantic plantation. On the basis of laboratory rearings, the polyhedral virus disease and parasites still appear to be the most important controlling factors.

Spruce Sawflies, *Pikonema* spp.—Two well-known defoliators, the yellow-headed spruce sawfly, *P. alaskensis* (Roh.), and the green-headed spruce sawfly *P. dimmockii* (Cress.) were found in association with the European spruce sawfly. The latter sawfly was by far the most abundant and was responsible for most of the defoliation recorded in the 40 white spruce plantations. The two other species were present in most localities but numbers were relatively low.

Spruce Budmoth, *Zeiraphera ratzeburgiana* Ratz.—This insect is common on white spruce almost every year. In 1966, the current growth of white spruce was heavily attacked at Ste-Foy, Quebec County, St-Roch-des-Aulnaies, l'Islet County and on Anticosti Island.

Birch Casebearer, *Coleophora fuscedinella* (Zell.)—This casebearer was again recorded throughout the Lower St. Lawrence and Gaspé regions but in lower numbers than in 1965. Moderate to severe infestations were found near Millstream and Pointe-à-la-Garde in Bonaventure County, and at Chandler, Percé and Gaspé in Gaspé-Sud County.

Amber-marked Birch Leaf Miner, *Profenusa thomsoni* (Konow)—This sawfly has been quite common both on ornamentals and in forest stands in the Gaspé Peninsula for the past few years. In 1966, the insect was particularly abundant in the following localities of Gaspé-Nord County: Ruisseau-Castor, Marsoui, Rivière-Madeleine, Petite-Vallee and Grand-Etang.

Ugly-nest Caterpillar, *Archips cerasivoranus* (Fitch)—This insect was again abundant in the same areas as reported in 1965. Numbers remained at very high levels at Champigny and Ste-Foy, Quebec County. The infestation varied from light to moderate at Ste-Sophie and Ste-Anne-des-Plaines, Terrebonne County; at Beaumont, Bellechasse County it was light. The severe infestation at St-Cuthbert, Berthier County collapsed through removal of the infested choke cherry trees.

Fall Webworm, *Hyphantria cunea* (Drury)—The fall webworm remained at a low level in most areas. Counts of 19 webs per roadside mile were recorded in St-Hyacinthe, Iberville, and Richelieu counties. In the moderate infestation area recorded near Noyan, Missisquoi County, in 1964, the nest counts per roadside mile were reduced from 138 to 11.

Loopers on Maples—Populations of three geometrids, the Bruce spanworm, *Operophtera bruceata* (Hulst), the linden looper, *Erannis tiliaria* (Harr.)

and the fall cankerworm, *Alsophila pometaria* (Harr.), which caused serious defoliation throughout the Quebec maple-grove territory in recent years, were again very low in 1966. Light defoliation by the spanworm and linden looper was recorded at Ste-Hélène, Kamouraska County. Records of adult catches on tanglefoot-banded-trees in 25 sample plots in the main sugar maple area revealed that the Bruce spanworm is presently the most abundant species. The fall cankerworm appears to be the least abundant of the three. Counts of adult females show that the population of all three species will again be low in 1967. Maple stands seriously defoliated during the outbreak years, continue to show very good recovery.

Maple Petiole Borer, *Caulocampus acericaulis* Mach.—This small sawfly, which mines the petiole of maple leaves, was more common in 1966. It was collected principally from sugar maple and its known area of distribution now extends from southwestern Quebec through the Eastern Townships to Bellechasse County. Light infestations were found at Mont-Orford, Brome County; Cookshire, Compton County; Lambton, Frontenac County; St-Agapit, Lotbinière County; and St-Raphaël, Bellechasse County. Up to 10% of the leaves of saplings were attacked in these areas.

Oak Leaf Tier, *Croesia semipurpurana* (Kft.)—This leaf tier has been the predominant insect defoliator of red oak in greater Quebec City for a number of years. It was particularly abundant between 1962 and 1964, decreased in numbers in 1965 but again increased in 1966. In areas where populations are high red oak may be completely defoliated although refoliation usually occurs later in the season. No tree mortality comparable to that observed in southern New England has occurred in Quebec.

Red-headed Pine Sawfly, *Neodiprion lecontei* Fitch—Outbreaks of this pest of planted red pine have been reported since 1965 in 5- to 15-year-old red pine plantations in Petite Nation and Rivière Rouge watersheds. In 1966 light to severe defoliation was recorded at St-André-Avelin, Namur and St-Rémi-d'Amherst, Papineau County. Part of the infested plantations were sprayed with DDT by the Rouge Valley Association in cooperation with the Quebec Department of Lands and Forests, and populations were substantially reduced. The severe infestation found at l'Avenir, Drummond County, in 1964, collapsed in 1965 and this year's sampling of the same area gave negative results.

A Miner on Aspen, *Nepticula* sp.—Larvae of this miner bore into the petiole and later into the leaf tissue of trembling aspen. Damage becomes apparent in late September when the leaves turn yellow except in the region of the mines. The insect has been recorded from Portneuf County in the west to Témiscouata County in the east. On the basis of 300 leaf samples taken in the fall in each of 50 localities, the average percentage of leaves affected was 37 with a maximum of 80. The highest counts were made at Valcartier, Portneuf County; St-Prosper and St-Luc, Bellechasse County; St-Marcel, St-Cyrille, St-Pamphile, L'Islet County; and near Beaupré, Montmorency County.

