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HISTORY OF POPULATION FLUCTUATIONS AND
INFESTATIONS OF IMPORTANT FOREST INSECTS
IN THE KAMLOOPS FOREST DISTRICT

BY
R.O. WOOD AND D.F. DOIDGE

APRIL 1972

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PACIFIC FOREST RESEARCH CENTRE
CANADIAN FORESTRY SERVICE
VICTORIA, BRITISH COLUMBIA
INTERNAL REPORT BC-32

DEPARTMENT OF THE ENVIRONMENT

APRIL, 1972

Revised by C. B. Cottrell and H. P. Koot^{1/}, February, 1976

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Victoria, B. C.

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INTRODUCTION

This report constitutes a history of some important forest insects in the Kamloops Forest District since 1912. Its purpose is 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.

There is little information available regarding the history of logging in the District. Logging in the Shuswap Lake and Okanagan areas began in the 1800's. The first sawmill in Enderby was built in 1894 by C. S. Smith of Vernon. During the second world war, the Vernon area alone supported 64 sawmills, and by 1954 there were 1,000 mills in the southern Interior (many of which were in the Nelson District) with an annual cut of more than 905,000,000 board feet.

Major losses from forest insects in the Kamloops District have been caused by bark beetles. Infestations of western pine beetle and mountain pine beetle were first reported in 1912 in ponderosa pine stands in the Merritt-Princeton area and during the next eight years spread throughout much of the range of ponderosa pine. The beetles also killed large numbers of lodgepole pine and western white pine trees. Most of the ponderosa pine mortality in the first few years of the infestations was attributed to western pine beetles but, by 1921, populations of this species declined to a low level, probably largely due to the lack of sufficient numbers of host trees with the thick bark necessary to the habits of the western pine beetle. Mountain pine beetles have been in epidemic outbreaks in the southern areas in the Okanagan Lake watershed south to the United States border and in the western section in the Hat Creek and Lillooet areas. The largest outbreaks at the present time are in lodgepole pine stands in the Okanagan Valley.

Douglas-fir bark beetles have caused tree mortality over extensive areas throughout the Kamloops District. Since 1922, red-topped Douglas-fir trees have been recorded annually, beginning at Adams Lake and extending throughout much of the range of this host. Annual counts of red-tops have fluctuated greatly; the highest was in 1960 when more than 26,000 beetle-killed trees were tallied.

Sporadic infestations of spruce beetle have occurred but, until 1968, on a relatively small scale. Severe infestations developed from 1969 to 1973 near McGillivray and Bouleau lakes and Whiterocks, Dome Rock, Gottfriedsen and Little White mountains.

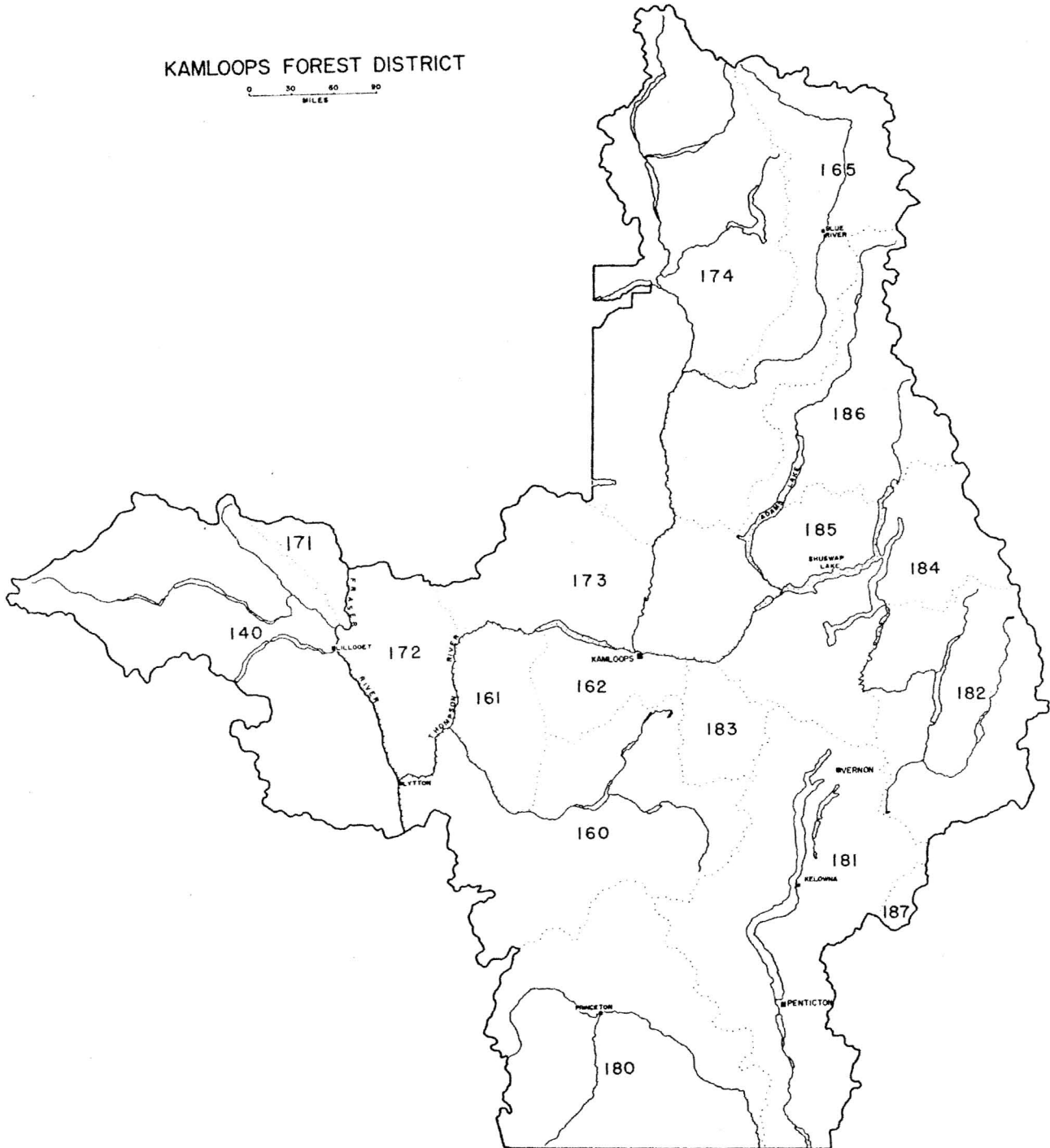
A bark beetle-fungus complex caused extremely heavy alpine fir mortality in high elevation spruce-balsam stands over the years. Records since 1926 show that areas in the North Thompson River, Shuswap Lake and Okanagan Lake drainages have sustained extensive tree mortality; more than 31,000 red-topped alpine fir trees were recorded in 1970.

Infestations of defoliating insects have been less damaging than those of bark beetles. There were outbreaks of Douglas-fir tussock moth in 1939, 1948-49, 1962-63 and 1971-75 in areas along the North Thompson River and from Kamloops to Osoyoos. The first large infestation of western false hemlock looper occurred in North Okanagan, Shuswap and Thompson River valleys from 1972 to 1975. Blackheaded budworm infestations occurred from 1965 to 1967 from Shuswap Lake to Sugar Lake. One-year-cycle spruce budworm caused serious defoliation of Douglas-fir in the Seton-Anderson lakes area and in Fountain Valley during 1943-45, 1951-52, 1956-58, and 1967-75. Larch sawfly infestations occurred in 1965 between Lumby and Vernon and in 1966-67 along the east side of Okanagan Lake. In 1966, a larch budmoth severely defoliated western larch in the Lumby area. A pine butterfly outbreak seriously damaged ponderosa pine, over 400 acres, at Okanagan Landing in 1962. Sporadic infestations of satin moth occurred at widespread locations from Lytton to Rutland during the years 1944-64. Tent caterpillar outbreaks were epidemic near Adams Lake from 1956-59 and near Wells Gray Park Road from 1964-73.

Information in this report was compiled from Annual District Reports, Forest Insect and Disease Survey, British Columbia, 1912-1975.

KAMLOOPS FOREST DISTRICT

0 30 60 90
MILES



BARK BEETLES

Mountain pine beetle, *Dendroctonus ponderosae*

Hosts are all pine species; Engelmann spruce may be attacked when present in an infested pine stand. The western pine beetle, *Dendroctonus brevicomis*, which attacks only ponderosa pine, is often found in conjunction with mountain pine beetle. Severe outbreaks of the two species occurred in the early 1900's in the Merritt-Princeton area but reports at that time did not separate the damage caused by each. Populations of *D. brevicomis* reportedly declined to a low level by 1921. Following is a record of annual damage caused by the two species of bark beetles until 1921; after that time it is attributed to mountain pine beetle. From 1921 to 1927, about \$80,000 was spent on bark beetle control.

Year	Remarks
1912	Infestation in pP began five miles from Princeton.
1913-19	An estimated 130,000 Mbf of pP killed in Merritt-Princeton area. A report by the Dominion Entomologist stated that "infested areas surround Okanagan L and extend as far west as Princeton and Nicola. Above Peachland the yellow pine and black pine have been practically killed off by the beetles". Attacks were reported in wwP stands around Sugar L in 1914.
1920-21	Infestations continued in pP and lP in Midday Valley and Kingsvale areas. Almost 1,300 Mbf were cut and burned as a control measure. Some wwP trees were killed near Adams L.
1922	Infestations in pP expanded in the Nicola L, Coldwater R and Aspen Grove areas, and in lP above Chute L near Lorna.
1923	Annual report of the Dominion Entomologist stated that "at least 20,000 Mbf in Coldwater R and 5,000 Mbf in Aspen Grove area have been killed". Infestations occurred in pP and lP at Spius Cr and expanded in lP near Lorna. Infestations in wwP near Adams L covered about 320 acres.
1924	pP - Infestations continued in Merritt district. About 15,000 infested pP and lP trees were cut and burned in control measures. lP - Estimate 6,000 red-tops near Lorna; infestation reported on Martin Mtn. wwP - Slight decrease in Adams L infestation.

Year	Remarks
1925	<p>pP - 8,400 red-tops in Inkaneep Forest Reserve. Dominion Forest Service report stated that from 20 to 25 million board feet were killed between 1921 and 1925.</p> <p>IP - 87,000 trees killed at Chapperon L; infestation continued near Lorna.</p>
1926	<p>pP - 1,300 red-tops near Aspen Grove; large infestation near Dot; scattered infestations in Monte Hills, along Salmon R, Fish and Mamit lakes; and in Botanie Valley.</p> <p>IP - 2,700 red-tops near Aspen Grove; Lorna infestation abated, partly due to control work.</p>
1927	<p>4,000 pP and IP cut and burned in control work in Merritt-Princeton area.</p> <p>IP - 5,600 trees killed at Lorna; Dominion Entomologist reported that 80% of IP was killed over 100 sq miles in Camp McKinney area.</p>
1928	<p>pP - 1,000 red-tops in Merritt-Princeton area; 500 near Grand Prairie; small outbreaks near Barriere, along Nuaitch, Spatum, Tranquille and Barnes creeks.</p> <p>IP - 6,000 red-tops in Merritt-Princeton area; large infestations near Tunkwa and Trout lakes, Tranquille Forest Reserve (50-80% of timber killed for several miles NW of Pass L), Martin Mtn (most of mature timber killed on E side), Monte Hills (estimated 10% of IP infested), Paxton Valley (20-50% of mature IP infested), Nehalliston Forest Reserve (Hoover, Parky and Lupin lakes and Darlington Cr), Penticton Indian Reserve (50% kill over 500 acres), W of Allen Grove (80% kill over 100 acres), SE of Penticton (90% of mature IP killed over 100 sq miles), between Whiteman and Irish creeks (80% kill over 50 sq miles), 50 acres near Chute L, 100 acres near Postill L, and smaller outbreaks near Yellow L, along Penticton-Keremeos Road and near Bear Cr.</p> <p>wwP - Niskonlith Forest Reserve (90% of trees killed over 3,000 acres near Bush Cr); Noisy Cr (90% kill over 160 acres); high tree mortality over 640 acres near Hupel.</p>
1929	<p>pP - Total of 3,200 red tops; 2,300 in Aspen Grove area and 900 in Kane Valley.</p> <p>IP - 16,000 red-tops in Aspen Grove area.</p>

Year	Remarks
1930	<p>pP - 90,000 red-tops (some was 1P) in Aspen Grove area; small infestations on north side of Hat Creek Valley and at Paul and Pinantan lakes.</p> <p>1P - Estimated that 40% on Tranquille Forest Reserve and 65% on Long Lake Reserve was infested or dead; infestations at Ganough, Paul and Pinantan lakes.</p>
1931	<p>Reports do not separate tree species; Spius Cr (870), Olsen L (1,000), Brookmere (100), Davis L (50% of all pine trees around the lake infested).</p>
1932	<p>Infestations subsided in Kane Valley and expanded near Brookmere; new infestations in Voght Valley, near Douglas L and at Deep Cr; scattered tree mortality near Olsen L and on Long Lake Forest Reserve.</p>
1939	<p>pP - 75 red-tops in Okanagan Mission.</p>
1946	<p>wwP - Estimated that more than 2,000 Mbf will be killed by 1947 on W side of Mabel L (indicating that infestations may be undetected for some time).</p>
1947	<p>wwP - Outbreaks at Cape Horne, head of Anstey Arm and Eagle Bay; Mabel L infestation expanded to 640 acres; some trees damaged in Trinity Valley.</p>
1948	<p>wwP - Small infestation near Celista; a few red-tops near Mabel L.</p>
1949	<p>1P - Infestations in Bridge K area (on E side of Marshall Cr and north of Hog Cr).</p> <p>wwP - Infestations continued around Shuswap and Mabel lakes.</p>
1950	<p>1P - Infestations covered 30 acres near Marshall Cr and 10 acres near Brett Cr.</p> <p>wwP - High tree mortality over 1,300 acres on NW side of Mabel L; scattered outbreaks around Shuswap L.</p>
1951	<p>pP - 425 red-tops at Alleyne L.</p> <p>wwP - Small infestations around Shuswap and Adams lakes and in Blue R area.</p>
1952	<p>pP - 265 red-tops at Alleyne L.</p> <p>wwP - 1,500 red-tops in Shuswap L area.</p>

