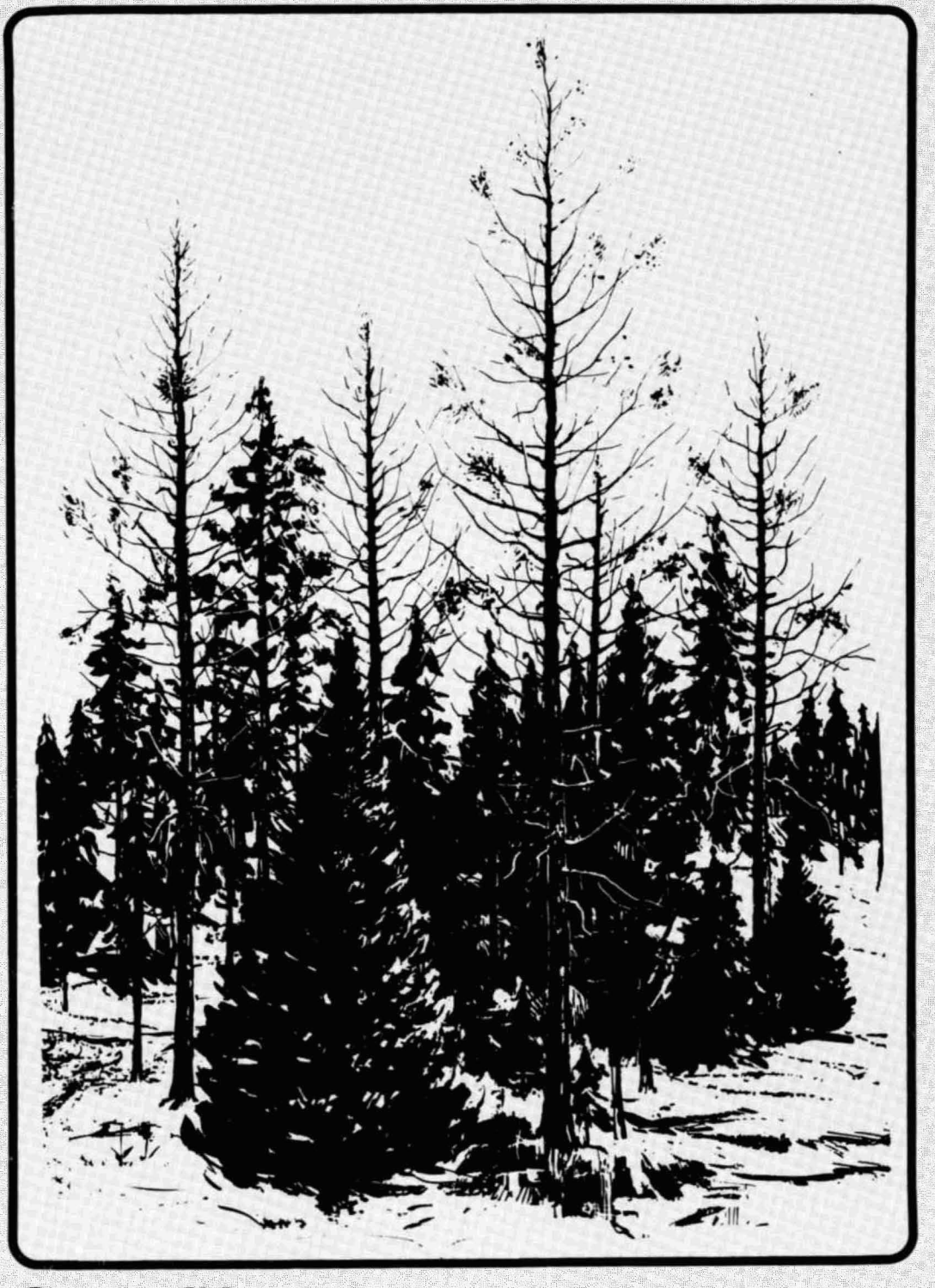
Forest Insect and Disease Conditions in Canada 1980



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Forest Insect and Disease Conditions in Canada 1980

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Introduction

In recent years, the growing need for more information on economic and environmental factors affecting our forests has led the Forest Insect and Disease Survey to change its emphasis. In previous years, the Survey gathered information on the distribution and incidence of forest insects and diseases with limited stress on their potential for economic or environmental impact. We are now devoting more attention to those insects and diseases that are likely to significantly affect the forest economy and environment. In addition, the concern for possible wood shortages in Canada in the forseeable future has underlined the need for quantitative estimates of losses for use in forest management planning. For this reason, more effort is being made to obtain quantitative damage and loss information in pest surveys but further improvements in forest inventories and economic analyses are also needed before complete, accurate, and timely impact information will be available. For various reasons, it will never be possible to express all observations quantitatively.

The present report, *Forest Insect and Disease Conditions in Canada 1980,* is our first attempt to modify the *Annual Report of the Forest Insect and Disease Survey,* which has been published since 1951. This new format and presentation of information reflects the changing emphasis of the Survey. It was felt that a national overview of forest insect and disease conditions in Canada with available quantitative data would provide a more useful document to those concerned with forest management. Consequently, the content of the report has been changed so that those pests considered to be currently most significant have detailed descriptions under "Major Forest Insects and Diseases." The status of other pests is summarized in tabular form by region. No attempt has been made to report the status of all pests in all regions. Numerous pests are consistently present in particular regions, but they may not be mentioned in this report unless significant changes in their status have occurred or new information has been obtained. Information on these and other pests can be obtained from the regional forest research centres concerned.

This report will continue to be modified to accurately reflect the activities and findings of the Survey. Because this is the first effort to change a 30-year tradition, we would appreciate your comments on the new format.

In addition to those cooperators listed, we would like to acknowledge the numerous others who have provided information, including the field and laboratory staffs of the forest research centres, officers of provincial and federal governments and agencies, the forest industry, and private individuals, and to specifically acknowledge the assistance provided by Mrs. Janet C. Lalonde in the editing and preparation of this report.

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Major Forest Insects and Diseases

Spruce Budworm

Choristoneura fumiferana (Clem.)

The spruce budworm continued to be the most destructive forest pest in Canada in 1980. Although complete estimates of mortality and growth loss resulting from defoliation by this insect are not available, it is known that the annual wood loss caused by the budworm currently exceeds that from any other cause. Wood loss from the outbreak to date is estimated to exceed 300 million m^3, the equivalent of 5 years' harvest of softwood in eastern Canada.

Balsam fir is the preferred host of the spruce budworm although it feeds heavily on red spruce, white spruce, and to a lesser extent on black spruce. At very high population levels it will attack hemlock and tamarack.

In some areas, populations of other insects such as the spruce beetle, eastern larch beetle, sawyer beetles, and bark weevils have increased rapidly in stands weakened by repeated budworm defoliation and in turn have themselves attacked and killed trees. These insects are discussed elsewhere in this report.

The area within which moderate to severe defoliation[1] of fir and spruce occurred from Ontario eastward increased by 1.1 million ha to 36.2 million ha in 1980 (Figure 1). Defoliation occurred in a number of scattered areas in Manitoba although populations generally declined, and visual defoliation was observed in two small areas in the Northwest Territories. In eastern Canada, dead and dying trees now occur within an area of 18.9 million ha, representing an increase of 1 million ha from 1979. Aerial spray operations, covering a total of 1.9 million ha, were carried out in Newfoundland, Nova Scotia, New Brunswick, Quebec, and Ontario. The status of the budworm by province follows.

Newfoundland

Defoliation — The total area of moderate to severe defoliation in productive softwood forests on the Island decreased slightly to 926 000 ha from 972 600 ha in 1979. There were no active budworm infestations in Labrador in 1980.

[1]Moderate to severe defoliation — 30% or more of current foliage removed.

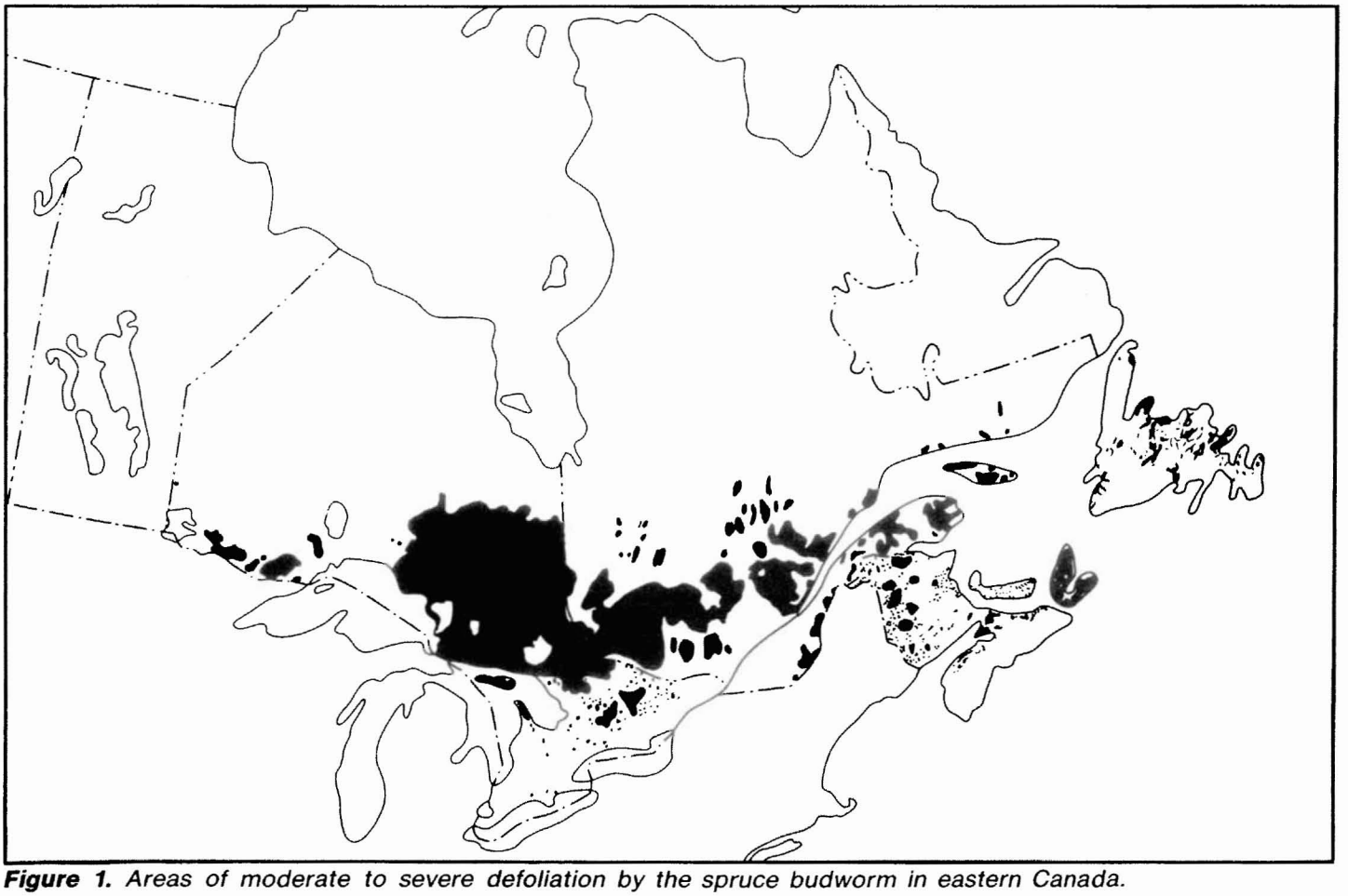

Figure 1. *Areas of moderate to severe defoliation by the spruce budworm in eastern Canada.*

In western Newfoundland most of the isolated patches of infestation reported in 1979 became more widespread in 1980 and coalesced into three larger infestations.

The boundaries of the outbreak remained relatively unchanged throughout central and eastern Newfoundland. However, the extent of severe defoliation in central Newfoundland decreased in some areas; reddening of the foliage was less evident as the trees produced fewer new shoots after several years of severe attack. Severe defoliation also occurred in isolated areas on the Avalon Peninsula, and the separated infestations near St. John's coalesced.

Damage — Aerial assessment surveys supplemented with ground checks were conducted in late July and August 1980. The total area of merchantable stands containing tree mortality was estimated at 427 500 ha. The total volume of these stands was about 40 million m^3, or 23% of the total softwood volume on the Island. The volume of dead trees was 17.1 million m^3, an increase of more than 6.8 million m^3 since 1979. An additional volume of 4.7 million m^3 was classified as moribund. Operations are underway to salvage as much of this dead and dying wood as possible before deterioration prevents its use. It has been predicted that if the outbreak continues unchecked over the next few years, sufficient quantities of wood will not be available to support the forest industry at current levels.

The total area of young unmerchantable stands in which dead trees occurred increased from 46 600 ha in 1979 to 62 590 ha in 1980. This increase was mainly caused by an expansion in the area of damaged stands in central and eastern Newfoundland where the budworm was more active. Most of the immature stands in western areas have had no defoliation since 1977 and tree mortality did not increase appreciably in 1980.

Control — The provincial Department of Forest Resources and Lands treated about 12 500 ha of forest improvement areas with *Bacillus thuringiensis* in 1980 to prevent further damage.

Forecast — Based on egg-mass and overwintering larval surveys, the area of moderate to severe defoliation is expected to increase in western Newfoundland in 1981 and decrease along the northeast coast. Inland in central Newfoundland severe defoliation is expected to occur from Red Indian Lake to Random Island including the Bonavista Peninsula. Severe defoliation is also forecast for the Bay d'Espoir area and two separate areas on the Avalon Peninsula. The total area of moderate to severe defoliation in the productive forests of the Island is expected to decrease in 1981 to about 800 000 ha. Almost all of this area falls in the moderate to very high hazard category, indicating that tree vigor will be reduced and extensive top killing and tree mortality can be expected.

Prince Edward Island

Defoliation — In Prince Edward Island, spruce budworm populations were very high in the early stages of development in most areas but the expected level of defoliation did not materialize. Inclement weather interfered with the development of the insect and rapid shoot growth provided a sufficient food supply. About 22 000 ha of moderate to severe defoliation occurred in 1980 compared to 28 800 ha in 1979.

Forecast — Egg-mass surveys indicate reduced infestation levels in Prince Edward Island in 1981.

Nova Scotia

Defoliation — Over 50% of the spruce-fir forest in Nova Scotia was moderately to severely defoliated in 1980. On mainland Nova Scotia there was a dramatic increase in the area of defoliation from 1979. Defoliation was severe on 130 900 ha, moderate on 103 200 ha, light on 57 100 ha, and 102 000 ha were classified as "variable" (a mixture of severe-moderate-light defoliation). The total area of defoliation of 393 300 ha in 1980 compares with that of 196 400 ha in 1979. The budworm outbreak on the mainland is confined to three main areas, Colchester-Cumberland counties, the Northumberland coast of Pictou-Antigonish counties, and the Annapolis Valley. Most of the moderate and severe defoliation, 168 100 ha (with an additional 45 800 ha variable), is in the Colchester-Cumberland counties outbreak, which has continued since the early 1970s. Considerable tree mortality has been occurring there for at least 4 years.

On Cape Breton Island, 986 500 ha of forest were defoliated in 1980, compared to the 890 000 ha in 1979. Defoliation was severe on 361 300 ha, moderate on 121 000 ha, light on 47 400 ha, and variable on 456 800 ha. The area of moderate, severe, and variable defoliation of 939 200 ha increased considerably from 725 800 ha in 1979.

Damage — Balsam fir continued to die on Cape Breton Island in 1980. The volume killed to date amounts to about 15 million m^3 or 43% of the total merchantable volume of that species on the Island.

A program to salvage the dead wood is continuing and about 700 000 m^3 have been placed in storage. A serious shortage of softwood fiber is predicted to occur in the mid to late 1980s.

Control — The provincial Department of Lands and Forests treated 25 670 ha of selected high-value stands in the Cape Breton Highlands and on the mainland with *Bacillus thuringiensis*.

Forecast — Egg-mass surveys indicate a continuation in 1981 of the three outbreaks on mainland Nova Scotia. Severe defoliation is forecast for most

of Cape Breton Island in 1981 and 10% of the remaining live trees are expected to die.

New Brunswick

Defoliation — In New Brunswick, moderate to severe defoliation occurred over 673 000 ha, or about 20% of the total area of spruce-fir forest, compared to 1.3 million ha in 1979. This defoliation occurred mainly in the western and east-central parts of the province. Only 93 000 ha of the moderately to severely defoliated forest was within the area treated with chemical insecticide. Defoliation was classified as light on about 176 000 ha.

Damage — Aerial damage appraisal surveys indicated that about 697 000 ha of forest have a visible amount of tree mortality attributable to spruce budworm defoliation. The volume of dead balsam fir within this area is estimated to be approximately 30 million m^3. In the affected areas of southern New Brunswick, 40% of the balsam fir volume is now dead and 17% is dead in northern New Brunswick. Losses are continuing and could have a serious impact on wood supplies.

Control — About 1.6 million ha were treated with chemical insecticide in New Brunswick in 1980. The largest area was treated with fenitrothion and Matacil was used on approximately 250 000 ha.

Forecast — Based on egg-mass surveys, budworm populations in 1981 will be higher in western and northern New Brunswick. The area of susceptible forests in the moderate to high hazard category is about 3 million ha. An additional 1.1 million ha are low hazard areas in which moderate to high budworm populations are expected in 1981.