Beech Scale, *Cryptococcus fagi* (Baer.)—Extensive surveys of beech stands were made along the boundary of the 1965 infestation, near Les-Etroits, Témiscouata County. The distribution of the insect remained unchanged; the percentage of trees affected and intensity of attack were about the same as in 1965.

Northern Pine Weevil, *Pissodes approximatus* Hopk.—This weevil was relatively abundant and associated with flagging in 10-year-old red pine and jack pine plantations at Ste-Christine and St-Basile, Portneuf County.

Pitch Nodule Maker, *Petrova albicapitana* (Busck)—This is a common pest of young jack pine throughout Quebec and its presence is reported in plantations almost every year. Jack pine has been extensively used for reforestation in central Quebec in recent years, and several young stands were reported as being severely infested, particularly in Portneuf County. Observations made in several extensive 5- to 10-year-old jack pine plantations at Ste-Christine revealed that approximately 50% of the trees were affected; the maximum was 80%.

OTHER NOTEWORTHY INSECTS

Insect	Host(s)	Locality	Remarks
Acleris variana Fern. Black-headed spruce budworm	Spruce, white Fir, balsam	Quebec in general	Population low every year. No report of infestation since 1947.
Adelges spp. Spruce gall aphid	Spruce, white	Several regions	Galls common; *A. abietis* Linn. more abundant than *A. cooleyi* Gill.
Anoplonyx spp. Sawflies	Tamarack	Throughout the host distribution	No important defoliation; *A. lutcipes* (Cress.) generally more abundant than *A. canadensis* (Hgtn.). Highest counts in Laurentide Park, and near La Tuque, Lavlolette Co.
Archips rosaceana Harr. Oblique-banded leaf roller	Several deciduous hosts	Southern Quebec	Population low and static for a number of years.
Argyresthia thuiella Pack. Arborvitae leaf miner	Cedar, eastern white	Eastern Townships	Rare in 1966.
Biston cognataria Gn. Pepper and salt moth	Tamarack Birch, white	14 localities scattered through southern Quebec	Occasionally found in very small numbers.
Bucculatrix ainsliella Murtf. Oak skeletonizer	Oak, red	Ste-Foy, Cap Rouge and vicinity	Very abundant in 1958; on the decrease ever since.
Bucculatrix canadensisella Cham. Birch skeletonizer	Birch, white	Southern and eastern Quebec	Populations decreasing.
Caliroa fasciata Nort. An oak slug	Oak, red	St-Edouard, Maskinongé Co.	First survey record.
Caripeta divisata Wlk. Grey spruce looper	Spruce, white Fir, balsam	Quebec in general	Common although at low population level.
Cecidomyia ocellaris O.S. Ocellate gall midge	Maple, sugar and red	Southern Quebec	Trace to light infestations.
Cenopis pettitana Rob. Pettit leaf roller	Maple, sugar and red	Southern Quebec	Common in maple groves.
Cinara curvipes (Patch) An aphid	Fir, balsam	All regions	Present each year but never abundant.
Coleophora laricella (Hbn.) Larch casebearer	Tamarack	Quebec in general Eastern Townships	Common. Moderate to severe infestations in some localities.
Dasineura balsamicola (Lint.) Balsam gall midge	Fir, balsam	All regions	Small increase.
Diprion frutetorum F. Nursery pine sawfly	Pine, Scots	St-Gilles, Lotbinière Co., Shawinigan-Sud, Champlain Co.	Low incidence.
Ectropis crepuscularia Schiff. Saddleback looper	Conifers and deciduous trees	All regions	Fairly common.

OTHER NOTEWORTHY INSECTS—Concluded

Insect	Host(s)	Locality	Remarks
Elaphria versicolor (Grote) Fir harlequin	Spruce, white	Southern Quebec	Low population.
Eriophyes fraxiniflorae (Felt) Ash flower blister mite	Ash, black	Quebec in general	More abundant in 1966.
Eriophyes sp. An eriophyid mite	Cherry, black	L'Avenir, Drummond Co., St-Jean d'Irlande, Mégantic Co.	Very abundant.
Fenusa dohrnii Tischb. European alder leaf miner	Alder	Ste-Foy, Quebec Co.	First survey record.
Gracillaria invariabilis Brown A leaf miner	Cherry, pin	St-Eugène, Roberval Co.	First survey record.
Lambdina fiscellaria fiscellaria (Guen.) Hemlock looper	Spruce, white Fir, balsam Maple, sugar	Quebec in general	Populations remain at low levels; no report of infestation since 1956.
Mindarus abietinus Koch Balsam twig aphid	Fir, balsam	General distribution.	Common every year.
Neodiprion abietis complex Balsam fir sawfly	Fir, balsam Spruce, white	Quebec in general	Common every year.
Neodiprion pratti banksianae Roh. Black-headed jack-pine sawfly	Pine, jack	Valcartier, Que. Co., St-Hilarion, Charlevoix Co.	Very low incidence.
Neodiprion virginianus complex Red-headed jack-pine sawfly	Pine, jack	Valcartier, Que. Co., Ste-Monique, Lac St-Jean Co., Mistassini, Roberval Co.	Populations at low levels.
Orgyia antiqua L. Rusty tussock moth	Spruce, white Deciduous trees	All regions	Relatively rare.
Phyllocnistis populiella Cham. Aspen leaf miner	Aspen, trembling	Mont-Joli, Matane Co. Ste-Jeanne D'Arc, Matapédia Co., Ste-Foy, Quebec Co.	First survey record.
Pristiphora geniculata (Htg.) Mountain-ash sawfly	Mountain-ash	Quebec region	Common.
Prociphillus tessellatus (Fitch) Woolly alder aphid	Alder Maples	All regions	More abundant than usual.
Rhyacionia buoliana Schiff. European pine shoot moth	Pine, Mugho	Quebec City area	Rare again this year in sampling stations.
Stilpnotia salicis (L.) Satin moth	Poplar, Lombardy, cottonwood	Quebec City and vicinity	Very rare.
Trichiocampus viminalis (Fall.) Poplar sawfly	Poplars	Greater Quebec	Some increase.
Vasates quadripedes (Shimer) Maple bladder gall mite	Maple, silver	Many regions	Common on ornamental plantings.

