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HISTORY OF POPULATION FLUCTUATIONS AND INFESTATIONS OF IMPORTANT FOREST INSECTS IN THE MAINLAND SECTION, VANCOUVER FOREST DISTRICT

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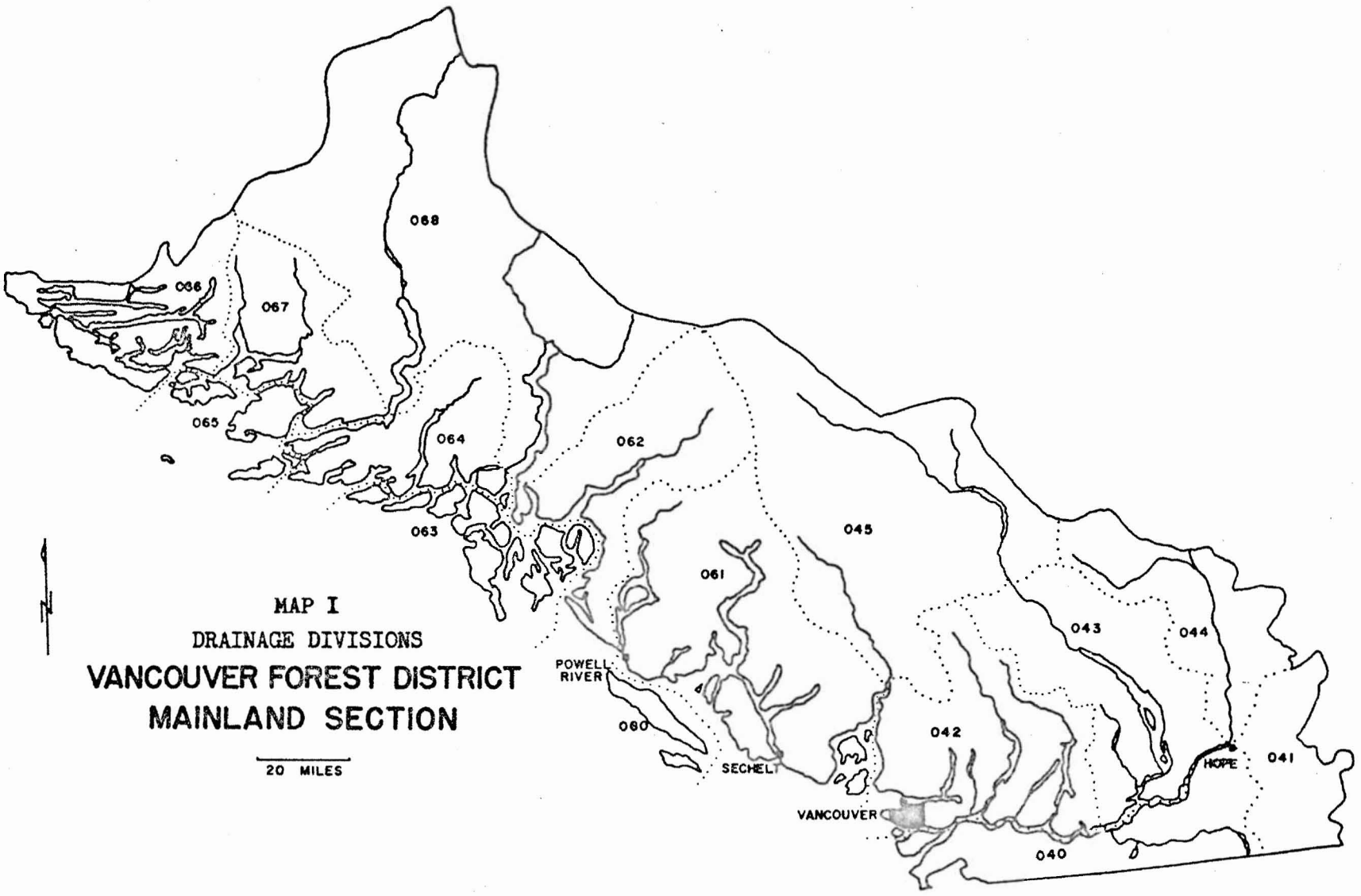

MAP I

DRAINAGE DIVISIONS

VANCOUVER FOREST DISTRICT
MAINLAND SECTION

INTRODUCTION

This report covers a brief history of forest insect populations on the southwestern British Columbia mainland during the last 25-odd years.

It serves to:

1. Designate the species of insects which have caused damage in the past and are presumably capable of causing damage in the future.

2. Record the pattern of population fluctuations.

3. Designate areas that appear to have chronic insect problems.

4. Point out the possibility of damage in different areas by insects, including species not known to have caused damage in the Vancouver Forest District in the past.

Widespread sampling of insect populations began in 1946, with the expansion of the Forest Insect and Disease Survey. Before 1946, surveillance was mainly confined to industrialized areas; therefore, reports of infestations in remote areas were sporadic. Observations have gradually improved due to expanded road systems and through the use of aircraft for surveillance of forest problems.

Logging started before 1900 in low elevation areas in the Lower Fraser Valley. Most mature timber was logged and the land converted to agricultural or industrial purposes, except land reserved for parks, watershed use and a few private timber holdings. However, other low elevation stands in tributary valleys, logged in the early 1900's, were left for forestry use and reseeded naturally. These included the Capilano, Indian, Pitt, Chehalis, Harrison and Chilliwack River valleys. Most mature timber in these areas is confined to high elevations and is rapidly being logged. To a lesser extent, the same applies to forests on the Sechelt Peninsula and mainland inlets. During periods of high looper populations in mature stands, much lower populations were found in surrounding low elevation immature stands than in mature stands at high elevations. However, as the second-growth timber in valleys logged shortly after 1900 reaches semi-maturity, and the habitat changes, these stands may become more susceptible to insect attack.

In summary, major forest insect outbreaks were as follows. Since 1900, western hemlock looper outbreaks have occurred in mature timber from 1911 to 1913 in Stanley Park; 1928 to 1930 in Stanley Park and Indian River Valley, in 1945-46 in Seymour and Indian River valleys, and at Coquitlam Lake in 1969-71. Small infestations of phantom hemlock looper occurred in Queens and Central parks in 1956-57 and in Hope Park in 1957. Large populations of green-striped forest loopers were found in

Stanley Park and in unlogged areas of the Capilano Valley in 1957-58 and in the Mamquam Valley in 1967-68. Saddleback loopers have been commonly found in Stanley Park and in North Vancouver mountains and valleys but have not caused serious damage.

Major outbreaks of blackheaded budworm occurred in hemlock-amabilis fir stands in 1926-30, 1940-41 and 1966-69. There was heavy defoliation but only minor tree mortality. Two large infestations of spruce budworm, 1943-44 and 1953-58, on Douglas-fir in the Lillooet and Fraser River valleys resulted in little tree mortality. However, tree mortality is resulting from a third infestation which began in 1969 and is currently active.

The balsam woolly aphid has caused annual mortality of amabilis fir since its presence was noted in the late 1950's. To date, spruce mortality caused by spruce aphid has been confined to non-forest sites.

Mountain pine beetles killed extensive but undetermined numbers of mature western white pine in the 1940's and 1950's. More detailed records of western white pine and lodgepole pine mortality were made in the 1970's. Periodically the Douglas-fir beetle has killed moderate numbers of trees in the drier portions of the District.

Information in this report was compiled from Annual District Reports, Forest Insect and Disease Survey, British Columbia 1936-1975, unpublished reports 1929-1975, and a variety of published histories of insects in British Columbia.

The numbers of larvae per three-tree beating sample are given in tabular form for most insects that feed singly on foliage in the larval stage. Drainage Divisions are shown on Map 1. Drainages 040-045 represent the portion of the District east of Howe Sound and D.D.'s 060-068 to the west. Host tree abbreviations are shown in Appendix I.

DEFOLIATORS

Western hemlock looper, *Lambdina fiscellaria lugubrosa*

This is the most important insect of the defoliator group in coastal B. C. There have been four known outbreaks which resulted in extensive mortality: 1911-13 in Stanley Park, Vancouver; 1928-30, from west of Howe Sound to Harrison Lake; 1945-47 from Salmon Inlet to Stave Lake, and 1969-71 at Coquitlam Lake. Western hemlock is the preferred host but, during outbreaks, Douglas-fir, amabilis fir, western red cedar and Sitka spruce are also damaged.