Year	Remarks
1953	<p>pP - 260 trees at Alleyne L; outbreaks between Tulameen and Thalia, along Otter, Myren and Trout creeks.</p> <p>lP - Tree mortality evident over 100 acres NW of Naramata.</p> <p>wwP - 1,000 red-tops from Cape Horne to Albas, along Anstey Arm and Celista Cr.</p>
1954	<p>pP - Small infestation at Little Shuswap L.</p> <p>wwP - New infestations at Mud L (Blue R) - 120 trees; infestation along Seymour Arm expanded to 3,200 acres.</p>
1955	<p>pP - 355 red-tops near Allison L; estimated that about 595 Mbf were killed in Alleyne L area from 1952 to 1955.</p>
1956	<p>pP - Loss of 255 Mbf mostly in small, scattered groups in Princeton-Aspen Grove area.</p> <p>lP - Volume loss of 3,000 Mbf over 600 acres NE of Penticton.</p> <p>wwP - Infestations covered 15,200 acres in Shuswap L area with loss estimated at 964 Mbf.</p>
1958	<p>wwP - Small infestations at Blue R, Thunder R, Gosnell, Noisy and Railroad creeks, and at Hidden L; increased tree mortality at Mabel L.</p>
1959	<p>pP and lP - 500 red-tops at Douglas L.</p> <p>wwP - 550 red-tops in Trinity Valley and 300 near Barton Cr; infestations continued near Mabel L.</p>
1960	<p>pP and lP - 270 red-tops at Douglas L.</p> <p>wwP - Total of 900 red-tops in scattered infestations at Gosnell, Burton Cr, Mabel L, Trinity Valley, Scotch Cr and Sicamous areas.</p>
1961	<p>pP - Scattered infestations near Hayes Cr and Douglas L.</p> <p>lP - 6,500 killed in Monte Hills over past five years; a few red-tops along Scottie Cr.</p> <p>wwP - Total of 1,600 red-tops in groups of up to 400 near Mabel L, Wap R, Spectrum Cr, Perry R, Adams L and Manning Park areas; Barton infestation collapsed.</p>
1962	<p>pP - Chapperon L infestation continued; 120 red-tops at Princeton; 100 at Carpenter L and Goldbridge; Lambly Cr, 1,000.</p>

Year	Remarks
1963	<p>pP - 100 red-tops at Rush L; infestations occurred near Lillooet, Goldbridge, Carpenter L and Bridge R areas.</p> <p>lP - Total of 15,500 red-tops; highest at Lambly Cr (7,000) and Venner Cr (8,100); from 200 to 300 red-tops at Joe Rich, Heckman and Vance creeks.</p> <p>wwP - Total of 4,800 dead trees; main areas at Mabel L - Wap R (1,400), Adams L (1,000), and from 400 to 900 at Blue R, Manning Park, Barriere and Sugar lakes.</p>
1964	<p>pP - Total of 6,100 red-tops; Chapperon L (5,000), and from 150 to 800 at Mission Cr, Rush L, Jura; smaller groups between Lillooet and Ashcroft.</p> <p>lP - Total of 9,000 red-tops; highest numbers at Venner Cr (5,000), Lambly Cr (2,000); remainder in groups of 200 to 500 at Rush L, Whiteman Cr, Joe Rich Cr, Lumby to Cherryville, Ashnola R and Riddle Cr.</p> <p>wwP - Total of 5,550 red-tops distributed as follows: Mabel L-Wap R (1,000), Shuswap L to Adams L (1,900), Blue R (1,400); up to 500 trees at Manning Park, Sugar L area and near Barriere.</p>
1965	<p>pP - Total of 14,000 red-tops; main areas at Jura (1,150), Chapperon L (5,750), Nicola R (1,100); remainder in groups of up to 500 trees at Allenby, Barnes L, Oliva and in scattered locations in western section of District.</p> <p>lP - Total of 4,000 red-tops; largest concentrations at Lambly Cr (2,000); from 250 to 650 at Salmon R, Ashnola R and Summerland.</p> <p>wwP - Total of 7,000 red-tops; most in Humamilt-Momich lakes area (3,400); remainder at Adams L and in Seymour R Valley.</p>
1966	<p>pP - Total of 13,500 red-tops; main area at Lower Hat Cr (3,000), Chapperon L (5,000); groups of up to 530 trees at Pinantan L, Tranquille Cr, Chase, Pritchard, Rush and Salmon lakes and along Nicola R.</p> <p>lP - 2,000 red-tops; largest numbers at Lambly Cr (700) and Joe Rich Cr (900).</p> <p>wwP - Total of 1,150 dead trees in groups of from 115 to 500 at Mabel, Sugar and Adams lakes and Blue R.</p>

Year	Remarks
1967	<p>pP - Total of 19,000 red-tops; largest concentrations at Princeton (1,000), Chapperon L (11,200), Osoyoos (1,000), Wolf Cub Cr (1,000), Lower Hat Cr - Gun L (2,000); counts of from 350 to 800 trees at Soap L, Skeikat Cr, Skaynaneichst Cr, Barnes L, Cache Cr and Pritchard.</p> <p>lP - Total of 10,650 trees; largest infestations at Whiteman Cr (2,000), Joe Rich Cr (2,500), Cayoosh Cr (5,000); up to 250 trees at Lambly Cr, Peachland and Ashnola R.</p> <p>wwP - Only 680 red-tops recorded in groups of up to 350 at Johnson and Adams lakes and Blue R.</p>
1968	<p>pP - Total of 7,350 red-tops; highest numbers at Chapperon L (3,000), Jura (1,200); groups of 250 to 500 at Cache Cr, Pritchard, Deadman R, Spences Bridge, Clapperton Cr, Barnes Cr, Inkaneep Cr and from Princeton to Aspen Grove.</p> <p>lP - Total of 17,500 red-tops; main areas, Cayoosh Cr (12,000), Joe Rich Cr (3,500); remainder in groups of 100 to 500 trees at Mission, Lambly and Terrace creeks.</p> <p>wwP - Total of 2,250 red-tops recorded, with most at Blue R (1,000), and from 100 to 600 trees at Brenner Cr, Adams L, Kwikoit Cr, Momich R and Humamilt L.</p>
1969	<p>pP - Total of 2,700 red-tops; infestations at Chapperon L and Lower Hat Cr collapsed; red-tops in small groups along W side of Okanagan L and in Princeton area.</p> <p>lP - Total of 8,000 red-tops; highest numbers near Cayoosh Cr (6,000) and Mission-Joe Rich creeks (1,000).</p> <p>wwP - Total of 900 trees; infestations increased at Ireland Cr and decreased in other areas.</p>
1970	<p>pP - Total of 1,000 red-tops in small scattered groups; new infestation at Baldy Cr E of Oliver.</p> <p>lP - Total of 4,000 red-tops; largest numbers at Cayoosh Cr (2,500).</p> <p>wwP - Total of 1,700 red-tops recorded; increase along Ireland Cr and in Sugar and Mabel lakes area.</p>
1971	<p>pP - 200 red-tops at Terrace Cr.</p> <p>lP - Total of 3,250 red-tops; Cayoosh Cr (1,500); Mission-Joe Rich creeks (1,200); Terrace Cr (550).</p>

Year	Remarks
1971 cont'd	wwP - Approximately 8,000 red-tops estimated as follows: Blue R (1,700), Squaw Valley-Sugar L (1,700), tributaries of Shuswap R north of Sugar L (1,000), Allison Pass (1,200), North Barriere L (950), Humamilt-Momich lakes (800), Larch Hills (700). High populations of beetles were found in most areas.
1972	pP - 360 red-tops; largest outbreak near Gun L (260). lP - Total of 4,000 red-tops; Cayoosh Cr (1,100); Whiteman Cr (750) and Terrace Cr (1,550). wwP - Total of 13,650 red-tops; Blue R (2,400); Adams L (1,200); Larch Hills (1,000); Mabel L (1,200); Sugar L-Squaw Va (5,000), and Manning Park (2,000).
1973	pP - Light attacks, 110 trees at Gun L. lP - Increase to 10,000 trees; Whiteman Cr (2,800); Terrace Cr (2,000); Mission Cr (500); Trout Cr (4,000) and Cayoosh Cr (700). wwP - Total of 9,300 trees; Blue R (4,500); Larch Hills (500); Mabel L (600); Sugar L-Squaw Va (1,200) and Manning Park (2,500).
1974	pP - 100 acres of mature trees attacked near Murray L (SW of Merritt), small outbreaks at Peachland, Lambly Cr and Gun L. lP - Increase to 22,300 trees; Whiteman Cr (5,000); Ellison (1,800); Mission Cr (2,800); Lambly Cr (6,500); Trout Cr (5,300) and Bridge R (900). wwP - Total of 15,600 trees; North Thompson Va (5,200); North Barriere L (1,600); Adams L (1,400); Sugar L-Squaw Va (2,500); Cayoosh Cr (2,600) and Manning Park (800).
1975	pP - Murray L infestation increased to 130 acres, few pP trees left. Small outbreaks at Carpenter L and Hat Cr. lP - 2- to 3-fold increases in many Okanagan Va infestations, counts presented in acres. Total acreage 10,750; largest outbreaks were: Whiteman Cr (1,000); Mission Cr (1,550); Terrace-Lambly creeks (3,300); Trout Cr (1,400) and Riddle Cr (1,000). wwP - Total 14,300 red-tops: Blue R (3,200); North Barriere L (2,000); Adams L (1,600); Cayoosh Cr (4,000) and Sugar L-Squaw Va (1,200).

Western pine beetle, *Dendroctonus brevicomis*

Attacks only ponderosa pine. This insect is believed to have been the major cause of ponderosa pine mortality in the early 1900's (see *D. ponderosae*). Populations declined by about 1921, probably due to a shortage of mature ponderosa pine which has the thick bark necessary to the habits of the insect. Since that time, damage from western pine beetle has been relatively light and sporadic.

Year	Remarks
1912 - 1921	See <i>D. ponderosae</i> .
1922 - 1952	Damage combined with that of <i>D. ponderosae</i> .
1953	Occasional attacks near Rutland and East Kelowna where trees were weakened by needle scale insects; also a few trees near Nahun, Little Shuswap L and Hat Cr.
1954	Not mentioned in reports.
1955	Low population in Alleyne L area.
1956	A few trees attacked in Penticton-Skaha L area.
1957	Some trees killed at Aspen Grove and near Penticton.
1958	Scattered red-tops recorded as follows: Pritchard (67), Little Shuswap L (70), Lytton (17), Robbins Rge (5), Monte L (14), Alleyne L (6).
1959	Scattered attacks associated with <i>Ips oregoni</i> . From 1957 to 1959, 126 trees were killed in the southeastern section of the District.
1960	A few trees killed near Aspen Grove, Alleyne L, Penticton, Okanagan Center and Silver Cr.
1961	A few red-tops north of Cherryville and in the Aspen Grove-Princeton-Tulameen area.
1962	Some trees infested in association with mountain pine beetle in Princeton-Aspen Grove area and near Chapperon L.
1963	Associated with mountain pine beetle in scattered locations.
1964	Some tree mortality between Okanagan Mission and Naramata, along the W side of Okanagan L between Shorts and Whiteman creeks and in Fountain Valley NE of Lillooet.
1965	Low population in Allison Cr Valley near Princeton.

Year	Remarks
1966	Two trees killed at Wood L.
1967	Not mentioned in reports.
1968	Associated with <i>Ips</i> sp. near Kelowna airport.
1969	Not mentioned in reports.
1970	Associated with mountain pine beetle at Baldy Cr E of Oliver.
1971-75	Not reported.

Douglas-fir beetle, *Dendroctonus pseudotsugae*

A major pest of Douglas-fir. Severe outbreaks have occurred in Douglas-fir stands throughout the Kamloops District

Year	Remarks
1914	Scattered attacks in Creighton Va.
1922-25	A few trees killed annually at Adams L.
1926	Scattered infested trees in Fraser Canyon, Upper Hat Cr Valley and Highland Valley; old infestations observed at Scottie Cr; 200 red-tops at Mabel L.
1927	Infestation on W side of Pillar L.
1928	Scattered infestations in Highland Valley, Hat Creek Forest Reserve, along Louis Cr and near Mabel L. Infestations at Scottie Cr and Deadman R cover four sq miles; 100 acres on Tranquille Forest Reserve; 640 acres on E side of Blind Bay; 320 acres at Skimikin L; 50% of Douglas-fir infested over "three sections and parts of two more" at MacLeod Cr; 160 acres on N boundary of Niskonlith Reserve; 175 red-tops around Shuswap L and 350 on Stoney Cr watershed; severe infestation for six miles along Skookum Cr (Vavenby area); scattered infested trees from Barriere to Kamloops.
1929	Not mentioned in reports.

