FIDS REPORT 92-11

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History of Population Fluctuations and Infestations of Important Forest Insects in the Kamloops Forest Region 1912-1991

P. Koot & J. Hodge
Forest Insect and Disease Survey

Pacific and Yukon Region

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INTRODUCTION

This report constitutes a history of some important forest insects in the Kamloops Forest Region since 1912. It's 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 Region. Logging in the Shuswap and Okanagan lakes 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 over 1000 mills in the southern interior (many of which were in the Nelson Region) with an annual cut of more than 905 000 000 board feet.

Major losses from forest insects in the Kamloops Region 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 ponderosa pine range. 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 infestation was attributed to the western pine beetle but, by 1921, populations of this beetle 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 of the Region. Current outbreaks of mountain pine beetle are extensive in the Okanagan TSA, particularly south of Vernon on the east side of the Okanagan Valley.

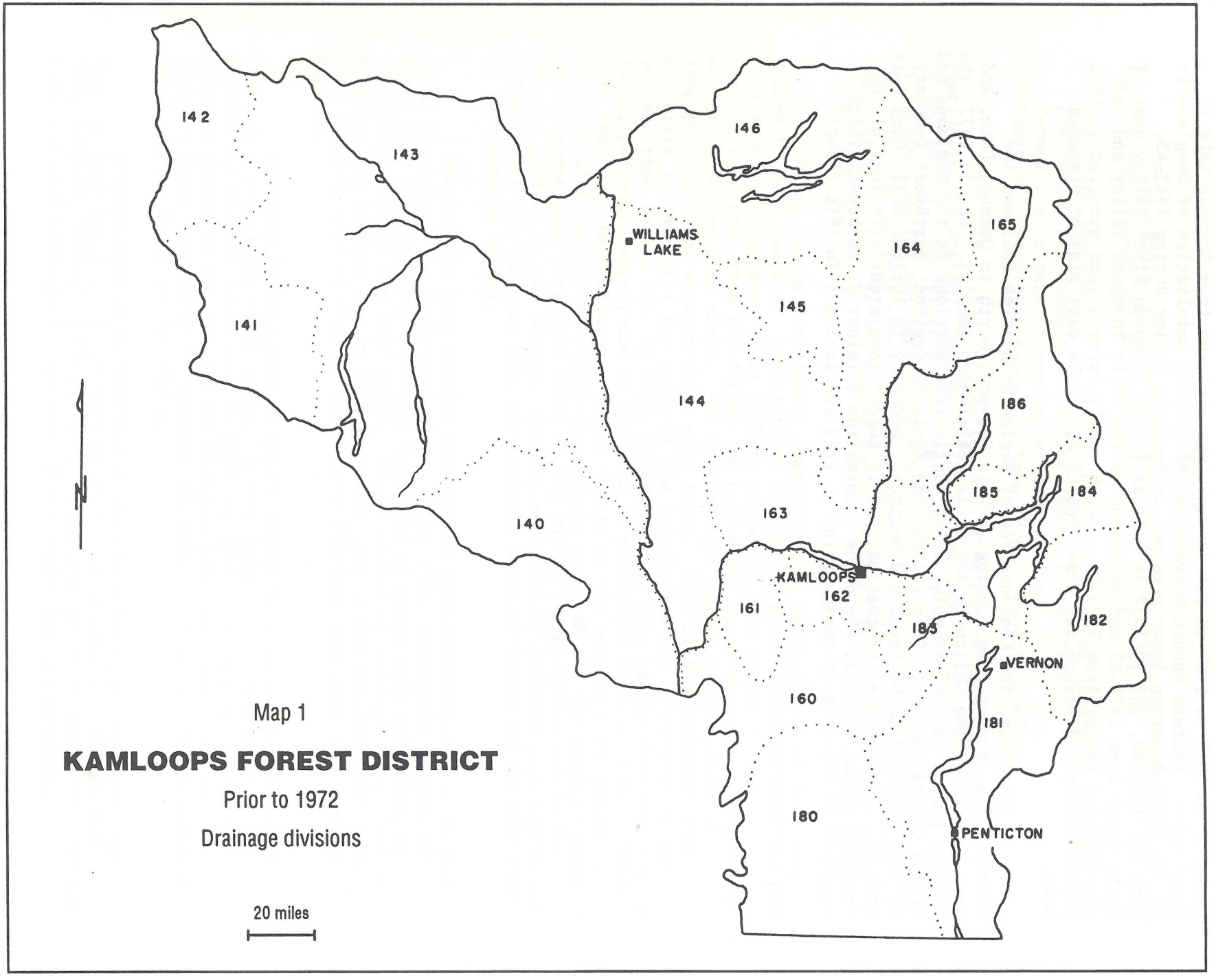
Douglas-fir bark beetles have caused tree mortality over extensive areas throughout the Kamloops Region. Since 1922, red-topped Douglas-fir trees have been recorded annually, beginning at Adams Lake and extending throughout most of the host range. Annual counts of red-tops have fluctuated greatly; the highest was in 1963 when more than 51 000 beetle-killed trees were tallied, most of them in the Clinton-Williams Lake area (now Cariboo Region).

Sporadic infestations of spruce beetle have occurred, but, until 1968, on a relatively small scale. Severe infestations developed in the Quesnel and Cariboo lakes area in 1968 and 1969, with smaller areas of moderate damage in the Shuswap and Okanagan lakes watersheds and in the Jamieson Creek area north of Kamloops and west of Lillooet between Anderson and Carpenter lakes in the 1980's.

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, 1975-76, 1981-85 and 1991 in areas along the Thompson River and from Kamloops to Osoyoos. Black-headed budworm infestations

occurred in 1965 to 1967 in the Quesnel Lake area and from Shuswap Lake to Sugar Lake. Western 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 1967-77 as well as in the Thompson River Valley east of Cache Creek from 1979-83 and expanding up the North Thompson Valley and into the Okanagan Valley from 1984-91. Larch sawfly infestations occurred in 1956 between Lumby and Vernon and from 1966-67 along the east side of Okanagan Lake.