Year	Avg no. larvae per positive sample in D.D.[1/]		Remarks
	040-045	060-068	
1911-13			Stanley Park, heavy defoliation, some mortality of wH.
1927			Indian R, large moth flight noted but no defoliation recorded.
1928			1. Indian R, severe defoliation in 2,000 acres of wH, wC, D and gF, 70-80% tree mortality. 2. Alouette L, two areas of defoliation, (a) Gold Cr and (b) SW of Alouette L. 3. Coquitlam L, light defoliation at SW end of lake.
1929			1. Indian R, infestation increased in size but defoliation was lighter. Area sprayed. 2. Alouette L, infestation continued. 800 acres of defoliation at Gold Cr and 320 acres SW of lake. 3. Coquitlam L, 640 acres of defoliation at SW end of lake, resulting in extensive tree mortality and top-killing.

[1/] D.D. = drainage division

Year	Avg no. larvae per positive sample in D.D. 040-045	Avg no. larvae per positive sample in D.D. 060-068	Remarks
			4. Seymour R, moderate to heavy defoliation of wH, wC and aF from reservoir dam to Loch Lomond, resulting in extensive top-killing of trees on 3,200 acres.
			5. Capilano R, small infestation, light to moderate defoliation.
			6. Chehalis R, 400 acres of moderate to heavy defoliation.
			7. Mill Cr, 300 acres of heavy defoliation of wH.
			8. Popkum, 25 acres.
			9. Stanley Park, high population.
1930			Stanley Park, moderate defoliation, Park sprayed.
1931-42			Larvae scarce.
1943			Low populations.
1944			Increased populations.
1945			N side of Fraser R and adjacent to Howe Sound, extensive damage.
1946			1. Seymour, Burwell, Eastcap and Palisade creeks, heavy defoliation.
			2. Widgeon Cr, extensive tree mortality.
			3. Indian R Valley, high population but only light defoliation.
1947			Infestations subsided, high parasitism recorded, collections of 158 at Burwell Cr, 22 at Seymour Cr, 69 at Lost L and 13 at Widgeon Cr.
1948			Low populations. One or two larvae per collection in Seymour Cr Valley.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1949	1.8	1.9	Low populations.
1950	1.9	0	Low populations. Slight increase in D.D. 042 (Vancouver to Stave L, N of Fraser R).
1951	2.0	1.0	Low populations.
1952	2.6	0	Low populations.
1953	3.2	3.8	Generally low populations. Avg of 9 larvae at Jones L. One wH collection at Vancouver Bay contained 36 larvae.
1954	4.6	13.0	Generally low populations. Avg of 4 at Vancouver Bay.
1955	2.2	2.2	Low populations.
1956	2.4	2.0	Common in small numbers, one collection at Roger Cr contained 40 larvae.
1957	4.0	2.6	Generally low populations.
1958	9.7	4.5	61 larvae in one collection at Prospect Point. Stanley Park sprayed, but mainly because of high green-striped forest looper population.
1959	11.7	1.7	Stanley Park, moderate population. Collections in Seymour Cr Valley contained up to 24 larvae and 19 at Coquitlam L.
1960	3.1	2.7	Generally low populations, one collection in Stanley Park contained 18 larvae.
1961	4.0	1.6	Low populations. Largest collections contained 13 larvae in Stanley Park and at Coquitlam L.
1962	2.8	2.3	Low populations. Largest collection contained 19 larvae at Stave Falls.
1963	2.9	1.3	Low populations. Largest collection contained 12 larvae at Rolley L.
1964	3.0	1.3	Low populations.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1965	2.5	1.6	Low populations. Largest collections were 8 at Joffre Cr and 9 in Upper Lillooet R.
1966	4.9	2.1	Increase, but generally low populations. Largest collections were: Chehalis R, 33 and 18; Nahatlatch R, 16; Stave L, 15 and Rolley L, 12 (all on wH), and 14 on D at Pemberton.
1967	4.8	2.5	Generally low populations. Largest collections were: 43 on wH at Rolley L and 25 on wH at Weaver L.
1968	8.4	2.4	Increased populations. Largest collections were: 45 on wC at Harrison Bay; 37 on wH at Lost Cr and 24 on wH at Salsbury L.
1969	15.1	7.3	Increased populations. Jervis Inlet to Harrison L. Collections in mature hemlock-cedar stands surrounding Coquitlam L contained up to 300 larvae but caused only light defoliation. Up to 50 larvae per collection were taken at scattered sites in Salmon, Narrows and Jervis inlets.
1970	148	1.4	Severe defoliation of wH and aF on 200 acres on E side of Coquitlam L with up to 900 larvae per collection. A fungus disease, *Beauvaria* sp., was present on dead pupae and adults in October.
1971	131	1.3	Outbreak at Coquitlam L increased to 625 acres with heavy defoliation and some tree mortality on 150 acres.
1972	10.0	1.2	Populations at Coquitlam L decreased; average of 28 larvae per collection. About 10% of the larval population were believed to be *Nepytia phantasmaria*. Larval parasitism of both species occurred; some pupae infected with a fungus, *Entomophthora* sp.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1973	50	1.4	Some defoliation on the island in Coquitlam L where 700 larvae were found in one collection. Area of tree mortality has now been clear-cut in salvage logging. Avg no. of larvae per positive sample for whole District was 4.7.
1974	5.0	1.0	Coquitlam L population collapsed. Low populations elsewhere.
1975	2.0	1.0	Very low populations.

Phantom hemlock looper, *Nepytia phantasmaria*

An important defoliator of conifers, mainly Douglas-fir, the hemlocks, western red cedar, Sitka spruce and the true firs. Infestations have occurred east of Howe Sound, but only occasional larvae have been collected in the northwest part of the Mainland Section. Losses have been small in the past, partly due to chemical control. However, this insect, along with the western hemlock looper, probably poses a significant threat to coniferous stands in the future.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1928-29			Indian R, present in large numbers in the western hemlock looper infestation.
1930-31			Indian R, populations declined. Stanley Park, heavy defoliation; Park sprayed in 1931, a few wH killed.
1932-39			Scarce.
1940-47			Not mentioned in reports.
1948			Populations low; found at Yale.
1949			Scarce.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1950	1.6		Low, found only in Capilano, Seymour, Coquitlam and Alouette valleys.
1951	2.9		Low populations.
1952	2.0		Low populations.
1953	2.1		Low populations.
1954	3.0		Largest collection, 15 at Tenas L.
1955	4.0		Largest collection, 11 at Boston Bar.
1956			Small infestations on wH and D in Central and Queens parks.
1957			Infestations in Central and Queens parks continued plus small outbreak in Hope Park. Central and Queens sprayed with DDT, damage prevented in Central Park but approx. 26,000 ft^3 killed in Queens Park (60% wH, 40% D).
1958			Infestations collapsed.
1959			Scarce.
1960			Low populations. Up to five larvae per collection in Hope Park.
1961-64			Low populations.
1965	6.7		Increase, collections of up to 62 in Central Park, 21 at D'Arcy and 12 in Hope Park.
1966			Low populations.
1967	2.4		Low, largest collections, 8 in Hope Park, 6 at Stave Falls.
1968	1.5		Low populations.
1969	4.5		Larvae commonly found in association with western hemlock looper. Up to 55 taken on D at Coquitlam L.
1970			Only three larvae found in entire District.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1971			Populations generally low. Numerous pupae collected in hemlock looper infestation at Coquitlam L; 33% were killed by fungus diseases *Isaria* sp. and *Beauvaria* sp.
1972	11.9	1.0	Greatest increase in population occurred at Clearbrook where defoliation by Douglas-fir tussock moth occurred.
1973	7.3	0	Low populations.
1974	2.7	0	Low populations.
1975	4.0	0	Low populations.