Quebec

Defoliation — In Quebec, the area of moderate to severe defoliation by the spruce budworm increased to 14.5 million ha from 13.5 million ha in 1979. As in other provinces, this includes the area within which tree mortality occurred. However, surveys conducted in Quebec do not record the level of current defoliation in stands with dead trees and consequently, some of the areas shown for the province in Figure 1 did not sustain moderate to severe defoliation in 1980. Increases in the area of defoliation were recorded in the western, central, and eastern parts of the province while a decrease occurred in southern Quebec.

Damage — The area within which balsam fir and spruce mortality occurred increased from 8.8 million ha in 1979 to 9.3 million ha in 1980. Wood losses from the present outbreak of the budworm in Quebec have been extensive and are expected to increase. Dead trees, predominantly balsam fir, now occur over large areas scattered across the province. Balsam fir is important to the forest industry and its loss could have a serious impact on the industry in some areas.

Control — Spray operations were carried out by the Quebec Department of Energy and Resources over 188 511 ha in the Lower St. Lawrence River region. Of this area, 166 331 ha were treated with chemicals, primarily fenitrothion and some Matacil, and 22 180 ha with *Bacillus thuringiensis.*

Forecast — Egg-mass densities generally increased in 1980 and moderate to severe defoliation is expected to occur over large areas in all parts of the province in 1981.

Ontario

Defoliation — The area of moderate to severe defoliation in Ontario totalled about 18.9 million ha in 1980, an increase of 400 000 ha over last year. Infestations continued in three major geographical areas of the province: southern Ontario, 1 million ha; northeastern Ontario, 17.1 million ha; and northwestern Ontario, 724 000 ha. Defoliation generally increased from 1979 levels; however, the most significant change occurred in northwestern Ontario where moderate to severe defoliation increased by 50% and a number of new infestations were found.

Damage — The extent and volume of budworm-associated tree mortality continued to increase in 1980. The area within which tree mortality occurred increased by 841 000 ha in 1980 to a total area of 8.4 million ha. Most of this increase took place in northeastern Ontario where varying amounts of tree mortality occur over 6.8 million ha. About 60%, or 29 million m^3, of the balsam fir in this area have been killed since the current outbreaks started in 1967. Balsam fir, although common, is generally not an important economic component of the forests in northeastern Ontario. The proportion of balsam fir by volume ranges from 4 to 17% in the various districts. However, mortality of balsam fir would be a significant factor in some management units with localized concentrations of the species.

Control — The Ontario Ministry of Natural Resources aerially sprayed 8 700 ha of commercially operable forest and about 1 770 ha of high-value specific use areas in 1980. Applications of chemical insecticides (Matacil, Orthene, Cygon) and the biological insecticide, *Bacillus thuringiensis,* were made.

Forecast — An overall decrease in budworm egg-mass densities occurred in 1980. The largest decline occurred in southern Ontario where the total area of moderate to severe defoliation is expected to diminish in 1981. In northeastern Ontario spruce budworm populations will still be high enough to cause moderate to severe defoliation over much the same area as in 1980. The total area affected in north-central and northwestern Ontario is expected to enlarge in 1981.

Western Spruce Budworms

Choristoneura spp.

Infestations of the western spruce budworm, *Choristoneura occidentalis* Free., have fluctuated but persisted in Douglas-fir stands in the southwestern interior portion of British Columbia for 11 years. In 1968, an outbreak occurred in the western part of the Kamloops Region near Lillooet and by 1977, infestations covered more than 245 000 ha. However, a significant decline occurred in 1978 and defoliation was mapped on only 30 400 ha.

Populations persisted, however, and defoliation occurred over 49 000 ha in 1979. A further increase occurred in 1980, with defoliation over 81 400 ha, generally in the area extending along the Fraser River from Hope in the eastern part of the Vancouver Forest Region to Clinton in the southern part of the Cariboo Region on the west, and east along the Thompson River from Spences Bridge to the Savona area in the Kamloops Region. The severity of defoliation also increased so that 22% of the total infestation area was rated severe, 26% moderate, and 52% light. Infestations currently affect about 2.5% of the area of the Douglas-fir forest type in the province.

In 1980, following a number of years of consecutive defoliation, several stands ranging in size from 60 to 2 500 ha and totalling more than 5 800 ha, contained high levels of top-kill and tree mortality. In the Fraser Canyon area, cruise strips in five accessible areas indicated that an average of 46% (range 24% to 73%) of the trees were dead and 11% had top-kill of varying length. In seven stands in the Pemberton area of the Vancouver Forest Region, 16% of the trees were dead, many from a combination of defoliation and subsequent bark beetle attack, and 53% had top-kill.

An assessment of the egg population at 50 locations in the infestation area indicated that moderate to severe defoliation will occur in 1981 at various locations in Manning Park and the Fraser Canyon in the Vancouver Forest Region and near Ashcroft, Cache Creek, and Walhachin in the Kamloops Region. The additional defoliation to trees that have already been defoliated will result in continued growth reduction and could increase tree mortality and top-kill.

Feeding by the two-year-cycle spruce budworm, *Choristoneura biennis* Free., which is generally most severe in even-numbered years, occurred over 365 000 ha in mature and overmature alpine fir and white spruce stands in the central part of British Columbia.

Mostly light to moderate defoliation occurred commonly in the area around Quesnel Lake in the northeastern part of the Cariboo Forest Region and north through Bowron Lake Provincial Park into the Bowron and Willow river drainages of the Prince George Region. Other localized infestations occurred to the east near McBride and Valemount and in Mount Robson Provincial Park. Infestations are expected to continue in 1981, but the heaviest feeding will not occur until 1982.

In southeastern British Columbia, localized infestations of 100 to 600 ha occurred at four locations in the Nelson Forest Region. In three of these areas, the budworm is "off phase," i.e., completing its life cycle and feeding heaviest in the odd-numbered years.

The respite in defoliation during the 1st year of larval development usually allows for some foliage recovery; consequently, mature trees are seldom killed. An extensive outbreak in the 1950s over much of the area persisted for 11 years and although top-kill and mortality of understory and regeneration were widespread, few overstory trees died. Radial increment slowed significantly during and after the period of severe defoliation.

Mountain Pine Beetle

Dendroctonus ponderosae Hopk.

The mountain pine beetle was the most damaging insect pest in western Canada in 1980. This insect attacks and kills primarily lodgepole pine, but several other western pine species are also susceptible. Most beetle-killed trees are of suitable size for sawlogs; hence the monetary loss in commercial forests can be significant. Other consequences are a hastening of forest succession, a change in age and diameter distribution of the pine component of forests, a reduction in aesthetic values, and an increase in fire hazard. Each of these effects can force disruptive changes in forest management plans. Potentially, the most damaging current outbreaks are in southeastern British Columbia and southwestern Alberta because they threaten pine forests under multiple use and ownership. These infestations are extensions of large outbreaks in the northern United States, centered on Glacier National Park in Montana.

Most infested stands are on provincial Crown Land, although large infestations occur in the Akamina - Kishinena Park Reserve and adjacent Waterton Lakes National Park, in Cypress Hills Provincial Park, and in several British Columbia provincial parks. Initial infestations are also evident in Kootenay, Glacier, and Yoho national parks.

In British Columbia, the outbreak has expanded since 1974 when a total of only 3 300 ha at 35 scattered locations were affected. In 1980, heavy mortality of mature pine trees occurred in more than 6 000 separate locations covering more than 156 000 ha in the interior of British Columbia (Figure 2). It is estimated that the more than 14 million trees killed over the past year in these infestations totalled 7.7 million m^3 in gross volume, a figure equivalent to about 10% of the annual cut of all species in that province.

The most concentrated areas of recently killed lodgepole and western white pine trees were in the Nelson Region in the southeastern corner of the province. An estimated 3 600 infestations, ranging in size from a few scattered trees to several hundred hectares, occurred over 33 400 ha. Despite altered harvest schedules and concentrated logging of infested and dead trees, the outbreaks continued to expand into adjacent mature stands. Logging of infested and dead trees has also failed to keep pace with the infestations in the Kamloops Region where lodgepole pine mortality occurred at 1 060 locations comprising 37 000 ha.

Figure 2. *Areas of British Columbia and western Alberta where mortality by the mountain pine beetle occurred.*

Outbreaks continued to spread in the Cariboo Region and currently cover more than 62 000 ha in about 1 400 separate areas. Although much of the timber in these areas is too far from processing plants to be utilized, some salvage logging has been carried out.

In the Prince George and Prince Rupert regions, at the northern limit of the beetle's range, there are about 200 recorded infestations comprising 21 500 ha.

The mountain pine beetle is now causing significant tree mortality in southwestern Alberta and in the Saskatchewan and Alberta portions of the Cypress Hills to the east.

In the foothills of southwestern Alberta, infested pine stands are scattered from the United States border northward for approximately 120 km. Since the start of the outbreak in 1976, the total area of beetle-infested forests in Alberta has increased to an estimated 8 000 ha, about twice the 1979 estimate. This area contains more than 1 million trees killed since 1978.

To date, only about 3 500 infested trees have been found in the outbreak areas straddling the Saskatchewan and Alberta border. Sanitation cuttings have been undertaken to remove and destroy beetle-infested trees from the outbreak areas in eastern Alberta and Saskatchewan. An assessment of this strategy will be made in 1981.

Barring the occurrence of conditions unfavorable to the beetle, such as extreme winter temperatures, epidemics generally persist for an average of 8 to 9 years until the pine component of the forest is severely depleted. Thus, most of the current outbreaks are not likely to subside for a few years, especially while an ample supply of mature susceptible trees is still available. The possibility of a decline of outbreaks owing to severe winter temperatures is greater in some of the Alberta and Saskatchewan infestations than in British Columbia.

Eastern Larch Beetle

Dendroctonus simplex Lec.

The eastern larch beetle was common throughout the range of tamarack in the Maritime Provinces and many mature and overmature tamarack trees were either infested or killed by this insect. This occurrence is the first recorded outbreak in the Maritimes Region in at least 25 years and was first recognized as such in 1977. Populations of the beetle have built up in stands following several years of moderate to severe defoliation by the larch sawfly or the spruce budworm. No special surveys were conducted in 1980 but it was estimated in 1978 that nearly 500 000 m^3 of tamarack (mostly in eastern and central Nova Scotia) were dead and the infestations have been expanding and intensifying since that time. Infestations are expected to continue in 1981 and cause additional mortality, especially in areas where trees are in a weakened condition.

The beetle caused some tree mortality in stands that have been weakened by spruce budworm defoliation in western and central Newfoundland and on the Avalon Peninsula. In southern Quebec, it killed 25% of the tamarack trees in several stands and 90% in one 20-ha stand. High populations were also recorded in dying trees in one area of eastern Ontario.

Spruce Beetle

Dendroctonus rufipennis (Kby.)

Spruce beetle populations are generally maintained at endemic levels in windthrown or damaged trees and logging slash. Occasionally, however, conditions favorable to the beetle such as warm summers, mild winters, or an increased supply of susceptible host material will trigger a rapid increase in beetle populations that will attack standing healthy trees. In recent years, these favorable conditions have occurred in several parts of Canada and resulted in significant spruce mortality in British Columbia, Nova Scotia, Prince Edward Island, and Newfoundland in 1980.

In British Columbia, mature spruce were killed over 80 000 ha, which represents about 2% of this forest type in the province. Infestations originated near areas of recent logging or windthrow. The main problem areas were in white spruce stands in the Prince George Region, where infestations occurred over 64 400 ha, an area slightly larger than the area logged in the region in 1979, and in the Prince Rupert Region with infestations over 12 700 ha. About 14 million m^3 of spruce were killed in these same regions during a previous spruce beetle outbreak in the early 1960s. Minor local infestations were recorded in Englemann spruce in the Kamloops and Nelson regions.

Strip cruises in areas of infestation covering 35 000 ha southeast of Prince George that had been attacked for the past 3 to 4 years showed that 36% of the spruce were attacked in 1980, up significantly from the 4% recorded in 1979; 15% had been previously attacked and 49% were healthy but susceptible to attack in 1981. The number of newly attacked trees also increased in infestations covering 9 000 ha to the north and east of Prince George.

Elsewhere in the region, infestations declined although scattered attacks occurred over 20 000 ha. The number of partially attacked trees in relation to the total current attacks indicates a further decline in beetle populations.

Light infestations, in which less than 5% of the trees were attacked, occurred in the Prince Rupert Region and indications are that, except for two localized infestations, there will be little change in 1981.

Harvesting schedules have been altered to allow salvage logging, and trap trees were used in areas of the Prince George and Prince Rupert regions as a means of reducing beetle populations.

Populations of the spruce beetle have been increasing at an alarming rate in Nova Scotia since the mid-1970s because of widespread blowdown that occurred in the eastern and central parts of the province in 1974 and the increasing numbers of stands weakened by the spruce budworm, especially on Cape Breton Island. Infestations are now killing patches of trees throughout Nova Scotia, mostly in white spruce stands. In 1979, 48% of the white spruce stands examined were either infested or contained dead trees. Examination of 24 infested white spruce stands during the fall of 1979 and spring of 1980 showed that the trees attacked represented 27% of the white spruce volume on these plots, and 18% of the volume was dead. It is estimated that 779 200 m^3 of white spruce were infested with beetles but still living and an additional 1 584 900 m^3 were dead from beetle attack. These figures represent about 11% of the merchantable white spruce volume in Nova Scotia. Sixty-eight percent of the infested wood was located on Cape Breton Island where more than one-third of Nova Scotia's white spruce volume is located. Here more than 20% of the merchantable volume of white spruce was infested or killed by beetles. Of the trees attacked, 85% were larger than 22 cm in diameter at breast height (DBH) and made up 82% of the affected wood volume.

In Prince Edward Island, an estimated 328 000 m^3 of spruce, which is 20% of the total spruce volume, were infested with or killed by the spruce beetle. Of this, 53% was newly infested. Most of the beetle activity occurred in Queens County where 61% of the white spruce trees examined had been affected. Infestations began in overmature stands that had been weakened by repeated spruce budworm defoliation.

In New Brunswick, a small stand was affected on Grand Manan Island. Some of the white spruce trees were dead, others were infested by beetles. This is the first record of the beetle in the province in the last 50 years.

A severe outbreak of the spruce beetle caused mortality of stands of mature white spruce in a number of areas of western Newfoundland. These stands have been weakened by spruce budworm attacks over the past 6 years. The outbreak is expected to continue and spread to adjacent areas.

Forest Tent Caterpillar

Malacosoma disstria Hbn.

Moderate to severe defoliation of trembling aspen by the forest tent caterpillar occurred over extensive areas of New Brunswick, Quebec, Ontario, Saskatchewan, and Alberta in 1980 (Figure 3). Smaller areas were affected elsewhere. Despite the spectacular nature of outbreaks of this insect, there have been relatively few reports of appreciable tree mortality to date. Some branch mortality has occurred but the main effect of outbreaks has been the reduction in annual growth of severely defoliated trees.

New Brunswick

The insect was again the most conspicuous hardwood defoliator in New Brunswick in 1980, especially in the western part of the province in the St. John River valley. This outbreak, which in 1978 defoliated a few small patches increased in size to 17 500 ha in 1979 and to 135 000 ha in 1980. The principal host was trembling aspen but other deciduous trees and shrubs were also affected. Insect populations were extremely high and thousands of migrating larvae invaded and created a nuisance in residential areas.

Severe defoliation of trembling aspen also occurred in parts of Queens, Sunbury, Kent, Northumberland, and Westmorland counties. These outbreaks have a history similar to the St. John River valley outbreak and occurred over a total area of 42 600 ha, compared to 19 500 ha in 1979. The current outbreaks are by far the most extensive in New Brunswick since 1943. The area of severe defoliation in New Brunswick totalled 177 600 ha. This represents 44% of the 403 000 ha of susceptible forest. Defoliated trees have not yet shown visible signs of decline.

Egg-mass surveys conducted in the fall indicate that the outbreak is likely to cover an even larger area in 1981 and larval populations may exceed the 1980 levels.

Prince Edward Island

In Prince County, the area of defoliation by the forest tent caterpillar decreased by about two-thirds from that reported in 1979. Defoliation occurred in mixed forest interspersed with large, unforested areas with groups of aspen trees of various sizes. The outbreak began in 1973 and by 1975 covered an area of 28 200 ha. In 1980 defoliation of trembling aspen was severe over 3 100 ha and occurred to a lesser degree, mostly light or trace, over an additional 2 000 ha. Disease and parasitism were high in the population and have been since 1976 when the collapse of the outbreak was first predicted. In 1980, total pupal mortality averaged more than 60% and egg-mass sampling indicates that, although the outbreak may persist in 1981, the area affected and the level of defoliation will be further reduced. Defoliation is expected to be light in most areas and moderate in some patches. However, the number of adults captured in light traps in both Queens and Kings counties increased considerably. This may indicate a population buildup in these counties.

In the outbreak area, the incidence of branch dieback of trembling aspen increased from 3 to 20% between 1975 and 1978. No assessment has been made since, but further stand deterioration was observed in the affected areas. In earlier outbreaks as much as 13% of the trembling aspen larger than 2.5 cm DBH were killed and another 45% had dead branches following 2 or 3 consecutive years of complete defoliation.

Nova Scotia

In Nova Scotia, light to moderate defoliation occurred on only a few apple and sugar maple trees at two locations. However, light trap catches increased considerably from 1979 and surveys will be conducted in 1981 to determine where an imminent outbreak is most likely to occur.