Initially, the Kamloops Forest Region boundaries followed the Canada-U.S.A. border from Manning Park to Osoyoos, north to Quesnel Lake, and west to include the Chilcotin and Chilko watersheds (Map 1). But in 1972, the Cariboo Forest Region was established mostly from portions of the Kamloops and Prince George regions. This reduced the Kamloops Regions' northwest boundary to just north of Cache Creek and northeast boundary to include Wells Gray Park (Map 2). To keep the information in this report consistent with that of the regional annual reports, where the information originated, outbreaks which occurred in the area of change prior to 1972 are included in this report.

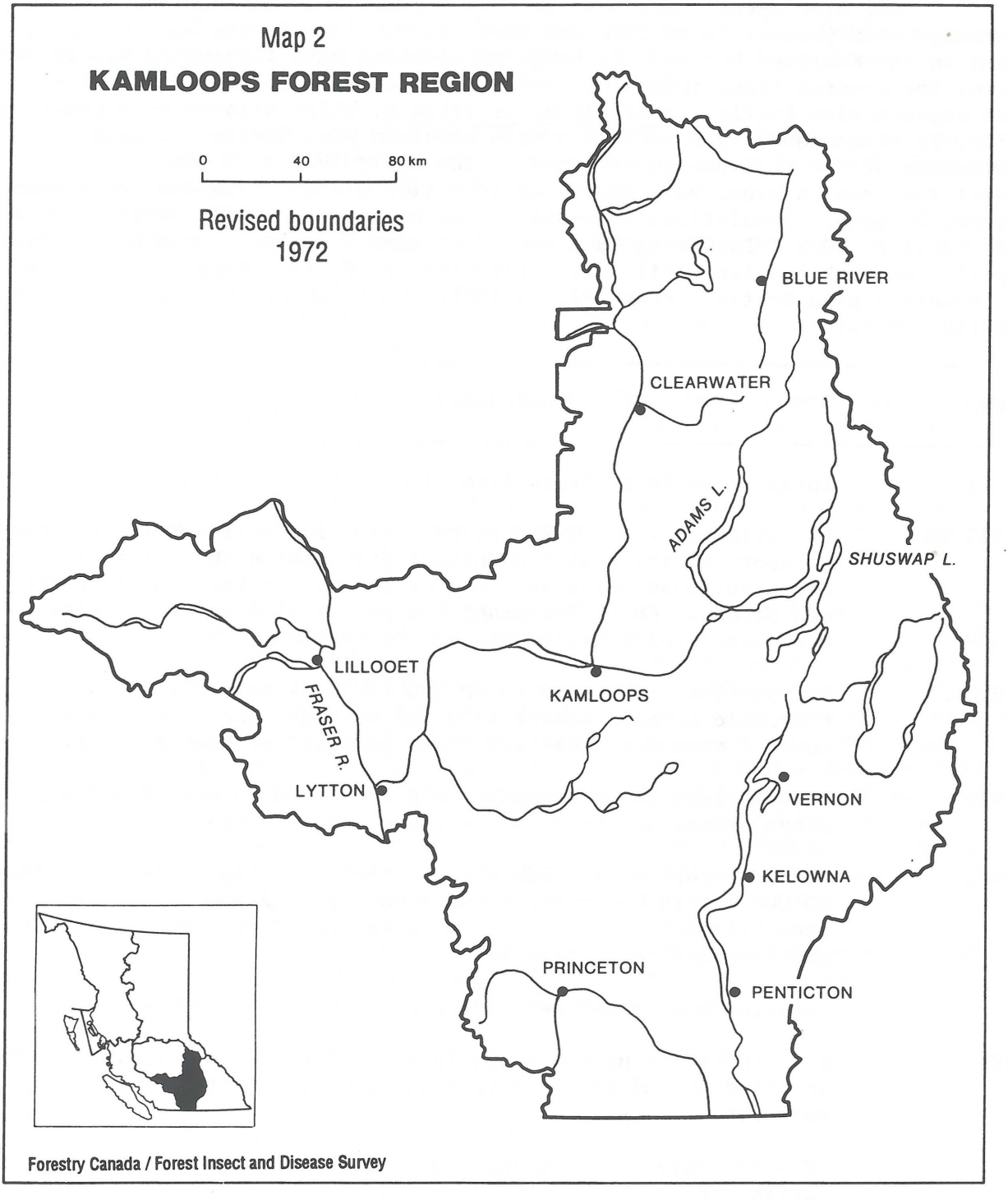


Map 1

KAMLOOPS FOREST DISTRICT

Prior to 1972

Drainage divisions


Map 2
KAMLOOPS FOREST REGION
0
40
80 km
Revised boundaries
1972
BLUE RIVER
CLEARWATER
ADAMS L.
SHUSWAP L.
LILLOOET
FRASER R.
KAMLOOPS
LYTTON
VERNON
KELOWNA
PRINCETON
PENTICTON
Forestry Canada / Forest Insect and Disease Survey

PINE PESTS

Mountain pine beetle, Dendroctonus ponderosae

All pine species are host to this beetle; Engelmann spruce may be attacked when present in an infested pine stand. This is the most damaging pest in the Kamloops Region. Although populations have fluctuated widely over time, the general trend indicates increasing damage caused by this beetle. The western pine beetle, Dendroctonus brevicomis, which attacks only ponderosa pine, is often found in association with mountain pine beetle. Severe outbreaks of the two species occurred in the early 1920's in the Merritt-Princeton area, but reports at that time did not separate the damage caused by each. Populations of western pine beetle 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 all damage 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."
1920-21	Infestations continued in pP and lP in Midday Valley and Kingsvale areas. Almost 1300 Mbf were cut and burned as a control measure. Some wwP trees were killed near Adams L.
1922	Infestations in pP expanded in 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 5000 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 above 130 ha.
1924	pP - Infestations continued in Merritt District. About 15 000 infested pH and lP trees were cut and burned in control measures. lP - Estimate 6000 red tops near Lorna; infestation reported on Martin Mtn. wwP - Slight decrease in Adams L infestation.