IMPORTANT FOREST DISEASES

Frost Injury—Following 2 to 3 weeks of continuous warm weather in April, a sudden drop in temperature to near 0°F on three occasions caused considerable damage to trees in many areas, particularly in eastern Quebec. Bud and twig mortality was pronounced on weeping willow, Lombardy poplar,

and some basswood trees in the vicinity of Quebec City and on several caragana shrubs in a nursery near Chicoutimi City. Numerous small cankers on young aspen in stands at Ste-Perpétue, L'Islet County, were attributed to frost injury as was a top-dying of yellow birch. Bud-freezing was also observed on balsam fir at higher elevations in the Laurentide Park.

Frost injury may also have been responsible for the sudden death of several planted eastern white cedars in the Morgan Arboretum, Macdonald College, and for bark cracking, small bark lesions and numerous gall-like growths observed on the stems and branches of several ornamental cedars in Quebec City and Montreal. Frost and winter drying probably contributed to the browning and shedding of branches on cedars in Amos, Abitibi County, at the Berthier nursery, and in several areas in Dorchester, Kamouraska, Rivière-du-Loup, and Témiscouata counties.

Winter Drying of Conifers—Severe browning and in many cases death of ornamental junipers and cedars in the Quebec City area was the only important damage attributed to winter drying in Quebec in 1966. However, other factors (see Frost Injury) may have been involved in this condition.

Animal Damage—Wounds caused by sapsuckers with subsequent abundant resin flow were observed on most nodes of nearly all Norway spruce trees in a 5-acre plantation at Parke Reserve, Kamouraska County. In this plantation, which consisted of 60% Norway spruce and 40% black spruce, only a few of the black spruce trees were injured. In a similar area one-half mile away, sapsuckers had injured from 1 to 10% of the Norway spruce trees while recent and old damage by porcupines was observed on approximately 25% of the remainder. Injury by sapsuckers was also observed on a few nearly mature red spruce trees at Duchesnay, Portneuf County, on nine mature ornamental Norway spruce trees in Quebec City, and on balsam fir trees on Anticosti Island, where several clumps of three to six dying trees were observed from Port-Menier to the central part of the Island. Isolations from necrotic zones and cankered areas near wounds on trees at Parke and Duchesnay yielded mainly *Retinocyclus abietis* (Crouan) Groves & Wells, *Aureobasidium pullulans* (de Bary) Arnaud, and a *Cytospora* sp.

Chlorosis—Severe yellowing of all the needles on a large number of young white spruce and red, jack, and Scots pines in a plantation at Valcartier, Quebec County, was attributed to mineral deficiencies.

Herbicide Injury—Noticeable injury by 2-4-D occurred over a band varying from a 100 to approximately 2,000 feet wide along a transmission line from St-Urbain to Baie-Ste-Catherine, Charlevoix County. Particularly, white birch at higher elevations was severely damaged. Most of the leaves had fallen by mid-August and new buds were swelling.

Varsol and Simazine caused severe mortality of 2 – 0 and 2 – 1 white spruce transplants in a nursery at New-Carlisle, Bonaventure County.

Canker and Dieback of Balsam Fir—Severe reddening of the foliage and crown mortality were recorded on 1 to 3% of 20-year-old balsam fir trees over approximately 1 square mile at Launière, Laurentide Park, and 5 square miles between Murdochville and Lake Ste-Anne, Gaspé County. Small cankers with slight resin flow at the base of branchlets and larger cankers on the stem were generally present on affected trees. *Thyronectria balsamea* (Cke. & Pk.) Seel., *Dermea balsamea* (Pk.) Seav. and a *Valsa* species were the main fungi associated with the cankers. This condition is apparently similar to that observed a few years ago in Ontario and New Brunswick (see 1961 Annual Report).

Nectria Canker of Balsam Fir—This perennial canker of balsam fir on Anticosti Island was reported for the first time in 1965. Results of inoculation tests (Ouellette, G. B. and G. Bard, Plant Disease Reptr. 50) have shown that a *Cylindrocarpon* sp. is the pathogen involved. In 1966, a *Nectria* sp. was observed in association with this *Cylindrocarpon* on some of the infected trees on Anticosti Island. Intensive surveys of balsam fir stands conducted in eastern parts of the Province, with the exception of areas east of Sept-Isles, Duplessis County, have not yet disclosed the presence of the disease in other areas.