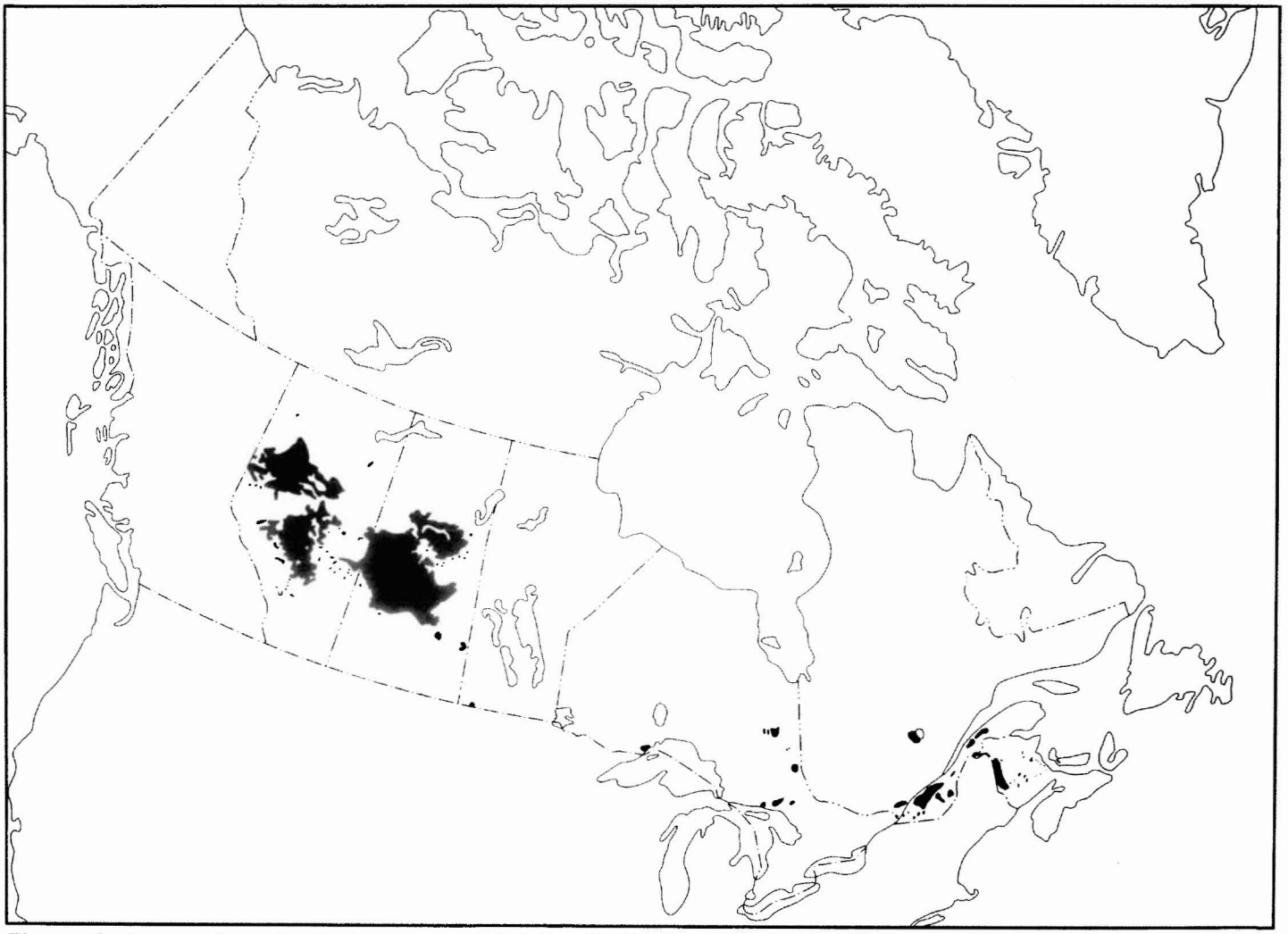

Figure 3. *Areas of moderate to severe defoliation by the forest tent caterpillar.*

Quebec

Populations of the forest tent caterpillar reached epidemic proportions in several parts of the province. Much of southern Quebec was infested and 60% of the samples from trembling aspen in this area were severely defoliated on areas ranging in size from 1 to 5 000 ha. Sugar maples in this area were also lightly to severely defoliated.

Two significant infestations occurred north of the St. Lawrence River. One infestation was located north of Montreal, where trembling aspen and grey birch were 20 to 100% defoliated on an area of several hundred hectares, and the other occurred west of Lake Saint Jean. The latter infestation expanded to 60 000 ha from 3 000 ha in 1979.

In the lower St. Lawrence region, almost all of the Témiscouata and Rivière-du-Loup census divisions and the northern parts of the Rimouski and Matapédia divisions were infested. Within this large area, trembling aspen was heavily defoliated in southern Témiscouata and in parts of northern Rimouski and Matapédia.

Egg-mass surveys indicate that populations on trembling aspen will increase in some areas in 1981 and remain at the 1980 level in others. Many sugar maple groves in southern Quebec are expected to be severely defoliated.

Ontario

In Ontario, heavy infestations recorded in aspen stands throughout the Northwestern Region and most of the North Central Region during the past several years virtually collapsed. However, in the Thunder Bay District of the North Central Region, the infestation continued and expanded to approximately 54 000 ha from 41 400 ha in 1979. Complete defoliation occurred throughout most of this area. Weather conditions are thought to have influenced the decline of populations. Warm weather during the latter part of April and early May was conducive to a successful larval hatch but then was followed by several days of extremely cool weather that probably affected larval survival adversely.

In the Northern Region, populations continued to decline in the Hearst, Kapuskasing, and Moosonee districts but increased in the Cochrane and Kirkland Lake districts where the insect caused severe defoliation. The area of moderate to severe defoliation in the region totalled 150 000 ha.

Moderate to severe defoliation occurred in three separate infestations, one in each of the Espanola, Sudbury, and North Bay districts of the Northeastern Region where the total area of the infestations almost tripled to 121 500 ha.

In 1981, the infestation in the Thunder Bay District will probably increase slightly in size, the infestations in the Cochrane and Kirkland Lake districts will continue at the moderate to severe level, and the infestations in the Espanola, Sudbury, and North Bay districts will expand.

The forest tent caterpillar has been associated with the recent decline of sugar maples in southern Ontario. Although other factors may be involved, high populations of the insect caused severe defoliation in the affected areas for several years prior to the onset of tree mortality.

The status of sugar maples affected by maple decline in the Owen Sound and Parry Sound forest districts improved considerably in 1980. Dead and dying trees were first observed in the Owen Sound District in 1976 and in subsequent years the condition intensified and expanded. It was most severe in 1978. Defoliation by the forest tent caterpillar was minimal in 1978 and maple vigor has since improved. Recovery in 1979 was more apparent in the Parry Sound District, possibly because weather conditions in the Parry Sound District in 1978 were more favorable for tree growth than the dry season experienced in the Owen Sound District. Both areas showed good recovery in 1980 based on vigorous branch growth and crown recovery. Although dieback symptoms remain common in these areas, the percentage of trees affected is now similar to the percentage affected elsewhere within the range of maples in Ontario. According to surveys conducted in 1977, it is common to find more than 20% of the sugar maples showing some dieback symptoms throughout Ontario. In total, 28 700 ha of sugar maple forest were affected and about half of the affected area experienced greater than 25% tree mortality. This represents about 14% of the 202 400 ha of susceptible maple forest in the two districts. The total loss of timber is estimated at slightly more than 2 million m^3 and is currently valued at $19.5 million.

Manitoba

Moderate to severe defoliation by the forest tent caterpillar occurred only in limited areas in the southwestern part of the province. Generally light defoliation is expected here in 1981.

Saskatchewan

Moderate to severe defoliation of trembling aspen occurred over an estimated area of 12.8 million ha in central Saskatchewan, which is more than double that reported in 1979. Approximately half of this outbreak was in agricultural and urban areas, and the other half in commercial forest areas and in

provincial and national parks. Results of egg-mass surveys indicate a general population decline may occur in the west-central part of the outbreak in 1981 but high populations will continue in the extreme western and eastern parts.

Alberta

Moderate to severe defoliation caused by the forest tent caterpillar alone or in association with other defoliators, predominantly the large aspen tortrix, *Choristoneura conflictana* (Wlk.), and the Bruce spanworm, *Operophtera bruceata* (Hulst), occurred over an area of approximately 7.5 million ha across the central half of Alberta. This is an increase of about 1.1 million ha over that reported in 1979. Roughly two-thirds of the affected area occurred in agricultural lands, including widely scattered aspen bluffs, farm woodlots, and ornamental trees and shade trees in urban areas. The other one-third was in commercial forest areas and in provincial and national parks. Infestations are expected to continue in 1981 with the same general distribution and intensity as in 1980.

British Columbia

In British Columbia, the forest tent caterpillar was reported only in the Clearwater area of the Kamloops Forest Region. Here, populations declined because of parasitism and only 140 ha of trembling aspen were lightly defoliated.

Dutch Elm Disease

Ceratocystis ulmi (Buis.) C. Moreau

Since its discovery in Canada in Quebec in 1944, Dutch elm disease has spread over an area stretching from southern Manitoba to the Atlantic Ocean, excluding Newfoundland (Figure 4). The disease is caused by the fungus *Ceratocystis ulmi,* introduced from Europe and transmitted chiefly by elm bark beetles. All native species of elm are susceptible including white, red, and rock elms. The disease has caused extensive mortality in eastern North America and will probably become a serious problem in all areas where elms are grown.

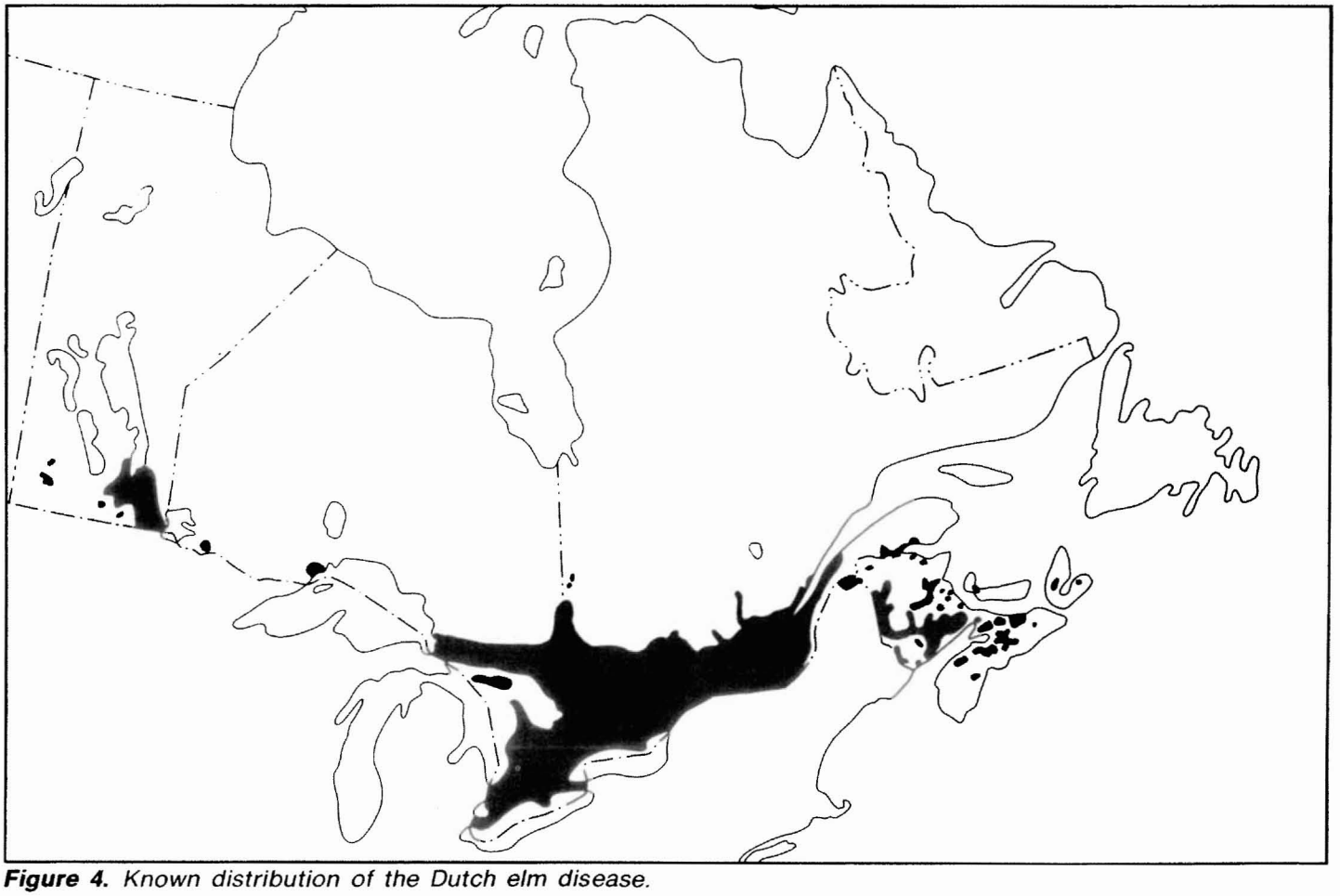

Figure 4. *Known distribution of the Dutch elm disease.*

No major changes occurred in the distribution of Dutch elm disease in the Maritime Provinces in 1980, but tree mortality intensified within the areas of Nova Scotia and New Brunswick where the disease is established. In Prince Edward Island, where the disease was first found in Prince County in 1979, the provincial government conducted a sanitation program to remove all infected elm trees. In 1980, intensive air and ground surveys failed to detect any diseased trees.

In Fredericton, N.B., where a sanitation program has been in effect since the early 1950s, infection rates were 7% and 9% respectively on the south and north sides of the St. John River. Until 1978, Fredericton had lost only about 16% of its original elm population since the initial infection was detected in 1961. The recent increase in infection rate may be caused, in part, by an influx of beetles laden with fungus spores from nearby uncontrolled areas where tree mortality ranges as high as 90%.

The disease occurs throughout the range of elms in Quebec except in the eastern Gaspé Peninsula and the Lake Saint Jean area. Mortality continued over the infected area but was particularly noticeable in the Montreal area.

Since Dutch elm disease was first detected in eastern Ontario in 1946, it has spread westward toward Manitoba. Movement of the fungus into Ontario from points in the United States has contributed to this rapid movement. Most of the elms in Ontario are found in the southern part of the province where the disease has been active for several years. It is estimated that 70% of the elm growing stock, or about 213 million m^3, has died It is difficult to put a monetary value on this loss as it includes trees in urban areas, fence rows, and unmanaged woodlots, many of which would not be cut for commercial purposes.

The City of Sault Ste. Marie, Ont., has maintained a control program since 1968 and initiated a more comprehensive approach in 1976 including chemical injection. Annual losses in the past 2 years have been reduced to about 1.5% of the original elm population.

Dutch elm disease was first detected in Manitoba in 1975 at Brandon, Selkirk, and Winnipeg. The disease has continued to spread and now occurs in 18 municipalities, as well as in mature elm stands and farm shelterbelts. Disease incidence remained high throughout most of the outbreak areas in 1980, including the City of Brandon, which is the westernmost extension of Dutch elm disease.

The City of Winnipeg initiated a control program several years prior to the appearance of Dutch elm disease. To date, disease incidence in Winnipeg is about 1%, which is much lower than that in surrounding areas where up to 85% of the elms are dead or dying. The number of diseased trees in Winnipeg in 1980 increased to 313 compared to 53 in 1979, but most of these occurred in mature elm stands in the extreme southern section of the city.

The major economic impact of Dutch elm disease has probably been in urban areas where considerable expense has been incurred by individuals and municipalities for tree removal, sanitation, chemical control, and replanting. The magnitude of the problem can be understood when one recognizes that elm constitutes as much as 50 to 80% of the shade trees of many cities. For example, prior to the occurrence of Dutch elm disease, Toronto had approximately 500 000 elms; Windsor, Ont., 10 000; Fredericton, N.B., 7 500; and Winnipeg, Man., 275 000.

Scleroderris Canker

Gremmeniella abietina (Lagerb.) Morelet

Scleroderris canker of conifers is caused by the fungus *Gremmeniella abietina,* formerly called *Scleroderris.* It has been recorded in all provinces except Prince Edward Island, Manitoba and Saskatchewan (Figure 5). At least two races of this fungus have been determined serologically.

North American Race

The North American race of *G. abietina* is widely distributed in Canada. In eastern Canada, it is most damaging on pines, especially red, jack, and Scots pines and often kills them during their first decade of growth. At various times, the disease has been a serious problem in nurseries and young plantations. Once the trees attain a height of about 2 m, they are relatively safe from lethal attack. In western Canada, where lodgepole, ponderosa, and white bark pines are the principal hosts, the disease is known to occur at only a few scattered locations in Alberta and British Columbia. No significant damage has been attributed to this disease in either province.

In New Brunswick and Nova Scotia in 1980, there was little current damage. This was likely the result of weather conditions unfavorable to infection.

Although there was no significant spread of the North American race detected in Quebec, the level of infection within the established range was high in 1980, reaching 80 to 100% in some plantations. The relatively large number of infections in very young plantations suggests that the planting stock may have been infected prior to removal from the nursery.

The detection in 1980 of scleroderris canker in the Dufferin Forest about 120 km north of Toronto extended the known southern limit in Ontario. Previously the disease seemed to be confined to parts of the province north of 45° latitude.

The North American race was not found in any new areas west of Ontario in 1980.