Year	Remarks
1925	pP - 8400 red tops in Inkaneep Forest Reserve. Dominion Forest Service report stated that from 20 to 25 million board feet were killed between 1921 an 1925.
1926	pP - 1300 red tops near Aspen Grove; large infestation near Dot; scattered infestations in Monte Hills, along Salmon R, Fish and Mamette lakes, and in Botanie Valley. lP - 2700 red tops near Aspen Grove; Lorna infestation abated, partly due to control work.
1927	4000 pP and lP cut and burned in control work in Merritt-Princeton area. lP - 5600 trees killed at Lorna; Dominion Entomologist reported that 80% of lP was killed over 100 sq miles in Camp McKinney area.
1928	pP - 1000 red tops in Merritt-Princeton area; 500 near Grand Prairie; small outbreaks near Barriere, along Nuaitch, Spatsum, Tranquille and Barnes creeks. lP - 6000 red tops in Merritt-Princeton area; large infestations near Tunkwa and Trout lakes, Tranquille Forest Reserve (50-80% of timber killed for several kilometers NW of Pass L), Martin Mtn (most of mature timber killed on E side), Monte Hills (estimated 10% of lP infested), Paxton Valley (20-50% of mature lP infested), Nehalliston Forest Reserve (Hoover, Parky and Lupin lakes and Darlington Cr), Penticton Indian Reserve (50% kill over 200 ha), W of Allen Grove (80% kill over 40 ha), SE of Penticton (90% of mature lP killed over 26 000 ha) between Whiteman and Irish creeks (80% kill over 13 000 ha), 20 ha near Chute L, 40 ha near Postill L, and smaller outbreaks near Yellow L, along Penticton-Keremeos Road and near Bear Cr. wwP - Niskonlith Forest Reserve 90% of trees killed over 1200 ha near Bush Cr); Noisy Cr (90% kill over 65 ha); high tree mortality over 260 ha near Hupel.
1929	pP - Total of 3200 red tops; 2300 in Aspen Grove area and 900 in Kane Valley. lP - 16 000 red tops in Aspen Grove area.

Year	Remarks
1930	pP - 90 000 red tops (some was lP) in Aspen Grove area; small infestations on north side of Hat Creek Valley and at Paul and Pinantan lakes.
	lP - Estimated that 40% of Tranquille Forest Reserve and 65% on Long Lake Reserve was infested or dead; infestations at Ganough, Paul and Pinantan lakes.
1931	Reports do not separate tree species; Spius Cr (870), Olsen L (1000), Brookmere (100), Davis L (50% of all pine trees around the lake infested).
1932	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.
1936	Dominion Forest Service reported that in Tatla L area "60 to 90% of lP was killed over hundreds of sq miles on E side of coast Range;" small infestation near Clinton.
1939	pP - 75 red tops in Okanagan Mission.
1946	wwP - Estimated that more than 2000 Mbf will be killed by 1947 on W side of Mabel L indicating that infestations may be undetected for some time).
1947	wwP - Outbreaks at Cape Horne, head of Anstey Arm and Eagle Bay; Mabel L infestation expanded to 260 ha; some trees damaged in Trinity Valley.
1948	wwP - Small infestation near Celista; a few red tops near Mabel L.
1949	lP - Infestations in Bridge R area (on E side of Marshall Cr and north of Hog Cr).
	wwP - Infestations continued around Shuswap and Mabel Lakes.
1950	lP - Infestations covered 10 ha near Marshall Cr and 5 ha near Brett Cr.
	wwP - High tree mortality over 500 ha on NW side of Mabel L; scattered outbreaks around Shuswap L.
1951	pP - 425 red tops at Alleyne L.
	wwP - Small infestations around Shuswap and Adams lakes and in Blue R area.
1952	pP - 265 red tops at Alleyne L.

Year	Remarks
1953	pP - 1500 red tops at Shuswap L area.
	lP - Tree mortality evident over 40 ha NW of Naramata.
	wwP - 1000 red tops from Cape Horne to Albas, along Anstey Arm and Celista Cr.
1954	pP - Small infestations at Little Shuswap L.
	wwP - New infestations at Mud L (Blue R) - 120 trees; infestation along Seymour Arm expanded to 1300 ha.
1955	pP - 355 red tops near Allison L; estimated that about 595 Mbf were killed in Alleyne L area from 1952 to 1955.
1956	pP - Loss of 255 Mbf mostly in small, scattered groups in Princeton-Aspen Grove area.
	lP - Volume loss of 3000 Mbf over 240 ha NE of Penticton.
	wwP - Infestations covered 6150 ha in Shuswap L area with loss estimated at 964 Mbf.
1958	lP - 25 red tops at Joes L (Cariboo).
	wwP - Small infestations at Blue R, Thunder R, Gosnell, Noisy and Railroad creeks, and at Hidden L; increased tree mortality at Mabel L.
1959	pP and lP - 500 red tops at Douglas L.
	wwP - 550 red tops in Trinity Valley and 300 near Barton Cr; infestations continued near Mabel L.
1960	pP and lP - 270 red tops at Douglas L.
	wwP - Total of 900 red tops in scattered infestations at Gosnell, Burton Cr, Mabel L, Trinity Valley, Scotch Cr and Sicamous areas.
1961	pP - Scattered infestations in Clinton area, near Hayes Cr, Douglas L and E of 70 Mile House along Fly Cr.
	lP - 6500 killed in Monte Hills over past five years; a few red tops along Scottie Cr.
	wwP - Total of 1600 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.