Nectria Canker on Beech, *Nectria galligena* Bres.—Further surveys for cankered American beech trees in Témiscouata County, where the beech scale was discovered in 1965, showed that two additional diseased trees had died recently. A few cankers caused by this fungus were also found on beech trees at St-Aubert, L'Islet County, and Ste-Germaine, Dorchester County, but in these localities the beech scale has not yet been observed.

Canker of Willow, *Discella carbonacea* Berk. & Br.—Numerous cankers caused by this fungus developed rapidly on the limbs and trunks of weeping willows following the frost injury reported above. Several trees were killed by the disease which was particularly prevalent in the vicinity of Quebec City. The perfect state of the fungus, *Cryptodiaporthe salicella* (Fr.) Petr. was also present on some of the diseased trees.

Hypoxylon Canker of Poplar, *Hypoxylon mammatum* (Wahl.) Miller—Light to moderate infections of this disease were observed on aspen at Lac Frontière, Montmagny County; St-Patrice, Lotbinière County; Woburn and Lac Mégantic, Frontenac County; New Carlisle, Bonaventure County; and St-Gédéon, Beauce County.

Dothichiza Canker, *Dothichiza populea* Sacc. & Briard—Cankers were common on Lombardy poplars in Quebec, causing a severe dieback following frost injury (see above). A *Cryptodiaporthe* sp. was observed in association with *Dothichiza* on cankered parts. *Valsa ambiens* (Pers.) Fr. and a *Diplodia* sp. were also frequently encountered on recently killed branches. Dieback of Lombardy poplar was also reported in a few areas in the Eastern Townships.

Canker of Chinese Elm, *Tubercularia ulmea* Cart.—This pathogen caused severe damage, particularly to trees in hedges in greater Quebec, in St-Pierre, Montmorency County, and at L'Assomption, L'Assomption County.

Top-dying of Yellow Birch—A striking top-dying of yellow birch with symptoms similar to those of "birch dieback", occurred in Quebec in 1966 (see accompanying map). In July, the upper crown of affected trees were characterized by the presence of partially bare branches and small, yellow leaves. Necrotic, swollen or partly opened buds often accompanied by browning of the pith and cambial layer of twigs suggested that frost had initiated the condition. Lower branches of larger trees as well as younger trees in the understory had normal foliage. In some places, especially near Stoneham, Quebec County, a number of small branches had died during the preceding years. These branches were generally colonized by fungi, the most common of which was a *Diaporthe*-like species. Here and in other areas, the fungi were already fruiting on some of the branches that died during 1966.

Root Rots, *Polyporus tomentosus* Fr. and *Armillaria mellea* (Vahl ex Fr.) Kummer—Following general thinning operations on all of the best sites in the Grand'Mère white spruce plantations, it was found that root rot caused by *Polyporus tomentosus* Fr. was widespread in the plantations and that from 20 to

90% of the trees were affected. A similar high incidence of this disease has been found in a natural stand of approximately 30-year-old white spruce at Vallée-Jonction, Beauce County.

Armillaria root rot was observed on 10% of the dead or dying 25- to 30-year-old lodgepole pine in a 2-acre plantation at Valcartier, Quebec County. The disease was also observed on individual trees at other locations: on balsam fir, at Les Bergeronnes, Saguenay County, and at Ste-Rose-du-Dégelé, Témiscouata County; on sugar maple, at Rivière-du-Loup; on American beech at Ste-Germaine, Dorchester County; on aspen at New Carlisle, Bonaventure County; and on red pine at Tourville, L'Islet County.

Root Mortality of White Spruce—Approximately 25 dying trees were observed in each of two areas of a 25-year-old white spruce planatation at Lac Mégantic, Frontenac County. Preliminary studies showed that extensive root mortality had occurred with dying roots showing a pronounced yellowish color in the wood and cambium. An unidentified *Ceratocystis* sp. was commonly isolated from these roots but its causal relationships with the disease has not been established. Bark beetles were present in the butts and exposed roots of a number of the trees.

Butt Rots—Up to 85% of the mature balsam fir trees on different sites over extensive areas along the Rivière Noire, Portneuf County, were estimated to contain butt rots. In samples from 40 trees, *Stereum sanguinolentum* (Alb. & Schw. ex Fr.) Fr., *Coniophora puteana* (Schum. ex Fr.) Karst. and *Corticium galactinum* (Fr.) Burt were, in decreasing order of importance, the main organisms encountered. In some areas, stem rot caused by *S. sanguinolentum* was also common, the fungus having entered the trees through leaders injured some 20 years ago.

A high incidence of butt rots was also reported in a 40-year-old plantation of Norway spruce at Proulx, Laviolette County.

Advanced brown cubical rot typical of that caused by *Coniophora puteana* was found on all overmature trees in a two-aged stand of balsam fir near Mile 55, Main Road, Anticosti Island.

Ink Spot of Poplar, *Ciborinia whetzelii* (Seaver) Seaver—Light to moderate infections of this disease were recorded on aspen in 1966 at several localities in the following areas: Mont-Laurier, Joliette, Quebec, Lake St-John, Montmagny, Rimouski and Gaspé. A severe infection covering a few hundred acres was observed in young aspen stands between Labrieville and Forestville, Saguenay County.