Green-striped forest looper, *Melanolophia imitata*

A damaging defoliator in coastal hemlock-cedar stands. Douglas-fir, the true firs, spruces and pines are also attacked. Mortality has occurred in Queen Charlotte and Vancouver Island infestations but none has been recorded in the Mainland Section. Heavy defoliation occurred in Stanley Park in 1958 which might have resulted in tree mortality if the park had not been sprayed with chemicals. Before 1949, this insect occurred only sporadically and was not considered to be a significant pest.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1949	3.6	2.4	Common but little damage.
1950	5.2	5.8	Common.
1951	3.1	1.5	Largest collection was 14 in Seymour Cr Valley.
1952	1.9	0	Low populations.
1953	1.6	1.4	Low populations.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1954	1.0	0	Low populations.
1955	1.0	1.4	Low populations.
1956	2.9	3.1	Low populations, increase.
1957	14.2	9.4	Moderate populations, highest in D.D. 042.
1958	40.5	6.4	High populations in Stanley Park, Capilano R Valley and Stave Falls. Up to 450 larvae per sample in Stanley Park, light to medium defoliation of overstory wH and D, heavy on understory trees. Park sprayed with DDT.
1959	12.1	4.1	Decrease but common, 111 on wH at Grouse Mtn, Stanley Park population controlled.
1960	1.9	1.5	Low populations.
1961	2.4	1.7	Low populations.
1962	1.3	1.5	Low populations.
1963	1.6	1.2	Low populations.
1964	2.7	1.8	Low, increase in D.D. 042.
1965	5.8	3.1	Increase mainly in D.D. 042, 043 and 061.
1966	14.0	10.8	High populations in D.D. 042, 061 and 063. Largest collection contained 112 larvae at Ruskin.
1967	6.7	11.0	High populations in Sechelt Pen.-Redonda I. E of Howe Sound, confined to D.D. 042 and 045 (Mamquam R Valley).
1968	6.3	4.5	Decreasing populations, a fungus disease, *Entomophthora* sp., was prevalent in larvae in all areas.
1969	2.1	1.5	General decrease. Small numbers found in mountains north of Vancouver.
1970	2.1	1.1	Low populations.
1971	1.2	1.0	Low populations.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1972	1.4	1.8	Low populations.
1973	2.3	1.6	Low populations.
1974	2.1	1.9	Low populations.
1975	2.7	3.4	Notable increase in populations in northern drainages.

Saddleback looper, *Ectropis crepuscularia*

A common defoliator of most conifers in B. C. wet belt areas. Not known to have caused serious damage in the Mainland Section. A severe infestation near Kitimat in the early 1960's resulted in extensive mortality.

Year	Remarks
1949	Low population.
1950	Increase but low population.
1951	Common.
1952-64	Scarce.
1965	Low, avg 2.2 larvae in D.D.'s 040-045.
1966	Increase, low population. Largest collections contained 16 larvae at Narrows Inlet and on Grouse and Seymour mtns.
1967	Low, avg 2.5 larvae. Common in D.D. 042, 6 on wH at Salsbury L, 5 on wC in Stanley Park and Seymour Cr Valley.
1968	Low, avg 1.0 larvae. Increase in D.D. 042 north of Vancouver, 11 on Grouse Mtn and 6 in Capilano R Valley.
1969	Low, avg 1.0 larvae.

Year	Remarks
1970	Avg of 20 larvae per positive sample.
1971-75	Very low populations.

Green velvet looper, *Epirrita autumnata*

A common, but so far insignficant defoliator of the hemlocks, true firs, spruce, Douglas-fir and western red cedar.

Year	Remarks
1948	Low populations.
1949	Common, slight increase.
1950	Slight increase, an avg of 3.0 larvae E of Howe Sound, the largest collection contained 12 larvae.
1951-57	Not mentioned in reports.
1958	E of Howe Sound, avg 8.4 larvae (avg 19 in Seymour Valley). W of Howe Sound, avg 4.4.
1959-61	Not mentioned in reports.
1962-64	Low populations.
1965-66	Not mentioned in reports.
1967	Scarce.
1968	Fraser Valley north, common in small numbers, largest collection 10 on mH at Cypress Cr.
1969	Roberts Cr and Woodfibre, common, up to 34 larvae per collection.
1970-75	Larvae common in low numbers.

Western winter moth, *Erannis vancouverensis*

A defoliator of a wide range of deciduous trees. The maples are the preferred hosts in the Mainland Section. Outbreaks have been scattered and of short duration. No mortality has been recorded.

Year	Remarks
1957	Skookumchuck, larvae numerous.
1958	Skookumchuck, increase, avg 48 larvae, the largest collection 127, vM severely defoliated, 45% larvae parasitized. Stanley Park, up to 34 larvae per collection.
1959	Skookumchuck, infestation collapsed, presumably from parasitism.
1960-61	Not mentioned in reports.
1962-64	Low populations.
1965-66	Not mentioned in reports.
1967-69	Up to 7 larvae per collection on vM and dM in the vicinity of Spuzzum and North Bend.
1970-71	Not mentioned in reports.
1972	Localized moderate population at Railroad Cr; light defoliation of a few understory Al trees.
1973	Populations low in Mainland areas.
1974-75	Not mentioned in reports.

Western blackheaded budworm, *Acleris gloverana*

There have been three periods in the last 40 years when budworm caused noticeable defoliation over a relatively large area: Howe Sound and Burrard Inlet, 1926-30; Mission and Vancouver, 1940-41; Hope Slide area, Fraser Canyon tributary valleys and Ruby Creek, 1966-68, and Howe Sound, Indian, Coquitlam and Pitt R valleys in 1969. In each infestation parasites, virus diseases or adverse weather conditions reduced the populations after two or three years and very little tree mortality occurred. Western hemlock and amabilis fir are the preferred hosts in the Mainland Section, although larvae are commonly found on Douglas-fir, grand fir, Sitka spruce and mountain hemlock.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1926-28			Howe Sound, moderate defoliation.
1929-30			Burrard Inlet, moderate defoliation.
1931-35			Scarce, no outbreaks reported.
1936-39			Common but no outbreaks reported.
1940			McConnel Cr (Steelhead), 75% of current wH foliage and 10% of current aF foliage lost on several sq miles.
1941			1. McConnel Cr, decrease, moderate defoliation of wH and aF. 2. Vancouver to Surrey, moderate defoliation.
1942			McConnel Cr and Vancouver, infestations subsided.
1943			Not mentioned in reports.
1944			Harrison L, light defoliation of wH.
1945			Moderate populations, no damage reported.
1946			Scarce.
1947			Widespread distribution but few in numbers.
1948			Scarce.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1949	1.0	1.0	Low populations.
1950	1.8	0	Low populations.
1951	3.5	1.8	Increase but low.
1952	5.7	0	Increase E of Howe Sound.
1953	5.8	1.6	Generally low populations, largest collections in D.D. 040 (Jones L).
1954	10.0	1.0	Increase in D.D. 040, six wH collections on Liumchen Cr averaged 34 larvae.
1955	6.3	10.8	Several collections near Yale averaged 25 larvae. The largest collection was 48 at Seymour Inlet.
1956	3.4	8.1	Decrease in larvae collected, but moderately high egg counts (9.8 eggs per 18" tip) in D.D. 063, 064 and 065.
1957	9.1	25.8	Up to 200 larvae per collection on Hardwicke and Harbledown Is (D.D. 063 and 065), but low egg counts. Several collections in Capilano and Seymour Cr valleys averaged 48 larvae.
1958	3.0	0	Populations collapsed.
1959	1.0	1.0	Low populations.
1960	2.5	1.0	Low populations.
1961	4.8	1.6	Low, largest collection contained 14 larvae in Queens Park.
1962	1.0	2.3	Low populations.
1963	1.9	2.1	Low populations.
1964	3.7	1.0	Generally low, largest collection contained 37 at Mt. Coulter (Hope Slide area).
1965	9.4	1.0	Increase in D.D. 042, one collection in Queens Park contained 139 larvae.
1966	16.0	1.8	Hope Slide area, small infestation, over 300 larvae per wH collection. Increases in D.D. 041, 043 and 044.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1967	22.2	1.7	1. Hope Slide, heavy defoliation (up to 90%) of immature wH and aF in 500 acres of valley bottom. Light to moderate defoliation in 5,000 surrounding acres. 2. Coquihalla Valley, 500 acres of heavy plus 2,000 acres light to medium defoliation of wH and aF. 3. Ruby, Inkawthia, Stoyoma and Scuzzy creeks, light defoliation. 4. Rising populations in D.D. 042 and Mamquam R portion of D.D. 045.
1968	40.7	3.0	1. Hope Slide, less defoliation, 100 acres heavy at Wray Cr plus 3,000 acres from trace to 15%. Avg 95.4 larvae per collection in D.D. 041 but feeding appeared limited by cold, wet weather. 2. Coquihalla, Ruby and Fraser Canyon areas, decreased defoliation. 3. Salsbury L, North Shore Mtns, Furry Cr and Mamquam R, increasing populations, light to medium defoliation of current foliage of wH and aF.
1969	21.1	17.1	1. Hope Slide, Coquihalla, Ruby and Fraser Canyon areas, infestations collapsed. 2. Moderate to high populations occurred from the west side of Howe Sound to Harrison L. Defoliation in acres was: (a) Mills Cr, 300 medium, 500 light; (b) Indian R, 1,400 heavy, 1,800 medium, 1,500 light; (c) Pitt R, 700 heavy, 2,000 medium, 1,600 light; (d) Coquitlam L, 300 heavy, 1,300 medium, 900 light; (e) Stave R, Chehalis R, Sloquet Cr drainages, 2,200 light.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1970	43	21	Up to 50% of current year's foliage lost at Stawamus R, Furry and Henrietta creeks and Capilano R. More severe defoliation in Indian R valley.
1971	12	2.6	Decreased populations. Two areas of defoliation - 125 acres at Furry Cr and 100 acres at Britannia Cr.
1972	3.9	6.7	Indications of a population increase between Howe Sound and Gilford Island.
1973	4.3	9.3	Light defoliation of understory trees at Furry and Woodfibre creeks.
1974	1.8	2.0	Low populations.
1975	1.0	1.0	Low populations.