Year	Remarks
1930	Outbreaks along Upper Hat Cr and Scottie Cr (70% kill over six sq miles); on Tranquille Forest Reserve at Cultus L and Tobacco Flats; on Nicola Forest Reserve near Maiden Cr (90% kill over 10 acres) and Venables Valley; on Niskonlith Forest Reserve at McGillivray Cr (60% kill over 320 acres); Cahility Cr (infestation covered 1,280 acres); Blucher Hall (50% kill over two sq miles) and at Canough and Paul lakes; in Shuswap L area (50 acres near Celista and 160 along Ross Cr); on Fly Hill Reserve near Harper, Chum and Skimikin lakes and between Turtle Valley and Chase Cr roads; along Adams L (two sq miles at Bush Cr and 30 acres between Bush Cr and Prospect Point); scattered areas near Barriere L. In the North Thompson drainage, infestations occurred opposite Blackpool (50% of trees over 640 acres were infested); near the mouth of Clearwater R (50% kill over 500 acres); and along Candle Cr (50% kill over 1,000 acres). Small infestations occurred on N side of valley between Irvine and Vavenby.
1932	Small infestations at Pillar L; larvae numerous in windfall in Larch Hills.
1939	Thirty red-tops along Bessete Cr; 100 dead trees along Cherry Cr.
1946	Small infestation along Upper Louis Cr.
1948	Scattered infested trees between Paul and Louis lakes.
1949	Small outbreaks near Cherryville, Lumby, Mt. Ida, Ducks Rge and N of Barriere.
1950	Moderate damage from Monte L to Monte Cr; small area at Pinantan L; in Squaw Valley, 40% of timber on 40 acres was killed over a period of several years.
1951	Mt. Ida infestation subsided; small infestation east of Lumby.
1952	Bestwick (12% kill on 200 acres); Louis Cr ("several patches of red-tops distributed for several miles around"); tree mortality for nine miles along both banks of Guichon Cr near Mamit L; 11 infestations with from 4 to 77 dead trees each in Lumby and Cherryville areas; numerous patches of 10 to 100 red-tops near Pinaus L, Falkland, Westwold and Spanish L; 37 red-tops at Silver Cr; 32 at Yellow L; two small patches on W boundary of Manning Park.
1953	Small outbreaks at Equesis, Shingle and Lawless creeks and near W boundary of Manning Park.
1954	Small outbreaks through central parts of the District, and 160 red-tops in southern areas.

Year	Remarks
1955	Active infestations present in the SE part of Niskonlith Forest Reserve and SE of Bestwick. In the central and Southern sections, a total of 2,400 red-tops were recorded, with most in Tranquille Cr and Bestwick areas; small groups were noted at Monte L, Paxton Valley and along the W side of Okanagan L.
1956	Total of 13,520 red-tops; main areas were: Bestwick (1,100), Tranquille Forest Reserve (2,100), Niskonlith Forest Reserve (2,600), Coldwater R Valley (2,600), Kane Valley (1,000); groups of up to 800 dead trees in the Long Lake Forest Reserve, North Thompson Valley, Highland Valley, Monte L to Salmon Arm, Okanagan L watershed, and in the Princeton area. April beetle mortality studies showed up to 64% mortality due to severe winter.
1957	Total of 735 red-tops recorded. Small groups of dead trees were noted at Loon L, from Sicamous to Monte L and SE to Princeton and Coalmont areas. Mortality of overwintering broods ranged from 18 to 50% at study plots.
1958	Total number of red-tops was 5,000. There were 1,300 red-tops on Niskonlith Forest Reserve, and groups of from 70 to 600 trees on Tranquille and Long Lake Forest reserves, in Arrowstone Hills, and near Campbell Rge, Knob Hill, Westwold, Woods L, Lumby, and in Coldwater Valley.
1959	Total of 3,800 red-tops. Areas affected were as in 1958, with the addition of Douglas L, Falkland, Monte L, Cherryville and Mabel L.
1960	Total of 26,000 red-tops recorded. Main areas were: Cache Cr (300), Tranquille Forest Reserve (1,100), Highland Valley (1,200); other groups of from 100 to 900 dead trees on Niskonlith and Long Lake Forest reserves, in Arrowstone Hills, Monte Hills, Kane Valley, near Salmon L, from Lumby to Cherryville, Enderby to Mabel L, Westwold to Monte Cr and Salmon Arm, near Ingram Cr, Woods L, Pinaus L, along E side of Adams L and W side of Okanagan L, and in Princeton-Aspen Grove area.
1961	Unusually dry conditions caused many currently-attacked trees to drop their needles by August. Total of 9,600 red-tops. There were 1,200 red-tops from Ingram Cr to Woods L, 1,100 in Highland Valley, and groups of from 150 to 650 in the following locations: Upper Salmon R-Westwold, Monte L-Monte Cr, Pinaus L, Falkland-Chase, Enderby-Mabel L, Sugar L-Cherryville, Harris Cr, W side of Okanagan L, Penticton-Keremeos, Princeton-Aspen Grove, Arrowstone Hills, Tranquille, Niskonlith and Long Lake Forest reserves, Salmon L and Kane Valley.

Year	Remarks
1962	Total of 8,300 red-tops recorded. Main areas were in Monte Cr-Upper Salmon R area (2,200) and Falkland-Westwold (1,200). There were other groups of up to 900 dead trees between Falkland and Chase and Lumby and Cherryville, in Mission Cr area, on Bonaparte and Douglas L plateaus, in Highland Valley, and along Tranquille Cr.
1963	Total of 14,400 dead trees. Highest concentrations were in areas of Monte Cr-Upper Salmon R (2,600), Douglas Plateau (2,400), Bonaparte Plateau (2,100) and Tranquille Cr (1,300). Groups of up to 850 red-tops were in areas of Skaha L-Keremeos, W side of Okanagan L, Princeton-Aspen Grove, Lumby-Squaw Valley, Enderby, Falkland-Chase, Pennask L-Nicola, Tunkwa, Highland Valley, Deadman Cr and Walhachin.
1964	A total of 19,700 red-tops was recorded. Main areas were: Monte Cr-Upper Salmon R (1,800), Douglas Plateau (3,300), Tunkwa (1,000), Bonaparte R (2,200), Adams L (1,150) and Johnson L (1,100). Groups of from 200 to 900 red-tops were observed at Shuswap and Okanagan lakes, from Lumby to Cherryville, Skaha L to Keremeos, Princeton to Aspen Grove, Tulameen to Brookmere, at Oliver, Paul Cr, Deadman R, Loon L, Mamit L, Scottie Cr and in Highland Valley.
1965	A marked decrease in number of red-tops - a total of 10,400 was recorded. Main areas were: Bonaparte R (1,900) and Loon L (1,800). Groups of from 100 to 900 were recorded in areas of Adams L-Humamilt L, Shuswap L, Monte Cr, Lumby, Upper Shuswap R, Chapperon L, Tranquille Cr, Deadman R, Copper Cr, Shumway L, Criss Cr, and in Highland Valley.
1966	Total number of red-tops decreased to 1,200. Groups of from 100 to 425 were noted at Loon L, Spanish L and Whiteman Cr.
1967	Total of 1,500 red-tops. Small groups of up to 400 dead trees were found at Criss and Tranquille creeks, Deadman R, Adams L, and in the areas of Missezula L and Penticton.
1968	Total number of red-tops was 3,000. Small groups of up to 170 were recorded from Adams L SW to Kamloops, along Tranquille Cr, in the Cache Cr and Merritt areas, and in scattered locations in Monte Hills, and Okanagan and Shuswap R watersheds.
1969	Numbers of red-tops totalled 4,500. Small groups were found in Adams L area, from Princeton to Missezula L, Kelowna to Falkland, at Cultus L, along Battle and Tranquille creeks and Nicola and Deadman rivers, and at Mamit L. Overwintering beetle mortality was apparently high.
1970	Number of red-tops decreased to 1,100. Beetle-killed trees were in scattered groups of up to 200, with the highest numbers in Adams L area and at Keremeos Cr.

Year	Remarks
1971	Only 195 red-tops recorded - the lowest count in about 20 years.
1972	Only 285 red-tops recorded.
1973	Groups of 5 to 10 attacked trees were noted near Carpenter L, Brash Cr and in the Monte Hills area.
1974	Slight increase; groups of 5 to 50 attacked trees in Bridge R Va; south of Lillooet, at Fountain, Pavilion L, Izman, Cornwall, Criss and Durand creeks; Paul L, Paxton Va and at Okanagan Ldg.
1975	Increase. Largest numbers of red-tops were at: Fountain Va (300), Ashcroft-Walhachin (170), Tranquille Cr (125), Botanie and Turnbull creeks (100 each). Smaller outbreaks at Siwhe, Venables creeks, Deadman R, Lac Le Jeune, Monte L, Westwold, Falkland and Vernon.

Spruce beetle, *Dendroctonus rufipennis*

An important pest of spruces. Records show no infestations prior to 1927 but since then populations have flared up at scattered locations, reaching a peak in the 1969-1974 period. Note: All spruce except black spruce is arbitrarily considered to be Engelmann spruce although white spruce may occur in the North Thompson Va.

Year	Remarks
1927	Small infestation (100 trees) on Bush Cr at Adams L.
1928-48	Not mentioned in reports.
1949	Severe infestation over 1/2 sq mile near Bolean L; 54 hbf killed on 11 acres cruised.
1950	Populations at Bolean L declined, due mostly to woodpecker predation.
1951-52	Not mentioned in reports.
1953	132 trees killed near Princeton.
1954-57	Not mentioned in reports.
1958	No attacks recorded.

Year	Remarks
1959	Light population on White Rocks Mtn; severe attacks to stumps and logs near Vavenby.
1960	Population subsided on White Rocks Mtn.
1961	Infestation of 30 acres near Lightning L (less than 100 trees killed in past 6 years).
1962	Small infestations in Manning Park at Lightning L and in Castle Valley. Light attacks to decked logs near Jamieson Cr.
1963	No fresh attack in Manning Park; light attacks at Bolean L, near Gosnell and E of Vavenby; log decks attacked near Blue R.
1964	Scattered tree mortality on Adams L and Fly Hill plateaus; 200 trees infested in seed blocks near Vavenby.
1965	Small infestation at Moira L; 40 dead trees at Spa L.
1966	Population decreased at Moira L (due to sanitation logging); light to moderate attack in scattered locations in North Thompson R drainage.
1967	Light attack to felled trees near Bolean L.
1968	Not mentioned in reports.
1969	Severe infestations at several locations: 5,500 acres in Dunsapie-Allan lakes area (14% tree mortality); 2,500 acres at Lambly L (4% tree mortality).
1970	Estimated 100 acres at Shorts Cr (23% of trees in cruise strip were currently attacked).
1971	Infestations increased to 2,150 acres in Okanagan and Barton Hill forests; up to 41% of the Engelmann spruce in prism plots on Whiterocks Mtn were attacked.
1972	Attacks increased in the mountainous areas surrounding Kelowna, but declined in other parts of the Kamloops Forest District. Estimated acres of infestation were: Dome Rock Mtn (1,300), Whiterocks Mtn (1,500), Cameo L-Mt. Gottfriedsen (700) and Little White Mtn (800). All infestations were heavy. In an 88-chain strip on Whiterocks Mtn, 92% of the spruce was killed between 1969 and 1972.
1973	All areas mentioned in 1972 were partially logged but infestations continued to increase. Acres of remaining infestations were: Whiterocks Mtn (1,500), Mt. Gottfriedsen (1,500), Little White Mtn (300) and Mt. Chapperon (200).

Year	Remarks
1974	Total of 12,000 acres logged on Dome Rock and Whiterocks mtns because of spruce beetle. All mature eS on Little White Mtn logged.
1975	All old infestations collapsed. One new 250-acre outbreak developed at the headwaters of Chu Chua and Birk creeks.

Western balsam bark beetle, *Dryocoetes confusus*

An enemy of alpine fir. In conjunction with a stain fungus, *Ceratocystis dryocoetidis*, this insect has killed large volumes of *Abies* spp. Early reports of damage are sketchy.

Year	Remarks
1926	A large infestation in Spa Hills.
1928	"Practically all the alF over several sections S of Granite Pk were infested."
1946	High mortality "during past years" near Clearwater and Murtle lakes; infestation over several sq miles near Crooked L.
1957	Dead and dying trees over 33 sq miles between 4,300 and 4,600 ft elevation surrounding McGillivray L; a few trees killed at Bolean and Spa lakes.
1958	Infestations reported as follows: McGillivray L (33 sq miles); east of Knouff and Badger lakes (7 sq miles); Johnson L to East Barriere L (11 sq miles); Barriere to Heffley (15 sq miles).
1959	From Kamloops to Murtle L infestations covered 45,000 acres with estimated volume loss of 33,350,000 ft ³ ; dead and dying trees were counted at Bolean L (400) and Scotch Cr (500).
1960	Very few trees recorded.
1961	On Hunters Rge, 60% of alF over 6 sq miles were killed; small groups above Sicamous and Owlhead creeks, W of Ideal L and S of Aberdeen L; 400 red-tops between Bouleau L and Shorts Cr; red-tops scattered over 12 sq miles on Cherry Ridge (Sugar L area); 100 dead trees on Niskonlith Forest Reserve and 500 on Tranquille Forest Reserve.