European Race

In 1975, a disease syndrome different from that normally associated with scleroderris canker in North America was reported in New York State. The disease was killing mature pine trees. Based on serological testing, the causal fungus was identified as the European race of *G. abietina.*

In 1978, it was confirmed that this fungus was present in one plantation in southern Quebec, a few kilometres from the closest infection in New York State. Subsequent surveys discovered the European race at a number of scattered locations in Quebec within 10 km of the international border, two locations in New Brunswick, and in a few trees near St. John's, Nfld.

All infected material found to date has been destroyed. The European race was not reported at any new locations in 1980.

The potential of the European race is not known. The disease has never developed in Canada, or in other parts of the northeastern United States where it occurs, as it did in New York State in the mid 1970s. Furthermore, the infection rate in New York has been much lower in the past few years. The situation will continue to be closely monitored by forestry and quarantine officials in both countries.

Stem and Root Decays

Over the long term, stem and root decays resulting from infections by a variety of fungi are collectively the greatest cause of wood loss. In the

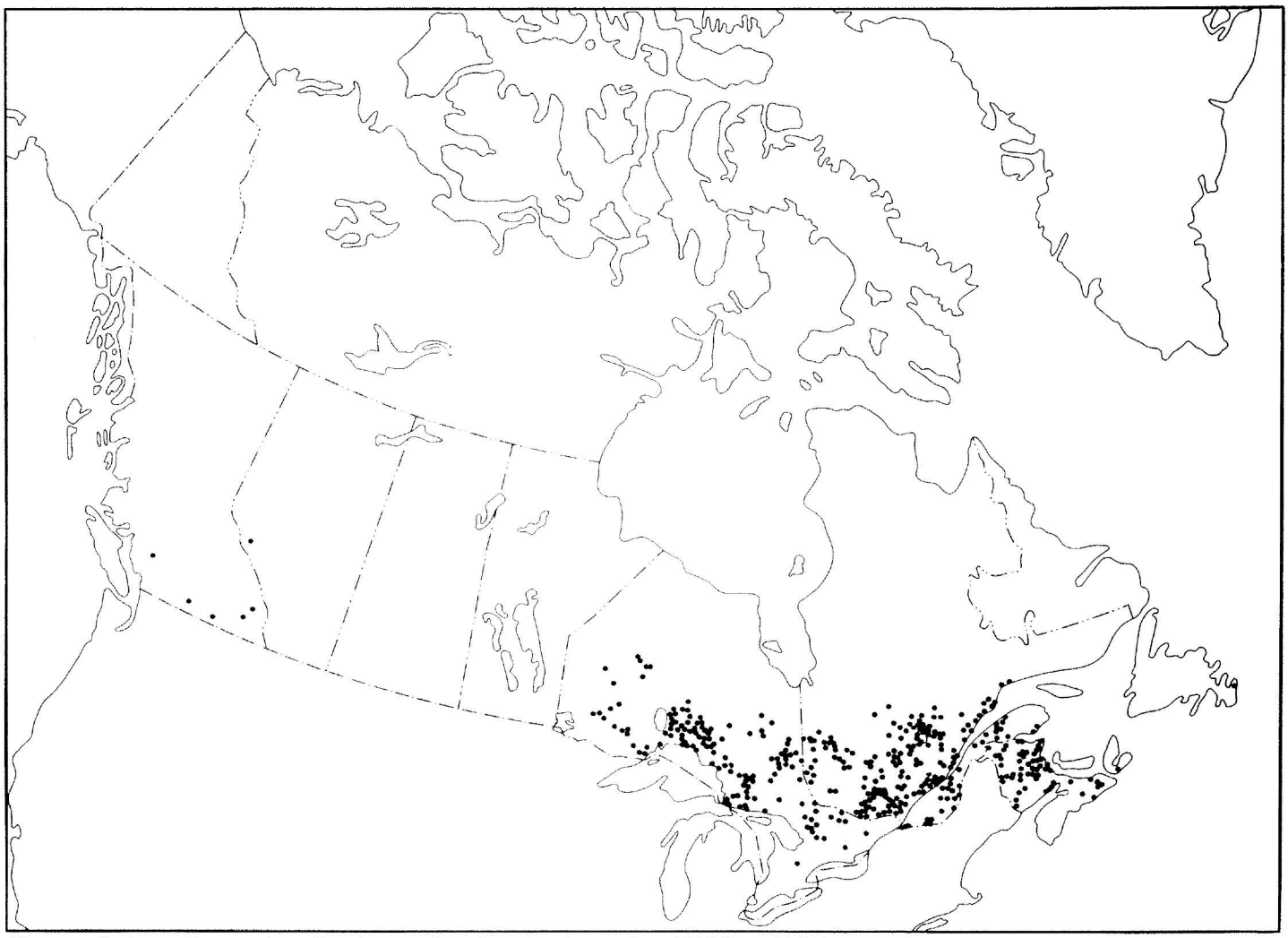

Figure 5. *Locations of collections of scleroderris canker (1967 to 1980).*

absence of widespread outbreaks of other devastating pests, the annual loss from these decays exceeds that resulting from any other cause. The average annual wood loss from decays is estimated to be about 30 million m^3, a volume equivalent to one-fifth of the wood harvested annually in Canada. Currently, the annual loss from decays is considered to be exceeded only by that caused by the spruce budworm. Most of the decay loss results from the actual destruction of wood by stem decays; the remainder is due to growth reduction and tree mortality caused by root decays.

Stem decays are common throughout the country and can develop in any tree exposed to infection as a result of injury or natural pruning. The severity of damage depends upon such factors as tree species, tree age, and stand history. Generally, decay volume increases with stand age and there are now large areas of highly defective mature and overmature stands being harvested. As these stands are removed and second-growth timber is cut on shorter rotations, decay losses are expected to decline significantly.

Root decays, like stem decays, attack both hardwood and softwood trees, but unlike stem decays they can be important in young natural stands or plantations. Many root-decaying fungi attack trees in stands that have been weakened by other agents but others are more virulent and infect apparently healthy trees. Root decays may spread upward and cause stem decay.

Decay infections develop rather insidiously and are not amenable to routine detection surveys and therefore to annual census. Consequently, the overall impact of these diseases in Canada cannot be updated annually. However, information will be presented as it becomes available.

Gypsy Moth

Lymantria dispar L.

The gypsy moth was introduced into the United States around 1870. It was first discovered in Canada in 1925 in southern Quebec and has since spread into Ontario. The insect poses a threat primarily to deciduous trees but will feed on some coniferous species. Repeated defoliation by the gypsy moth has caused considerable damage (tree mortality and growth loss) in the hardwood forests of the northeastern United States. Outbreaks in Canada have been relatively short lived in any one location and no significant tree mortality has been recorded. The insect to date has affected mainly aesthetic values in urban and recreational areas.

The general area of gypsy moth infestation (Figure 6) expanded considerably in eastern Ontario in 1980

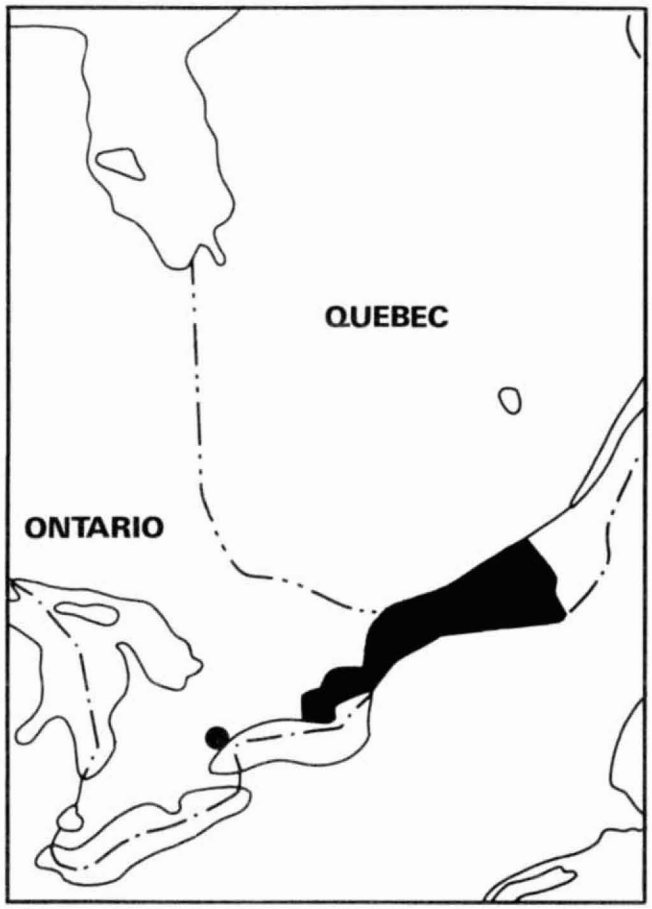

Figure 6. *Known distribution of gypsy moth. Courtesy Plant Products and Quarantine Division, Agriculture Canada.*

and now encompasses the city of Ottawa. Three small infestations were found outside this area — one in Mississauga and two in Oakville. In Quebec, the known area of distribution was extended 40 km to the east with the discovery of numerous egg masses between Victoriaville and Gentilly. An egg mass found 80 km east of this area at Tring-Jonction, Beauce Census Division, was immediately destroyed. The insect is not yet known to be established in New Brunswick although the infestation in Maine expanded and now extends to within 30 to 40 km of the New Brunswick border.

In Quebec, defoliation of grey birch, trembling aspen, and red oak was evident mainly in the southern and western parts of the area of general infestation. The defoliation varied from 30 to 100% and occurred in numerous areas, mainly 100 to 500 ha in size but occasionally from 1 000 to 3 500 ha. Defoliation was recorded over 3 500 ha in each of two areas.

In 1978 the gypsy moth was found in Vancouver, B.C., and a spray program was carried out by the

Plant Products and Quarantine Division of Agriculture Canada and the City of Vancouver in 1979 in an attempt to eradicate the insect. As a follow-up, the infested area was carefully surveyed in 1979 and 1980 but the insect was not found.

Spray projects were conducted in Ontario and Quebec in the spring of 1980 as part of the program of the Plant Products and Quarantine Division to limit and delay the spread of gypsy moth in Canada. In Quebec, six campgrounds were sprayed from the ground with a mistblower. These campgrounds were chosen for treatment because they had high populations of gypsy moth and are visited by large numbers of campers from outside the generally infested area. Therefore, the risk of these campgrounds being a source for the spread of gypsy moth was high. The total area treated in Quebec was 285 ha. Counts of egg masses in the fall showed the control achieved was not satisfactory in all of the campgrounds because of the inability to achieve full coverage with a mistblower and because of migration of caterpillars from surrounding untreated areas. Egg masses in another three campgrounds were treated by handsprayer. In Ontario, 485 ha of severe infestation on Howe Island, near Kingston, were aerially sprayed in May. A visual survey in July and egg-mass scouting in November failed to locate any sign of gypsy moth in the treated area. Howe Island is considered a high-risk area for spread of gypsy moth because of logging activities and the transport of outdoor equipment by cottage owners.

Oak Leaftier

Croesia semipurpurana Kft.

The oak leaftier has been a persistent and widespread pest of red oak in Ontario for a number of years. Defoliation by this insect is probably a major predisposing factor in oak decline, dieback, and mortality. Serious tree deterioration and mortality has occurred in a number of areas in Ontario with a history of oak leaftier infestations.

The Ontario Ministry of Natural Resources has sprayed several hundred hectares of high-value oak-maple forest in the Central Region annually since 1977 to minimize defoliation. In May 1980 a total of 767 ha of high-value oak-maple forest was aerially sprayed.

In 1980, approximately 50 000 ha of forest in the Central, Algonquin, Eastern, and Northeastern regions suffered moderate to severe defoliation. Stands affected in the Central Region were usually farm woodlots or county forests of mixed oak-maple content. All age classes of trees were attacked but most stands contained mature trees of merchantable, sawlog size. Oak content ranged from 20 to 90% and defoliation in many cases was complete. Mortality of all age and size classes was evident. Because oak deteriorates slowly after dying, a number of landowners have been able to complete salvage operations.

Infestations in the Algonquin Region were generally light to moderate and occurred mainly in immature oak-pine forests where the oak content was approximately 50%. No tree mortality was observed.

Severe defoliation occurred at several locations in the Eastern and Northeastern regions. The forests affected in these areas consist chiefly of mixed hardwoods with oak comprising approximately 10 to 25% of the stands. Most stands are immature to semimature with virtually all timber under sawlog size.

In New Brunswick and Nova Scotia, the oak leaftier together with an oak leafroller, *Pseudexentera cressoniana* Clem., caused considerable defoliation of oak in 1980. The defoliation in New Brunswick, mostly attributable to the oak leaftier, was severe or moderate in essentially the same areas as in 1979: the St. John River valley from Woodstock to Cambridge Narrows and scattered other locations where oak occurs in Albert, Westmorland, Kings, Queens, and Northumberland counties. Repeated defoliation affected trees in Queens County, where in 1980 about one-third of the trees in a mature, 50-ha red oak stand had up to 90% of the leaves damaged to some extent, and some of the trees had twig and branch dieback. At one location in Kings County, upper crown mortality was common and at least half of the crown was dead on 37% of the trees.

In Nova Scotia, the leafroller was the predominant species in 1980. The level of leaf rolling and, to a lesser degree, leaf shredding varied from severe to light in locations throughout much of Lunenburg County, most of the eastern half of Queens County, and in parts of central and eastern Annapolis County. Smaller areas of affected trees also occurred in Hants, Kings, and Shelburne counties. Twig and branch dieback was common in many areas but has not changed significantly since 1979.

Light to moderate defoliation of red oak trees, caused by the oak leaftier, occurred at one location in Queens County, P.E.I.

No control action against this insect was taken in the Maritime Provinces.

In Quebec, the oak leaftier was recorded in the lower Ottawa Valley, where populations declined from 1979 levels, and in the Cap-Rouge area west of Quebec City where populations increased and reached moderate to high levels locally.

Special Surveys

Cone and Seed Pests

British Columbia

Cones of the major coniferous tree species were examined from 140 locations throughout the province, except in the Prince George Region where cone crops were very light. Damage to Douglas-fir cones, primarily by the Douglas-fir cone moth, *Barbara colfaxiana* (Kft.), the fir coneworm, *Dioryctria abietivorella* (Grote), and the Douglas-fir cone gall midge, *Contarinia oregonensis* Foote, rendered stands unsuitable for collecting at 90% of the locations in the Cariboo Region, 34% in the Kamloops Region, 54% in the Vancouver Region, and 83% in the Nelson Region.

Engelmann and white spruce cones were infested with the spruce seed moth, *Laspeyresia youngana* (Kft.), and the spruce cone maggot, *Hylemya anthracina* (Czerny), and were unsuitable for collecting in 87% of the locations in the Kamloops Region, 83% in the Prince Rupert Region, and almost all sites in the Cariboo Region. The inland spruce cone rust, *Chrysomyxa pirolata* Wint., was found in 19% of the cones in a seed orchard in Kamloops Region. At two locations in the Cariboo Region, 20 and 35% of the cones were diseased. Cones of other conifers examined were relatively free of pests.

Ontario

In a survey of black spruce stands in 1980, 18 to 55% of the cones examined were damaged. In the North Central and Northern regions, the principal insects causing this damage were the spruce budworm, *Choristoneura fumiferana* Clem., and the spruce coneworm, *Dioryctria reniculelloides* Mut. & Mun. In the Northwest Region, 19% of cones were affected and most of the injury was caused by two cone maggots, *Hylemya anthracina* Czerny and *Dasineura rachiphaga* Tripp. Cone rust damage was negligible.

Pests in Young Stands

British Columbia

Because of the increasing emphasis on management of young stands, pest problems in young forests are a growing concern. Accordingly, 145 stands, including plantations, young natural stands, spaced stands, and seed orchards throughout the province were examined. Of these, 22 were relatively free of pests, 37 had only minor pest conditions, but 86 (59%) had significant pest problems.

One of the major problems in coastal Douglas-fir stands continued to be root rot, *Phellinus weirii* (Murr.) Gilbertson, which infected up to 10% of the trees in 11 of 16 young stands and two small seed orchards. Infections of *Phellinus,* as well as Armillaria root rot, *Armillaria mellea* (Vahl ex Fr.) Kummer, and black stain root disease, *Verticicladiella wagenerii* W.B. Kendr., were scattered throughout several spaced and natural stands in the Kamloops and Nelson regions.

Stem and branch rusts or cankers, including stalactiform blister rust, *Cronartium coleosporioides* Arth., globose gall rust, *Endocronartium harknessii* (J.P. Moore) Y. Hirat., and atropellis canker, *Atropellis piniphila* (Weir) Lohm. & Cash, were common in many spaced and natural lodgepole pine stands throughout British Columbia. In one 18-year-old stand near Prince George, the frequency of gall and stem rust infections was 5 to 20% higher after various spacing treatments than in the untreated area. The highest frequency of infection occurred in stands that had been machine treated, followed by hand-spacing in the leave strips. In 4 of 16 stands examined in the Cariboo Region, rust infections averaged 30% (range 6 to 68%). Rusts, as well as dwarf mistletoe, *Arceuthobium americanum* Nutt. ex Engelm., were prevalent in a mixed stand near Kamloops. At several locations in the Nelson Region, gall rust affected almost half of the trees and, in a 50-year-old stand, 10% of the lodgepole pine were cankered by *Atropellis.* Premature needle loss caused by *Lophodermella concolor* (Dearn.) Darker was frequently conspicuous, particularly in northern British Columbia.