Western spruce budworm, *Choristoneura occidentalis*

There have been three major outbreaks in the past 40 years. In 1943-44, infestations occurred in the vicinity of Pemberton and at the headwaters of the Skagit R. From 1953 to 1958, severe infestations occurred in the Lillooet R Valley and in the Fraser Canyon. During the current outbreak, which began in 1969, infestations have recurred in the Pemberton Valley, Fraser Canyon and Skagit River Valley. Tree mortality and top-kill has become evident in some areas, notably at Railroad Creek northwest of Pemberton.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1933-37			No outbreaks reported, larvae scarce.
1938			No infestations but larvae common on D at Lulu I.
1939-42			Not mentioned in reports.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1943			Heavy defoliation of D from Pemberton to Anderson L, also 30 sq miles of heavy defoliation at the headwaters of Skagit R (Skaist Cr).
1944			Pemberton and Skagit R, extensive infestations.
1945			Infestations presumably collapsed.
1946-48			Low populations.
1949	1.0	0	Low populations.
1950	2.9	1.8	Low populations.
1951	4.4	1.8	Generally low.
1952	3.7	1.0	Low populations.
1953	14.0	0	Increase in Fraser Canyon, Anderson R and Nahatlatch R. Lighter populations in Lillooet R Valley.
1954	37.6	0	Lillooet R Valley, from Mt. Currie to Port Douglas, 89 sq miles of defoliation (15-75% up to 3,000' el). 24 sq miles of defoliation in Fraser Canyon - Nahatlatch R area.
1955	25.2	1.0	Pemberton, Owl Cr, Birkenhead and D'Arcy areas, infestation increased to 141 sq miles. Fraser Canyon area increased to 30 sq miles of defoliation.
1956	49.1	1.0	Lillooet R Valley, Tisdall - D'Arcy, 452 sq miles of defoliation. Anderson R, 30 sq miles.
1957	48.9	0	Lillooet R Valley, 498 sq miles of defoliation (78 heavy, 33 medium, 387 light). Anderson R infestation subsiding.
1958	46.7	1.8	Lillooet R Valley, additional 150 sq miles of light defoliation.
1959	2.9	1.0	Populations collapsed, largest collection contained six larvae.
1960	4.3	0	Populations low, largest collections contained 14 and 11 larvae near Hells Gate.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1961	4.5	1.0	Low populations, largest collection contained 21 in Queens Park.
1962	1.2	1.0	Low populations.
1963	4.8	0	Moderate increase, largest collection contained 19 larvae at North Bend. Light defoliation on D at Ainslie Cr (Boston Bar).
1964	1.7	0	Low populations.
1965	2.6	0	Low, increase in D.D. 042, 17 larvae in one collection in Queens Park.
1966	4.2	0	Low, collections of 16 in Queens Park, 12 at D'Arcy and 11 at Hope.
1967	2.6	0	Low, avg 3.0 larvae in Fraser Canyon and 2.5 near D'Arcy.
1968	5.1	0	Fraser Valley and Canyon, 63% of collections were positive vs 39% in 1967 and averaged 6.1 larvae. Pemberton area, 71% of collections positive vs 33% in 1967 and averaged 3.6 larvae. Largest collections: Abbotsford, 27; Hope, 25 and Clearbrook, 16.
1969	6.8	1.0	Increase in Pemberton - D'Arcy area, 100% of collections contained an average of 8.0 larvae. Light defoliation of immature D at Pemberton Meadows and lower Blackwater Cr. Collections of 42, 21, 17 and 13 larvae were taken at Hope, Alice L, Hells Gate and Boston Bar, respectively.
1970	2.6	1.0	Infestations increased from Pemberton to Salal Cr, along Soo R and Rutherford Cr and in Haylmore Cr Valley. Light to heavy defoliation on 12,500 acres.
1971	14	0	Infestations continued in Pemberton Valley; new outbreaks occurred in the Blackwater Cr - Birkenhead L area, along Fraser R between Hope and Boston Bar and southeast of Hope at Tashme. Defoliation was light to severe over 27,990 acres.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1972	17.6	0	Infestations continued in all previously infested areas and a new outbreak occurred at Cheakamus L northeast of Squamish. Total area of defoliation was 54,760 acres.
1973	56	1.0	Infestations continued with new areas of defoliation along the Coquihalla R, Eight Mile Cr east of Hope, near western edge of Manning Park, along Nahatlatch L and R and along Green R at north end of Lillooet L. Total area defoliated was 134,340 acres.
1974	84	0	Infestations persisted in all previously infested areas with new outbreaks along Lillooet L and Silverhope Cr - Skagit R. Total defoliated area was 193,600 acres.
1975	57.4	0	Infestations declined along Lillooet R northwest of Pemberton and expanded along Lillooet L, Fraser Canyon, Silverhope Cr - Skagit R and Nahatlatch L. Light to severe defoliation occurred over 201,440 acres. At Railroad Cr, 8% of trees in a study plot have been killed by repeated defoliation.

Silver-spotted tiger moth, *Halisidota argentata*

A common, native defoliator of conifers in southwestern B. C. Large populations usually occur near tide water, but small numbers have been found as far inland as Chilliwack. Douglas-fir is the preferred host, but western hemlock, lodgepole pine, grand and amabilis firs, western red cedar and Sitka spruce are also occasionally defoliated. Overwintering takes place in the larval stage so that noticeable defoliation occurs in the spring before most other insects are active. No tree mortality has been recorded.

Year	Remarks
1934	Chilliwack, small infestation on D. First record in the Mainland Section.
1935	Quadra I, small infestation on D at Heriot Bay.

Year	Remarks
1936-38	Scarce.
1939-40	Not mentioned in reports, presumably scarce.
1941	Vancouver, occasional webs noted.
1942-46	Not mentioned in reports, presumably scarce.
1947	Lower Mainland, moderate numbers.
1948	Low population. Found in Stanley Park and at Horseshoe Bay.
1949-54	Scarce.
1955	Gibsons Landing to Lund and Johnstone Strait islands, large populations along coastal fringe area.
1956-59	Scarce.
1960	Vancouver to Powell R, common, caused little damage.
1961	Vancouver to Powell R, increase.
1962	Vancouver to Powell R, increase, moderate to severe defoliation in Stanley Park, West Vancouver, Gibsons Landing and Sechelt.
1963	Vancouver to Powell R, decrease, low population, noticeable defoliation at Roberts Creek and Lund.
1964-66	Scarce.
1967	West Vancouver, light defoliation of D and sP at Pt. Atkinson Lighthouse Park, elsewhere common in small numbers.
1968	White Rock along shoreline to Britannia, from Powell R to Lund and on Texada I, light to heavy defoliation of D, wH, sP and wC. Heaviest defoliation occurred between Horseshoe Bay and Britannia where up to 25 ft of D and 10 ft of wH upper crowns were stripped. Larvae were common as far east as Abbotsford.
1969	Scarce, population may have been killed as a result of low winter temperatures.
1970-75	Populations low and scattered.

Forest tent caterpillar, *Malacosoma disstria*

A colonial defoliator of a wide variety of deciduous trees and shrubs. The preferred hosts in the Mainland Section are red alder, black cottonwood and willow. Two favored hosts in interior B. C., trembling aspen and white birch, have a limited distribution in the Vancouver Forest District. Damage usually results only in reduced tree growth, but repeated defoliation may cause the death of limbs. Defoliation is conspicuous in June. No infestations have been reported from west of Howe Sound.