Year	Remarks
1962	Scattered red-tops from headwaters of Ferry Cr to Aberdeen L and N of Park Mtn; infestations persisted on Cherry Ridge and at Bouleau L; 300 red-tops at Knouff L, and 2,300 distributed between Whitewood, Jamieson and Watching creeks.
1963	Red-tops scattered over 48 sq miles on Hunters Rge; high tree mortality on Mara Mtn; infestations declined near Jamieson Cr.
1964	Most red-tops observed on Hunters Rge; smaller numbers from Terrace Mtn to Bouleau L and in Grizzly Hills; 250 red-tops in Cariboo Mtn Rge, 500 near Badger L, 300 near Barriere L and 500 at Jamieson Cr.
1965	Hunters Rge outbreak continued from Blurton Cr to Yard Cr; red-tops scattered in Cariboo Rge, near Badger L, Barriere L and Jamieson Cr.
1966	Relatively low numbers of red-tops: Anstey Mtn (200), Tsuius Cr (200), Whiteman Cr (200), Harris Cr (250), Moira L (500).
1967	Decrease in tree mortality recorded: Olivine Mtn (100), Lambly Cr (200), Moira L (75).
1968	Total of 8,000 red-tops counted. Increase due mostly to better air coverage. Highest concentrations of dead trees at Chase Cr (1,000) and Louis Cr (1,000); up to 700 red-tops in groups at Cayenne Cr, Whiteman Cr, Terrace Cr-White Rocks Mtn, Lambly Cr, Ireland Cr, Winters Cr, Wentworth Cr, Johnson L, Efdee L, Martin Meadow and Whitewood Cr.
1969	Numbers of red-tops increased to 15,600. Highest tree mortality occurred at the following locations: Whitewood Cr, Martin Meadow, Heffley L, Sullivan L, Louis Cr, Thuya L, Terrace Mtn (1,000 trees each); Harris Cr to McAuley Cr (1,700); from 400 to 500 red-tops were recorded at Moira L, Beauregard L, Bartlett Cr, Fadear Cr, Latremouille Cr and Bonaparte L.
1970	Total of 31,600 red-tops recorded. Areas of heaviest damage were: Badger L (2,000), Mt. Lolo (1,000), Sullivan L (3,000), Community L (1,500), Mt. Leslie (1,000), North Queest Mtn (1,000), Mission Cr (1,000), Queest Mtn (3,000), Cariboo Plateau (5,000), Terrace Mtn (1,000), Whiteman Cr (1,000), and Bouleau Cr (1,500); groups of up to 600 red-tops were noted at Skaist Cr, Angelmont Mtn, Anstey R, Trepanier Cr, Islaht Cr, Park Mtn and Buck Hills.
1971	Total of 17,100 red-tops recorded. Groups of 550 to 2,100 were estimated at Bob Cr, Jamieson Cr, Queest Mtn, Hunters Rge, Bouleau L, Terrace and Copper creeks.

Year	Remarks
1972	Decline; total of 12,600 red-tops recorded. The largest groups of dead trees were at: Mann Cr (550), Community L (600), Hunters Rge (2,000), Fly Hill (700), Spa Hills (900), Tuktakamin Mtn (1,000) and Shorts Cr (750).
1973	Continued decline; total of 3,200 red-tops recorded. The largest groups of dead trees were at: Bouleau L (400), Fly Hill (700), Whiteman Cr (300), Mt. Gottfriedsen (800) and Greyback Mtn (400).
1974	Total of 3,250 red-tops recorded. The largest groups of dead trees were at: Bouleau L (500) and Trepanier Cr (700).
1975	Decline; 500 trees recorded at North Barriere L and Eneas Lakes and 400 in each of the headwaters of Shorts and Terrace creeks.

Red turpentine beetle, *Dendroctonus valens*

Hosts are pines and occasionally spruce, larch and Douglas-fir. The beetle is not economically important. Monterey pine in the United States has been killed but no record has been made of tree mortality by this insect in B.C. Attacked trees may become weakened and susceptible to other organisms. It is very common in ponderosa pine in the Interior.

Oregon pine engraver, *Ips oregoni*

Attacks all pines but is most common in ponderosa and lodgepole. Populations build up in logging slash and windfalls but outbreaks usually last only one season.

Year	Remarks
1959	From 1957 to 1959, 1,100 pP were killed in upper Okanagan L area, Hullcar and Knob Hill districts.
1960	Heavy infestation of slash near Okanagan Ldg. and on Salmon R Indian Reserve.
1961	Between Carr's Ldg. and Okanagan Center, 250 pP were killed; at Chapperon L, 2,300 immature pP in a 4-mile-square area were infested in association with mountain pine beetle.

Oregon pine engraver, *Ips oregoni*, cont'd.

Year	Remarks
1968	Scattered groups of immature pP; 500 trees at Ellison, 300 near O'Keefe, and 100 near Rutland.
1969-71	No damage recorded.
1972-75	No damage recorded.

Engraver beetles, *Ips pini* and *Ips plastographus*

Attacks all pines; no record of extensive infestations.

Year	Remarks
1965	200 pP killed on Anarchist Mtn in 1964.
1966	A few pP killed at Vernon and Summerland.
1967-75	No damage recorded.

DEFOLIATORS

Douglas-fir tussock moth, *Orgyia pseudotsugata*

This is the most important insect of the defoliator group in the Kamloops Forest District. It attacks Douglas-fir and sometimes ponderosa pine, and is capable of sudden outbreaks which usually cause tree mortality. Chronic outbreak areas are: North and South Thompson, Okanagan and Similkameen valleys. Infestations have ranged in size from small groups of trees to an area 30 by 15 miles northeast of Okanagan Lake.

Year	Remarks
1916	First reported outbreak at Chase.
1917	Small but severe infestations occurred at Hedley and Chase.
1918	Defoliation continued at Hedley and Chase; minor outbreaks were reported at Salmon Arm and Armstrong.
1919	Infestations continued at Chase and Armstrong with new outbreaks at Vernon and Kamloops.
1920	Defoliation occurred near Kamloops and between Vernon and Kelowna.
1921	Infestations remained active between Chase and Kamloops and from Vernon to Kelowna.
1922	A large population hatched in the spring, but the larvae died before maturing.
1923-27	No further defoliation recorded.
1928	Two small outbreaks developed, one near Kamloops, the other at Vernon.
1929	About 100 acres of D and pP were killed in Sullivan Va; other outbreaks occurred at Chase and along Little Shuswap L.
1930	Outbreaks for 5 miles along both sides of the North Thompson R near McLure; infestations near Paul L, Heffley Cr (100 acres) and Gold Cr (50 acres). Other reports from Adams L, Squilax, Chase, south of Salmon Arm and in the BX District of Vernon.
1931	Infestations expanded at Vernon, Kamloops, Merritt, Monte Cr Valley, Campbell Cr, Knutsford, Stump L; severe infestation over 1½ sq miles at Okanagan Ldg.

Year	Remarks
1932	Infestation subsided in all areas except at Stump L where sporadic tree mortality occurred over 10 acres; small patches of dead trees between Westwold and Falkland.
1936	Small infestations at Salmon Arm and Armstrong.
1937	Ornamental firs damaged at Salmon Arm and Vernon.
1938	Defoliation occurred at Armstrong, Larkin, Vernon, Lavington and Coldstream Valley.
1939	Infestations expanded near Lavington, Armstrong, Vernon and Okanagan Ldg; moderate defoliation occurred over a 30 by 15 mile area NE of Okanagan L and along the North Thompson R. A large proportion of late instar larvae were killed by a wilt disease.
1940	Infestations collapsed due to effects of wilt disease.
1945	Numerous larvae in Vernon.
1946	Scattered tree mortality in Vernon; severe defoliation at Hedley and Monte L.
1947	Scattered outbreaks from Kamloops to Osoyoos.
1948	Serious defoliation occurred at Monte Cr (3,200 acres), Oregon Jack Cr (4,000 acres), Monte L, Stump L, Walhachin, Barnes L, Cache Cr, Kamloops, Falkland, Chase, Kelowna, Penticton; light defoliation in Sullivan and Heffley Cr valleys and at Agate Bay. There was a high incidence of parasitism and disease of tussock moth larvae.
1949	From 10 to 100% defoliation of trees at Savona (2,200 acres), Criss Cr (1,300 acres), Clemens Cr (300 acres); light populations of tussock moth at Oregon Jack Cr, Ashcroft, McLure, Jamieson Cr, Vinsulla, Larkin, and in Venables Valley (from 1 to 157 larvae per sample); population at Carquille was from 11 to 44 larvae per sample.
1950	Low population but further tree mortality occurred.
1951	Small infestation along Hydraulic Cr near Kelowna.
1953	Larvae on Long Mtn near Oyama numbered 1.5 per collection.
1954	Larvae present at Hydraulic Cr, Oyama and Olalla.
1955	Light defoliation occurred on two acres at Olalla.
1956	Olalla infestation subsided (diseased larvae present). Light populations occurred on Long Mtn and Yellow L.

Year	Remarks
1957	Up to 27 larvae per collection near Lillooet.
1958	Increase in population near Lillooet, Seton L and Bridge R.
1959	Small infestation near Lillooet collapsed.
1960	Only one larva collected in District.
1961	Severe defoliation at Okanagan Ldg. and Armstrong.
1962	Okanagan Ldg. infestation expanded to 200 acres; outbreaks at Head-of-the-Lake (100 acres) and Armstrong (30 acres); small infestations in Okanagan and Similkameen valleys. Okanagan Ldg. infestation was sprayed with $\frac{1}{2}$ pound DDT per acre; a virus disease was present at all locations.
1963	Moderate to heavy defoliation occurred in Coldstream, Lavington, BX District, Armstrong, Oyama, and at Ellison L; scattered infestations between Hedley and Keremeos and Okanagan and Kalamalka lakes. High larval mortality caused by starvation and a polyhedral virus in Similkameen Valley.
1964	General decline of infestations except W of Ellison L.
1965	No larvae collected. Up to 50% tree mortality in stands which were defoliated for two consecutive years.
1966-70	Very few larvae collected.
1971	Eight infestations of from one to 10 acres occurred at Oyama, Winfield, Glenmore District, Westbank and Kaleden. A few larvae were found at Oliver and Osoyoos. Up to 90% defoliation of D and pP was recorded in the infestations.
1972	Defoliation occurred on 1,700 acres in 41 scattered locations from Salmon Arm to Osoyoos. The largest infestation (1,000 acres) was at Kilpoola L; most of the smaller (1-50 acres) outbreaks were in the vicinity of Winfield and Kelowna.
1973	Total of 5,100 acres of severe defoliation with some tree mortality, 2,500 acres in the Kelowna-Winfield-Oyama areas and 1,000 at Kilpoola L. New outbreaks at Salmon Arm, Savona, Okanagan Falls and Penticton.
1974	7,300 acres severely defoliated along the North Thompson Va from Westsyde to McLure and 800 acres south of Kamloops. Infestations in the Okanagan Va declined to 575 acres of moderate defoliation in eight areas from Vernon to Penticton. A nuclear polyhedral virus was present in many areas.

Year	Remarks
1975	14,300 acres along the North Thompson Va and 6,300 acres south of Kamloops L were heavily defoliated. Infestations in the Okanagan Va collapsed. Most of the North Thompson infestation was sprayed with a bacteria, <i>Bacillus thuringiensis</i> , which resulted in little foliage protection.

Western blackheaded budworm, *Acleris gloverana*

An important defoliator of western hemlock, but also feeds on Douglas-fir, spruces, alpine fir, and occasionally on lodgepole pine. Serious defoliation has been restricted to wet-belt areas near Lumby, Mabel and Shuswap lakes. Severe infestations occurred in these areas from 1965 to 1967.

Year	Remarks
1952	Low population; average of 6 larvae per collection.
1954	Moderate infestation at Mud L near Blue R.
1955	Scattered light populations.
1956	From 10 to 30 larvae per collection from WH between Avola and Albreda; up to 30 larvae per sample from D in W areas; low population on WH near Hidden L.
1957	Average of 40 larvae per collection from D in Mt. Lolo area; low population in other areas.
1958	Numbers of larvae from D ranged from 30 to 50 in Highland Va and averaged 11 near Mt. Lolo; average of 32 larvae from eS at Tunkwa L and 15 from a1F at McGillivray L.
1959-62	Low population.
1963	Increase in population in E area of District - 45% of collections from WH averaged 5 larvae.
1964	General increase in population throughout District.
1965	Serious defoliation occurred between 3,000 and 4,000 ft elevation in following areas: Tum Tum L, Ratchford Cr, Anstey R, near headwaters of Sim Cr, at Three Valley, near Mabel L, along Shuswap R, Wap R, Noisy, Kingfisher, Cook, Cottonwood, Tsuius, Holstein, Reiter, Curwen, Vanwyk, Gates and Lindmark creeks.

Year	Remarks
1966	Larval populations high in overmature wH in Enderby and Lumby areas. Defoliation occurred above 3,500 ft in following areas: Perry R (light to moderate defoliation over 16,500 acres), headwaters of Crazy Cr (moderate defoliation over 3,000 acres and moderate to heavy over 6,000 acres).
1967	Areas of defoliation of wH increased from 37,000 acres to 46,700. Light to moderate damage occurred along Holstein, Sim, Crazy and Wap creeks, Perry, Eagle and Shuswap rivers, Sugar and Shuswap lakes. Other areas of damage were as follows: Holstein Cr (moderate to heavy on 3,000 acres); Cherry and Outlet creeks (2,500 acres light to moderate); Sugar L (1,000 acres light to moderate, 500 moderate to heavy); Shuswap R (1,500 light to moderate, 7,000 moderate to heavy); Wap Cr (3,000 light to moderate, 5,500 moderate to heavy) and Shuswap L (500 light to moderate, 1,000 moderate to heavy. Noticeable feeding damage occurred on D along Oregon Jack and Upper Hat creeks roads. Very few pupae found in fall, probably due to high temperatures in July with no precipitation.
1968	Two small areas of defoliation occurred along Crazy and Ratchford creeks on wH. Current year's growth on eS was from 75 to 85% defoliated along the Tulameen R. On Nicoamen R plateau, 100% of current year's growth on some Douglas-fir trees was lost.
1969	There was a general collapse of all infestations.
1970	Low population on all hosts.
1971	Very low population.
1972	Increase.
1973	100 acres of wH moderately defoliated in the Tsuius Cr Va.
1974-75	Generally low populations.