The Douglas-fir engraver, *Scolytus unispinosus* Lec., killed about 2 500 Christmas trees predisposed by severe stem blazing during the growing season. Top-kill affected from 3 to 60% of the young trees in areas with several consecutive years of defoliation by the western spruce budworm, *Choristoneura occidentalis* Free. The incidence of black army cutworm, *Actebia fennica* (Tausch.), has declined in recent years, but in one area Douglas-fir seedlings over 10 ha were completely defoliated and some replanting will be necessary.

The pine engraver, *Ips pini* (Say), and red turpentine beetle, *Dendroctonus valens* Lec., killed more than 5 000 immature ponderosa and lodgepole pine trees in a fire-damaged stand, and attacked 10% of the potential crop trees in a spaced stand in another area.

Other problems of lodgepole pine included the lodgepole terminal weevil, *Pissodes terminalis* Hopping, a pine needleminer, *Coleotechnites* sp., and a pitch moth, *Petrova sp.*

Ontario

A survey of high-value eastern white pine plantations in 1980 detected a number of potentially damaging pests, but most were at low levels.

The most abundant insect was the pine bark adelgid, *Pineus strobi* Htg. It was present in 58% of the stands and in 12% of the trees sampled. In all cases the intensity of infestation of individual trees was rated as light.

White pine blister rust, *Cronartium ribicola* J.C. Fischer ex Rabh., was the most damaging disease detected by the survey. In most plantations, however, incidence was low (average 3.3%, range 0 to 15%) and about half of the affected trees (average 1.6%, range 0 to 11%) had stem cankers.

The white pine weevil, *Pissodes strobi* Peck, was present in 53% of the stands sampled, and about 8% of the trees had weeviled leaders. It was not encountered in the stands in the Eastern Region, probably a reflection of control programs in that region. Also, trees over 2 m tall were more severely affected, indicating a population buildup as stands age.

A pine spittlebug, *Aphrophora cribrata* (Wlk.), was commonly present in all but the Eastern Region on trees of all height classes. The intensity of infestation was always low to trace, and overall it was present in 7% of the trees sampled.

The most common form of foliar damage to white pine over the years has been semimature tissue needle blight caused by air pollutants. Two stands in the Algonquin Region suffered moderate foliar damage from this blight. Elsewhere, occasional occurrences of trace or low damage were present. Disease-caused foliar damage was negligible.

Armillaria root rot, *Armillaria mellea* (Vahl ex Fr.) Kummer, does not appear to be a serious problem to white pine management in Ontario. The disease was detected in only 10% of the stands sampled and the percentage of trees affected was never greater than 2%. Black stain root disease, *Verticicladiella wagenerii* W.B. Kendr., was not found in any of the stands examined.

Most of the tree mortality encountered in the survey was the result of white pine blister rust or armillaria root rot infection. One stand had 15% mortality, but the trees were small and drought was considered a contributing factor. Mortality in all other stands did not exceed 3% and usually was less than 1%.

Other Insects and Diseases

Newfoundland Region

Insect or Disease	Host(s)	Locality	Remarks
Armillaria root rot *Armillaria mellea* (Vahl ex Fr.) Kummer	Balsam fir Black spruce	Throughout the Island	Disease continued to spread, particularly in cutover areas where new plantations are being established without site treatment and in natural stands predisposed by insect attack.
Balsam fir sawfly *Neodiprion abietis* complex	Balsam fir White spruce	Western Newfoundland	Trace of defoliation.
Balsam twig aphid *Mindarus abietinus* Koch	Balsam fir	Western and central Newfoundland	Light infestations.
Balsam woolly aphid *Adelges piceae* (Ratz.)	Balsam fir	Codroy Valley to St. George's Bay in western Newfoundland	Populations increased in immature stands. Indications are that new outbreak is developing.
Birch casebearer *Coleophora serratella* (L.)	Birch	Western Newfoundland	Light damage throughout with patches of moderate damage.
		Central Newfoundland	Moderate to severe defoliation of semimature stands. Severe defoliation forecast for 1981.
		Eastern Newfoundland	Severe defoliation throughout Terra Nova National Park and on the Bonavista and Avalon peninsulas. Severe defoliation again forecast for 1981.
Birch leafminer *Fenusa pusilla* (Lep.)	White birch	Throughout the Island	Light to moderate browning.
Broom rusts *Melampsorella caryophyllacearum* Schroet.	Balsam fir	Throughout the Island	Up to 50% of the trees affected at some locations.
Chrysomyxa arctostaphyli Diet.	Black spruce	Throughout the Island; eastern Labrador	Affected up to 50% of the trees in some locations on the Island and up to 50% of trees in Labrador.
Dothichiza canker *Dothichiza populea* Sacc. & Briard	Lombardy poplar	Throughout the Island	Continued to cause tree and branch mortality in many urban areas.
Eastern blackheaded budworm *Acleris variana* (Fern.)	Balsam fir White spruce	Western Newfoundland	Trace of defoliation.
European pine sawfly *Neodiprion sertifer* (Geoff.)	Red pine	St. John's and Wilson Lake area, Avalon Peninsula	Severe defoliation.
European spruce sawfly *Gilpinia hercyniae* (Htg.)	Balsam fir White spruce	Western Newfoundland	Trace of defoliation.
Frost damage	Balsam fir Black spruce	Central Newfoundland; eastern Labrador	Shoot mortality common. In some areas of Labrador up to 70% of the new shoots of black spruce regeneration killed.
	Miscellaneous broadleaved trees and shrubs	Throughout the Island	Up to 35% of the foliage and 10% of the trees affected in forests and urban areas.
Hemlock looper *Lambdina fiscellaria fiscellaria* (Guen.)	Balsam fir	Near Leg Pond, headwaters of Salmon River and Main Brook on Northern Peninsula	Total area infested 10 110 ha. Volume of dead and dying trees estimated at 195 430 m^3. Infestations are forecast to collapse in 1981.
Ink spot *Ciborinia whetzelii* (Seaver) Seaver	Trembling aspen	Eastern Labrador; central Newfoundland	Affected up to 70% of the trees and 60% of the foliage; caused about 40% shoot mortality and some seedling mortality.
Larch casebearer *Coleophora laricella* (Hbn.)	Tamarack	Eastern Newfoundland	Severe defoliation.

Insect or Disease	Host(s)	Locality	Remarks
Larch sawfly *Pristiphora erichsonii* (Htg.)	Tamarack	Codroy Valley to Birchy Lake and along the Northern Peninsula to Round Lake in western Newfoundland	High populations caused severe defoliation. Isolated patches of defoliation elsewhere.
		Labrador	End of outbreak that started in 1975. About 70 to 80% tree mortality recorded in some stands.
Large aspen tortrix *Choristoneura conflictana* (Wlk.)	Trembling aspen	Central Newfoundland	Light defoliation.
Mountain-ash sawfly *Pristiphora geniculata* (Htg.)	Mountain-ash	Throughout the Island	Light to moderate defoliation.
Needle rusts *Chrysomyxa ledi* d By. *Chrysomyxa ledicola* Lagerh.	Black spruce	Scattered patches on the Avalon Peninsula; central and western Newfoundland; along North West River Road in eastern Labrador	Affected up to 90% of the new foliage and up to 80% of trees in regeneration.
Satin moth *Leucoma salicis* (L.)	Balsam poplar	Western Newfoundland	Severe defoliation in scattered patches from St. Andrews to Fischell's River. Infestation expected to increase in 1981.
	Ornamental poplar	Avalon Peninsula	Severe defoliation in a number of areas. Infestation expected to decrease in 1981.
Spruce coneworm *Dioryctria reniculelloides* Mut. & Mun.	Black spruce	Between Bishop's Falls and Terra Nova in central Newfoundland	Severe defoliation. Infestation expected to continue in 1981.
Squirrel damage	Red pine Black spruce	Western and central Newfoundland; eastern Labrador	On the Island, up to 20% of the current year's cones damaged at some locations. In Labrador, damage less severe.
Tip blight *Rehmiellopsis balsameae* Waterman	Balsam fir	Grand Falls in central Newfoundland; along Churchill Falls Road in eastern Labrador	Moderate to severe; killed up to 70% of new shoots and affected up to 100% of trees.
White pine blister rust *Cronartium ribicola* J.C. Fischer ex Rabh.	Eastern white pine	Gambo and Terra Nova National Park in central Newfoundland	Moderate to severe infection.
Wind damage	Coniferous and deciduous trees	Western and central Newfoundland	High winds caused considerable stem, branch, and top breakage in several areas in western and particularly central Newfoundland. The total volume of blowdown estimated at 4 370 000 m^3, most of which occurred in balsam fir stands killed or severely damaged by spruce budworm.
Winter injury	Balsam fir Black spruce Red pine Scots pine	Avalon Peninsula	Damage unusually conspicuous in several wind-exposed forested areas and on ornamental trees in St. John's. As much as 40% of foliage affected at some locations.
Witches' broom *Arceuthobium pusillum* Pk.	Black spruce	Western and central Newfoundland	Damage from the eastern dwarf mistletoe increased in previously infested areas and was observed at several new locations.
Yellowheaded spruce sawfly *Pikonema alaskensis* Roh.	White spruce Black spruce	Western and central Newfoundland	Severe defoliation.

Other Insects and Diseases

Maritimes Region

Insect or Disease	Host(s)	Locality	Remarks
Armillaria root rot *Armillaria mellea* (Vahl ex Fr.) Kummer	Balsam fir Jack pine Tamarack	Maritime Provinces	Disease associated with mortality in numerous situations where preconditioning factors weakened trees (spruce budworm defoliation of fir, faulty planting, etc.). Most noteworthy observation in 1980 was the involvement of the fungus in spruce budworm weakened stands in central New Brunswick.
Balsam fir aphid *Cinara* sp.	Balsam fir	New Brunswick	Damage common in Christmas tree plantation at McGivney, in an improved stand at Cross Creek, York County, and in several areas in Charlotte County.
Balsam gall midge *Paradiplosis tumifex* Gagné	Balsam fir	New Brunswick; Nova Scotia	In New Brunswick, localized severe infestations at Letite, Charlotte County, and at Spruce Lake, St. John County; light to moderate in Kings, Queens, Sunbury, York, Kent, Gloucester, Westmorland, Albert, and Charlotte counties. In Nova Scotia, light infestations in Colchester, Cumberland, Hants, Lunenburg, and Yarmouth counties. Populations expected to remain low in Nova Scotia and Prince Edward Island, but may increase in New Brunswick.
Balsam twig aphid *Mindarus abietinus* Koch	Balsam fir	Maritime Provinces	Populations generally low except in two areas of western Restigouche County and near Minto, Sunbury County, N.B. No increase expected in 1981.
Balsam woolly aphid *Adelges piceae* (Ratz.)	Balsam fir	Maritime Provinces	Thirty-three of the 60 stands examined in 1980 in New Brunswick, Nova Scotia, and Prince Edward Island were infested. Tree mortality (4 to 100%) attributed to repeated attacks occurred in six stands.
Beech bark disease Beech scale *Cryptococcus fagisuga* Lind. Nectria canker *Nectria coccinea* var. *faginata* Lohm., Wats. & Ayers	Beech	Maritime Provinces	Little changes in tree mortality (6.5%), incidence (85 to 90%), and distribution since 1969 survey. Incidence of crown dieback increased nearly fourfold.
Birch casebearer *Coleophora serratella* (L.)	Alder White birch	Maritime Provinces	Browning on white birch severe or moderate over widespread areas of northwestern New Brunswick and in other scattered areas of the province; in Nova Scotia, in the lowlands of Cape Breton Island and in parts of Colchester and Cumberland counties; and at scattered areas throughout Prince Edward Island. Alder severely discolored at locations in New Brunswick and Prince Edward Island.
Birch leafminer *Fenusa pusilla* (Lep.)	White birch Grey birch	Maritime Provinces	Foliage browning of grey birch and to a lesser extent white birch generally moderate throughout Nova Scotia and southern New Brunswick. Severe browning in areas of varying sizes in both provinces especially in north-central and western parts of Nova Scotia. Discoloration variable at scattered locations in Prince Edward Island. Very little leaf browning observed in northern New Brunswick. Repeated feeding by this insect can cause loss of tree vigor which may result in growth loss and predisposition to secondary organisms.
Birch sawfly *Arge pectoralis* (Leach)	White birch	Nova Scotia	Localized severe infestation reported in 1979 at MacKenzies Mountain, Inverness County collapsed. No insect or injury present in 1980.
Birch skeletonizer *Bucculatrix canadensisella* Cham.	Birch	Maritime Provinces	Outbreaks occur periodically and sometimes cover extensive areas. Last outbreaks reported in 1977. Extensive survey in 1980 indicates that populations of this insect are extremely low throughout.

Insect or Disease	Host(s)	Locality	Remarks
Bronze birch borer *Agrilus anxius* Gory	White birch	Maritime Provinces	Attacked and killed weakened trees in many areas. In Prince Edward Island National Park at Rustico Island, 36% of trees dead; in Victoria Park, Charlottetown, P.E.I., 16% mortality; and at Dalhousie Junction, Restigouche County, N.B., 28% mortality. *See also:* Deterioration of birch.
Bruce spanworm *Operophtera bruceata* (Hulst)	Apple Sugar maple Red oak	New Brunswick	Moderate defoliation of maple along the Plaster Rock-Renous highway near York-Victoria-Northumberland county line. Insect numbers low and defoliation negligible elsewhere. *See also:* Winter moth.
Canker *Dasyscypha* sp.	Tamarack	Southeastern New Brunswick	To date, this unidentified species of *Dasyscypha* caused branch cankers on a few trees at 10 locations in York, Sunbury, Queens, Kings, St. John, Westmorland, and Kent counties. Foliage above swollen canker turned yellow prematurely but whether branch mortality will result is not yet known (a similar sample, from western Nova Scotia on dead branches indicates that possibility). Cankers averaged about one per tree. First report of this condition in the Maritimes.
Cedar leafminers *Argyresthia aureoargentella* Brower *A. thuiella* (Pack.) *Pulicalvaria thujaella* (Kft.)	Cedar	Prince Edward Island; Nova Scotia	Severe leaf mining again over about 2 000 ha in Muddy Creek-Sandy Park area and north of Highway 2, Prince County, P.E.I. Tree deterioration continued as evidenced by many dead branches. Browning of ornamental cedars common at Truro and Brookfield in Colchester County, and at Elmsvale, Halifax County, N.S.
Deterioration of birch	White birch	New Brunswick; Nova Scotia	Widespread browning and loss of foliage in a coastal strip in southern New Brunswick, on Campobello, Deer, and Grand Manan islands, N.B.; and in Cumberland County, N.S. Cause unknown.
Eastern spruce gall adelgid *Adelges abietis* (L.)	White spruce	New Brunswick	Numerous galls on 10% of trees in 2-ha plantation at Lower Little Ridge, Charlotte County; common on scattered trees in areas of Charlotte, York, Kings, Westmorland, Albert, and Restigouche counties.
Eastern tent caterpillar *Malacosoma americanum* (F.)	Apple Pin cherry Miscellaneous hardwood bushes	Maritime Provinces	Defoliation widespread and often severe in many areas in southern half of New Brunswick and in parts of Kings, Hants, and Inverness counties in Nova Scotia. In New Brunswick, insect common in some areas of forest tent caterpillar outbreak. High egg-mass counts in southwestern Charlotte County, N.B., indicate further defoliation in 1981.
Elm leafminer *Fenusa ulmi* Sund.	English elm	Maritime Provinces	Foliage browning severe and widespread at Amherst, Earltown, Halifax, Liverpool, Parrsboro, Pictou, River John, Truro, and Windsor, N.S.; at Charlottetown, Montague, Murray River, Richmond, and Summerside, P.E.I.; and at Dorchester, N.B. Moderate browning at Kentville, Wolfville, Annapolis Royal, Bedford, Bridgetown, Eureka, Lower Economy, and Stellarton, N.S.; and at Baie-Verte and Sackville, N.B. Trees at Dorchester, N.B., deteriorating from years of repeated attacks.
European pine sawfly *Neodiprion sertifer* (Geoff.)	Austrian pine Scots pine Red pine	Nova Scotia	First confirmed record from ornamental trees at Little Harbour, Pictou County, and at Truro, Colchester County.
European pine shoot moth *Rhyacionia buoliana* (Schiff.)	Red pine Scots pine	Nova Scotia; Prince Edward Island	Because of exceptionally good growth of new shoots, damage in plantations "appeared" reduced from previous levels. However, insect numbers remained high, infestations continued in 1980, and insect remains a serious pest.