Year	Remarks
1935	Pemberton Meadows, numerous larvae in old (1932-34) satin moth infestation.
1936-57	Rarely mentioned in reports, presumably at low population levels for the most part.
1958	1. 18 miles N of Pemberton, infestation 4 miles long. 2. Delta, Surrey and Langley municipalities, infestation covering 120 sq miles, light to heavy defoliation of Al, bCo, W.
1959	Infestations subsided.
1960-61	Ladner to Abbotsford, light to heavy defoliation, in association with the western tent caterpillar.
1962	Ladner to Abbotsford, continued infestation, also at Pitt Meadows.
1963	Populations decreased.
1964-67	Scarce.
1968	Fraser Mills to Port Mann, 60% defoliation of 200 acres of bCo, rAl, W.
1969	Fraser Mills, infestation increased to 250 acres (50-60% defoliation), scarce elsewhere. Satin moth larvae were commonly found in association with forest tent caterpillars at Fraser Mills.
1970-75	Not mentioned in reports.

Western tent caterpillar, *Malacosoma californicum pluviale*

A colonial defoliator of alder and willow plus a variety of small trees and shrubs. Damage usually results only in reduced tree growth. Commonly found throughout the Mainland Section of the Vancouver Forest District.

Year	Remarks
1937	Mission and Sumas districts, small infestations.
1938	Mission and Sumas, infestations subsided.
1939	Vancouver and district, heavy infestations.
1940-45	Not mentioned in reports, presumably at low population levels.
1946	Thormanby I, heavy infestations.
1947	Texada I, 4 sq miles of defoliation at Shelter Pt, common in Powell R area. Small infestation on rAl at mouth of Capilano R.
1948-52	Scarce.
1953	Pitt Meadows, 10 sq miles of defoliation.
1954	Pitt Meadows, 10 sq miles plus a small infestation at Lindell Beach (Cultus L). Heavy defoliation on Bowen I and at Gibsons Landing.
1956	Low populations in all areas.
1957-59	Scarce.
1960-61	Ladner to Abbotsford, light to heavy defoliation in association with forest tent caterpillar.
1962	Ladner to Albion, light defoliation.
1963	Low populations.
1964-66	Scarce.
1967	Texada I, common.
1968	White Rock to Britannia, heavy defoliation, especially north of Horseshoe Bay, main host was rAl. Powell R area, moderate defoliation.
1969	White Rock to Britannia and from Howe Sound to Powell R, very heavy defoliation in a 2- to 3-mile wide coastal strip.

Year	Remarks
1970	Infestations collapsed from action of polyhedral virus. Low populations along Howe Sound and Galiano I.
1971	Scattered tents along Capilano R and in West Vancouver.
1972	Low population along Chapman Cr Road.
1973	Occasional tents near Squamish and along Silver-Skagit Road.
1974	Light defoliation of scattered trees along Coquihalla R.
1975	No larvae observed in District.

Fall webworm, *Hyphantria cunea*

A widespread colonial defoliator of deciduous trees in southern B. C., of which alder, cottonwood, birch and willow are the most important forest hosts. Not considered an economically important pest, although entire trees may occasionally be defoliated. Damage is most conspicuous late in summer and characterized by skeletonized, shrivelled brown leaves encased in webbing.

Year	Remarks
1935-38	Lower Fraser Valley, abundant, total defoliation of roadside Al and wB.
1939	New Westminster area, numerous webs on Al.
1940-46	Not mentioned in reports, presumably low population.
1947	Agassiz Mtn, heavy defoliation.
1948	Ladner to Hope, light defoliation.
1949-50	Scarce.
1951	Increase, but low population.
1952	Fraser Valley, prevalent.
1953-55	Low populations.

Year	Remarks
1956	Increase, but generally low populations.
1957	Fraser Valley, increase, heaviest defoliation at Chilliwack.
1958	Fraser Valley, moderate population.
1959	Ladner to Hope, scattered infestations on south side of Fraser R. Moderate defoliation at Powell L.
1960	Ladner to Hope, increased defoliation, heaviest at Pierdonville, Cultus L and Yarrow. Common on Sechelt Peninsula.
1961	Fraser Valley, increase, also at Yale and Harrison L.
1962	Fraser Valley, decrease. Scattered infestations from Howe Sound to Lund, 50 to 100% of alders between Sakinaw and Ruby lakes were defoliated.
1963	Fraser Valley, decrease. Howe to Hotham sounds and Jervis and Sechelt inlets, common, heaviest defoliation along east shore of Ruby L.
1964	Fraser Valley, further decrease. Sechelt Peninsula, only light defoliation.
1965	Sechelt Peninsula and Fraser Valley, low in general, increase at Chilliwack and Boundary Bay.
1966	Sechelt Peninsula, scarce. Fraser Valley, increase, still moderately low population.
1967	Fraser Valley, population remained moderately low, increase from Harrison Hot Springs to Green Point. Sechelt Peninsula, scarce.
1968	Fraser Valley, increase, common. Heavy defoliation in Tsawwassen and Beach Grove areas. Light population from Pemberton to D'Arcy and on the Sechelt Peninsula.
1969	Fraser Valley, increase, especially on bCo, Abbotsford to Chilliwack. Sechelt Peninsula, low population.
1970	Moderate to severe defoliation of Al between Yarrow and Rosedale and from Haney to Harrison.
1971	High populations between Yarrow and Agassiz, lower numbers from Haney to West Vancouver and Squamish.
1972	Moderate populations near Yarrow.
1973	Lower populations in Fraser Valley.
1974-75	Very low populations.

Satin moth, *Stilpnotia salicis*

An introduced species, first found in B. C. in 1920, defoliating Lombardy poplars in New Westminster, (later, the original source of introduction was assumed to have been Vancouver in 1919 or earlier). In addition to exotic poplars, black cottonwood, trembling aspen and willow are attacked. Small numbers of aspen have been killed after repeated attacks.

Year	Remarks
1920-23	Vancouver and New Westminster, defoliation occurred only on introduced poplars including Lombardy, black, white and Carolina.
1924-28	Distribution extended as far east as Chilliwack causing up to total defoliation of bCo, tA and W.
1929-32	Boundary of infestations extended from Powell R to Yale and into the Pemberton Valley.
1933	Fraser Canyon, extended to Keefers. Pemberton Meadows, continued defoliation.
1934	Pemberton Meadows, continued defoliation.
1935	Scarce, minor defoliation of poplars at Point Grey.
1936	Scarce.
1937	Sumas Prairie, small infestations on W.
1938	Vancouver and district, light attacks.
1939-40	Not mentioned in reports, presumably scarce.
1941	Lower Fraser Valley, small populations.
1942-60	Not mentioned in reports.
1961	Haney and Pierdonville, small infestations.
1962-66	Not mentioned in reports.
1967	Scarce.
1968	Langley, small infestation on white poplar.
1969	Langley and Ladner, small infestations on white poplar. Fraser Mills, numerous larvae on bCo and W in association with forest tent caterpillar.
1970-72	Not mentioned in reports.

Year	Remarks
1973	Adults in flight at Birkenhead L.
1974	Severe defoliation of about two acres of bCo at Birkenhead L.
1975	Birkenhead L infestation expanded into two small areas of defoliation along the lake. The parasite *Apanteles solitarius* was present in the population. Small areas of defoliation of deciduous trees at Meager and Capricorn creeks (Lillooet R tributaries) were attributed to satin moth.

Conifer sawflies, *Neodiprion* spp.