Leaf Rust of Aspen, *Melampsora medusae* Thuem.—Light to moderate infections of this rust were recorded in the following localities by county: Parke Reserve and Holliday in Kamouraska, Lac Frontière in Montmagny, Daaquam in L'Islet, St-Gédéon in Beauce, Piopolis in Compton, Ste-Christine and Duchesnay in Portneuf, New Carlisle in Bonaventure, St-Siméon in Charlevoix, Labarre in Chicoutimi, and St-Louis-de-Gonzague in Beauharnois.

Stem Rusts of Pine—Light to moderate infections by globose gall rust, caused by *Peridermium harknessii* J. P. Moore were recorded in 8- to 12-year-old plantations of Scots pine in the following localities by county: La Pocatière in Kamouraska, Lac Mégantic in Frontenac, New Carlisle in Bonaventure, and St-Jules and St-Côme in Beauce. Moderate infections of this rust occurred on approximately 10% of 20- to 40-year-old jack pine trees in stands at Sault-au-Mouton, and near Lac Cassé, Saguenay County. In the last two areas, also, another 15% of the trees were infected by *Cronartium stalactiforme* Arth. & Kern.

Light to moderate infections by *Cronartium comandrae* Pk. were common in a young jack pine stand at St-Hilarion, Charlevoix County.

White pine blister rust, caused by *Cronartium ribicola* J. C. Fischer, occurred on 10 to 15% of the white pine trees in a 60-year-old stand of 1 acre at Routhierville, Matapédia County, and on approximately 10% of the 15- to 20-year-old trees scattered over an area of 400 square miles in Kamouraska County, and over 90 acres at St-Gilles, Lotbinière County.

The disease continued to intensify in many 15- to 20-year-old plantations in Beauce County, particularly in the 200-acre plantation at Séverin where, at many points, 100% of the trees are infected.

Needle Rusts—In general, needle rusts were not common in Quebec during 1966. *Chrysomyxa ledi* de Bary caused moderate infections on young regeneration black spruce in the Nicabau Area, Roberval County, and *C. ledicola* Lagh., on black spruce in stands between Labrieville and Forestville, Saguenay County, and on Anticosti Island. Light infections by *Coleosporium asterum* (Diet.) Syd. were observed on either jack or red pine in young plantations averaging 5 acres in area in several localities in Portneuf, Lotbinière, Lévis, Beauce, Frontenac, Wolfe and Compton counties.

Yellow Witches' Broom on Balsam Fir, *Melampsorella caryophyllacearum* Schroet.—Severe infections causing up to 20 brooms per tree were observed on a large proportion of balsam fir trees over approximately 10 acres near Les Bergeronnes, Saguenay County, and Baie-St-Paul, Charlevoix County. Similar infections were common in many stands on Anticosti Island, where many trees have been killed by the disease.

Needle Casts—Infections by *Hypodermella mirabilis* Darker were common, varying from light to severe, on 10- to 15-year-old balsam fir trees around Bellerive, Chicoutimi County. Light infections by *Hypodermella ampla* (J. J. Davis) Dearn., were recorded on jack pine at Clermont, Charlevoix County, and by *H. nervata* Darker on young balsam fir at Les Escoumins, Saguenay County, and in the Laurentide Park, Montmorency County.

Deterioration of Maple—As expected, many of the roadside maple trees severely affected in 1965 died during 1966. Leaf scorch and early leaf fall on the remaining trees were, however, much less severe in 1966 than in preceding years.

New records of maple deterioration were obtained in the following localities by county: Lyster in Lotbinière, Lac Guindon in Terrebonne, St-Lin in L'Assomption, Lacolle in Chateauguay, and St-Ephrem in Beauce. In the first locality, several cankers caused by *Nectria galligena* Bres. were observed on branches of declining trees, while in the second, *Daedalea unicolor* Bull. ex Fr. was associated with basal stem cankers. *Steganosporium pyriforme* (Hoffm.) Cda. was common on dying branches at all localities.

Galls on Red Maple—Galls of various shapes originating from patches of necrotic or reddish cambial tissues were observed on the trunk and almost every branch of two ornamental red maple trees at Batiscan, Champlain County. No fungi were obtained from galls on living branches. The symptoms, including dwarfing of the trees, are suggestive of a virus disease.

Snow Blight, *Phacidium abietis* (Dearn.) Reid & Cain—Severe infections of this disease were observed on balsam fir regeneration at several places along the Ste-Anne River, Montmorency County, and at Mont-Albert, Gaspé County. Snow blight was also common on young red spruce at Duchesnay, Portneuf County.