Insect or Disease	Host(s)	Locality	Remarks
Fall cankerworm *Alsophila pometaria* (Harr.)	Apple Elm Oak	Nova Scotia; New Brunswick	Light to moderate defoliation of apple at North East Margaree, Inverness County, N.S., of elm and oak at Fredericton, N.B., and in association with winter moth and bruce spanworm of apple at West Paradise and at Middleton, Annapolis County, N.S. Few trees involved in all cases.
Frost damage	Coniferous and deciduous species	Maritime Provinces	Late frost killed new shoots in widely separated areas. Most significant damage occurred in a 5-ha balsam fir Christmas tree demonstration area at Village-St-Laurent, Gloucester County, N.B. Both hardwood and softwood species affected in parts of Nova Scotia. Frost damage minimal on Prince Edward Island.
Globose gall rust *Endocronartium harknessii* (J.P. Moore) Y. Hirat.	Jack pine Scots pine	New Brunswick	Seventy-five percent of the lower branches infected in a small Scots pine plantation at Rexton, Kent County. Galls numerous on branches of a few jack pine at Berryton, Albert County, and at Tracadie, Gloucester County. A few small trees and numerous small branches on other jack pine killed at Kouchibouguac National Park.
Greenstriped mapleworm *Dryocampa rubicunda rubicunda* (F.)	Beech White birch Red maple	Maritime Provinces	Moderate defoliation of red maple at Malakoff, Westmorland County, N.B., and severe defoliation of individual trees in Chignecto Game Sanctuary, Cumberland County, N.S. Outbreak collapsed in Prince County, P.E.I. The area of infestation by greenstriped mapleworm in combination with pinkstriped oakworm much reduced in New Brunswick from 1979 levels. Moderate or severe defoliation by these two insects near Magaguadavic Lake, McDougall Lake, Queens Lake, and Caribou Lake in southwestern New Brunswick on a total of 1 500 ha. At Caribou Lake, defoliation occurred for 4th consecutive year, and tree mortality and crown dieback common on red maple.
Hemlock looper *Lambdina fiscellaria fiscellaria* (Guen.)	Coniferous species	Maritime Provinces	Populations remained very low throughout.
Ink spot *Ciborinia whetzelii* (Seaver) Seaver	Trembling aspen	Prince Edward Island; New Brunswick	Severe discoloration on a few trees in Prince Edward Island. Disease present throughout central and northern New Brunswick but few leaves affected.
Larch casebearer *Coleophora laricella* (Hbn.)	Tamarack	Maritime Provinces	Severe or moderate needle browning in parts of York, Sunbury, Queens, Westmorland, and Northumberland counties, N.B., and in Yarmouth, Digby, Annapolis, Colchester, Halifax, and Inverness counties, N.S. Populations increasing and light browning resulted from feeding in many stands in eastern and southern New Brunswick, western Nova Scotia, and throughout Prince Edward Island.
Larch sawfly *Pristiphora erichsonii* (Htg.)	Tamarack	Maritime Provinces	Populations declined to lowest levels since 1955. Only a trace of defoliation in a few areas in southwestern Nova Scotia.
Maple leafroller *Cenopis acerivorana* MacK.	Red maple Sugar maple	Maritime Provinces	More common than in previous years in eastern Nova Scotia and western Prince Edward Island. Populations lower in New Brunswick. Considered a significant factor in general decline of maples.
Mountain-ash sawfly *Pristiphora geniculata* (Htg.)	Mountain-ash	Maritime Provinces	Defoliation severe on scattered trees in parts of York, Kent, Albert, and Westmorland counties, N.B., but variable in many areas of Nova Scotia and throughout Prince Edward Island.

Insect or Disease	Host(s)	Locality	Remarks
Needle rust *Coleosporium asterum* (Diet.) Syd.	Jack pine	New Brunswick	Infection ranged from very light to severe (37% moderate to severe) on 95% of trees in an 8-ha, 4-year-old plantation at Canaan, Kings County.
Pine bark adelgid *Pineus strobi* (Htg.)	Eastern white pine	Maritime Provinces	Insect present in 37 of 40 locations surveyed. Insect populations low in all areas. Trees showed no evidence of reduced vigor.
Pine tortoise scale *Toumeyella parvicornis* (Ckll.)	Jack pine Red pine	New Brunswick	Infestation in the provenance plantations at Despres Lake, Northumberland County continued. In a jack pine plantation there, 5% of the trees are dead and 84% infested, of which 71% have at least 70% of the crown affected.
Pinkstriped oakworm *Anisota virginiensis virginiensis* (Drury)	Beech White birch Red maple	New Brunswick	Occurred in infestations mixed with greenstriped mapleworm. *See also:* Greenstriped mapleworm.
Red pine sawfly *Neodiprion nanulus nanulus* Schedl	Red pine Eastern white pine	Nova Scotia; Prince Edward Island	Defoliation severe on red pine and light on white pine understory over about 4 ha at Mt. William, Pictou County, N.S. Few other localized outbreaks in Nova Scotia and Prince Edward Island.
Roadside salt damage	Coniferous species	Maritime Provinces	Reddening of needles of conifers, mostly red pine and eastern white pine, close to roads where salting is carried out during winter.
Root collar weevils *Hylobius* spp.	Eastern white pine Jack pine Red pine Scots pine Colorado blue spruce	Maritime Provinces	In New Brunswick, damage and some mortality occurred in jack pine plantations in St. John, Albert, and Sunbury counties; in Nova Scotia, a few Scots pine died in Inverness County and a few white pine in Annapolis County. At Brookvale, Queens County, P.E.I., more than half the trees in a small (less than 1 ha) red pine plantation infested and in very poor condition. Colorado blue spruce infested at Port Hill, Prince County, P.E.I.
Satin moth *Leucoma salicis* (L.)	Willow Silver poplar	Maritime Provinces	Defoliation of mostly ornamental silver poplar trees to various degrees throughout much of the three provinces. Outbreak in Kent County, N.B., on trembling aspen in natural stands reported in 1979 did not continue. Late summer leaf skeletonizing indicates further defoliation in numerous areas in 1981.
Secondary stem insects Sawyer beetles *Monochamus* spp. Bark weevils *Pissodes* spp.	Balsam fir Spruce Jack pine	Maritime Provinces	Important agents in the primary stages of deterioration of dead and dying trees. However, tree mortality can occur when populations increase and the insects attack living trees repeatedly. Such mortality was recorded in 1980. Particularly noteworthy was the mortality of balsam fir caused by bark weevils on Cape Breton Island, N.S., and by sawyer beetles and weevils in Victoria County, N.B.
Spring cankerworm *Paleacrita vernata* (Peck)	Elm	Nova Scotia	Outbreak in Hants County reported in 1979 collapsed. Defoliation only on a few trees near Middleton, Annapolis County.
Spruce bud midge *Rhabdophaga swainei* Felt	Black spruce White spruce	Maritime Provinces	Populations generally low except in isolated areas of Victoria, Charlotte, Queens, and Gloucester counties, N.B. At Veneer Siding, Victoria County, N.B., 691 buds/100 m^2 killed in a black spruce plantation.
Spruce coneworm *Dioryctria reniculelloides* Mut. & Mun.	Balsam fir Black spruce Red spruce White spruce	Maritime Provinces	Insect present at low levels throughout.

Insect or Disease	Host(s)	Locality	Remarks
Storm damage (summer)	Coniferous and deciduous species	Prince Edward Island; Nova Scotia	High winds on August 16 carrying ocean salt caused severe browning of all vegetation along northern coast of Prince Edward Island, most noticeably in Stanhope Beach area of Prince Edward Island National Park, and at St. Eleanors and Belmont, Prince County. Same storm affected, to a lesser degree, coastal areas of Pictou, Inverness, and Victoria counties, N.S.; Birch foliage discolored on Cape Breton Highlands, and birch and poplar in Halifax County, N.S.
Storm damage (winter)	Trembling aspen Balsam fir Black spruce	Prince Edward Island	Freezing rain, snow, and wind on November 18 broke stems, branches, and pushed trees over to 30 to 45° angle in pockets in southeast Queens and Kings counties.
Swaine jack pine sawfly *Neodiprion swainei* Midd.	Jack pine	Nova Scotia	Outbreak in the Chignecto Game Sanctuary, Cumberland County, collapsed, probably as a result of spraying in 1979.
White pine weevil *Pissodes strobi* (Peck)	Norway spruce Red spruce White spruce Eastern white pine Jack pine Red pine Scots pine	Maritime Provinces	N.S. 51.4% of 325 trees at 12/12 locations damaged by the insect. N.B. 41.0% of 325 trees at 11/12 locations. P.E.I. 3.5% of 85 trees at 3/3 locations. In New Brunswick up to 56% of white spruce, and up to 24% of red spruce also damaged. Other hosts also attacked in numerous locations.
Willow blight *Venturia saliciperda* Nuesch	Willow	Maritime Provinces	Severe or moderate foliage browning over much of mainland Nova Scotia, Prince County, P.E.I., and St. John, Kent, and Victoria counties, N.B. Disease intensity in New Brunswick somewhat reduced from 1979 levels.
Willow flea weevil *Rhynchaenus rufipes* (Lec.)	Hybrid poplar Silver poplar Willow	Maritime Provinces	Severe browning at many locations in Victoria, Carleton, York, Charlotte, Sunbury, St. John, and Westmorland counties in New Brunswick; Annapolis, Hants, Halifax, Colchester, Pictou, Antigonish, and Guysborough counties in Nova Scotia; and throughout Prince Edward Island. Less severe browning common in these and other counties.
Winter moth *Operophtera brumata* (L.)	Apple Red oak	Nova Scotia; Prince Edward Island	In Nova Scotia, mixed populations of winter moth and Bruce spanworm caused moderate defoliation at Mochelle, Annapolis County, and light to moderate defoliation in other parts of the county. Severe defoliation in 1979 at Abercrombie, Pictou County, declined to light in 1980. Defoliation of apple in areas of Pictou and Antigonish counties was moderate, a reduction from severe in 1979. Limited infestations also in Hants, Yarmouth, and Lunenburg counties. Apple moderately defoliated in Queens County, P.E.I. *See also:* Fall cankerworm.
Yellowheaded spruce sawfly *Pikonema alaskensis* (Roh.)	Black spruce Red spruce White spruce Colorado blue spruce	Maritime Provinces	Incidence of defoliation higher in Nova Scotia than in 1979. Severe or moderate defoliation on single or small groups of trees at many locations in the eastern half of the mainland. Tree mortality continued at Wentworth Centre, Cumberland County, N.S. In New Brunswick, population lower at Upham, Kings County, than in 1979 and defoliation only light in the 110-ha area of black spruce. Defoliation in Charlotte County on white spruce and other areas as well. In Prince Edward Island, insect observed in two areas of Prince County but defoliation negligible.

Other Insects and Diseases

Quebec Region

Insect or Disease	Host(s)	Locality	Remarks
Ambermarked birch leafminer *Profenusa thomsoni* (Konow)	White birch	Western, central, and eastern Quebec	Localized infestations of moderate and severe defoliation occurred within a band 150 km wide extending from Abitibi Census Division in the west to the tip of the Gaspé Peninsula in the east.
Arborvitae leafminer *Argyresthia thuiella* (Pack.)	Eastern white cedar	Huntingdon, Châteauguay, Saint-Jean, Missisquoi, and Shefford census divisions	Defoliation ranging from 40 to 100% in numerous locations.
Armillaria root rot *Armillaria mellea* (Vahl ex Fr.) Kummer	Balsam fir	Province wide	From 15 to 35% of the trees affected in stands severely defoliated by the spruce budworm.
Aspen leafminer *Phyllocnistis populiella* (Cham.)	Trembling aspen	North shore of St. Lawrence River	General increase in populations; up to 85% leaf mining.
Beech bark disease *Beech scale* *Cryptococcus fagisuga* Lind. Nectria canker *Nectria coccinea* var. *faginata* Lohm., Wats. & Ayers	Beech	Southern and eastern Quebec	Special survey conducted in 1980. Known distribution of beech scale extended 80 km westward and now occurs in Eastern Townships south of Montreal.
Birch casebearer *Coleophora serratella* (L.)	Birch	Eastern half of province	Insect abundant. Moderate or severe defoliation in some areas. Gradually spreading westward.
Ceratocystis canker *Ceratocystis fimbriata* Ell. & Halst.	Trempling aspen	Forillon National Park in Gaspé-Est Census Division	An eastward extension of the known distribution of this disease in Quebec.
Jack pine sawfly *Neodiprion pratti banksianae* Roh.	Jack pine	Gatineau Census Division	Defoliation up to 40% at Kazabazua.
Frost damage	Balsam fir	In and around Mont-Tremblant and Laurentides parks	An average of 50% of buds killed on 75 to 100% of trees.
	Black spruce White spruce	Province wide	Light damage in natural stands of black spruce and in plantations of white spruce; 90% of buds killed on 30 000 black and white spruce in a plantation in Labelle.
	Sugar maple	Province wide	Severe damage occurred over 130 000 ha in stands above 500 m in altitude in the Appalachian Mountains.
	Trembling aspen White birch Red maple Balsam poplar	Abitibi and Temiscamingue census divisions	Moderate damage to birch and maple and severe damage to other species.
	Black ash	Labelle Census Division	From 50 to 90% of foliage affected on 80 to 100% of trees within 50 km of Mont-Laurier.
Leaf blight *Linospora tetraspora* G.E. Thompson	Balsam poplar	Sunny-Bank, Gaspé-Est Census Division; Saint-Omer, Bonaventure Census Division; Val-Limoges, Labelle Census Division	Severe infections; 80 to 100% of foliage affected on 80% of trees.
Leaf rust *Melampsora medusae* Thuem.	Hybrid poplar	Lotbinière and Témiscouata census divisions	Severity decreased from 1979. At Villeroy, 30% of the foliage on 90% of the trees was affected; at Lac Dole Reserve, 12% of the foliage on 70% of the trees affected.
Nectria canker *Nectria galligena* Bres.	Hybrid poplar	Nicolet Census Division	Occurred in 11-year-old plantation at Nicolet, particularly on hybrids with *Populus trichocarpa*.

Insect or Disease	Host(s)	Locallty	Remarks
Pales weevil *Hylobius pales* (Hbst.)	Scots pine	Compton Census Division	Moderate to severe attack in plantation of 50 000 trees at Moes-River and moderate attack in plantation at Martinville.
Pine bark adelgid *Pineus strobi* (Htg.)	Eastern white pine	Central and southern Quebec	Moderate to severe attack on thousands of seedlings in provincial government nurseries in Berthierville, Victoriaville, and Saint-Jean-des-Piles.
Pine needleminer *Exotelia pinifoliella* (Cham.)	Jack pine	Central and southern Quebec	Severe infestations in some plantations.
Potebniamyces canker *Potebniamyces coniferarum* (Hahn) Smerlis	Eastern white pine	Arthabaska Census Division	Several hundred seedlings out of 575 000 killed in the Victoriaville Nursery by this uncommon disease.
Redheaded pine sawfly *Neodiprion lecontei* (Fitch)	Red pine	Lower Outaouais region	Spray program with a polyhedrosis virus carried out in 12 plantations. In 3 consecutive years, this program has virtually eliminated the insect.
		Southern Quebec	Of 1 477 pine plantations visited, 67 were found to be infested along the St. François River.
Red pine needle midge *Thecodiplosis piniresinosae* Kearby	Red pine	Terrebonne Census Division	Moderate browning in plantation on Mt. Tremblant (836 m in altitude).
		Stanstead Census Division	Moderate attack on half of 2 000 trees in plantation at Saint-Herménégilge.
Swaine jack pine sawfly *Neodiprion swainei* Midd.	Jack pine	Champlain Census Division	Fifty percent defoliation over 3 000 ha near Lake Cousacouta.
White pine blister rust *Cronartium ribicola* J.C. Fischer ex Rabh.	Eastern white pine	Frontenac Census Division	Ten percent of the trees killed and more than 35% of residual living trees infected in a 12-year-old plantation of 2 000 trees at Notre-Dame-des-Bois.
White pine weevil *Pissodes strobi* (Peck)	Scots pine	Southwestern Quebec	Eight and 40% of trees affected in plantations of 30 000 and 2 000 trees respectively.
	Eastern white pine	Pontiac, Gatineau, Labelle, and Papineau census divisions	Light to severe attacks; 60% of trees affected in a 5-ha stand at Notre-Dame-du-Laus.
		La Tuque, Champlain Census Division	Thirty-five percent of trees affected in natural stand; 25% of trees affected in a plantation of 500 trees.
	Black spruce	Abitibi and Témiscamingue census divisions	From 4 to 10% of trees affected in many locations.
	Norway spruce	Champlain, Compton, and Beauce census divisions	Plantations at La Mauricie National Park (2 500 trees), Bastican (1 600), East-Angus (150 000), and Armstrong (4 100) were infested at the level of 90, 50, 50, and 60% respectively.
Yellowheaded spruce sawfly *Pikonema alaskensis* (Roh.)	Black spruce	Labelle Census Division and La Mauricie National Park	Defoliation from 40 to 80% in natural stands or on ornamental trees.
		La Vérendrye Park	Numerous small infestations causing 10 to 90% defoliation, averaging 40-50%.