These sawflies are suspected of causing mortality in the 1920's and 30's on the Queen Charlotte Islands. Since then, however, no mortality has been recorded even during periods of large populations. Attacks most conifers, but particularly western hemlock and amabilis fir in the Mainland Section.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1947			Up to 35 larvae per collection from North Vancouver to Rosedale.
1948			Collections of 92 larvae at Dog Mtn, 31 in Indian R, 29 near Alouette L and 17 in Capilano R Valley. Hosts unknown.
1949			Common but low populations, highest on Mt. Seymour.
1950	10.5	20.6	Moderately high populations from Drury Inlet to Redonda Islands and from Howe Sound to Stave L. The largest collections contained 170 larvae at Whonock and Chilliwack.
1951	6.2		Low populations.
1952	11.5		Low populations.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1953		23.0	Increase, largest collections were 251 at Woodfibre, 129 at Vancouver Bay and 108 at Halfmoon Bay.
1954			SW of Jones L, small infestations on wH and aF.
1955			Common but low populations, Jones L infestations subsided.
1956			Increase but low; avg 72 larvae on lP from Owl Cr to D'Arcy.
1957			Low populations.
1958		5.6	Low, some defoliation at Lorenzetta Cr.
1959		23.	No defoliation reported.
1960		137.	Increase, 11 collections in Sechelt Peninsula, avg 382 larvae. One sq mile of lP defoliated NW of Chilliwack L.
1961		22.9	Decline but common. Infestation near Chilliwack L subsided.
1962		9.7	Common but low, 116 on wH at Ruby Cr, 54 on aF in Chilliwack R Valley.
1963		6.6	Low populations.
1964		3.6	Low, 73 larvae on wH at Nowhokam Cr (Boston Bar).
1965		4.4	Low populations.
1966			Low populations.
1967	7.0		Increase but generally low.
1968	22.8		Increase all areas. Small amounts of defoliation on wH and aF east of Hope and at Furry Cr, 300-400 larvae per collection.
1969	18.0		Hope Slide, Furry and Raffuse creeks, light defoliation of wH and aF, 200+ larvae per collection.
1970	20.2	35.	One collection of more than 800 larvae at Woodfibre.

Year	Avg no. larvae per positive sample in D.D.		Remarks
	040-045	060-068	
1971	4.4	2.7	Low populations.
1972	16.6	26.5	Populations increased but no defoliation recorded.
1973	12.1	18.5	Low to moderate populations; maximum of 120 larvae per sample.
1974-75			Numbers of larvae not tabulated in reports. No defoliation recorded.

Striped alder sawfly, *Hemichroa crocea*

Introduced in B. C., presumably between 1920 and 1925. Larvae feed in colonies, skeletonizing entire leaves. There may be two broods per year in coastal areas. Suspected of causing limited mortality of alders.

Year	Remarks
1930	Rosedale, small numbers of alders defoliated.
1931	Rosedale, increased defoliation. Stanley Park, severe defoliation of small patches of rAl.
1932	Rosedale, infestation increased to ½ mile. Stanley Park, severe defoliation of rAl.
1933-36	Lower Fraser Valley, extensive infestations, particularly in the vicinity of Abbotsford.
1937	Lower Fraser Valley, continued defoliation. Powell R, several hundred acres of defoliation at Townsite.
1938-46	Not mentioned in reports, presumably infestations continued at a reduced level.
1947	Grouse Mtn, Cultus L, prevalent but less numerous than in last few years.
1948	Fraser Valley, low populations. Bute Inlet, 80 to 100% defoliation.

Year	Remarks
1949	Powell R and along the shores of Powell L, 75% defoliation; 50 to 80% from Stillwater to Lund and at Mowat Bay on Texada I, Fraser Valley, low populations.
1950	Powell R to Lund, heavy populations. Fraser Valley, scarce.
1951	Powell R to Lund, decline. Fraser Valley, scarce.
1952	Powell R, small localized infestations. Fraser Valley, scarce.
1953	Scarce.
1954	Fraser Valley, increase, avg 34 larvae per collection at Bridal Falls and Seymour R.
1955	Fraser Valley, 60-acre infestation 1 mile E of Yarrow.
1956	Barnet to Port Coquitlam, Ioco and Buntzen L, Deep Cove, Lynnmour and Seymour Mtn up to 1,100 ft elevation, 125 sq miles of severe defoliation.
1957	North Vancouver, subsiding. Still pockets of defoliation in Coquitlam Valley and small outbreak in Stanley Park at Brockton Point.
1958	Coquitlam Valley, continued but decreased defoliation. Small populations in Mahon Park (N. Van.), Brockton Point, Capilano Indian Reserve and Garibaldi Park (Haney).
1959	Haney, several small infestations. Scarce in other areas.
1960	Ioco and vicinity, near Westview and along Alice L Road (Sechelt Peninsula), moderate defoliation in small infestations.
1961	Fraser Valley and Sechelt Peninsula, populations declined.
1962-69	Extremely scarce.
1970-75	Not mentioned in reports.

Pine butterfly, *Neophasia menapia*

Has caused extensive mortality of ponderosa pine in the northwestern United States. Large populations have occurred on Douglas-fir in coastal B. C. and have caused some defoliation in the Vancouver Island Section. Larval populations are difficult to detect since they feed in the upper crowns of mature trees. Most reports are based on the observation of butterfly flights.

Year	Remarks
1938	Large butterfly flight noted near Squamish.
1939-44	Not mentioned in reports.
1945	Numerous adults noted in Seymour R Watershed.
1946-62	Not mentioned in reports.
1963	Butterfly flight reported in Squamish R Valley.
1964-67	Not mentioned in reports.
1968	Butterfly flights reported from Fir and Hornet creeks, tributaries of Big Silver Cr.
1969	No butterfly flights observed.
1970-75	No populations recorded.

Douglas-fir tussock moth, *Orgyia pseudotsugata*

An important defoliator in the Interior, this tussock moth is not normally found in the coastal areas. In the 1970's, a small outbreak occurred in the Fraser Valley with moderate to severe defoliation for one year. The host is primarily Douglas-fir but the insect has been found on western hemlock, western larch, spruce and ponderosa pine.

Year	Remarks
1971	Larvae numerous on scattered Douglas-firs at Abbotsford and Clearbrook; moderate to severe defoliation at Clearbrook. Some larvae infected with polyhedral virus.

Year	Remarks
1972	Infestation continued. Defoliation about the same in Clearbrook and lighter as far west as Surrey. Some top-kill in Abbotsford and Clearbrook. Polyhedral virus killed some larvae. Egg masses collected in the fall were heavily parasitized.
1973	Infestation collapsed. A maximum of two larvae per sample at Clearbrook.
1974-75	No larvae collected.

SUCKING INSECTS

Balsam woolly aphid, *Adelges piceae*

An introduced species, its presence in B. C. was verified in 1958. Indications are that it had been present since at least 1950. Amabilis fir is the main host in the Mainland Section, and occasionally grand and alpine fir.

Year	Remarks
1958	Known to occur on the east side of Howe Sound, North and West Vancouver and in New Westminster.
1959	Known infested area increased to include the west side of Howe Sound (Potlatch Cr, Rainy R, Dakota and Roberts creeks). 3,900 dead and dying trees were counted in the Mainland area, the heaviest mortality occurred at Cypress Cr where 2,000 aF were killed.
1960	Known range expanded to the east to include Indian Arm and Madeira Park to the west; 5,300 dead and dying trees were counted.
1961	Known range expanded to include Indian R Valley and Coquitlam L; 8,300 dead and dying trees were counted, the heaviest mortality occurring in Cypress and Seymour Creek and Indian R valleys. There were over 200 attacked trees at Rainy R, Woodfibre Cr, Mill Cr, Capilano R and Coquitlam L.

Year	Remarks
1962	No expansion recorded; 5,800 dead and dying trees were counted.
1963	Known range expanded to include the east side of Jervis and Sechelt inlets and Ashlu Cr and Mamquam R Valley.
1964	Decrease in the number of red-topped balsam in Jervis and Sechelt inlets, Howe Sound and the Capilano R Valley. Distribution was unchanged.
1965	Known area of infestation unchanged.
1966	Eastward extension of attack at Widgeon Cr, Haney, Langley, Agassiz, Popkum and Tretheway Cr.
1967	New infestations found in Upper Stave R Valley and at Tretheway and Bremner creeks, where alF as well as aF was infested.
1968	Known boundaries unchanged. 800 red-topped aF in the Indian R Valley.
1969	Infestation area extended slightly northward in the Pitt R Valley (Boise Cr). Largest concentrations of dying trees were in the Seymour, Indian and Coquitlam R valleys.
1970	Tree mortality continued in Stawamus, Indian, Seymour and Coquitlam R valleys.
1971	No change recorded in infestation boundaries.
1972	First occurrence recorded on Pender I; two gF trees attacked.
1973	No change recorded.
1974	Aphid was collected in Garibaldi Park.
1975	The known distribution was expanded to Mt. Elphinstone near Gibsons Landing and Lyons L near Halfmoon Bay. Areas of dead Abies spp. S of Cheakamus L, at Rutherford Cr and along the upper Lillooet R indicated suspect areas for the insect.

Spruce aphid, *Elatobium abietinum*

Sitka spruce is a minor species in the Mainland Section. No serious damage has been found in forest sites although shoreline and exposed trees occasionally suffer moderate defoliation. Tree mortality has been confined to Sitka and exotic spruce in windbreaks and residential gardens in the Fraser Valley from Ladner to Chilliwack.