OTHER NOTEWORTHY DISEASES

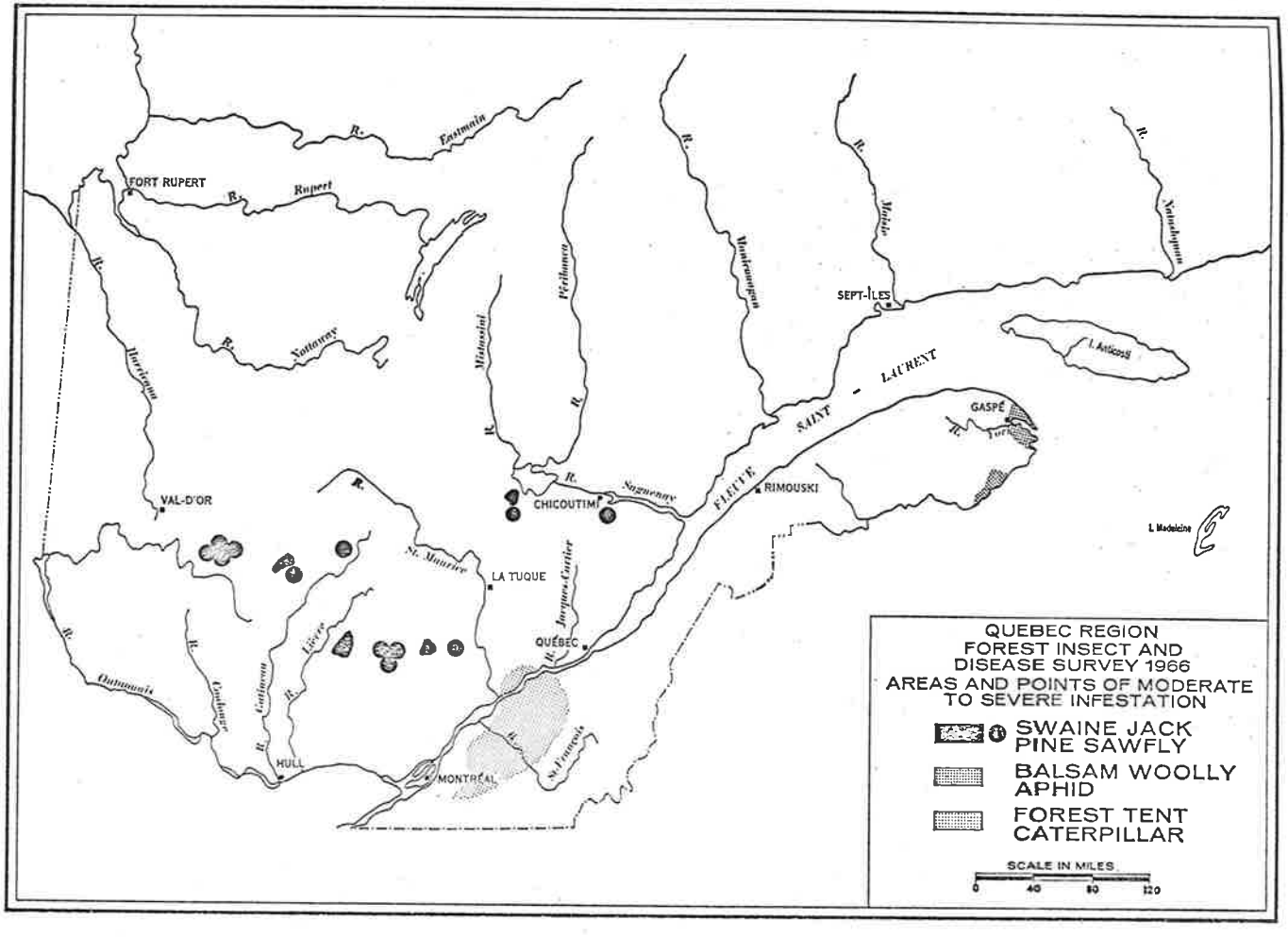
Organism and Disease	Host(s)	Locality	Remarks
Chaetoscutula sp. probably *juniperi* E. Müller	Spruce, black	Lac Clair, Saguenay Co.	On living needles. First record in North America.
Chrysomyxa chiogenis Diet. Needle rust	Spruce, black	Baie Jolliette, Anticosti Island	Light infections on spruce and *Gaultheria hispidula*.
Chrysomyxa empetri Schroet. ex Cumm. Needle rust	Spruce, white	Port-Menier, Anticosti Island	Light infections on spruce and crowberry.
Chrysomyxa pirolata Wint. Cone rust	Spruce, white	New Carlisle, Bonaventure Co.	Severe infection on a dozen trees in a windbreak.
Coleosporium campanulae Lév. ex Kickx. Needle rust	Bluebell	Rivière à l'Huile, Anticosti Island	Extension of known distribution.
Coleosporium viburni Arth. Needle rust	Pine, jack	St-Hilarion, Charlevoix Co., Holliday, St-Gabriel, and Parke, Kamouraska Co.	First host records.
Cordana pauciseptata Preuss Blue stain	Fir, balsam	Perthuis, Portneuf Co.	First herbarium record.
Criconemoides curvatum Raski, 1952 Root feeding nematode	Conifers	Widespread in Quebec forest nursery soils	First record in Quebec nurseries (see Sutherland Phytoprotection 46,1965)
Cylindrocladium scoparium Morg. Root rot	Conifers	Normandin, Roberval Co. and Proulx, Laviolette Co.	Extension of known distribution.
Cytospora sp. Canker	Spruce, white	Lac à la Tortue, Champlain Co.	Associated with cankers on a few dying 5-year-old transplants.
Dasyscyphus calyciformis (Willd.) Rehm Canker	Pine, Scots	Lac Mégantic, Frontenac Co.	First host record.
Didymascella thujina (Durand) Maire Needle blight	Cedar, eastern white	Stoneham, Quebec Co., and Pont-Rouge, Portneuf Co.	Moderate infection on several trees.
Dothiorella ulmi Verrall & May Cephalosporium wilt	Elm, white	Beaconsfield, Jacques-Cartier Co., and St-Gédéon, Beauce Co.	Caused death of a few trees.
Erwinia amylovora (Burr.) Winslow *et al.* Fire blight	Mountain-ash	L'Assomption, L'Assomption Co.	Killing a few large trees.
Eutypella sabina (de N.) Hoehn.	Juniper, creeping	Kamouraska, Kamouraska Co.	First record in Quebec and first host record.
Fusarium sp.	Elder	Beaupré, Montmorency Co.	Isolated from bleeding cankers.
Gloeosporidiella ribis (Lib.) Pet. Leaf spot	Gooseberry	Forestville, Saguenay Co.	Heavy infection on shrubs in a hedge.
Hypodermella concolor (Dearn.) Darker Needle cast	Pine, jack	St-Urbain, Charlevoix Co.	Light infection on a few trees.
Kirschsteiniella thujina (Pk.) Pomerleau & Etheridge Blue stain	Fir, balsam	Port-Menier Anticosti Island	Extension of known distribution.