Other Insects and Diseases

Ontario Region

Insect or Disease	Host(s)	Locality	Remarks
Ambermarked birch leafminer *Profenusa thomsoni* (Konow)	White birch	Geraldton District	Severe browning.
American aspen beetle *Gonioctena americana* (Schaef.)	Trembling aspen	Northern Ontario; Algonquin Provincial Park	Moderate to severe defoliation in scattered areas.
Annosus root rot *Fomes annosus* (Fr.) Karst.	Red pine	Central Region	Newly detected infection centers in a merchantable plantation in Blenheim Township. Scattered mortality with heavy damage on 1.6 of the 8 ha.
Aspen casebearer *Coleophora innotabilis* Braun.	Balsam poplar	Caledon Township, Maple District; West Gwillimbury Township, Huronia District	Very heavy infestations.
Aspen leaf blotchminer *Lithocolletis ontario* Free.	Trembling aspen	Northern Ontario; Algonquin Region	Population levels fluctuated. Light to heavy foliar damage.
Aspen leafroller *Pseudexentera oregonana* Wlshm.	Trembling aspen	Province wide	Declining populations in northern Ontario. Light to moderate populations throughout southern Ontario.
Aspen twinleaf tier *Enargia decolor* (Wlk.)	Trembling aspen	Temagami, Parry Sound, and Bracebridge districts	Moderate to severe defoliation.
Balsam fir sawfly *Neodiprion abietis* complex	Balsam fir	Northern Ontario; Eastern and Algonquin regions	Light to moderate defoliation.
Balsam poplar leafblotch miner *Lithocolletis nipigon* Free.	Balsam poplar	Thunder Bay District	High numbers recurred.
Balsam twig aphid *Mindarus abietinus* Koch	White spruce	Wingham District	Moderate infestations.
Birch leafminer *Fenusa pusilla* (Lep.)	White birch	Northwestern Ontario	Generally low numbers.
		Thunder Bay	Heavy infestation in and around city.
Birch skeletonizer *Bucculatrix canadensisella* Cham.	White birch	Fort Frances, Blind River, and Chapleau districts	Increased populations with moderate defoliation.
Bronze birch borer *Agrilus anxius* Gory	White birch	Red Lake District	Serious damage and moderate mortality throughout 19 500 ha of forest.
Brown spot needle blight *Scirrhia acicola* (Dearn.) Siggers	Mugho pine	Sauble Falls Provincial Park, Owen Sound District	Defoliation found on three trees. First record of this fungus in Ontario and the first record on Mugho pine.
Cedar leafminers *Argyresthia aureoargentella* Brower, with *A. canadensis* Free., *A. thuiella* (Pack.), and *Pulicalvaria thujaella* (Kft.)	Eastern white cedar	Southern Ontario	Populations increasing except in Algonquin Region. Twig and top mortality common, with tree mortality near Owen Sound.
Conifer-aspen rust *Melampsora medusae* Thuem.	Trembling aspen Tamarack Hybrid poplar	Northeastern and Southwestern regions	Trace levels with occasional high foliar damage on certain hybrid poplar clones.
Cytospora canker *Leucostoma kunzei* (Fr.) Munk	Spruce	Province wide	Damaged spruce planted as ornamentals; most severe on blue spruce.
Dieback of pine *Cenangium ferruginosum* (Fr.) Fr.	Jack pine	Central Region	Occurrence at low levels.

Insect or Disease	Host(s)	Locality	Remarks
Eastern blackheaded budworm *Acleris variana* (Fern.)	White spruce Black spruce Blue spruce Hemlock	Huronia and Aylmer districts	Common, light to heavy infestations.
Eastern dwarf mistletoe *Arceuthobium pusillum* Pk.	Black spruce	Province wide	Common cause of witches' brooms throughout the range of its host.
Eastern pine shoot borer *Eucosma gloriola* Heinr.	Jack pine Red pine Eastern white pine	Province wide	Low numbers persist in the northwest, but northeastern, central, and southern Ontario suffered heavy damage with southwestern Ontario experiencing low levels.
Eastern spruce gall adelgid *Adelges abietis* (L.)	White spruce	Aylmer and Simcoe districts	Common.
Eastern tent caterpillar *Malacosoma americanum* (F.)	Choke cherry Pin cherry	Southern Ontario	Common on roadside trees and ornamentals.
Elm lace bug *Corythuca ulmi* O. & D.	White elm	Wilberforce Township, Pembroke District	Heavy damage.
Elm leafminer *Fenusa ulmi* Sund.	White elm	Pembroke and Cornwall districts	Moderate damage to roadside trees.
European fruit lecanium *Lecanium corni* Bouché	Red oak	McDougall Township, Parry Sound District	Common.
European pine sawfly *Neodiprion sertifer* (Geoff.)	Red pine Scots pine Mugho pine	Sault Ste. Marie, Cornwall, Napanee, Tweed, Pembroke, Lindsay, and Chatham districts	Increased and high populations at these locations. Elsewhere populations remained stable at low levels.
European pine shoot moth *Rhyacionia buoliana* (Schiff.)	Red pine Scots pine	South of Georgian Bay	Several scattered areas suffered heavy infestation.
European spruce sawfly *Gilpinia hercyniae* (Htg.)	White spruce	Mather Township, Fort Frances District	Low numbers.
Eutypella canker *Eutypella parasitica* Davidson & Lorenz	Sugar maple	Southwestern Region	Special survey of maple decline plots indicate 7% of sugar maple in Owen Sound District affected.
Fall cankerworm *Alsophila pometaria* (Harr.)	Manitoba maple	Pembroke and Cambridge districts	Heavy damage to shade trees.
Fall webworm *Hyphantria cunea* (Drury)	Hardwoods	Fort Frances District	Single scattered colonies.
		North Bay District	Moderate infestation expanding.
		Algonquin Provincial Park and Eastern Region	Low to moderate numbers.
		Central and Southwestern regions	Increasing numbers and severe defoliation throughout most of area.
Frost damage	Various hardwoods and softwoods	Throughout most of province	Damage was most severe in Northern and Northeastern regions.
Greenstriped mapleworm *Dryocampa rubicunda rubicunda* (F.)	Red maple Sugar maple	Blind River District	Marked increase in population levels and pockets of heavy defoliation.
Hemlock looper *Lambdina fiscellaria fiscellaria* (Guen.)	Hemlock	Minden and Bancroft districts	Low levels of larvae in previously severely infested trees.

Insect or Disease	Host(s)	Locality	Remarks
Jack pine budworm *Choristoneura pinus pinus* Free.	Scots pine Jack pine	Northwestern and southern Ontario	Population increase at Kenora failed to materialize. Light infestations only in Maple and Huronia districts and on Pelee Island.
Jack pine sawflies			
Neodiprion pratti banksianae Roh.	Jack pine	Sioux Lookout, Chapleau, Huronia, and Maple districts	Light infestations.
Neodiprion pratti paradoxicus Ross	Jack pine	Pembroke District	Increasing and heavy populations caused major defoliation. Light to severe defoliation throughout district.
Jack pine tip beetle *Conophthorus banksianae* McP.	Jack pine	Northern Ontario	Common, low to high populations in many plantations with conspicuous damage.
Larch casebearer *Coleophora laricella* Hbn.	Tamarack European larch	Province wide	Pockets of low populations throughout north. Widespread with pockets of heavy to severe defoliation throughout southern Ontario.
Larch sawfly *Pristiphora erichsonii* (Htg.)	Tamarack European larch	Province wide	Generally low to moderate populations in northern Ontario with pockets of increasing damage. New distribution record at Otoskwin River. In southern Ontario populations light with increases in the Central and Southwestern regions.
Large aspen tortrix *Choristoneura conflictana* (Wlk.)	Trembling aspen	Espanola, Parry Sound, Bracebridge, and Minden districts	Moderate to severe defoliation; 2 500 ha severely defoliated for 3rd year at Parry Sound.
Linden looper *Erannis tiliaria* (Harr.)	Basswood	Tavistock, Aylmer District	Low populations, but buildup expected in 1981.
Maple leafcutter *Paraclemensia acerifoliella* (Fitch)	Sugar maple	Cambridge, Napanee, Brancroft, and Maple districts	Light to heavy damage. Up to 100% defoliation.
Maple leafroller *Cenopis acerivorana* MacK.	Red maple Sugar maple	Sault Ste. Marie District; southern Ontario	High populations.
Maple webworm *Tetralopha asperatella* (Clem.)	Sugar maple	Central Region	Light to moderate defoliation in scattered areas with one instance of heavy defoliation. Implicated in dieback situations in the northern United States.
Mountain-ash sawfly *Pristiphora geniculata* (Htg.)	Mountain-ash	Province wide	High populations throughout much of northern Ontario. New record at French Lake, 65 km west of previous boundary. Light to heavy defoliation in southern Ontario.
Northern pine weevil *Pissodes approximatus* Hopk.	Eastern white pine	Simcoe District	Trees heavily infested.
Oak leafblotch miner *Lithocolletis hamadryadella* Clem.	Bur oak Red oak	Eastern Region	Marked increase in damage levels; moderate to severe defoliation.
Orangestriped oakworms			
Anisota finlaysoni Riotte	Bur oak	Napanee and Cambridge districts; Toronto	Populations up markedly.
A. senatoria (J.E. Smith)	White oak	Southwestern Region to Pt. Pelee National Park	Light to moderate infestations.
Oystershell scale *Lepidosaphes ulmi* (L.)	Beech Dogwood	Owen Sound and Lanark districts	Heavy infestations.
Pine bark adelgid *Pineus strobi* (Htg.)	Eastern white pine	Southwestern Ontario	Common throughout.

Insect or Disease	Host(s)	Locality	Remarks
Pine false webworm *Acantholyda erythrocephala* (L.)	Red pine Jack pine Scots pine Eastern white pine	Pembroke to Parry Sound and Owen Sound, and south to Lake Ontario and Elmira	Population levels generally increasing; older infestations declining.
Pine needle midge *Contarinia baeri* (Prell)	Scots pine	Southern Ontario	First record in Huronia District. Low populations in Southwestern Region with pockets of higher levels in the Central and Algonquin regions.
Pine spittlebug *Aphrophora cribrata* (Wlk.)	Scots pine Eastern white pine	Southern Ontario, north to Blind River District	Light to severe damage scattered throughout; populations declined at Espanola.
Pine tortoise scale *Toumeyella parvicornis* (Ckll.)	Jack pine Scots pine	Parry Sound, Algonquin Park, and Tweed districts	Heavy infestations with some tree mortality of jack pine. Moderate infestations on Scots pine.
Poplar gall mites *Aceria* near *dispar* (Nal.)	Trembling aspen	Atikokan and Thunder Bay districts	Heavy, widespread damage.
Eriophyes sp.		Northern Region	Small pockets of heavy infestation.
Poplar leaf beetle *Chrysomela walshi* Brown	Balsam poplar	Northern Region	Populations remain high with severe discoloration and damage to trees.
Redheaded jack pine sawfly *Neodiprion virginianus* complex	Jack pine	Northwestern and North Central regions	Declined and low populations.
		Northern and Northeastern regions	Pockets of severe defoliation.
Redheaded pine sawfly *Neodiprion lecontei* (Fitch)	Red pine Jack pine	Southern Ontario	Generally low populations with pockets of severe defoliation in southeastern Ontario.
		Sault Ste. Marie District	Heavy damage and population increase.
Red pine cone beetle *Conophthorus resinosae* Hopk.	Red pine	Temagami District	Heavily infested mature and overmature stands. Particularly heavy damage on shorelines.
Red pine sawfly *Neodiprion nanulus nanulus* Schedl	Red pine Jack pine	Province wide	Low populations and scattered colonies.
Root rots			
Armillaria mellea (Vahl ex Fr.) Kummer	Jack pine Red pine Scots pine	Province wide	Common at light damage levels in young plantations.
Cylindrocladium floridanum Sob. & Seymour	Black spruce	Midhurst Nursery, Huronia District	Mortality of seedlings at 80% level in one compartment of black spruce.
Rhizina undulata Fr.	Conifers	Province wide	Fruiting bodies common following fire on upland sites previously occupied by coniferous forests.
Satin moth *Leucoma salicis* (L.)	Lombardy poplar Silver poplar	Eastern Region	Populations and distribution continue to increase.
Sawyer beetles *Monochamus* spp.	Black spruce Jack pine	Northwestern, North Central, and Northern regions	Damage caused by feeding of adult beetles detected over 200 ha, generally in or around cutover areas. Tree mortality occurred over 135 ha.
Spruce bud moth *Zeiraphera canadensis* Mut. & Free.	White spruce Norway spruce Chinese spruce	Southern half of North Central and Northwestern regions	Scattered pockets of heavy defoliation of open growing trees and ornamentals.
		West and South of Toronto	Medium infestations.

Insect or Disease	Host(s)	Locality	Remarks
Spruce coneworm *Dioryctria reniculelloides* Mut. & Mun.	White spruce Black spruce	Western half of North Central, Northern, and Northeastern regions; Cambridge District	Insect present in low to moderate numbers.
Swaine jack pine sawfly *Neodiprion swainei* Midd.	Jack pine	Temagami District, Northeastern Region	Two heavy infestations, 325 and 450 ha in size, causing mortality in the Elk Lake Management Unit.
Sweetfern blister rust *Cronartium comptoniae* Arth.	Jack pine	Throughout host range	Common in scattered plantations, causing moderate damage on younger trees.
Walnut caterpillar *Datana integerrima* G. & R.	Black walnut Hickory Butternut	Central and Southwestern regions	Population increased with heavy damage over most of area.
White pine blister rust *Cronartium ribicola* J.C. Fischer ex Rabh.	Eastern white pine	Throughout host range	Common at the trace levels; occasionally causing severe mortality.
White pine cone beetle *Conophthorus coniperda* (Sz.)	Eastern white pine	Angus, Huronia District	Heavily infested white pine cones.
White pine weevil *Pissodes strobi* (Peck)	Eastern white pine Jack pine	Province wide	Populations were lower in northern Ontario, but increased toward the east and south.
Woolly larch aphid *Adelges strobilobius* (Kltb.)	Black spruce	Ignace District; Shoals Provincial Park	Light infestation. Heavy damage on understory trees.
Yellowheaded spruce sawfly *Pikonema alaskensis* (Roh.)	White spruce Black spruce Blue spruce	Northern Ontario	Pockets of severe defoliation with tree mortality in northwestern Ontario.
		Southern Ontario	Pockets of moderate to severe damage with low numbers in the southwestern portion.
Zimmerman pine moth *Dioryctria zimmermani* complex	Red pine Austrian pine Scots pine	Huronia, Cambridge, and Maple districts	More pockets of heavy infestation than in 1979.

Other Insects and Diseases

Western and Northern Region

Insect or Disease	Host(s)	Locality	Remarks
Birch leafminers *Fenusa pusilla* (Lep.) *Heterarthrus nemoratus* (Fall.) *Profenusa thomsoni* (Konow)	Birch species	Urban centers	High populations in most large centers.
Bruce spanworm *Operophtera bruceata* (Hulst)	Trembling aspen	Alberta	Predominant cause of defoliation in some areas in association with forest tent caterpillar and other defoliators.
Chemical injury	All species	All areas	Mortality and injury to non-target trees and shrubs by agricultural chemicals (herbicides, soil sterilants) are increasing each year. One of the most important problems in urban centers.
Comandra blister rust *Cronartium comandrae* Pk.	Pine	Alberta	Acceptable but detectable number (ca. 1%) of 2-0 bare root seedlings at the Pine Ridge Tree Nursery infected.
Dwarf mistletoe *Arceuthobium americanum* Nutt. ex Engelm.	Jack pine	Northern Alberta	Large area of heavily infested jack pine forests destroyed by fire in 1979 and 1980. Residual infected trees are a threat to regeneration, and a sanitation program including control burning has been considered by Alberta Forest Service.
Early aspen leafcurler *Pseudexentera oregonana* Wlshm.	Trembling aspen	Alberta; Saskatchewan	Caused significant defoliation in some areas in association with forest tent caterpillar and other defoliators.
European spruce sawfly *Gilpinia hercyniae* (Htg.)	Spruce	Manitoba	Low level of infestation recognized in Moose Lake area.
Fire blight *Erwinia amylovora* (Burr.) Winslow et al.	Apple Cotoneaster Crabapple Hawthorn Mountain-ash Pear	Major urban centers	Slight decrease in infections over 1979. Very common. The most important ornamental tree disease.
Frost damage	All species	All areas	Above-average incidence of winter drying and frost damage in 1980 attributed to low winter precipitation and adverse temperature fluctuations in the spring.
Globose gall rust *Endocronartium harknessii* (J.P. Moore) Y. Hirat.	Lodgepole pine Jack pine	All areas	Extensive rodent damage of rust galls noted in several foothill locations. Recognized as one of most important disease problems of man-made and man-assisted young hard pine forests.
Jack pine budworm *Choristoneura pinus pinus* Free.	Jack pine	Saskatchewan	Defoliation light to moderate in one plantation. Recent epidemics in region collapsed in 1980.
Larch casebearer *Coleophora laricella* Hbn.	Tamarack	Manitoba	Insect was first detected in southeastern Manitoba in 1965. Light damage was recorded in the Marchand and Sprague areas but no significant increases in population or area of distribution.
Larch sawfly *Pristiphora erichsonii* (Htg.)	Tamarack	Northwest Territories; Alberta; Manitoba	Moderate to severe defoliation in several areas in the Northwest Territories. Infestation in foothills west of Edson decreased significantly. Very low population level in Manitoba.
Large aspen tortrix *Choristoneura conflictana* (Wlk.)	Trembling aspen	Alberta	Predominant cause of defoliation over large areas in association with forest tent caterpillar and other defoliators.
		Northwest Territories	Sizeable patches of moderate to severe defoliation probably caused by this species observed in the Slave River area.

Insect or Disease	Host(s)	Locality	Remarks
Linden looper *Erannis tiliaria* (Harr.)	Trembling aspen	Alberta	Abundant at some locations, particularly in Lesser Slave Lake area.
Lodgepole terminal weevil *Pissodes terminalis* Hopping	Pine	Rocky Mountain Foothills	Common in thinned or planted stands.
Needle discoloration	Most conifers	All areas	Higher than usual incidence of needle discoloration and casting of spruce and pine needles. Probably caused by drought conditions in the spring of 1980 or fall of 1979.
Needle miner *Eucordylea starki* (Free.)	Lodgepole pine	Rocky Mountain national parks	Isolated heavy infestations in Kootenay National Park and light infestations in Banff and Yoho national parks.
Pine root collar weevil *Hylobius warreni* Wood	Pine	Rocky Mountain Foothills	One of the most important insects causing mortality in thinned and planted young pine stands. Together with pitch nodule maker (*Petrova* spp.) and armillaria root rot, damage has increased several fold since 1978 in mechanically thinned plots.
Silver leaf *Stereum purpureum* (Pers. ex Fr.) Fr. (= *Chondrostereum p.*)	Mountain-ash Apple Cotoneaster Other species	Urban centers	Especially common on planted trees 15 years or older.
Smaller European elm bark beetle *Scolytus multistriatus* (Marsh.)	Elm	Winnipeg	Small numbers found, confirming presence of beetle in Manitoba.
Spruce gall aphids *Adelges cooleyi* (Gill.) *Pineus similis* (Gill.) *Pineus pinifoliae* (Fitch)	Spruce	All areas	Common on mature and small ornamental plantings. Slight increase in population levels and damage in most areas.
Transplant injury	All species	All areas	Many urban and nursery tree problems attributable to improper planting practice and poor quality planting stock.
Winter drying	All species	All areas	Above-average incidence of winter drying and frost damage in 1980 attributed to low winter precipitation and adverse temperature fluctuations in the spring.
Yellowheaded spruce sawfly *Pikonema alaskensis* (Roh.)	Spruce	Manitoba	Moderate to severe defoliation recorded on several young roadside white spruce in Duck Mountain Provincial Park and near Goose, Bird, and Long lakes. Elsewhere, low populations fairly common.