Year	Remarks
1938	A Vancouver Golf Course. Severe outbreak on several hundred young sS.
1939	Vancouver, injured ornamental spruce.
1940	Vancouver, increase, numerous.
1954	Vancouver, on blue spruce, confined to City and Stanley Park.
1955	Vancouver only.
1956	Vancouver, decrease.
1958	Deep Cove to Horseshoe Bay and Lower Fraser Valley to Chilliwack, moderate infestation.
1959	Fraser Valley, subsided.
1961	Fraser Valley, trees recovered after 1958 attack. Heavy defoliation on Texada and Gilford islands and along the south side of Knight Inlet.
1962-63	Fraser Valley, low.
1964	Fraser Valley, occasional heavy attacks. Light damage to shoreline sS at Deserted Bay, Port Neville and Loughborough Inlet.
1965	Fraser Valley, increase, some mortality. Light damage at Port Neville.
1966	Fraser Valley, heavy defoliation.
1967	Fraser Valley, increase, mortality at Yarrow, Chilliwack, Sumas, Langley, Ladner.
1968	Fraser Valley, decrease, more mortality from previous attacks, North Vancouver, Yarrow, Chilliwack, Langley, Ladner.

Year	Remarks
1969	Decrease, very scarce, population may have been reduced by the cold winter temperatures. The approximate number of semi-mature shelterbelt spruce killed between 1964-68 was: Ladner, 20; Cloverdale to Langley, 10; Clearbrook, 4; Sumas Prairie, 38 and Chilliwack, 10.
1970	Light to moderate defoliation of shelterbelt spruce from Tsawwassen to Sumas and Mission to Harrison.
1971-72	Not mentioned in reports.
1973	Occasional tree damaged on lower Mainland.
1974-75	Not mentioned in reports.

BARK BEETLES

Mountain pine beetle, *Dendroctonus ponderosae*

The main host in the Mainland Section is western white pine. There are a few extensive stands of lodgepole pine in areas that border the interior of B. C., e.g. the Klinakiini, Cheakamus, Lillooet and Skagit R drainages. In other areas, lodgepole or shore pine is confined to small pockets or scattered individuals. Ponderosa pine is a minor species and is restricted to the D'Arcy and Boston Bar areas.

Year	Remarks
1914-45	No serious outbreaks reported.
1946-59	More detailed annual surveys commenced in this period. The surveys showed that tree mortality was quite extensive in the Skagit R Valley and in North Shore Mountains in previous years, but numbers of trees were not recorded.
1960	Extensive mortality of wwP in the Squamish R Valley and on Sechelt Peninsula.
1961	450 red-topped wwP at Birkenhead L, 90 wwP at Gray Cr (Sechelt Inlet).

Year	Remarks
1962	Counts of red-topped wwP were: Skagit Valley, 1,600; Nahatlatch Valley, 420 and 100+ near Alta L. The Skagit and Nahatlatch infestations included some lP mortality.
1963	The Skagit (no count) and Nahatlatch (100 red-tops counted) infestations decreased. New attacks on wwP were recorded at: Soo R, 75; Birkenhead L, 105 and 175 at Blackwater L.
1964	Skagit R Valley, 400 wwP and a small number of lP red-tops were counted. Approximately 50 immature wwP at Caran Ridge (Sechelt Peninsula) were attacked.
1965	An estimated 1,000 wwP were attacked at Scuzzy Cr, 500 in upper Anderson R Valley and 200 in upper Skagit Valley. Only a few new attacks on wwP and lP were noted in lower Skagit Valley.
1966	Low populations, small numbers of current attack were noted in Scuzzy, Anderson and Skagit valleys.
1967	Low populations, an estimated 35 red-topped wwP east of Birkenhead L constituted the only known attack.
1968	Low populations, no attacks on wwP recorded. 25 pP near D'Arcy were killed; these trees were on the perimeter of a larger infestation in the Kamloops Forest District.
1969	Low populations. No additional attacks on pP noted. Scattered small pockets of wwP were beetle-killed in the Glacier-Fire lakes area NW of Harrison L.
1970	Not mentioned in reports.
1971	50 wwP recorded at Birkenhead L and 200 lP at Haylmore Cr.
1972	1,325 wwP recorded in groups of up to 500 trees in Lillooet L area and along Anderson R in the Fraser Canyon.
1973	2,930 wwP tallied, most of which were along Kookipi Cr, a tributary of Nahatlatch R.
1974	1,955 wwP killed in the Birkenhead L - Pemberton area and Anderson R, Kookipi and Scuzzy creeks in the Fraser Canyon. Extensive mortality of lP occurred in the Klinaklini R drainage where 10,300 red-tops were estimated. Numerous old, dead lP indicated tree mortality was occurring for some years. A group of 400 lP was noted at Haylmore Cr.

Year	Remarks
1975	3,595 wwP counted in the following areas: Birkenhead L - Blackwater Cr, Lillooet L, Sumallo R, Skagit R, Nahatlatch L and R and East Anderson R. Surveys along Klinaklini R disclosed an estimated 40,000 red-topped lP; 300 lP recorded at Haylmore Cr.

Douglas-fir beetle, *Dendroctonus pseudotsugae*

A periodic pest of mature and overmature Douglas-fir. To date, all serious outbreaks have been confined to the drier portions of the Mainland Section, i.e., Lillooet and Skagit R valleys and Fraser Canyon area.

Year	Remarks
1929	An unpublished report states that, "All serious epidemics subsided in the B. C. coast section" (thus implying that outbreaks occurred in the 1920's, but are unrecorded).
1930-48	No serious infestations reported. 10+ red-tops at White Rock in 1936.
1949	A few trees attacked at Wilson Cr.
1950	A few trees attacked near Lund.
1951	No infestations reported.
1952	Anderson and Skagit R valleys, small patches of beetle-killed trees.
1953	Several new patches of red-tops in Anderson R Valley. Beetles attacking some trees in the Lillooet R Valley, which had been severely defoliated by spruce budworm.
1954	Small infestations near Port Douglas and Tenas L in Lillooet R Valley. Fewer red-tops were noted in Anderson and Silver-Skagit areas.
1955	Further attacks recorded in the Lillooet Valley, near Port Douglas and Roger Cr. Also new attacks in Anderson Valley.

Year	Remarks
1956	Further attacks in Lillooet Valley, but fewer than in 1955. Only one fresh pocket of red-tops in Anderson Valley.
1957-59	Little beetle activity noted.
1960	Small groups of trees attacked in Anderson, Skagit and Lillooet R valleys. Two small infestations reported on Sechelt Peninsula involving 50 trees near Pender Harbour and 60 at Agamemnon Channel.
1961	200 red-tops in Nahatlatch R Valley, 40 north of Boston Bar and a few in Skagit Valley.
1962	135 red-tops in Nahatlatch R Valley, 55 at Ainslie Cr (N of Boston Bar), 27 at North Bend (Chaumox) and 30 in the Silver-Skagit area.
1963	The numbers of red-tops declined, only 85 trees were counted in the Nahatlatch, Boston Bar and North Bend areas.
1964	100 attacked trees in Scuzzy and Stoyoma creeks (near Boston Bar).
1965	No infestations recorded.
1966	40 red-tops counted between Yale and Boston Bar and 30 in the Silver-Skagit area.
1967	Increase in Fraser Canyon to 301 red-tops between Yale and Boston Bar and to 75 in the Silver-Skagit; 25 attacked-trees were noted in the Pemberton area.
1968	240 red-tops counted from Yale to Boston Bar. On the east side of Harrison L, 40 trees were attacked at Big Silver Cr and 12 at Cogburn Cr. Twenty trees were attacked at the north end of Lillooet L.
1969	Decrease in attack in the Fraser Canyon area; about 20 trees were noted in the vicinity of Spuzzum. There were 110 red-tops in the Tretheway - Sloquet Creek and Glacier-Fire lakes area NW of Harrison L.
1970	Moderate populations in decked logs at Yale.
1971	Some attacks on windfelled trees at Railroad Cr; 150 red-tops at Spuzzum Cr.
1972	Light attacks on felled trees at Spuzzum Cr and on standing trees along Silver-Skagit Road, where blowdown occurred in winter of 1971-72.