OTHER NOTEWORTHY DISEASES—Continued

Organism and Disease	Host(s)	Locality	Remarks
Leucostoma kunzei (Fr.) Munk ex Kern Canker	Larch, European	Lyster, Lotbinière Co.	On dying branches of an ornamental tree.
Lophodermium piceae (Fckl.) Hoehn. Needle cast	Spruce, black	Anticosti Island	Light infection on a few trees.
Lophomerum darkeri Ouellette Needle cast	Spruce, white	Baie St-Paul, Charlevoix Co., and La Patrie, Compton Co.	First records in North America.
Marssonina populi (Lib.) Magn. Leaf spot	Aspen, trembling	Colombier, Saguenay Co.	Heavy infections in patches in a young stand.
Melampsora sp. Needle rust	Fir, balsam	La Miche, Montmorency Co.	Light infection on a few trees.
Micropera sp.	Hemlock, eastern	Lac Aylmer, Wolfe Co.	Associated with cankers on dying branches.
Microcallis sp.	Spruce, black	Lac Clair, Saguenay Co.	First record in North America.
Milesia fructuosa Faull Needle rust	Fir, balsam Fern	Duchesnay, Portneuf Co.	Moderate infections on both hosts in a small stand.
Mycena corticola (Fr.) S.F. Gray	Maple, sugar Basswood	Lyster and Ste-Agathe, Lotbinière Co.	Associated with sap rot on living trees. First herbarium record.
Myxosporium sp.	Cedar, eastern white	Lac Guindon, Terrebonne Co.	Associated with a branch canker.
Nectria fuckeliana Booth	Spruce, white and Norway	Lac St-Charles, Quebec Co., and Gould, Compton Co.	Collected on dying trees.
Paratylenchus aculentus Brown, 1959. Root feeding nematode	Pine, red	Berthierville, Berthier Co.	First record in Quebec nurseries.
Paratylenchus projectus Jenkins, 1956. Root feeding nematode	Conifers	Widespread in forest nursery soils	First record in Quebec nurseries.
Pestalotia funerea Desm.	Cedar, eastern white	Lac Guindon, Terrebonne Co.	Associated with a branch canker. First herbarium record.
Phomopsis sp.	Fir, balsam	Baie Joliette, Anticosti Island	Causing branch cankers on a few trees.
Pollaccia radiosa (Lib.) Bald & Clf. Leaf and twig blight	Aspen, trembling	Colombier, Saguenay Co.	Moderate infection in a young stand of over 20 acres.
Pollaccia saliciperda (Alb. & Tub.) Arx Willow blight	Willow, weeping	Champigny, Quebec Co.	Heavy infection on young trees in a nursery.
Pratylenchus penetrans (Cobb. 1917) Filipjev & Stekhoven Root feeding nematode	Conifers	Widespread in forest nursery soils	First record in Quebec nurseries.
Tylenchorhynchus sp. Cobb, 1913. Root feeding nematode	Spruce, white	New Carlisle, Bonaventure Co.	First record in Quebec nurseries.