Other Insects and Diseases

Pacific and Yukon Region

Insect or Disease	Host(s)	Locality	Remarks
Armillaria root rot *Armillaria mellea* (Vahl ex Fr.) Kummer	Lodgepole pine Western white pine	Clearwater; Vavenby	Associated with 24 to 28% mortality in stands previously defoliated by sawfly. Elsewhere scattered mortality common.
Bark beetles *Pseudohylesinus granulatus* (Lec.) *P. nobilis* Sw. *P. grandis* Sw.	Amabilis fir	Kelsey Bay, Vancouver Island	Attacked trees weakened by coniferous sawfly.
Black stain root disease *Verticicladiella wagenerii* W.B. Kendr.	Lodgepole pine	Southern British Columbia	Affected 21% of the trees and an additional 12% had died; now known at various coastal and interior locations since first verified in 1976.
Coniferous sawfly *Neodiprion* sp.	Amabilis fir	Kelsey Bay, Vancouver Island	Light feeding at two locations where heavy feeding occurred in 1978 and 1979.
Douglas-fir beetle *Dendroctonus pseudotsugae* Hopk.	Douglas-fir	Throughout British Columbia	Generally light, scattered mortality of weakened or stressed trees.
Douglas-fir needle midges *Contarinia* spp.	Douglas-fir	Columbia and Kootenay valleys	Most 1980 needles infested in localized patches, including many Christmas tree cutting areas.
Douglas-fir pole beetle *Pseudohylesinus nebulosus* (Lec.)	Douglas-fir	Okanagan Valley	Scattered tree mortality associated with excessive logging debris.
Douglas-fir tussock moth *Orgyia pseudotsugata* McD.	Douglas-fir	Okanagan Valley; Kamloops; Hedley	Increased incidence and numbers of larvae in collections and adults in pheromone traps, but defoliation barely discernible. Light and moderate defoliation predicted in 1981 near Hedley.
Dwarf mistletoes *Arceuthobium americanum* Nutt. ex Engelm.	Lodgepole pine	Interior of British Columbia	Widespread and severe in many older stands. Sanitation at harvest or thinning is gradually reducing losses.
A. douglasii Engelm.	Douglas-fir	Okanagan and Kootenay Lake valleys	Infection persists, with heavy brooming in many open growing stands.
A. laricis (Piper) St. John	Western larch	Southeastern British Columbia	Brooming, top-kill, and mortality common.
A. tsugense (Rosend.) G.N. Jones	Western hemlock	Campbell River; Port McNeil	Most understory trees infected. Also common elsewhere in coastal stands.
Engraver beetle *Ips* sp.	Ponderosa pine	Cranbrook; Kimberley	Beetles attacked trees weakened by drought and fire and in recently spaced stands.
European pine shoot moth *Rhyacionia buoliana* Schiff.	Scots pine Austrian pine Mugho pine	Kelowna; Kamloops; Summerland; Vernon	Infested trees continue to be found in ornamental plantings, including 14 at Vernon, the first occurrence since 1976.
Fall webworm *Hyphantria cunea* (Drury)	Deciduous species	Vernon to Shuswap Lake; Vancouver Island; southern British Columbia	Conspicuous on roadside shrubs.
Fir-fireweed rust *Pucciniastrum epilobii* Otth	Amabilis fir Alpine fir	Vancouver Island; Prince George	Severe and widespread infection, with discoloration and loss of current year's foliage.
Larch casebearer *Coleophora laricella* (Hbn.)	Western larch	South-central and southwestern British Columbia	Infestations light to severe throughout most of host range. No tree mortality recorded to date.
Larch needle cast *Hypodermella laricis* Tub.	Western larch	Southeastern British Columbia	Foliar discoloration widespread; often associated with larch casebearer at lower elevations.
Larch sawfly *Pristiphora erichsonii* (Htg.)	Western larch	Fernie; Sparwood	Populations active since 1975 subsided, with only light defoliation in 1980. Parasites were released at three locations.

Insect or Disease	Host(s)	Locality	Remarks
Large aspen tortrix *Choristoneura conflictana* (Wlk.)	Trembling aspen	Prince George; Vanderhoof; Williston Lake; Dawson Creek	Light and moderate defoliation over 48 000 ha; a decrease from 1979.
		Yukon	Moderate and severe defoliation in large patches at Carmacks, Stewart Crossing, and Mayo.
Lodgepole terminal weevil *Pissodes terminalis* Hopping	Lodgepole pine	Williams Lake	Attacks declining, but up to 30% of leaders attacked prior to 1980 in spaced stands.
Maple leaf decline	Broadleaf maple	Vancouver Island and mainland	Cause unknown. Widespread wilting and discoloration of foliage.
Northern pitch twig moth *Petrova albicapitana* (Busck)	Lodgepole pine	Red Rock nursery near Prince George	More than 75% of the trees in a large provenance trial affected.
Pine needle sheathminer *Zelleria haimbachi* Busck	Lodgepole pine Ponderosa pine	Clearwater; Cache Creek; Princeton	Severe defoliation of current growth increased to 5 500 ha, light elsewhere. More than half the branch tips infested near Cache Creek.
Pine root collar weevil *Hylobius warreni* Wood	Lodgepole pine	Clearwater; Nass River	Killed 5% of seedlings and 12-year-old trees in plantations.
Rabbit and rodent damage	Lodgepole pine	Yukon; north central British Columbia	Girdled up to 30% of the young trees at various locations.
Spruce aphid *Elatobium abietinum* (Wlk.)	Sitka spruce	Queen Charlotte Islands	Defoliation of shoreline trees since 1976 caused a few dead tops and trees.
Western balsam bark beetle *Dryocoetes confusus* Sw.	Alpine fir	Central British Columbia	Scattered recently attacked trees common.
Western blackheaded budworm *Acleris gloverana* (Wlshm.)	Alpine fir White spruce	Houston; Smithers	Light defoliation of new growth.
Western hemlock looper *Lambdina fiscellaria lugubrosa* (Hulst)	Western hemlock	Coquitlam Lake	Increasing numbers, but no apparent defoliation and egg counts low.
Winter moth *Operophtera brumata* (L.)	Garry oak Broadleaf maple Willow	Victoria; Sidney	Severe defoliation continued and large moth flights indicate similar conditions for 1981.

Selected Publications and Reports

The following list includes reports and publications produced in 1980 by the staff of the Canadian Forestry Service that may be of interest to readers of this report.

Newfoundland Forest Research Centre

Moody, B.H. 1980. The status of spruce budworm in Newfoundland in 1979. Dep. Environ., Can. For. Serv., Nfld. Forest Res. Cent. Inf. Rep. N-X-190. 36 p.

Schooley, H.O. 1980. An evaluation of the hazard rating system for balsam woolly aphid damage in Newfoundland. Proc. Symp. Hazard rating systems in forest pest management. Athens, GA. 31 July - 1 August, 1980. USDA Forest Serv. Tech. Bull. (in press).

Schooley, H.O. 1980. Damage to black spruce cone crops by the spruce budworm. Dep. Environ., Can. For. Serv., Nfld. Forest Res. Cent. Inf. Rep. N-X-187. 15 p.

Schooley, H.O. 1980. Recognizing outbreaks of the balsam woolly aphid. Woody Points 10(1):10.

Schooley, H.O. 1980. Spruce cone beetle (Anobiidae: *Ernobius* sp.) reduces the natural storage of seed by black spruce *(Picea mariana).* Proc. IUFRO Symp. Forest tree seed storage. Chalk River, Ont. 22-27 September 1980. 13 p. (in press).

Schooley, H.O. 1980. The introduction, spread and occasional resurgence of the balsam woolly aphid in Newfoundland. Proc. 2nd IUFRO Conf. Dispersal of forest insects, evaluation, theory and management implications. Washington State Univ., Pullman, WA. 27-31 August, 1980. pp. 116-127.

Singh, P. 1980. Armillaria root rot in Canadian forests: Status of the disease and research on it. Proc. 5th Int. Conf. Problems of root and butt rot in conifers. IUFRO 1978 Working Party S2.06.01. Hessische Forstliche Versuchsanstalt, Munden. pp. 197-204.

Singh, P.; Dorworth, C.E.; Skilling, D.D. 1980. *Gremmeniella abietina* in Newfoundland. Plant Dis. 64:1117-1118.

Maritimes Forest Research Centre

Kettela, E.G. 1980. A synopsis of results of budworm spraying in New Brunswick in 1980 and a forecast of infestations and hazard for 1981. Marit. Forest Res. Cent. Tech. Note No. 18.

Kettela, E.G. 1980. Spruce budworm infestations in Nova Scotia in 1980 and a forecast for 1981. Marit. Forest Res. Cent. Tech. Note No. 19.

MacLean, D.A. 1980. Vulnerability of fir-spruce stands during uncontrolled spruce budworm outbreaks: a review and discussion. For. Chron. 56:213-221.

Magasi, L.P. 1980. Control of scleroderris canker in small plantations. Marit. Forest Res. Cent. Tech. Note No. 11.

Magasi, L.P.; Titus, F.A.; Kettela, E.G. 1980. Parasitism and biological control. *In* I.W. Varty (chairman). Environmental surveillance in New Brunswick 1978-1979. Effects of spray operations for forest protection. Committee for Environmental Monitoring of Forest Insect Control Operations (EMOFICO). Univ. New Brunswick, Fredericton, N.B.

Miller, C.A.; Greenbank, D.O.; Kettela, E.G. 1980. Utilisation possible de lampes-pièges dans le couvert forestier pour prédire les populations d'oeufs de la Tordeuse des bourgeons de l'Épinette. Serv. can. for., Rev. bim. rech. 36:8-9.

Ostaff, D.P. 1980. Conditions of balsam fir on research plots on Cape Breton Island in the fall of 1980. Marit. Forest Res. Cent. Tech. Note No. 17.

Renault, T.R.; Ostaff, D.P. 1980. Spruce beetle infestations in the Maritimes. Marit. Forest Res. Cent. Tech. Note. No. 21.

Laurentian Forest Research Centre

Benoit, P. 1980. La spongieuse — une menace? Le Progrès forestier. June 1980. pp. 18-19.

Benoit, P. 1980. Moyens de protéger vos arbres contre la spongieuse. Le Progrès forestier. Sept. 1980. pp. 20-21.

Benoit, P. 1980. Trio saccageur dans le sud de la province. Racine 2(2):R14-R15. *In* Forêt conservation 47(3).

Cauchon, R.; Lachance, D. 1980. Recherche de *cryptopycnies* pour un diagnostic précoce de *Gremmeniella abietina.* Can. J. Plant Pathol. 2(4):232-234.

Lachance, D. 1980. Le chancre scléroderrien. Le Progrès forestier. March 1980. pp. 9-11.

Lachance, D. 1980. Le chancre scléroderrien du pin et nous. Racine 2(1): R3-R4. *In* Forêt conservation 47(1).

Lachance, D. 1980. Nos arbres et le pic maculé. Racine 2(2):R15. *In* Forêt conservation 47(3).

Great Lakes Forest Research Centre

Basham, J.T. 1980. Preliminary report on the rate of deterioration of spruce budworm-killed balsam fir, and its relationship to secondary stem insects. Dep. Environ., Can. For. Serv., Great Lakes Forest Res. Cent. Rep. O-X-314. 23 p.

Euale, L.R.; Gardiner, L.M.; Huntley, G.D.; Jago, L.G.; Kondo, E.S. 1980. An integrated Dutch elm disease control program for Sault Ste. Marie. Part III. Dep. Environ., Can. For. Serv., Great Lakes Forest Res. Cent. Rep. O-X-307. 38 p.

Gardiner, L.M.; Webb, D.P. 1980. Tests of chlorpyrifos for control of the North American elm bark beetle (*Hylurgopinus rufipes* Eichh.). Dep. Environ., Can. For. Serv., Great Lakes Forest Res. Cent. Rep. O-X-311. 21 p.

Griffiths, K.J. 1980. A gypsy moth bibliography. Dep. Environ., Can. For. Serv., Great Lakes Forest Res. Cent. Rep. O-X-312. 2 vols. 350 p.

Griffiths, K.J.; Lyons, L.A. 1980. Further releases of *Lophyroplectus luteator* (Hymenoptera: Ichneumonidae), an introduced parasite of *Neodiprion sertifer* (Hymenoptera: Diprionidae). Can. Entomol. 112:421-426.

Gross, H.L.; Ek, A.R.; Patton, R.F. 1980. Comparison of sample rules for estimating jack pine density, basal area, and percentage with sweetfern rust cankers. Can. J. Forest Res. 10:190-198.

Gross, H.L.; Patton, R.F.; Ek, A.R. 1980. Spatial aspects of sweetfern rust disease in northern Ontario jack pine-sweetfern stands. Can. J. Forest Res. 10:199-208.

Gross, H.L.; Syme, P.D. 1980. Results of a special survey of high value jack pine stands in northern Ontario, 1979. FIDS Special Survey #3. Suppl. rep. to regional forest pest results. Great Lakes Forest Res. Cent.

Howse, G.M. 1980. Losses from and control of spruce budworm and other insects in the boreal mixedwood forest. Proc. COJFRC Boreal Mixedwood Symp. Great Lakes Forest Res. Cent. (in press).

Howse, G.M.; Harnden, A.A.; Carrow, J.R. 1980. The 1979 spruce budworm situation in Ontario. Dep. Environ., Can. For. Serv., Great Lakes Forest Res. Cent. Rep. O-X-310. 89 p.

Rose, A.H.; Lindquist, O.H. 1980. Insects of eastern larch, cedar and juniper. Dep. Environ., Can. For. Serv. Tech. Rep. 28. 100 p.

Sanders, C.J., compiler. 1980. A summary of current techniques used for sampling spruce budworm populations and estimating defoliation in eastern Canada. Dep. Environ., Can. For. Serv., Great Lakes Forest Res. Cent. Rep. O-X-306. 33 p. + Appendix.

Stocks, B.J.; Kourtz, P.H.; Todd, J.B. 1980. Satellite mapping of spruce budworm-killed balsam fir in Ontario. Pages 125-128 *in* C.R. Mattice, coordinator. Remote sensing symposium. Dep. Environ., Can. For. Serv., Great Lakes Forest Res. Cent. COJFRC Symp. Proc. O-P-8.

Syme, P.D. 1980. Occurrence of the introduced sawfly, *Acantholyda erythrocephala* (L.) in Ontario. Can. For. Serv. Res. Notes 1:4-5.

Syme, P.D.; Gross, H.L. 1980. Results of a special survey of red pine plantations in southern Ontario. 1979. FIDS Special Survey #2, Suppl. rep. to regional forest pest results. Great Lakes Forest Res. Cent.

Whitney, R.D. 1980. *Polyporus tomentosus* root and butt rot of trees in Canada. Pages 283-297 *in* C.R. Mattice, coordinator. Remote sensing symposium. Dep. Environ., Can. For. Serv., Great Lakes Forest Res. Cent. COJFRC Symp. Proc. O-P-8.

Northern Forest Research Centre

Drouin, J.A. Pesticide field trials on shade and shelterbelt trees in Alberta, 1979. Dep. Environ., Can. For. Serv., North. Forest Res. Cent. Inf. Rep. NOR-X-227.

Ives, W.G.H.; Cunningham, J.C. 1980. Application of nuclear polyhedrosis virus to control Bruce spanworm (Lepidoptera: Geometridae). Can. Entomol. 112:741-744.

Still, G. 1980. Jack pine budworm outbreak in Saskatchewan collapses. Dep. Environ., Can. For. Serv., North. Forest Res. Cent. Forest Manage. Note No. 3.

Pacific Forest Research Centre

Alfaro, R.I.; Pierce, Jr., H.D.; Borden, J.H.; Oehlschlager, A.C. 1980. Role of volatile and nonvolatile components of Sitka spruce bark as feeding stimulants for *Pissodes strobi* Peck (Coleoptera: Curculionidae). Can. J. Zool. 58:626-632.

Alfaro, R.I.; Pierce, Jr., H.D.; Borden, J.H.; Oehlschlager, A.C. 1980. Insect feeding and oviposition deterrents from western red cedar foliage. J. Chem. Ecol. 7:39-48.

Alfaro, R.I.; Borden, J.H. Predation by *Lonchaea corticis* Taylor on the white pine weevil, *Pissodes strobi* Peck. Can. Entomol. 112(1). (in press)

Thomson, A.J.; Van Sickle, G.A. 1980. Estimation of tree growth losses caused by pest activity. Can. J. Forest Res. 10:176-182.

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