Year	Remarks
1962	pP - Chapperon L infestation continued; 120 red tops at Princeton; 100 at Carpenter L and Goldbridge.
1963	pP - 100 red tops at Rush L; infestations occurred near Clinton, Lillooet, Goldbridge, Carpenter L and Bridge R areas.
	lP - Total of 16 000 red tops; highest at Lambly Cr (7000) and Venner Cr (8100); from 200 to 300 red tops at Joe Rich, Heckman, Vance and Meldrum creeks.
	wwP - Total of 4800 dead trees; main areas at Mabel L - Wap R (1400), Adams L (1000), and from 400 to 900 at Blue R, Manning park, Barriere and Sugar lakes.
1964	pP - Total of 6100 red tops; Chapperon L (5000), and from 150 to 800 at Mission Cr, Rush L, Jura; smaller groups between Lillooet and Ashcroft.
	lP - Total of 19 000 red tops; highest numbers at Bull Mtn (5000), Tyee L (5000), Venner Cr (5000), Lambly Cr (2000); remainder in groups of 200 to 500 at Rush L, Whiteman Cr, Joe Rich Cr, Lumby to Cherryville, Ashnola R and Riddell Cr.
	wwP - Total of 5550 red tops distributed as follows: Mabel L-Wap R (1000), Shuswap L to Adams L (1900), Blue R (1400); up to 500 trees at Manning Park, Sugar L area and near Barriere.
1965	pP - Total of 14 000 red tops; main areas at Jura (1150), Chapperon L (5750), Nicola R (1100); remainder in groups of up to 500 trees at Allenby, Barnes L, Oliva and in scattered locations in western section of Region.
	lP - Total of 14 000 red tops; largest concentrations at Lambly Cr (2000), Bull Mtn-Williams L (10 000); from 250 to 650 at Salmon R, Ashnola R and Summerland.
	wwP - Total of 7000 red tops; most in Humamilt-Momich lakes area (3400); remainder at Adams L and in Seymour R Valley.
1966	pP - Total of 14 100 red tops; main area at Lower Hat Cr (3000), Chapperon L (5000); groups of up to 530 trees at Pinantan L, Tranquille Cr, Clinton, Chase, Pritchard, Rush and Salmon lakes and along Nicola R.
	lP - 11 600 red tops; largest numbers at Bull Mtn, Tyee, Cuisson and Williams lakes (10 000); 700 to 900 at Lambly and Joe Rich creeks.
	wwP - Total of 1150 dead trees in groups of from 115 to 500 at Mabel, Sugar and Adams lakes and Blue R.

Year	Remarks
1967	pP - Total of 20 000 red tops; largest concentrations at Princeton (1000), Chapperon L (11 200), Osoyoos (1000), Wolf Cub Cr (1000), Lower Hat Cr - Gunn L - Clinton (3000); counts of from 350 to 800 trees at Soap L, Skiekat Cr, Skaynaneichst Cr, Barnes L, Cache Cr and Pritchard. lP - Total of 20 650 trees; largest infestations at Whiteman Cr (2000), Joe Rich Cr (2500), Cayoosh Cr (5000), Bull Mtn (10 000); up to 250 trees at Lambly Cr, Peachland and Ashnola R. wwP - Only 680 red tops recorded in groups of up to 350 at Johnson and Adams lakes and Blue R.
1968	pP - Total of 7350 red tops; highest numbers at Chapperon L (3000), Jura (1200); 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. lP - total of 47 500 red tops; mains areas east of Williams L (20 000), Bull Mtn (10 000), Cayoosh Cr (12 000), Joe Rich Cr (3500); remainder in groups of 100 to 500 trees at Mission, Lambly and Terrace creeks. wwP - Total of 2250 red tops recorded, with most at Blue R (1000), and from 100 to 600 trees at Brenner Cr, Adams L, Kwikoit Cr, Momich R and Humamilt L.
1969	pP - Total of 2700 red tops; infestations at Chapperon L, Lower Hat Cr and Clinton collapsed; red tops in small groups along W side of Okanagan L and in Princeton area. lP - Total of 20 500 red tops; highest numbers near Tyee L (3000), E of Williams L (7500), Cayoosh Cr (6000), Cariboo L (2000), Million-Joe Rich creeks (1000); infestation at Bull Mtn collapsed. wwP - Total of 900 trees; infestations increased at Ireland Cr and decreased in other areas.
1970	pP - Total of 1000 red tops in small scattered groups; new infestation at Baldy Cr E of Oliver. lP - Total of 4000 red tops; largest numbers at Cayoosh Cr (2500). wwP - Total of 1700 red tops recorded; increase along Ireland Cr and in Sugar and Mabel lakes area.

Year	Remarks
1971	pP - 200 tree tops at Terrace Cr.
	lP - Total of 3250 red tops; Cayoosh Cr (1500); Mission-Joe Rich creeks (1200); Terrace Cr (550).
	wwP - Approximately 8000 red tops estimated as follows: Blue R (1700), Squaw Valley-Sugar L (1700), tributaries of Shuswap R north of Sugar L (1000), Allison Pass (1200), North Barriere L (950), Humamilt-Momich lakes (800), Larch Hills (700). Highest populations of beetles were found in most areas.
1972	pP - Total of 360 red tops; the largest infestation involved 260 trees near Gun Lake.
	lP - Total of 4050 red tops (plus some 2000 trees in the Mission Creek Valley which were logged in 1972); the largest infestations occurred at Cayoosh Cr. (1100), Whiteman Cr. (750), and Terrace Cr. (1550).
	wwP - Total of 13 650 red tops; Blue River (2400), Adams Lake (1200), Larch Hills (1000), Mabel Lake (1200), Sugar Lake-Squaw Valley (5000), and Manning Park (2000).
1973	pP - Low number of red tops, largest infestation at Gun Lake (100).
	lP - Total of 9820 red tops (plus several thousand trees logged in 1972-73); Whiteman Cr (2800), Terrace Cr (2000), Mission Cr (500), Trout Cr (4000), Cayoosh Cr (700).
	wwP - Total of 9300 red tops; Avola-Lempriere (4500), Larch Hills (500), Tsuius Cr (600), Sugar Lake-Squaw Valley (1200), Manning Park (2500).
1974	pP - Total of 150 red tops detected at Peachland, Lambly Cr, and Gun lake.
	lP - Total of 22 300 red tops; Whiteman Cr (5000), Ellison (1800), Mission Cr (2800), Lambly Cr (6500), Trout Cr (5300), Bridge R (900).
	wwP - Total of 15 600 red tops in the North Thompson and Shuswap drainages.