One-year-cycle spruce budworm, Choristoneura occidentalis

An important defoliator of Douglas-fir. Severe outbreaks have been confined to the western portion of the District, occurring mainly in the Fountain Valley and Anderson-Seton lakes area.

Year	Remarks
1916-1920	Small infestations in the Lillooet district.
1943	Infestations on Mission Ridge near Anderson L, on Mt. McLean near Lillooet, along Bridge R and in Botanie Valley.
1944	Infestation on Mission Ridge and Mt. McLean increased; lower parts of some young trees at mouth of Adams R were defoliated.
1945	Infestations persisted on Mission Ridge, Mt. McLean and in Botanie Valley; severe defoliation at Cayoosh and Fountain creeks.
1946	Populations decreased on Mission Ridge and Mt. McLean; larvae numerous in spots along the Bridge and Yalakom rivers; light defoliation at Fountain Cr, Crown L and Pavilion Mtn; high population 14 miles SW of Clinton.
1947	General decline of population.
1948	Some defoliation S and W of Lillooet.
1949	Infestation in Fountain Valley.
1950	100% defoliation of current year's growth in Fountain Valley.
1951-52	Fountain Valley infestation persisted.
1953-55	Infestation continued.
1956	Light to severe defoliation over 120,000 acres along Anderson and Seton lakes to Bridge R.
1957	Above infestation expanded to Pavilion Mtn.
1958	Infestations persisted.
1959	Infestations collapsed; trace of defoliation at Seton L; some top kill occurred on S side of Seton L.
1960	Low population.
1961	Average of one larva per collection.

Year	Remarks
1962	Low population; 15% of collections were positive.
1963	Low populations; 10% of collections were positive.
1964	Generally low populations; 5% of collections positive.
1965	Collections were 13% positive with average of 1.5 larvae.
1966	10% of collections contained an average of 1.3 larvae.
1967	Moderate to severe defoliation of current year's growth on trees between the 3,500 and 3,900 ft elevation on Mission Mtn.
1968	Up to 90% defoliation of current year's growth on Mission Mtn.
1969	Mission Mtn infestation increased to 400 acres.
1970	Anderson-Seton lakes infestation increased to 4,250 acres with damage in the following areas: Mission Mtn (800 acres heavy defoliation); Whitecap Cr (350 acres heavy, 1,500 acres light); S of Seton L (1,600 acres light). Up to 80% of current year's foliage was lost on trees in areas of heavy defoliation.
1971	Anderson-Seton lakes infestation increased to 11,300 acres. Moderate to severe defoliation recurred on Mission Mtn and along Whitecap Cr, and new areas of damage occurred along McGillivray Cr and at the S end of Anderson L.
1972	Increase to 45,000 acres of defoliation around Anderson, Seton, Carpenter, Gun and Downton lakes. Heaviest defoliation at Whitecap Cr, Mission Mtn, and Gun L. Heavy defoliation on 200 acres along Kwoiek Cr.
1973	Increase to 68,800 acres at Anderson-Seton lakes and Bridge R Va, Carpenter L and south side of Downton L. 700 acres of light and 900 acres of moderate defoliation along Kwoiek Cr.
1974	Increase. 86,000 acres defoliation at Anderson-Seton lakes, Bridge R Va, Kwoiek Cr and in new areas along Fountain Va, Botanie Cr, Skaist Cr (Manning Park) and along Adams R. Defoliation heavy on 3,000 acres, moderate on 17,000 and light on 66,000.
1975	Increase. 101,500 acres defoliation: 85,000 at Anderson and Seton lakes, Cayoosh Cr, Bridge R Va, Kwoiek Cr, and tributary valleys of Fraser R from Fountain south to Kwoiek Cr. 9,500 acres defoliation along Adams L and R; 7,000 acres at Manning Park. Eighth consecutive year of defoliation in Bridge R Va.

Two-year-cycle spruce budworm, *Choristoneura biennis*

Interior Engelmann spruce and alpine fir are the preferred hosts of this insect, although lodgepole pine may be attacked when mixed with the other two hosts. Chronic infestation areas are along the North Thompson River, near McGillivray and Bolean lakes, and in the Monashee area near Lumby.

Year	Remarks
1939	Infestation north of Kamloops.
1944	Heavy defoliation of alF and eS along the lower Clearwater R, Skaist Cr, and at Bolean and Arthur lakes; Monashee Summit.
1945	Moderate to heavy populations on alF at Sock L and W of Clearwater; Martin Cr, Bolean, Johnson and Parky lakes and Monashee Summit.
1946	Light defoliation of alF and eS at Sock L, Martin Cr, Bolean, Johnson and Parky lakes and Monashee Summit.
1947	Not mentioned in reports.
1948	From 10 to 20% of new growth lost near Bolean L; small outbreak near headwaters of Martin and Irish creeks; larvae numerous on Monashee summit.
1949	Infestations at Sock, Johnson and Mayson lakes, Russel Cr and E of Barriere; light populations in Silver Hills, Bolean L and Monashee areas.
1950	Light defoliation at Bolean and Arthur lakes; up to 50% defoliation of alF at Sock L, from McGillivray to Barriere L, Cicero L, Johnson L, South Barriere L and Russel Cr.
1951	Generally low population.
1952	Defoliation noticeable at Sock L - average of 1.5 larvae per ft ² of foliage on alF; high populations at Johnson and South Barriere lakes.
1953	Light infestations persisted.
1954	Light defoliation near Bear L; light to moderate populations on Spa Hills Plateau, along Monashee Road, upper Whiteman Cr and on Adams Plateau.
1955	Populations declined; 11% of eS and 8% of alF buds mined at Bear Cr; 5% of eS buds mined at Bolean L.
1956	Light population at Bolean L.

Year	Remarks
1957-59	Low population.
1960	Light defoliation of alF in Jamieson Cr area; average of 0.3 larvae per collection in central parts of District.
1961	Low population.
1962	Moderate moth flight in Vernon on Aug. 1.
1963	Low population.
1964	Low to moderate population on Jamieson Cr TFL.
1965	Larvae collected only at Jamieson Cr.
1966	Maximum of 10 larvae per collection at Jamieson Cr; 5 to 10% defoliation of understory alF and eS.
1967	Light populations at Jamieson Cr.
1968-73	Very low populations.
1974	Moderate defoliation of 3,000 acres of eS and alF along Lempriere Cr and along North Thompson R near its headwaters. First record of damage in this area.
1975	No defoliation.

Larch sawfly, *Pristiphora erichsonii*

A defoliator of western larch. In the Kamloops District, the host is restricted to the southern and eastern sections. Small infestations occurred in the Trinity Valley area in the 1940's; larger ones occurred in the 1960's in the Okanagan Lake area and as far east as Harris Creek.

Year	Remarks
1942	Larvae recorded in Vernon for the first time in the BX District; a small infestation in Trinity Valley.
1943	Present in Shuswap L region.
1944	Increase in population from Vernon to Trinity Valley.
1945	Larvae collected from E side of Okanagan L between Penticton and Ellis creeks.

Year	Remarks
1946	Small infestation near Lavington.
1947	Not mentioned in reports.
1948	Populations collapsed at Trinity Valley, possibly due to parasites <i>Tritneptis klugii</i> and <i>Mesoleius tenthredinis</i> , which had been released in 1941.
1949-62	Low populations.
1963	Populations increased; most severe infestation at Lavington.
1964	Highest population at Lavington; larvae numerous at Cherryville, Mission and Belgo creeks and Terrace Mtn.
1965	Outbreak proportions for first time since late 1940's; moderate to heavy defoliation between Lumby and Vernon; heaviest damage on Vernon Hill, S slope of Aberdeen Mtn, and S side of Coldstream Valley.
1966	Infestations near Kelowna; pockets of 100% defoliation in Coldstream Valley.
1967	Western larch defoliated over 13,400 acres along E side of Okanagan Valley from Osoyoos to Vernon. The largest area was 1,200 acres near junction of Pearson and Mission creeks.
1968	Population declined, partly due to <i>Tritneptis klugii</i> .
1969	Population collapsed.
1970	Low population.
1971	Scattered pockets of defoliation in E Okanagan Valley.
1972	Several small areas of defoliation near Vernon and Lavington.
1973-75	Larvae scarce.

Conifer sawflies, *Neodiprion* spp.

There are several species of this genus common to the Kamloops District. They may be found on almost all coniferous trees but outbreaks have been small in area and of short duration. The greatest damage in the Kamloops District occurred W of Kamloops in the Deadman River area where there was mortality of ponderosa pine in the 1950's.

Year	Remarks
1928	Up to 100% defoliation of 1P over 2 sq miles S of Salmon Arm.
1931	Heavy defoliation of 1P on Mt. Ida - some tree mortality occurred.
1938	Severe localized outbreak on wH at Trinity Valley.
1939	Trinity Valley infestation increased in severity.
1946	Defoliation of pP occurred over 5 acres at Deadman R - up to 20% defoliation on some trees.
1947	Defoliation of pP at Deadman R increased to 90% on some trees.
1948-49	Deadman R infestation persisted.
1950	Deadman R infestation continued - 9 trees dead; light population of sawfly E of Winfield on pP; 30% defoliation of 1P on Silver Star Mtn; numerous larvae on wH at Sitkum Cr.
1951	Deadman R infestation continued; high population on D at Scotch Cr, Adams R, Oyama Mtn, Harper L Rd, Niskonlith Indian Reserve; up to 100% defoliation of current growth on D over 100 acres at Squilax.
1952	Additional tree mortality occurred at Deadman R.
1953-54	Not mentioned in reports.
1955	Light defoliation of pP on Niskonlith Indian Reserve.
1956	Defoliation of D occurred over 4 acres near Larkin and 3 acres at Squilax.
1957	Not mentioned in reports.
1958	Up to 100% of old growth needles of 1P lost over 20 acres near Little Shuswap L; light to moderate defoliation of D north of Little Shuswap L; light damage to pP near Savona, Ashcroft and Lytton.
1959	Light damage to 1P near Squilax; larvae numerous on wH near Cherryville, Sugar L and Kingfisher Cr; light defoliation of wH near Clearwater, Blue R and Lempriere.

Year	Remarks
1960	Deadman R infestation collapsed.
1961	Light defoliation on 1P near Squilax and on D north of Squilax.
1962	Low population on pP along Thompson R; light defoliation of wH at Hidden L.
1963	Moderate defoliation of pP on north arm of Okanagan L; high populations on wH at Enderby and in upper Shuswap Valley, 80% of collections were positive with an average of 45 larvae; between Blue R and Clemina, 33% were positive with an average of 18 larvae.
1964	Infestation along Okanagan L collapsed. At Little Shuswap L, up to 90% defoliation occurred on D for two miles along the N shore up to 1,400 ft elevation.
1965	Moderate defoliation of D along Little Shuswap L.
1966	Generally low populations.
1967	Up to 300 larvae per collection on wH near Blue R.
1968	No information.
1969	Moderate to heavy defoliation of D over 80-100 acres along Head-of-the-Lake Rd (near Vernon).
1970	Head-of-the-Lake infestation collapsed.
1971	Moderate numbers on wH and D.
1972	Moderate defoliation of immature D on several acres near Irish Cr.
1973-75	Moderate populations only.

Western hemlock looper, *Lambdina fiscellaria lugubrosa*

Western hemlock and western red cedar are the preferred hosts of this insect but Douglas-fir, spruce, and alpine fir may also be attacked. Understory deciduous trees and shrubs may also be defoliated during a severe infestation. Outbreaks in the District have been confined to the wet-belt area and have been of short duration.

Year	Remarks
1945	Moths numerous in Blue R, Lempriere, Tum Tum L areas.
1946	Areas of WH defoliated as follows: Clearwater (23 sq miles), Azure L (8 sq miles), Hobson L (17 sq miles), Blue R (40 sq miles).
1947	Infestations collapsed.
1948-51	Low populations.
1952	7 larvae collected at Hidden L.
1953	Avg of 3 larvae per collection and maximum of 11 at Hidden, Mara and Mabel lakes.
1954-60	Low populations.
1961	Light defoliation near Pyramid; 60% of collections were positive with an avg of 3 larvae.
1962	Larvae numerous at Pyramid and Hidden lakes.
1963	Severe defoliation of WH over 100 acres NE of Hidden L.
1964	Hidden L infestation controlled by a spray program; light defoliation near Lempriere - avg of 74 larvae per sample.
1965	In E portion of District, 53% of collections were positive with an avg of 2.3 larvae; collections in North Thompson R area averaged 3 larvae.
1966-70	Low populations.
1971	In E section, 24% of the collections were positive, with an avg of 11.5 larvae. Largest collections, from WC and WH, contained 61 larvae near Hidden L, 43 at Kingfisher Cr and 27 at Noisy Cr. Defoliation was negligible.
1972	No defoliation; populations significantly reduced by a fungus disease, <i>Entomophthora</i> sp. Largest collections were: 44 larvae on WH and 34 on WC in Sicamous and Enderby ranger districts.

Year	Remarks
1973	Heavy defoliation of wH and wC in two 300-acre areas along Tsuius Cr. Moderate defoliation on current year's growth of wH and wC from Avola to Lempriere and in the Perry R drainage.
1974	High populations in North Thompson Va north of Blue R but no damage; decline in Shuswap drainage. Small infestation on D near Black Pines in association with <i>Nepytia freemani</i> and <i>Orgyia pseudotsugata</i> .
1975	Light defoliation of D near Barriere in association with <i>Nepytia freemani</i> . Elsewhere larvae were common. Populations north of Blue R declined.