OTHER NOTEWORTHY DISEASES—Concluded

Organism and Disease	Host(s)	Locality	Remarks
Tylenchus emarginatus Cobb, 1893. Root feeding nematode	Conifers	Widespread in forest nursery soils	First record in Quebec nurseries.
Uncinula adunca (Wallr. ex Fr.) Lév. Powdery mildrew	Poplar, balsam	Matapédia, Matapédia Co., and Parke Reserve, Kamouraska Co.	Heavy infections in patches in young stands.
Uredinopsis macrosperma Magn. Needle rust	Fern	Ste-Sabine, Dorchester Co.	Heavy infection.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R. Rupert
R. Nottaway
R. Harricana
VAL-D'OR
R. Ottawa
R. Gatineau
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R. St. Maurice
LA TUQUE
R. Jacques-Cartier
QUÉBEC
HULL
MONTRÉAL
R. St. François
R. Saguenay
CHICOUTIMI
R. Mistassini
R. Péribonca
R. Manicouagan
SEPT-ÎLES
R. Moisie
R. Natashquan
I. Anticosti
SAINT - LAURENT
FLEUVE
RIMOUSKI
GASPÉ
R. Matapédia
I. Madeleine
QUEBEC REGION
FOREST INSECT AND
DISEASE SURVEY 1966
AREAS AND POINTS OF MODERATE
TO SEVERE INFESTATION
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PINE SAWFLY
BALSAM WOOLLY
APHID
FOREST TENT
CATERPILLAR
SCALE IN MILES
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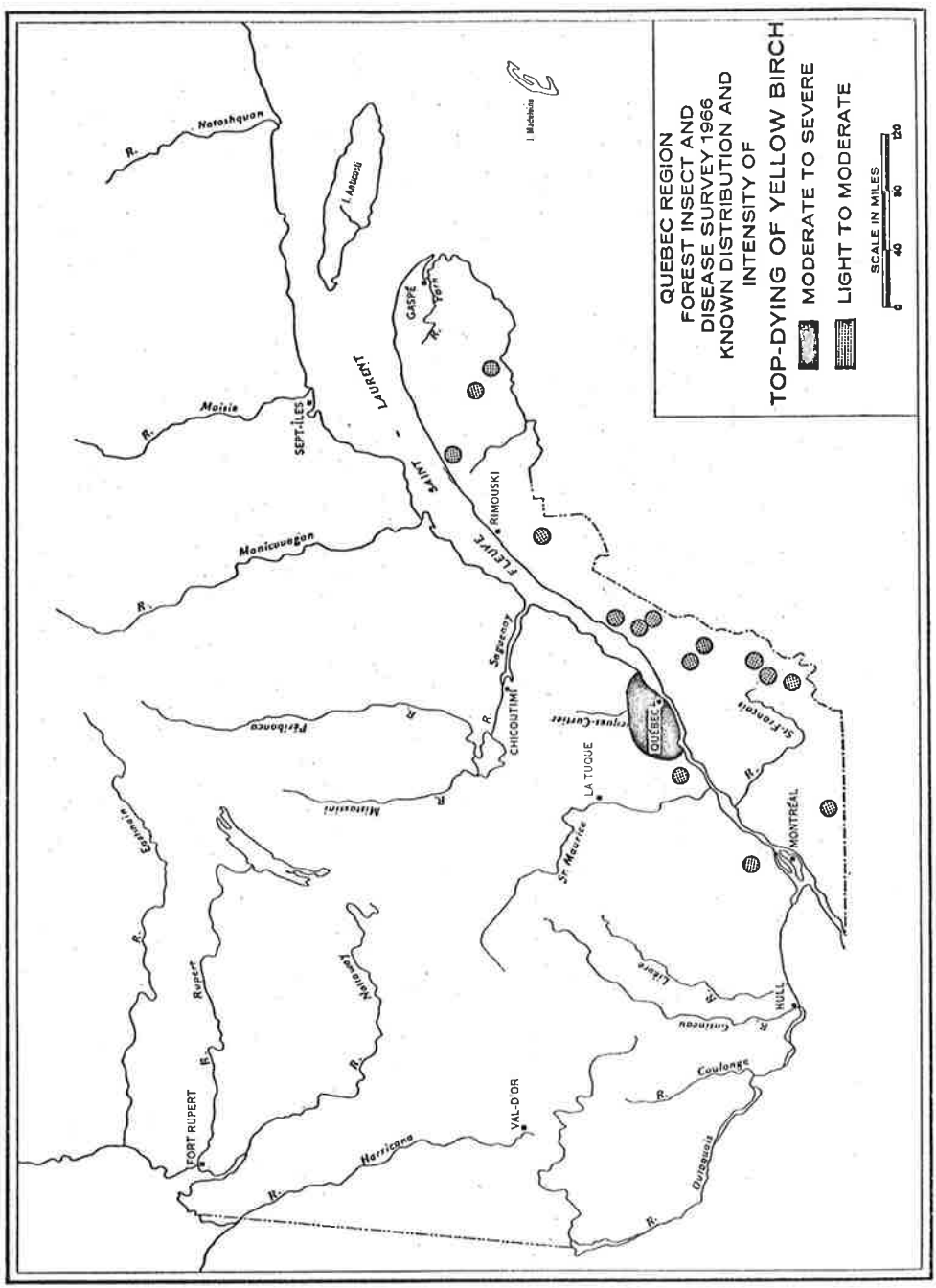
QUEBEC REGION
FOREST INSECT AND
DISEASE SURVEY 1966
KNOWN DISTRIBUTION AND
INTENSITY OF
TOP-DYING OF YELLOW BIRCH
MODERATE TO SEVERE
LIGHT TO MODERATE
SCALE IN MILES
0 40 80 120
R. Natashquan
I. Mingan
I. Anticosti
GASPÉ
SEPT-ÎLES
R. Moisie
SAINT LAURENT
FLEUVE
RIMOUSKI
R. Manicouagan
R. Saguenay
CHICOUTIMI
Rivière-Ouelle
QUÉBEC
St-Féréol
R. Péribonca
R. Mistassini
LA TUQUE
St Maurice
MONTRÉAL
R. Gatineau
R. Rupert
FORT RUPERT
R. Nottaway
R. Harricana
VAL-D'OR
R. Libby
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HULL
R. Coulonge
R. Dumoine