Year	Remarks
1975	pP - Total of 120 ha affected; Murray Lake (40 ha), Carpenter Lake (20 ha), Hat Cr (20 ha).
	lp - Total of 4350 ha; Whiteman Cr (400), Ellison (480), Mission Cr (620), Lambly Cr (1320), Trout Cr (760), and Riddle Cr (400). Smaller infestations also occurred at Oyama Lake, Murray lake, and the Ashnola R Valley.
	wwP - Total of 2895 ha; Avola to Lampriere (480), Gannett Lake (240), North Barriere lake (200), Cayoosh Cr (800), and Yalakom River (240).
1976	pP - Total of 1261 ha; Gun Lake (384), Tyaughton Lake (340), Marshall Cr (210), Hat Cr (210), and Pavilion Mtn (48).
	lP - Total of 12 375 ha; Gun lake (1328), Yalakom R (340), Cayoosh Cr (745), Ashnola R (243), Trout Cr (3847), Lambly Cr. (988), TFL 9 & CP's 2-9 (1900), Mission Cr (1936).
	wwP - Total of 2397 ha; Adams L (482), Gannett L (253), Blue R (502 ha), Upper Thompson R (226).
1977	pP - Total of 3200 ha attacked by Mountain and Western Pine Beetle, Dendroctonus brevicomis; Carpenter Lake (1700 ha).
	lP - Total of more than 10 000 ha with the largest infestations in the Okanagan Valley and near Gun Lake.
	wwP - Infestations persisted near Blue R (500 ha), Sugar Lake (150 ha) and Adams and Shuswap lakes.
1978	Total of 17 770 ha were damaged. Areas with the largest infestations were Trout Cr (4800 ha), Goldbridge (4400), Stein R (1600), and Ashnola R (450).
1979	Total of 19 990 ha damaged of which 11 500 was lP, 7290 was mixed lP and pP, and 1065 was wwP. Areas most severely affected were: Goldbridge (300 ha), Ashnola R (756), Trout Cr (1500), and Whiteman Cr (1260).
1980	Total of 37 000 ha. Mostly lP with small amounts of pP were killed at Goldbridge-Carpenter lake (over 12 000 ha), west of Okanagan lake (14 330), and Ashnola R (1000). 600 ha of wwP were killed at Blue R.

Year	Remarks
1981	lP - Total of 2 694 900 red tops on 19 000 ha; Goldbridge-Tyaughton Cr (2 547 000 on 13 760 ha), Downton Lake (17 180 on 406 ha), Stein Lake and River (40 695 on 880 ha), and Mission Cr (9200 on 576 ha). pP - Total of 4100 red tops on 180 ha, much of which was in the Goldbridge-Carpenter lake area. wwP - Total of 6000 red tops on 320 ha; Cayoosh Cr. (1510 on 37 ha), Stein R (2100 on 26 ha), and Mabel Lake (375 over 48 ha).
1982	Decrease to 920 000 pine killed on 22 000 ha. Major declines were in the Gold Bridge-Downton-Carpenter Lake areas where 760 000 pine were killed on 5 550 ha and Stein Valley - 34 425 pines killed on 550 ha. Increases recorded at Hayes Creek - 60 750 pines killed on 1 350 ha.; Mission-Belgo creeks - 24 250 pines on 1 500 ha; Ashnola River - 9 350 trees on 5 150 ha. Other increases in West Kettle River Valley due to TSA boundary adjustments. Up to 59% of pine killed in Gold Bridge area on 14 000 ha since outbreaks began in 1976.
1983	Increase to 5.7 million lodgepole pine in 535 infestations over 44 000 ha., nearly 80% of which was in Lillooet District.

Timber Supply Area	Area (ha)	Number of trees killed	Volume loss (m^3)
Kamloops	1 650	194 700	46 000
Lillooet	36 000	4 428 000	3 204 000
Merritt	2 370	279 600	66 000
Okanagan	3 940	807 700	461 000
Total	43 960	5 710 000	3 777 000

Outbreaks expanded near Gold Bridge, Carpenter Lake, Tyaughton and French Bar creeks and east of Kelowna. Major infestations continued in the Stein River Valley and in Trout Hayes, Summers, Shorts and Lambly creeks in the Okanagan and Ashnola River Valley.

1984 Areas of infestation increased to 58 000 ha containing 5 million trees in 600 infestations. Tree mortality increased in chronic areas near Carpenter Lake, Gold Bridge, Tyaughton and French Bar creeks. Infestations doubled in size near Hayes and Trout creeks and continued at Mission-Belgo creeks, Summers Creek, Manning Park to Princeton, Dale Creek and West Kettle River. Infestations declined in the main Stein River Valley, due to host depletion, but increased along its tributaries.

Year	Remarks

Timber Supply Area	Area (ha)	Number of trees killed	Volume loss (m^3)
Kamloops	295	5775	3985
Lillooet	46 830	4 542 510	2 552 235
Merritt	3165	62 390	43 075
Okanagan	7710	395 525	134 925
Total	58 000	5 006 200	2 734 220

1985

Infestations decreased to 4 533 000 pines killed on 46 760 ha, an additional 25 000 ha were mapped as "gray" mostly from French Bar Creek to Gold Bridge, in Mission and Belgo creeks east of Kelowna, at Trout and Hayes creeks west of Summerland. Infestations more than doubled in areas north of Lillooet along the Fraser River, continued in previously chronic areas and decreased between Manning Park and Princeton.