Year	Remarks
1973	Not mentioned in reports.
1974	200 red-tops recorded in Silver-Skagit Valley.
1975	400 red-tops in Silver-Skagit Valley. Beetle attacks occurred on Douglas-fir trees defoliated during consecutive years of spruce budworm infestations at Railroad Cr, Sumallo R and Haylmore Cr.

STEM BORERS

Poplar-and-willow borer, *Cryptorhynchus lapathi*

An introduced pest, first discovered in the Okanagan and Lower Fraser valleys in the 1920's. At the present time, the insect has a wide distribution in southern B. C. and along the Nass and Skeena River valleys. It attacks willows, poplars and alders.

Year	Remarks
1930	Vancouver, first report of damage on the Lower Mainland, but presence of insect known for at least three years.
1933	Vancouver, caused damage to ornamental W in Stanley Park nurseries.
1934	Surrey, W attacked at Green Timbers.
1935	Vancouver area parks, additional attacks on W.
1936	Sumas Prairie, attacking native W.
1937	Sumas Prairie, thousands of W stems killed. Green Timbers, infestation continues.
1938	Green Timbers, additional attacks on W.
1939	Vancouver area, first record of attack on bCo. Continued attacks on W.

Year	Remarks
1940	Lower Fraser Valley, common.
1941-46	Not mentioned in reports.
1947	Fraser Valley, new locality records at Pitt L, Chilliwack and Yale.
1948	Kawkawa L (Hope), extensive damage of W in one sq mile, some tree mortality was recorded. W in Seymour Cr Valley, heavily infested.
1949	Alouette L and Chehalis R, new locality records.
1950	Not mentioned in reports.
1951	Elk Mtn (Chilliwack) and Kawkawa L, W heavily infested.
1952-57	Not mentioned in reports, but probably common in the Fraser Valley.
1958	Common on W at Slesse Cr, Agassiz, Silverhope Cr to Ross L, Hope, Anderson R and Fraser Canyon area; bCo north of Port Douglas heavily infested.
1959	Fraser Valley and along Howe Sound, attacks on W common, heavy from Mission to Rosedale; bCo infested in UBC Forest, Haney.
1960	Fraser Valley and Howe Sound W to Madeira Park, common on W.
1961	Lower Mainland, common on W; bCo infested in Skagit R Valley.
1962	Chilliwack R Valley, attacks decreased.
1963	Fraser Valley, heavy attacks reported.
1964-69	Fraser Valley, light attacks only.
1970-73	Low populations.
1974	Severe infestation of bCo shade trees at Anderson Lake fisheries station.
1975	Heavy mortality of W on 50 to 100 acres of clear cut along Mamquam R. Infested trees common from Boston Bar to Vancouver and along the Sechelt Peninsula.

TERMINAL BORERS

European pine shoot moth, *Rhyacionia buoliana*

An introduced species, first discovered in Victoria in 1927. Its distribution has since extended to include southern Vancouver Island, the Lower Fraser Valley, Kamloops and the Okanagan Valley. Most exotic two- and three-needle pines are attacked, plus lodgepole and ponderosa pines in gardens and parks. No attacks have been found in native pines in forest sites.

Year	Remarks
1938	Vancouver gardens and Stanley Park, 1P attacked. First record on the Mainland.
1939	Vancouver, infestation on Scots pine, controlled artificially.
1959	Greater Vancouver area, light attacks on Mugho and Austrian pines.
1960	Greater Vancouver area, additional light attacks.
1964	Greater Vancouver area, lodgepole, Mugho, Austrian, Scots and red pines attacked in residential gardens.
1965	Vancouver to Chilliwack, infested pines in gardens and parks.
1966	Vancouver and Yarrow, heavy attacks; elsewhere, light.
1967	Vancouver to Chilliwack, additional attacks. Especially severe on exotic and native pines in Vancouver gardens and parks.
1968	Vancouver gardens, high populations on lodgepole, Scots and Mugho pines.
1969	Vancouver area, additional attacks. No tree mortality has been reported but many trees have been so severely disfigured by repeated attacks that they were removed.
1970	Not mentioned in reports.
1971	Some planted trees infested in Vancouver.
1972	Low population. Of 243 trees examined in Vancouver only 2% were infested.
1973	Not mentioned in reports.
1974	Flight traps showed moderate to heavy populations in Vancouver. Plant Protection Branch found infested trees in nurseries at Chilliwack and Langley.
1975	Populations continued in Vancouver area.

PITCH MOTHS

Sequoia pitch moth, *Vespamima sequoiae*

Attacks small groups or individual trees, occasionally causing tree mortality. After repeated attacks, larval tunnelling may girdle the bole.

Year	Remarks
1958	Common on lP from Lillooet L to Port Douglas.
1959	Heavy infestations in pP plantations at Green Timbers and Alouette L.
1960	lP heavily infested north of Cheekeye in Cheakamus R Valley.
1961-66	Not mentioned in reports.
1967	lP and pP in WilliamsPark, Langley, heavily infested.
1968	Numerous attacks on lP and pP north of Boston Bar, but no tree mortality.
1969	No new attacks recorded.
1970-75	Not mentioned in reports.

LEAF BEETLES

Pacific willow leaf beetle, *Pyrrhalta carbo*
Alder leaf beetle, *Pyrrhalta punctipennis*

Common skeletonizers of leaves of alder, willow, poplar, birch and undergrowth shrubs, often resulting in severe defoliation over a large area. No tree mortality has been recorded. Both species have a widespread distribution in B. C., but in the Mainland Section *P. carbo* has caused the most serious defoliation in alder stands.

Year	Remarks
1934	*P. carbo*, South Vancouver and Stanley Park, small infestations on W.

Year	Remarks
1935-46	Not mentioned in reports.
1947	*P. carbo*, Britannia Beach, New Westminster, Maple Ridge Park, heavy defoliation on rAl. Powell R, defoliation of W. *P. punctipennis*, Cultus L, abundant on rAl.
1948	*P. carbo*, Vancouver, Surrey, Cultus L, noticeable defoliation of W. *P. punctipennis*, Howe Sound, abundant on rAl.
1949	*P. carbo*, Chilliwack, common.
1950-56	Not mentioned in reports.
1957	*P. carbo*, Lake Erroch to Morris Cr Valley, Norrish R Valley and Seabird I, abundant.
1958	*P. punctipennis*, Coquitlam R Valley and Flood, moderate defoliation.
1959	*P. carbo*, Vancouver to Bute Inlet, heavy defoliation of W.
1960-66	Not mentioned in reports.
1967	*P. carbo*, Harrison and Hope B.C.F.S. Ranger Districts, widespread heavy defoliation of rAl.
1968	*P. carbo*, east side of Harrison L, extensive heavy defoliation on rAl.
1969	*P. carbo*, east side of Harrison L, extensive moderate defoliation of rAl. Saltery Bay to Lund, moderate defoliation of W. *P. punctipennis*, Chilliwack, moderate defoliation of mature bCo.
1970	*P. carbo*; defoliation of rAl and bCo at Harrison L, Squamish R and at Estero Basin near Bute Inlet.
1971	*P. carbo*; heavy defoliation of rAl along power line near Squamish.
1972	*P. punctipennis*; light defoliation of rAl along Chapman Cr road.
1973	*P. carbo*; moderate defoliation of roadside W along Capilano R.
1974	Not mentioned in reports.
1975	*P. carbo*; moderate population on W at Norrish Cr. *P. punctipennis*; present on fireweed along Mamquam R.

Alder flea beetle, *Altica ambiens*

A common and widely distributed skeletonizer of alder leaves; the resulting defoliation is not considered to be serious.

Year	Remarks
1947	Langley, light skeletonizing on rAl.
1948	Upper Pitt R, West Vancouver, defoliation of rAl.
1949-57	Not mentioned in reports.
1958	Coquitlam R Valley, moderate defoliation.
1959-66	Not mentioned in reports.
1967-69	Fraser Valley, common, moderate defoliation, especially in the Chilliwack B.C.F.S. Ranger District.
1970-75	Not mentioned in reports.

APPENDIX I. Host tree abbreviations

Abbr	Common name	Abbr	Common name
wC	western red cedar	sS	Sitka spruce
D	Douglas-fir	Al	alder-general
		rAl	red alder
aF	amabilis fir	tA	trembling aspen
alF	alpine fir		
gF	grand fir	wB	white birch
mH	mountain hemlock	bCo	black cottonwood
wH	western hemlock		
		dM	Douglas maple
lP	lodgepole pine	vM	vine maple
pP	ponderosa pine		
sP	shore pine		
wwP	western white pine	W	willow-general