Pine butterfly, *Neophasia menapia*

Primarily an enemy of ponderosa pine in the Interior, but will feed on lodgepole and western white pine when mixed with ponderosa pine. Adults are sometimes seen hovering near tops of Douglas-fir but there have been no records of damage to this tree species. Pine butterfly infestations occurred near Okanagan Landing in the early 1960's and some tree mortality resulted.

Year	Remarks
1962	Light defoliation of pP over 400 acres at Okanagan Landing.
1963	Okanagan Landing infestation remained about the same in area - defoliation was severe over about 100 acres and light to moderate over remainder.
1964	Okanagan Landing infestation declined; estimated that 28% of attacked trees will die.
1965	Further decline of infestation; a few trees defoliated in Vernon.
1966	Infestation collapsed.
1967	Generally low population; a few larvae collected near Ellison airport.
1968-70	High numbers of larvae in localized area in Vernon; occasional adults in flight; no serious defoliation recorded.

Year	Remarks
1971	Not recorded in reports.
1972	Light defoliation of mature pP on west side of Okanagan L from Peachland to Summerland.
1973	Light defoliation Peachland to Summerland, also near Duck L and along the north arm of Okanagan L.
1974-75	No reports of damage or flights.

Western false hemlock looper, *Nepytia freemani*

Douglas-fir is the preferred host of this looper, although it is found fairly frequently on western hemlock and has been collected from Engelmann spruce, alpine fir and ponderosa pine. Prior to the severe outbreak in the North Okanagan, Shuswap, South and North Thompson valleys from 1972-75, the only recorded damage occurred near Chase in 1963-64.

Year	Remarks
1952	Collections on D at Whiteman Cr averaged 16 larvae per sample.
1954	Moderate population at Squilax.
1955	Collections in Lillooet region averaged 3 larvae, with a maximum of 6.
1956-60	Larvae common in Lillooet area.
1961	56% of collections in S part of District were positive, with an avg of 4.3 larvae.
1962	Populations increased in the S in areas of tussock moth infestations; there was a maximum of 104 larvae per collection. In the N, above normal numbers of larvae were found at Agate Bay, McGillivray L and Copper Cr - 32% of collections were positive, with avg of 12 larvae.
1963	Light defoliation S of Chase, moderate populations throughout southern part of District.
1964	Numerous larvae at Chase but populations declined before any major damage occurred.
1965-70	Low populations.

Year	Remarks
1971	47% of D collections contained larvae and averaged 10.9. Largest collections were: 52 larvae at Brash Cr, 40 near Chase and 24 in Harris Cr Va.
1972	Light to severe defoliation of semi-mature trees on 3,200 acres in the vicinity of Salmon Arm and Enderby. Heaviest damage near Sunnybrae, Celista, White L, Gleneden, Broadview, Canoe, N of Enderby and Mara L.
1973	Infestation expanded to include Vinsulla, Niskonlith and Little Shuswap lakes, Turtle Va, Coldstream and Lavington (total 4,900 acres). Defoliation less extensive in Salmon Arm area where 300 acres of trees were killed.
1974	14,000 acres of moderate to severe defoliation on both sides of the North Thompson Va from Westsyde to McLure, both sides of the South Thompson Va near Chase and near Vernon, Lavington and Lumby.
1975	Most infestations collapsed, due in part to high egg parasitism. 1,800 acres were moderately defoliated at Louis Cr, Barriere, Monte L, Larkin, Pritchard and Lavington.

Larch casebearer, *Coleophora laricella*

This insect poses a major threat to western larch stands in the District. The present population is an extension of the infestation in the United States but will probably expand throughout the range of the host in the District.

Year	Remarks
1968	First record in the District taken on Anarchist Mtn, along Camp McKinney Rd and at Vaseux Cr; there were 4.5 casebearers per 18-inch branch on Anarchist Mtn.
1969	Populations declined, probably due to extremely cold winter.
1970	Defoliation in areas of Anarchist Mtn, Camp McKinney Rd and Vaseux Cr; avg of 18.5 casebearers per 18-inch branch on Anarchist Mtn.
1971	An avg of 11.4 larvae per branch were found along Camp McKinney Rd.
1972-75	Low populations persist on Anarchist Mtn.

Satin moth, *Stilpnotia salicis*

An introduced insect. Hosts of this defoliator are trembling aspen, black cottonwood, willow, and most exotic poplars. Infestations have fluctuated over a wide range in the Kamloops District but tree mortality has been reported only at Campbell L in 1957, Knutsford, 1959, and Pritchard, 1960.

Year	Remarks
1932	First reported at Seton L (Squamish Va introduction route).
1933	S of Lytton (first record of Fraser Va introduction route).
1935	Advanced to Lillooet.
1944-45	Small infestation near Lytton in Botanie Va.
1946	Botanie Va infestation expanded to 200 acres; recorded at Spences Bridge.
1948	Moth flight at Cache Cr.
1949-50	New locality records at Savona, Cornwall Lodge, Ashcroft and Stump L.
1951-53	Up to 100% defoliation of tA at Currie Cr; a small area of damage at Savona in 1953.
1954	Currie Cr infestation increased in size; 60-100% defoliation of tA at Bestwick, 100% at Lac du Bois. Reported along N arm of Okanagan L.
1955	Infestations at Bestwick and Lac du Bois increased; low populations at Stump L, Harper Ranch and Spences Bridge; new locality record at Okanagan Landing; host was eastern cottonwood.
1956	Populations declined at Bestwick and Lac du Bois; small infestation on ornamental poplars at Kinsmen Beach near Vernon - controlled by DDT spray.
1957	Further decrease at Bestwick and Lac du Bois; two new infestations at Pritchard (200 bCo 30-40% defoliated) and Knutsford (500 tA 60% defoliated); small groups of trees at Vernon, Kelowna and Penticton defoliated up to 75%.
1958	Severe defoliation from Monte Cr to Falkland; light damage near Armstrong, NE of Salmon Arm, and from Adams R to Celista. Some control spraying was done in Vernon.

Year	Remarks
1959	High mortality of tA over two acres near Knutsford; some defoliation at Pritchard (70% on bCo and 25-50% on tA); 5 acres of tA 15 miles N of Kamloops was up to 50% defoliated.
1960	Moderate to heavy defoliation of tA at Knutsford and Stump L; severe top kill at Pritchard; severe defoliation of tA W of Okanagan Center.
1961	Severe defoliation at Ashton Cr (parasite <i>Meteorus versicolor</i> abundant); moderate damage to bCo at Okanagan Center; severe defoliation of hybrid poplars at Swan L; infested white poplars at Vernon and Rutland; light to moderate damage to tA and bCo in Chase-Kamloops-Aspen Grove areas.
1962	Increased defoliation at Ashton Cr; small population at Maiden Cr.
1963	Ashton Cr infestation increased; 20 bCo at Hedley defoliated; large areas of defoliation between Monte Cr and Kamloops and Shumway and Stump lakes (up to 75% defoliation); 80-90% larval parasitism at Maiden Cr.
1964	Ashton Cr infestation collapsed; severe defoliation of bCo along Similkameen R; tA at Campbell L damaged; 56% larval parasitism at Maiden Cr.
1965-66	Small infestation at Hedley.
1967-70	Generally low populations; one small grove of bCo defoliated at Agate Bay.
1971-72	Not recorded in reports.
1973	Small but severe infestations on tA and bCo at Dry and Allison lakes.
1974	Repeated defoliation at Dry and Allison lakes.
1975	Several dozen large groves of tA defoliated near Merritt, Courtney L and Aspen Grove as well as repeated damage at Dry and Allison lakes. Two infested silver poplars at Avola may constitute a northern distribution record. Small areas of bCo at Nicola and Carpenter lakes were moderately defoliated.

Fall webworm, *Hyphantria cunea*

Almost any deciduous tree or shrub will be attacked by this defoliator but the most common hosts are chokecherry, willow, trembling aspen, black cottonwood and rose. The insect is very common in the southern and central parts of the District. The following table lists only peak years or areas where higher populations occurred. No tree mortality has been attributed to the insect but it is a nuisance to home owners and orchardists.

Year	Remarks
1946	Severe defoliation of bCo along Deadman R; tents numerous at Vernon and Larkin.
1947-51	Common along Shuswap L, throughout Okanagan Va and N of Princeton; light, sporadic occurrence in Kamloops area.
1952-53	Severe defoliation at Cinnemousun Narrows; common between Shuswap and Little Shuswap lakes.
1954-56	Populations declined near Oliver and Osoyoos and increased at Kalamalka L, Armstrong, Vernon and Lumby.
1957	100% defoliation of roadside shrubs in Kamloops.
1958	Webs present at Pavilion; common at Savona and Okanagan Va.
1959	Webs averaged 26 per mile near Spences Bridge and 69 at Savona.
1960	Webs averaged 42 per mile at Spences Bridge, 33 at Savona, and 164 at Duck L.
1961-62	Population declined at Spences Bridge and Savona; webs numerous throughout Okanagan Va.
1963	Population increased at Savona and Spences Bridge; severe defoliation on public beach at Seton L.
1964-65	High numbers of webs at Spences Bridge, Savona, Texas Cr and Seton L.
1966-67	High populations at Okanagan L, Savona, Spences Bridge, and Seton L. Average of 399 webs per mile at Okanagan L in 1966 and 466 in 1967.
1968	Populations remained high; average of 486 webs per mile at Okanagan L.
1969	Highest numbers at Okanagan L; present along South and North Thompson rivers, Little Shuswap L and Nicola R.

Year	Remarks
1970	Tents numerous but less than in former years; common throughout Okanagan Va.
1971	Common in Okanagan Va.
1972	Common but declining in Okanagan and Thompson valleys.
1973-75	Scarce.

Saddleback looper, *Ectropis crepuscularia*

Preferred hosts are Douglas-fir, western hemlock, alpine fir and western red cedar, but may be found on other conifers. The insect is quite common in the District, mostly in the wet belt, but has never been a serious problem.

Year	Remarks
1950	Light defoliation of understory wH at Hidden L.
1952	Light defoliation of wH from Thunder R to Albreda.
1953	Highest population from Albreda to Angus Horne; wH in Thunder R from 60-100% defoliated, lighter on wC.
1954-58	Low populations.
1959	Slight increase in North Thompson Va.
1960	Between Clearwater and Clemina, 80% of collections were positive, with average of 1.5 larvae.
1961-62	Low populations.
1963	83% of collections in North Thompson R area were positive, with an average of 5 larvae.
1964-75	Low populations.

Forest tent caterpillar, *Malacosoma disstria*

The major infestations of this insect have occurred on trembling aspen, but it does occur on other deciduous hosts as well as spruce, Douglas-fir and lodgepole pine when food is scarce. Although severe outbreaks have occurred, tree mortality was recorded only at Barton Cr in 1959.

Year	Remarks
1945	Numerous larvae near Three Valley Gap.
1946-51	Low populations.
1952	Defoliation from Birch I to Vavenby.
1953	Heavy defoliation on Canoe Mtn (Blue R), Vavenby - Birch I.
1954	Infestations subsided.
1955	Not mentioned in reports.
1956-59	Infestation at Barton Cr (Adams L) covered 400 acres and expanded to 750. Defoliation was up to 100% for consecutive years and resulted in mortality of from 10 to 20 trees per acre in centre of infestation. High larval parasitism in 1959.
1960	Barton Cr infestation collapsed.
1961-63	Low populations.
1964-69	Infestation in tA along Wells Gray Park Rd covered 320 acres and expanded to 16,000 by 1969.
1970	Wells Gray Park infestation collapsed.
1971	Scattered pockets of heavy defoliation near Raft and Mad rivers and at Winfield.
1972-73	Moderate to heavy defoliation on 4,000 acres of tA in Mad R Va.
1974	Mad R infestation collapsed.
1975	No outbreaks recorded.

Ugly nest caterpillar, *Archips cerasivoranus*

An insect common on roadside shrubs. It does little economic damage but at times is a pest in parks and gardens.

Year	Remarks
1952	Nests common along No. 1 Highway between Lytton and Pavilion.
1953-55	Low populations.
1956-58	Sporadic occurrence at Chase-Savona, Spences Bridge-Boston Bar, Kamloops-Birch I, and along Nicola R.
1959	Low populations.
1960-61	Present at Birch I, Kamloops, Lytton, Spences Bridge, and along Nicola R.
1962-66	Low populations.
1967	Numerous bushes infested near Vernon.
1968	Low populations.
1969	Nests common along Little Shuswap L.
1970	Low populations.
1971	Defoliation near head of Okanagan L.
1972	Common in N Okanagan.
1973-75	Fairly scarce.

Larch budmoth, *Ziraphera improbana*

An enemy of western larch in Kamloops District. There are no records of attack prior to 1965. Damage is restricted to stands above 4,000 ft elevation. Damage may be confused with that caused by larch needle cast, *Hypodermella laricis*.

Year	Remarks
1965	Larvae collected near Aberdeen L and Vance Cr.

Year	Remarks
1966	Degrees of defoliation occurred as follows: Putnam Cr (heavy over 1,500 acres), Vance Cr (heavy - 500 acres), Harris Cr (heavy - 1,000 acres), Creighton Cr (light to heavy - 1,200 acres), Echo L (moderate to heavy - 1,000 acres), Ferry Cr (light - 200 acres), and Nicklen L (light - 50 acres).
1967-70	Low populations.
1971	Increasing populations.
1972	Heavy defoliation on 5,000 acres SE of Silver Star Provincial Park; 2,000 acres on Hunters Range and 1,000 acres in Squaw Va. Small pockets near Lumby and Cherryville.
1973	Heavy defoliation of 1,200 acres SE of Silver Star Park.
1974	Defoliation on 1,000 acres SE of Silver Star Park, 500 acres at each of Heckman Cr, Vernon Hill and Dutton Cr (SE of Okanagan Falls).
1975	All infestations declined, light defoliation only.