Timber Supply Area	Area (ha)	Number of trees killed	Volume loss (m^3)
Kamloops	240	12 000	4800
Lillooet	37 000	3 700 000	1 850 000
Merritt	2620	131 000	52 400
Okanagan	6900	690 000	276 000
Total	46 760	4 533 000	2 183 200

1986

Infestations containing 4.8 million trees covered 46 750 ha, mainly in the Lillooet and Okanagan TSA's. Areas of chronic infestation include Gold Bridge to French Bar Creek, Stein River, east of Kelowna along Mission, Daves and Belgo creeks, west of Summerland and in the Ashnola River Valley.

Timber Supply Area	Area (ha)	Number of trees killed	Volume loss (m^3)
Kamloops	340	20 400	13 000
Lillooet	30 630	3 140 450	1 559 000
Okanagan	11 770	1 197 500	550 000
Merritt	4 010	431 650	172 400
Total	46 750	4 790 000	2 294 400

Year	Remarks

1987

More than 1.8 million pines were killed over 19 000 ha.. Reductions are mostly the result of host depletion in the Lillooet TSA which is as high as 80% along Downton and Carpenter lakes. More than 70% of pine died in the Mission-Belgo creeks area. Active infestations continue west of Summerland and east of Okanagan Lake between Vernon and Penticton.

Timber Supply Area	Area (ha)	Number of trees killed	Volume loss (m^3)
Kamloops	150	16 000	8000
Lillooet	5300	541 600	265 400
Okanagan	11 300	1 053 700	483 650
Merritt	2250	238 600	95 200
Total	19 000	1 849 900	852 250

1988

Infestations declined slightly to 3.6 million trees over 17 650 ha, mostly in the Okanagan and Merritt TSA's. Infestations include, east and south of Kelowna from Daves Creek to Little White Mtn., Saunier, Dale and Stirling creek drainages; west of the Okanagan Valley infestations continued in Trout, Spukunne, Shinish and Jellicoe creeks. Pockets of mortality occurred east of Vernon from Aberdeen Lakes to the Kettle River and of white pine from Vavenby to Albreda and near Barriere lakes.

Timber Supply Area	Area (ha)	Number of trees killed	Volume loss (m^3)
Kamloops	170	4800	3600
Lillooet	1260	47 200	23 600
Okanagan	13 550	2 940 400	1 470 300
Merritt	2650	575 100	287 500
Total	17 630	3 567 500	1 785 000

1989

Decrease to 1.2 million pine killed on 12 000 ha. The largest and most widespread outbreaks continue in lodgepole pine stands in the Okanagan TSA along both sides of the Okanagan Valley, from Vernon south to the U.S.A. border. Infestations in other TSAs were generally smaller and scattered.

Timber Supply Area	Area (ha)	Number of trees killed	Volume loss (m^3)
Kamloops	800	10 400	7800
Lillooet	100	3100	2000
Okanagan	9 600	1 079 000	539 600
Merritt	1500	141 100	70 600
Total	12 000	1 233 600	620 000

Year	Remarks

1989 (Cont'd) While beetle infestations in lodgepole pine stands continued at lower levels, infestations in stands containing white pine increased in the Kamloops TSA along the North Thompson River Valley from Vavenby to Albreda and in the Adams Lake-Barriere lakes area.

1990 The number of pine killed declined to 835 000 on 6000 ha, while the number of infestations actually increased almost two-fold, but were smaller and more severe. Eighty percent of the outbreak area was in the Okanagan TSA. Expansions occurred as spot infestations of 5-30 each from Penticton to Swalwell Creek and east to Arlington Lakes. Declines were recorded near Glen Lake, Trout Creek and in the Vaseux and Saunier creeks drainages.

Timber Supply Area	Area (ha)	Number of trees killed	Volume loss (m^3)
Kamloops	579	9600	6400
Okanagan	5111	751 000	375 000
Merritt	310	74 400	31 000
Total	6000	835 000	412 400

1991 Infestations more than doubled to 18 975 ha, leading to mortality of an estimated 3 519 650 pine. This is the first increase since 1984. The outbreak in the Okanagan TSA accounts for 86% of the total area infested. Significant increases occurred in the Stirling Creek-Vaseux Creek and Anarchist Mountain areas. Infestations in other TSA's were generally small and scattered, with a few larger pockets. Infestations on white pine expanded in the Barriere Lakes area and near Momich Lake increased to 800 trees.

Timber Supply Area	Area (ha)	Number of trees killed	Volume loss (m^3)
Kamloops	1808	51 500	36 500
Lillooet	2	300	150
Okanagan	16 453	3 360 300	1 277 800
Merritt	712	107 550	53 750
Total	18 975	3 519 650	1 368 200

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
1912-21	See D. ponderosae.
1922-52	Damage combined with that of D. ponderosae.
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 Ips oregoni. From 1957 to 1959, 126 trees were killed in the southeastern section of the Region.
1960	A few trees killed near Aspen Grove, Alleyne L, Penticton, Okanagan Centre 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 with W side of Okanagan L between Shorts and Whiteman creeks and in Fountain Valley NE of Lillooet.
1965	Low populations in Allison Creek Valley near Princeton.

Year	Remarks
1966	Two trees killed at Woods L.
1967	Not mentioned in reports.
1968	Associated with Ips sp. near Kelowna airport.
1969	Not mentioned in reports.
1970	Associated with mountain pine beetle at Baldy Cr east of Oliver.
1971-89	Not mentioned in reports, but occasional attacks to single trees common in Region.
1990	Beetles caused group killing on nearly 100 ha comprising 62 spot infestations, the largest of which was at Copper Creek having 165 attacks. Scattered pockets of 2-20 trees each were common in the Kamloops and surrounding area. In the Okanagan Valley, infestations expanded slightly near Naramata.
1991	Infestation at Copper Creek declined to a few scattered attacks. Elsewhere occasional single attacks note throughout host range.

Pine needle sheathminer, Zelleria haimbachi

Occurs commonly on ponderosa and lodgepole pine in the Region. The most severe infestation was in the North Thompson River Valley and area in 1979-80. Smaller infestations occurred in 1951 at Penticton, 1958 north of Spences Bridge, and 1962 at Louis Cr, Paxton Valley, Scotch Cr, and Equesis Cr. Infestations expanded yearly after 1985 with 26 625 ha affected in 1990 in the Shuswap and Adams lakes and North Thompson River drainages, but no 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 Valley.
1956	Up to 100% of new terminals infested on pP over 100 acres at Shaw Springs.
1958	Light to severe infestation over 2500 acres of pP between Venables Valley and Twaal Cr.
1959	Above infestation collapsed; high population at Vaseux Cr; larvae present at Merritt, Nicola, Barnhartvale.
1960	High populations 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), Equesis 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.
1972-78	Low populations; no damage reported.
1979	Heavy defoliation of current year's growth of lodgepole pine occurred near Vavenby (630 ha), Reg Christie Cr (250 ha), Trout Cr (190 ha), and north of Clearwater River near Spahats Cr Park (125 ha).

Year	Remarks
1980	Total of 5400 ha defoliated: from Clearwater to Batholith Rapids (1250 ha); McLeod L (800 ha); and patches from Clearwater along the North Thompson R to Vavenby (3350 ha); light defoliation was also recorded in the Princeton area near Pothold Cr (32 ha); Shrimpton Cr (932 ha) and Elliot Cr (16 ha) and along Little Shuswap Lake (95 ha).
1981	All populations collapsed.
1982	Present at low levels near Clearwater.
1983-84	Low populations.
1985	Increased populations severely discolored up to 30% of new shoots of lodgepole pine on more than 50 ha along the Fly Hills near Salmon Arm.
1986	New growth 10-100% defoliated in 1-to 5-ha pockets from Birch Island to McMurphy; 80-100% defoliation for 5 km along Scotch Creek Rd; 50-100% from km 40 to 62 north of Skwaam Bay and 410 ha of immature lodgepole pine along the Fly Hills; current growth 60-100% lost over 100 ha near Wallensteen Creek.
1987	Severe defoliation from Salmon Arm to Clearwater. Current growth 100% defoliated over 295 ha along Fly Hills; 30-50% from Pillar Lake to Charcoal Creek; 15-100% on scattered trees near Gold Bridge and Barriere areas and from Clearwater to Vavenby.
1988	Severe defoliation increased to 575 ha along Fly Hills. Light discoloration of new shoots occurred in small groups of pines near Princeton Lake, Mount Lolo and Mount Tod and at Eagle Rock, Grandview and Kalamalka seed orchards. Ponderosa pine was lightly defoliated at Skihist Provincial Park.
1989	Populations increased causing light to moderate discoloration of 7500 ha in 33 separate areas in the Adams, Shuswap, and Barriere lakes area. Discoloration was not evident in the previously damaged area along the Fly Hills.
1990	The outbreak expanded to 26 625 ha in 114 areas. Areas of light to moderate defoliation include Barriere, Adams, and Shuswap lakes, Clearwater and North Thompson rivers, between Pritchard and Tappen, and near Enderby. Several small infestations near Falkland declined.

Year	Remarks
1991	Infestations declined to 11 680 ha in 52 separate areas. In addition, mixed stands of lodgepole pine and Douglas-fir were moderately to severely defoliated over 13 460 ha by the sheathminer and western spruce budworm at 12 locations, mostly between Monte Lake and Salmon Arm. Areas of light to moderate discoloration include The North Thompson Valley near Barrier, Clearwater, Vavenby, and Avola, along Adams Lake, the Salmon River Valley and north of Kelowna.

Conifer sawflies, Neodiprion spp.

There were several species of this genus common to the Kamloops Region. 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 Region occurred W of Kamloops in the Deadman River area where there was mortality of ponderosa pine in the 1950's, and in the North Thompson River Valley where over 14 000 ha of lodgepole pine was severely defoliated.

Year	Remarks
1928	Up to 100% defoliation of lP over 500 ha S of Salmon Arm.
1931	Heavy defoliation of lP on Mt Ida - some tree mortality occurred.
1938	Severe localized outbreak of wH at Trinity Valley.
1939	Trinity Valley infestation increased in severity.
1946	Defoliation of pP occurred over 2 ha 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 lP 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 40 ha 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 2 ha near Larkin and 1 ha at Squilax.
1957	Not mentioned in reports.
1958	Up to 100% of old growth needles of lP lost over 10 ha near Little Shuswap L; light to moderate defoliation of D north of Little Shuswap L; light damage to pP near Savona, Ashcroft and Lytton.

Year	Remarks
1959	Light damage to lP near Squilax; larvae numerous on wH near Cherryville, Sugar L and Kingfisher Cr; light defoliation of wH near Clearwater, Blue R and Lempriere.
1960	Deadman R infestation collapsed.
1961	Light defoliation on lP 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 450 m 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 heave defoliation of D over 30-40 ha along Head-of-the-Lake Rd.
1970	Head-of-the-Lake infestation collapsed.
1971	Moderate numbers on wH and D.
1972	Moderate defoliation of immature Douglas-fir on several ha near Irish Cr.
1973-75	No damage recorded.
1976	Severe defoliation of old foliage of lodgepole pine occurred on 14 175 ha along the North Thompson River from Vavenby to Cottonwood Flats.
1977	Severe defoliation of lodgepole pine on 9700 ha north of Vavenby was recorded as well as light to moderate defoliation of western hemlock on 1600 ha in Wells Gray Park and 200 ha near Blue River.