Other defoliators of minor significance

Insect	Year	Remarks
<i>Arge pectoralis</i> Birch sawfly	1951	Severe defoliation of 7 trees at Hidden L.
<i>Erranis vancouverensis</i> Western winter moth	1959	10 acres of M, B and A1 defoliated at Agate Bay.
	1973	Small outbreak on M, Coldstream Cr.
	1975	Infestations on M and B, Simikin Va and Corning Cr.

Insect	Year	Remarks
<i>Dichomeris marginella</i> Juniper webworm	1934	Recorded near Summerland.
	1942	Severe infestation near Kelowna.
	1967	Severe damage to shrubs in Okanagan Valley towns and cities.
<i>Hemichroa crocea</i> Alder sawfly	1961	20 acres of trees defoliated near Winfield.
	1968	A few bushes infested near Sugar L.
<i>Malacosoma pluviale</i> Western tent caterpillar	1951	Infestations on Anarchist Mtn and N of Osoyoos.
	1952-53	Infestations on Anarchist Mtn, Cherryville and O'Keefe.
<i>Melanolophia imitata</i> Green-striped forest looper	1949	20 to 30 larvae per collection common throughout District.
	1950	Common on D in Barriere R.D.
<i>Nematus nigriventris</i> Poplar sawfly	1940-50	Severe defoliation of bCo at Eagle and Shuswap rivers, from Three Valley to Grinrod, and at Mabel L.
<i>Nymphalis antiopa</i> Mourning cloak butterfly	1949	Severe defoliation in Sicamous area.
	1951	Sporadic damage near Princeton.
	1957	Light damage to tA and W in Thompson R Va, in Vernon, Enderby, Salmon Arm and Sicamous areas.
	1958-61	Defoliation of W at Blue R.
<i>Orgyia a. badia</i> Rusty tussock moth	1936-39	Defoliation of ornamental spruce in Salmon Arm and Vernon.

LEAF BEETLES

Alder flea beetle, *Altica ambiens*

A native species which skeletonizes leaves of alder, willow, trembling aspen and black cottonwood. Damage occurs during both the larval and adult stages.

Year	Remarks
1941	Outbreaks on Al at Malakwa, Long L and Okanagan Mission.
1948-49	Common on Al in Kamloops area; up to 100% defoliation of some trees in Salmon Arm.
1959	Light to severe defoliation of Al on 15 acres S of Kelowna; light damage in Trepanier Cr Va.
1960	Small infestation on Al near Larkin; severe damage on 3 acres near mouth of Salmon R; light damage near Kelowna airport and W side of Kalamalka L.
1962	Moderate to severe damage to Al at Sicamous and Chase, and in W section at Texas Cr, Applespring Cr, Yalakom R and Izman Cr; bCo between Shuswap and Mara lakes was infested.
1963	Severe damage to bCo in Monte Cr, Shuswap and Mara lakes areas, and on Al from Lillooet to Lytton.
1964	Moderate attack on Al in Lillooet-Ashcroft area.
1965	Moderate population near Seton L; some damage along Texas Cr road.
1969	Severe damage to Al and bCo in localized areas on W side of Okanagan L and in Salmon Arm area.
1970	Defoliation up to 100% on Al and bCo in small areas along Little Shuswap R, Little Shuswap L, and Okanagan and Mabel lakes.
1971	Moderate to severe damage along Coldstream and Duteau creeks.
1972	Moderate to severe defoliation of Al in Okanagan and Shuswap valleys.
1973-75	Generally low populations.

Other leaf beetles of minor significance

Insect	Year	Remarks
<i>Altica bimarginata</i> Alder leaf beetle	1932	Severe defoliation of A1, B, and tA in China Valley.
	1947	Common in Salmon Arm; infestation in Trinity Valley.
<i>Bucculatrix canadensisella</i> Birch skeletonizer	1955	Small infestation in Salmon Arm affecting from 15 to 100% of foliage on some trees.
<i>Chrysomela scripta</i> Poplar leaf beetle	1952	Up to 50% defoliation of bCo in small outbreaks between Princeton and Hedley.
<i>Phytodecta americanum</i> American poplar leaf beetle	1948	Common between Salmon Arm and Notch Hill; 100% defoliation of tA on 2 acres at Tappen.
<i>Pyrrhalta carbo</i> Pacific willow leaf beetle	1944	Damage to W at Albas.
	1957	Severe damage on W NE of Kamloops.

NEEDLE AND LEAF MINERS

Douglas-fir needle midges, *Contarinia* spp.

A dipterous insect which mines the current year's needles of Douglas-fir. It is a major pest of Christmas trees and is common throughout the range of the host in the District.

Year	Remarks
1952-54	Widespread in Okanagan Va; up to 75% of needles mined from Peachland to Westbank, and from 40-90% at Carlin; lower populations at Squilax, Celista, Anglemont, and in North Thompson R Va.
1955	85% of needles damaged at Westbank and Hydraulic Cr; from 10-50% at Peachland, Shuswap L, Barriere, Oyama, Penticton and Lytton.
1956-60	Reduced populations; about 30% of needles attacked.
1961	Severe infestations at Okanagan Mission, Terrace Mtn, Equisis Cr, Fintry, Whiteman Cr, Head-of-the-Lake and Larkin (up to 80%); lower populations at Louis Cr, Tranquille Cr, Red L, Lytton and Campbell Rge; needle discoloration along Similkameen R.
1962-63	High populations at Lillooet, Princeton, Ashnola R, Peachland, Monte Cr, Mission Cr (up to 80% of needles infested).
1964	Severe damage at Peachland (85%) and Hedley (34%); from 1 to 65% at 10 permanent sample plots.
1965	Average of 59% of needles damaged at Ashnola R; up to 9% in other areas.
1966-68	Generally low populations.
1969-70	Infestation at sample plots ranged from 2 to 41% in 1969 and 5 to 24% in 1970. Severe damage to understory trees throughout Okanagan Va in 1970.
1971	Infestation at sample plots ranged from 2 to 34%.
1972-73	Severe infestations on immature and semi-mature D from Kelowna to Winfield and near Okanagan L from O'Keefe to Whiteman Cr.
1974	Extensive damage throughout the Okanagan Va. Near Shuttleworth Cr, semi-mature trees had lost all of their 1973 foliage by mid-1974.
1975	Extensive damage for about 10 miles along the Similkameen R E of Princeton (Bromley).

Pine needlesheath miner, *Zelleria haimbachi*

Occurs commonly on ponderosa and lodgepole pines in the District. The most severe infestation was north of Spences Bridge in 1958. Smaller infestations occurred in 1951 at Penticton, and in 1962 at Louis Cr, Paxton Valley, Scotch Cr and Equisis Cr, but no tree mortality as a result of damage has been recorded.

Year	Remarks.
1949-50	Larvae numerous between Oliver and Penticton.
1951	Moderate to heavy damage to pP over 900 acres N of Penticton at Campbell Mtn; 70 acres of lP infested at Westbank.
1952	Populations declined in Okanagan Va.
1956	Up to 100% of new terminals infested on pP over 100 acres at Shaw Springs.
1958	Light to severe infestation over 2,500 acres of pP between Venables Va and Twaal Cr.
1959	Above infestation collapsed; high population at Vaseux Cr; larvae present at Merritt, Nicola, Barnhartvale.
1960	High population at Vaseux Cr on pP; low at Martel, Dot, Savona, Robbins Rge and Barnhartvale.
1961	100% of new shoots infested over 20 acres of lP at Yard Cr.
1962	Severe infestations in lP stands - 85 to 95% of current growth destroyed in Paxton Valley, Bolean, Charcoal and Chase creeks; 100% destroyed over 300 acres at Louis Cr; infestations at Scotch Cr (600 acres), Equisis Cr (300 acres), and Aberdeen Mtn (100 acres).
1963-67	Generally low populations.
1968	Severe damage to pP near Gallagher L - heavy defoliation on trees up to 60 ft tall.
1969-71	Low populations; Gallagher L infestation collapsed.
1972-74	No damage reported.

Aspen leaf miner, *Phyllocnistis populiella*

An insect commonly infesting the leaves of trembling aspen. High populations occur sporadically throughout the range of the host in the District.

Year	Remarks
1954-57	From 25 to 100% of leaf surfaces were infested in the following areas: Adams L, Red L, Robbins Rge, Pillar L, Cache Cr, Clinton, Enderby to Shuswap L, and from Salmon Arm south through the Okanagan Va.
1958-61	Moderate to severe infestations at Hat, Oregon Jack and Cache creeks, Wells Gray Park, North Thompson R Va, Deadman R, Le Jeune L, Stump L, Coldwater R Va, Vernon to Salmon Arm, Robbins and Campbell ranges, Glenemma Rge, Falkland and Aspen Grove.
1962-64	Generally lower populations; some heavily infested groves in Princeton area.
1965	High populations from Sicamous to Three Valley, at Aspen Grove and Carlin.
1966	Highest populations in Chase, Salmon Arm and Sicamous areas.
1967	Low populations.
1968	Moderate to heavy damage at Carlin.
1969-75	Low populations.

Leaf blotch miner, *Lithocolletis* sp.

A miner of black cottonwood leaves. Usually infestations are localized and there is no permanent damage.

Year	Remarks
1958	Abundant at a few localities in the Okanagan; highest populations at Kalamalka and Wood lakes.
1959	General decline at all locations.
1966	Infestations over 5 acres at Salmon Arm, 20 acres near Enderby, 10 acres at Vernon, 20 acres near Kelowna, and 5 acres at Penticton.
1967-75	No outbreaks reported.

SUCKING INSECTS

Cooley spruce gall aphid, *Adelges cooleyi*

An enemy of Douglas-fir and Engelmann spruce, the insect causes galls on branch terminals on spruce and is most noticeable on Douglas-fir by the tufts of "wool" over the egg masses. Sporadic high populations have occurred and have probably caused a considerable loss of increment on spruce. Needle damage to Douglas-fir is rarely serious, except on Christmas-tree stock.

Year	Remarks
1940-41	Damage to spruce in BX District and at Armstrong.
1942-43	Not reported.
1944	High population near Kelowna.
1945-58	Not reported.
1959	Severe infestation on D at Lytton; light damage near Bridge L.
1960	Not reported.
1961	Up to 28% of eS tips infested throughout the District; heavy on D in parts of the Okanagan.
1962	Severe infestation of eS in Charcoal Cr Valley.
1963	Low populations.
1964-65	Not reported.
1966	Common on Christmas trees near Falkland; up to 34% of D needles infested at Coalmont.
1967-68	Moderate populations on D at Keremeos, Cherry Cr, Heffley Cr and Barriere.
1969-70	High populations on D in North Thompson R area, Cherry Cr, Coalmont, Keremeos, Monte Cr and Falkland; up to 100% of current growth infested in Kelowna-Penticton area.
1971	Up to 80% of needles on current year's growth on D were damaged near Coalmont and Winfield; from 2 to 14% of needles infested at other plots.
1972	Moderate damage throughout the District.
1973	Light damage only.
1974	Heavy attacks near Kamloops L and in the Shuswap and Okanagan valleys.
1975	Low populations.

Balsam woolly aphid, *Adelges piceae*

Discovered on *Abies alba* at Oliver and on *Abies concolor* in Penticton in 1967. The infested trees were sprayed and later destroyed. No other reports of the presence of the pest in the District have been received.

A mealy bug on conifers, *Puto cupressi*

The largest infestation of this insect is at present at Asp Cr where damage covered 8 acres in 1968. Other areas where the pest has occurred are Beaconsfield Mtn and near the upper part of Memaloose Cr. The aphid causes deformation and blackening of foliage on 1P, eS, a1F and wBP.

Spruce spider mite, *Oligonychus ununguis*

Although this is not an insect, it is listed here because it is quite common in the Okanagan Valley and may cause numerous requests for information from home owners. It occurs on spruce, Douglas-fir and juniper.

Year	Remarks
1961	Severe discoloring of D from Okanagan Landing to Otter Bay; moderate populations at Chase and near Anglemont.
1962	Mites abundant on D and roJ near Vernon and Monte Cr, and on D at Salmon Arm.
1963	Severe discoloration of D near Okanagan Landing and at Chase, Monte Cr and Otter L.
1964	Fourth year of infestation of D near Okanagan Landing; damage on D noted along the Similkameen R.
1965	Population decreased at Okanagan Landing; damage occurred to D at Harper L.
1966-74	Not reported.
1975	Severe infestation on 2,000 acres of D from Winfield to Kelowna; these trees had previously been defoliated by Douglas-fir tussock moth.

STEM BORERS

Poplar-and-willow borer, *Cryptorhynchus lapathi*

The major host of this weevil is willow; it also attacks poplar species and alder. Sizeable infestations have occurred, notably at Tranquille in 1958 and near Heffley Lake in 1969.

Year	Remarks
1923	First record in British Columbia.
1924	Damage to bCo and W in Kelowna city park.
1932	Reported from Penticton.
1934	Reported from Summerland.
1937-38	Damage to W at Okanagan Landing and Head-of-the-Lake.
1939-57	Not reported.
1958	Heavy mortality of W over 250 acres at Tranquille.
1959	Sporadic damage to W at North Kamloops.
1960	Heavy mortality of W over 4 acres at Larkin; scattered attacks west of Falkland, Squilax, and S of Sicamous.
1961	Severe damage to W at Salmon Arm, Enderby and Gardom L; damage also at Oliver, Hedley, Tulameen and Manning Park.
1962	Heavy infestations in W and light attacks to bCo and Al from Enderby to Shuswap L; infested W at Tulameen, and attacks occurred on Terrace Mtn to the 4,200 ft level.
1963	Severe infestations in W from Enderby to Shuswap L, and in Kamloops-Clearwater areas.
1964	Severe damage to W along North Thompson R, in Enderby-Shuswap L area, and at Cache Cr; N record at Blue R.
1965	Moderate W mortality in Enderby-Shuswap L area; present at Oregon Jack, Botanie, Texas, Twaal and Izman creeks and Bonaparte R.
1966	Light population at Nicola R, Wells Gray Park Rd, Oregon Jack and Botanie creeks.
1967	Scattered dead W in Kamloops, along Wells Gray Park Rd and North Thompson R.

Year	Remarks
1968	Heavy attacks on W in Merritt-Coldwater R area.
1969	Mortality of W over 100 acres near Heffley L.
1970	Scattered dead W in North Thompson R area, especially along road to Mt. Tod.
1971-73	Not reported.
1974-75	Some attacked trees reported at Sugar L.

TERMINAL BORERS

Lodgepole pine terminal weevil, *Pissodes terminalis*

Preferred host is lodgepole pine but it does attack western white pine and, occasionally, ponderosa pine. It is common in a few locations in the southern parts of the District.

Year	Remarks
1965	Infested leaders noted at Mile 5, Coldwater Rd.
1966-67	Not mentioned in reports.
1968	40% of 500 1P examined at Tunkwa L were infested.
1969	Tunkwa L infestation collapsed, probably due to cold winter.
1970-75	Low populations.

Spruce weevil, *Pissodes strobi*

Preferred host in Kamloops District is Engelmann spruce, but it also attacks lodgepole pine. The insect is common on spruce along roadsides or in other open sites.

Year	Remarks
1928	Outbreak near Shuswap L.
1930	Considerable damage to spruce near White L.
1948	Common near Clearwater L.
1955	Infestation covered 10 acres near headwaters of Ellis Cr.
1957	Not mentioned in reports.
1959	20% of trees on 10 acres were infested at McMurphy; 50 trees infested on upper Clearwater R; infestation over 5 acres at Tunkwa L.
1963-64	Not mentioned in reports.
1965	Up to 18% of trees in plots in Clearwater area were infested.
1966	Up to 25% current attack on trees examined in Clearwater area.
1967-68	Populations generally declined.
1969	Areas of heaviest attack were at Apex Mtn and Whipsaw Cr where up to 20% of examined trees were infested.
1970	Infestation in 50-tree plots was as follows: Terrace Mtn - 20%; Belgo Dam Rd - 10%; Monashee Mtn - 6%; Stuart L - 2%.
1971-75	Not recorded.

European pine shoot moth, *Rhyacionia buoliana*

An introduced pest which has been of major concern in the Okanagan Valley. Since 1961 there has been an annual survey of exotic pines in nurseries, plantations, and many home gardens. Most of the infested seedlings found were Scots pine imported from Ontario, but some came from the Vancouver area.

Year	Remarks
1961	First recorded collection - a Mugho pine at Kelowna.
1962	One infested Mugho pine in Kelowna.
1963	30 infested seedlings in Kelowna-Penticton area; one infested shoot found on pP at Summerland.
1964	One infested Austrian pine in Kelowna.
1965	One larva found on Scots pine at Oliver and one on Mugho pine in Kelowna - both trees imported from Holland.
1966	2 larvae from Scots pine imported from Ontario.
1967	Damage found on Scots pine at two plantations near Kelowna and on two pP near the plantations.
1968-70	No shoot moth or damage found.
1971	As above.
1972	One dead pupa taken from Scots pine in Joe Rich Cr plantation. Infested Austrian and Mugho pines imported from Vancouver to a retail outlet in Kelowna. All but 20 trees destroyed.
1973-74	No shoot moths found in forest sites.
1975	No shoot moths found in forest plantations, but exotic pines on Okanagan Regional College (Kelowna) grounds heavily infested.

SCALE INSECTS

Pine needle scale, *Phenacaspis pinifoliae*

Preferred hosts are ponderosa and lodgepole pine, but the insect also attacks Douglas-fir, hemlock and spruce. Chronic areas are the Okanagan Valley, where severe infestations have occurred, particularly in the Penticton area.

Year	Remarks
1946	lP near head of Okanagan L and at Squilax, and pP N of Okanagan Center, infested.
1952-53	Entire groves of pP from East Kelowna to Okanagan Mission heavily infested.
1955	Severe infestations and some tree mortality near Penticton, East Kelowna, Winfield and Wilcox.
1956	Infestations declined.
1957	Severe attack to pP over 2 sq miles on Nicola Indian Reserve; heavy damage near Vernon and lower Trout Cr; light to moderate populations at NW end of Okanagan L, East Kelowna, Winfield, Oyama, Squilax.
1959	pP infested at Lower Nicola, Nicola, Savona, Kamloops, Naramata, Summerland, Winfield, Okanagan Center, Kelowna and Vernon.
1960	High populations for 3 miles along Mamit L Rd; light attacks to lP near Barriere; high numbers of predator, <i>Chilocorus tricyclus</i> , at Nicola, Savona and Kamloops.
1961-64	High populations at West Summerland, Naramata-Penticton, East Kelowna, Glenmore, Carr's Ldg. and Whiteman Cr; light attacks along Mamit L Rd. D Christmas trees at Clinton heavily infested in 1963.
1965	Tree mortality attributed to weakening of trees by scale insects occurred at Winfield, Glenmore, East Kelowna and Carr's Ldg.
1966	Heavy attack to pP E of Kelowna.
1968	Severe attacks on pP along McCulloch Rd E of Kelowna; infested trees at Winfield, Penticton; moderate population on D at Salmon L.
1969-70	Generally low populations.

Year	Remarks
1971	About 500 acres of pP near Nicola L were severely infested. "All sizes of pine were affected in a belt between 2,500 and 3,000 ft elevation." A few trees had died.
1972	Heavy infestations of pP near Kelowna, Rutland, Glenmore, Winfield and Oyama. Nicola L infestation declined.
1973-74	Heavy infestations in Central and North Okanagan.
1975	Abundant attacks in and around Kamloops. Okanagan populations declined.

Black pineleaf scale, *Nuculaspis californica*

An insect enemy of ponderosa pine. It is commonly found in conjunction with pine needle scale in the Okanagan Valley and drier parts of the western portions of the District.

Year	Remarks
1956	pP severely damaged from Naramata to Osoyoos; some tree mortality from Campbell Mtn to Skaha L.
1957	First record in W portion of District at Lytton, where infestation was over 10 acres; 900 trees killed to date in Skaha L area (infestation in association with <i>P. pinifoliae</i>).
1958-59	Lytton infestation expanded along Botanie Valley; total of 1,160 trees killed near Penticton since 1956.
1960	Infestations declined in Botanie Valley and Penticton area.
1961-63	Intermittent infestations at West Summerland and at Penticton, Okanagan Ldg. and Lytton.
1964-65	Populations increased on pP from Naramata to Princeton; present in Lillooet area.
1967-72	Low to moderate populations persisted on pP in Penticton and East Kelowna areas.
1973	Localized outbreak at Penticton.

Year	Remarks
1974	Some tree mortality E of Penticton. New, severe attacks from Summerland to Trout Cr.
1975	Severe attacks Summerland, Trout Cr and Penticton. Light attacks N of Oliver.

CONE AND SEED INSECTS

Douglas-fir cone moth, *Barbara colfaxiana*

An insect commonly infesting Douglas-fir cones in the Interior, particularly in the central and southern parts. It is frequently found in conjunction with the cone pyralid, *Dioroctria abietivorella*. The following infestation ratings are based on examination of 50-cone samples.

Year	Remarks
1957	Walker L - 8%; Greenstone Mtn - 96%; Tranquille Mtn - 71%; Highes L - 48%.
1958	Moderate populations in Okanagan Valley; Kamloops - 20%.
1959	Craigellachie - 37%; Grandview Bench - 55%; Keremeos - 62%; Anarchist Mtn - 41%; less than 25% at Tranquille, Nicola, Merritt, Lytton, Canoe Point, Sweetsbridge and Princeton.
1960	Generally light cone crop; Grandview Bench - 62%.
1961	Olalla - 64%; Armstrong - 82%; low population at Kirton and Fairview.
1962-63	Not reported.
1964	Highest population at Lac Le Jeune - 64%.
1966	From 26 to 58% at Heffley Cr and along Glimpse L Rd; up to 76% in S areas.
1967-75	Not reported.

A ponderosa pine cone borer, *Dioryctria auranticella*

A major pest in ponderosa pine cones but may also be found in Douglas-fir cones or new shoots of ponderosa pine. Large percentages of cones have been infested in various areas but there are no records on the percentage of seeds damaged. Infestation ratings refer to the percentage of ponderosa pine cones damaged in 50-cone samples.

Year	Remarks
1952	Oliver - 64%; populations high near Kelowna and low N of Princeton.
1955	Infested cones found from Lytton to Spences Bridge, along Durand Cr, in Deadman R Valley, and at Savona and Kamloops.
1957	Nicola - 70%; Savona - 78%; Anarchist Mtn - 62%; Keremeos-48%; Richter Pass - 70%; Oliver - 45%; Winfield - 68%; Glenemma Rge - 73%; less than 25% at Little Shuswap L, Westsyde and Merritt.
1958	Keremeos - 52%; Richter Pass - 72%; Anarchist Mtn - 36%; Oliver - 68%; Winfield - 74%; Glenemma Rge - 76%; Little Shuswap L - 58%; Savona - 98%.
1959	Keremeos - 38%; Richter Pass - 62%; Anarchist Mtn - 27%; Oliver - 73%; Winfield - 71%; Glenemma Rge - 54%; Savona - 94%; Nicola - 36%; less than 25% at Little Shuswap L, Mamit L and Merritt.
1960	Glenemma Rge - 31%; Savona - 28%; Nicola - 36%; low population at Anarchist Mtn, Oliver, Merritt and Mamit L.
1961	Light cone crop; less than 25% of cones infested at Winfield and Princeton.
1962	Average of 13% of cones infested at four locations.
1964	Average of 30% of cones infested in central parts of District.
1965	Infestation of cones ranged from 26 to 63% at 20 plots in the District.
1966	From 60 to 100% of cones were infested at Mamit L, Nicola, Savona, and Little Shuswap L.
1967-75	Not mentioned in reports.

WOOD BORERS

The following table lists the wood borers which are common to the Kamloops District and which are usually found infesting log decks or in fire-damaged standing timber.

Wood borers common to Kamloops Forest District

Insect	Year	Remarks
<i>Monochamus</i> sp. Round-headed borer	1966	Log decks of eS and a1F infested at Clearwater.
	1967	High populations in standing, fire-killed pP in Paxton Valley and in log decks in Penticton.
<i>Tetropium</i> sp. Round-headed borer	1967	High population in fire-killed pP trees in Paxton Valley.
	1969	Moderate population in fire-killed eS and a1F at Ross Cr.
<i>Sirex cyanus</i> Blue horntail	1969	High population in fire-killed eS and a1F at Ross Cr.
<i>Melanophila drummondi</i> Flat-headed borer	1921	A number of mature D killed.
	1932	Larvae numerous in windfalls and beetle-killed D at Chase.
<i>Buprestis rusticorum</i>	1932	As above; small infestation at Aspen Grove.

PIN HOLE BORERS

Ambrosia beetle, *Trypodendron lineatum*

May cause severe damage to decked logs or to trees killed or weakened by disease or other insect attacks. Common throughout the District.

Year	Remarks
1960	Heavy attack to unpeeled wC poles at Sugar L; light attacks to eS at Jamieson Cr and Sock L.
1961	Severe attacks to decked D, eS and wH logs at Malakwa; eS logs attacked at Thunder R and Grizzly L.
1962	Decked logs at Gosnel attacked.
1963	Heavy attacks throughout North Thompson R Valley; eS logs attacked at Pyramid, Blue R and Avola (up to 60 entrance holes per sq ft).
1964	Severe attacks on standing beetle-killed eS from Avola to Gosnel.
1965-68	No reports.
1969	62 holes per sq ft in alF killed by <i>Dryocoetes-Ceratocystis</i> in Fly Hill.
1970	Up to 40 holes per half sq ft in beetle-killed eS trees at Blue R; light population in beetle-killed eS at Kwikoit and Shorts creeks.
1971-75	Not recorded.

PITCH MOTHS

Sequoia pitch moth, *Vespa mima sequoiae*

An enemy of lodgepole and ponderosa pines, and occasionally Douglas-fir. No large-scale infestations have occurred but the insect has caused damage in localized areas in the District, especially in the North Thompson River drainage.

Year	Remarks
1959	1P N of McLure have suffered repeated attacks over several years; several trees have broken off at the base.
1960	Fresh attacks on 1P at McLure; 18 1P attacked at Clearwater.
1961	Attacks continue at McLure and Clearwater; 22 1P killed over 10 acres at Squilax.
1965	Several small groups of 1P infested at Barriere.
1975	Localized but severe attacks on 1P and pP at Salmon Arm.

APPENDIX 1. Host tree abbreviations

Abbr	Common name	Abbr	Common name
wC	western red cedar	roJ	Rocky Mountain juniper
D	Douglas-fir	eS	Engelmann spruce
alF	alpine fir	Al	alder-general
wh	western hemlock	tA	trembling aspen
1P	lodgepole pine	B	birch-general
pP	ponderosa pine	bCo	black cottonwood
wwP	western white pine	M	maple-general
wbP	whitebark pine	W	willow-general