Year	Remarks
1978	Light to moderate defoliation was evident on lodgepole pine on 2200 ha from Vavenby to Avola. The infestation in western hemlock at Wells Gray park and Blue River collapsed.
1979	Light defoliation which severely damaged regeneration was apparent near Kingfisher and Noisy Creeks on western hemlock.
1980-84	No damage reported.
1985	Moderate to severe defoliation of 20 m tall lodgepole pine on 500 ha between Wire Cache and McMurphy.
1986	Infestation between Wire Cache and McMurphy collapsed. Dieback symptoms on 5-10% of branches.
1987	Collected in low numbers at McNulty near Vavenby; no damage.
1988	Up to 20% defoliation of immature ponderosa pine in localized area near Orchard Lake.
1989	No recorded activity.
1990	New growth 80% defoliated in plantation at Gold Creek.
1991	No recorded activity

Pine butterfly, Neophasia menapia

Primarily an enemy of ponderosa pine 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 where some tree mortality occurred.

Year	Remarks
1962	Light defoliation of pP over 150 ha at Okanagan Landing.
1963	Okanagan Landing infestation remained about the same in area - defoliation was severe over about 40 ha 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.
1971	Not recorded in reports.
1972	Light defoliation of mature ponderosa pine on the west side of Okanagan Lake from Peachland to Summerland.
1973	Area from Peachland to Summerland lightly defoliated again as well as near Duck Lake and along the north arm of Okanagan Lake.
1974-88	No damage reported.
1989	No damage, but large numbers of pine butterflies were observed in flight in the upper crowns of ponderosa pine during mid-summer in stands east of Pritchard along the South Thompson River and along Monte Creek.
1990	Moth flights common along highway between Penticton and Kelowna, but no defoliation.
1991	No activity or damage reported.

European pine shoot moth, Rhyacionia buoliana

An introduced pest which has been a 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.
1972-75	No damage reported.
1976	Infested pines were found in Kelowna in May and later one in Vernon. A comprehensive survey was carried out to determine the incidence in planted pines in Kamloops and all cities in the Okanagan Valley as well as nurseries outside of town limits. Infested pines were found in Kelowna (41 locations) and Vernon (8 locations). Control programs involving pruning and spraying were carried out but pheromone traps indicated adults were still about.
1977	Annual examination produced positive identification of infested shoots at 40 locations in Kelowna and 18 locations in Vernon. All infested shoots were removed and burned. No adults were caught in 326 pheromone traps.
1978	Infested shoots were found at 30 locations in Kelowna, 15 in Kamloops, 3 in Peachland, and 3 in Westbank.

Year	Remarks
1979	Infested shoots were found at 41 locations in Kelowna, 17 in Summerland, and 2 in Kamloops. Pheromone traps produced negligible results.
1980	Infested shoots were found at 50 locations in Kelowna, 14 in Vernon, 3 in Summerland and 1 in Kamloops. No pheromone traps were placed out.
1981	A cost-benefit analysis concluded that the survey was not feasible and therefore was terminated.
1982-84	No damage recorded. Surveys of natural pine stands discontinued.
1985	No damage. Average 7 moths per pheromone-baited trap at five locations in Kelowna; three locations in Vernon and two in Penticton were negative.
1986	No damage. No moths caught in traps placed at nine locations between Vernon and Hedley.
1987	Up to six infested shoots per tree found on 90% of Mugho pine at Penticton.
1988	An average 20% of shoots infested on 80% of pines at Trinity Centre in Penticton and 5% at Okanagan College in Kelowna, where trap catches averaged 33 and 18 moths per trap respectively.
1989	Infestations continued causing damage to 30% of new shoots at Trinity Centre in Penticton, and 5% shoot damage at Okanagan College in Kelowna.
1990	Up to 30% of shoots of Mugho and 90% of Scots pine were infested at Trinity Centre in Penticton, despite pruning attempts in 1989. In Kelowna at Okanagan College, up to 40% of shoots were infested.
1991	Populations on Mugho and Scots pines remained at levels similar to 1990 at Kelowna and Penticton.

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 at low infestation levels in young stands throughout much of the Region.

Year	Remarks
1962	Roadside trees attacked along Alexis Cr and Dear R and at Tatla Jct.
1963	10% of trees examined at Big Bar L and Dean R were infested.
1964	30% of lP reproduction on old burn infested at Big Cr.
1965	Infested leaders noted at Mile 5, Coldwater Rd, Horse L, Young L, 70 Mile House, Big Bar L, Jesmond Cr, Mile 104 Cariboo Hwy, Gustafsen L and Fletcher L.
1966	25% of leaders attacked at Tatla L.
1967	Low population in Cariboo.
1968	40% of 500 lP examined at Tunkwa L were infested.
1969	Tunkwa L infestation collapsed, probably due to cold winter.
1970	Low populations.
1971	Common on reproduction in Cariboo and Chilcotin.
1972-81	Low Populations.
1982	At Dee Lake, 11% of leaders were infested in a recently spaced 35-year- old stand. Terminal mortality rarely exceeded 1% in 10-15-year old stands near Dardanelles, Stump and Aberdeen lakes.
1983-84	Not mentioned in reports.
1985	Terminal mortality was 12% near Greenstone Creek and Chuwhels Lake and 6% at Paska Lake.
1986	Thirty percent of terminals infested at McKay Creek and 2% at Km 32-Okanagan Falls Road.
1987	Terminals were attacked on 6% of lodgepole pine at km 17, Railroad Creek.
1988	Less that 5% infested leaders at Whitewood Lake.

Year	Remarks
1989	No recorded activity.
1990	Found on 2% of lodgepole pine in a plantation east of Penticton
1991	Recorded in 8 young stands in Penticton District and 1 in Kamloops District. Highest intensity was near Big White Mtn. where 9% of lodgepole pine were attacked.

Pine needle scale, Chionaspis 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 infestation 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 520 ha 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 5 km along Mamit L Rd; light attacks to lP near Barriere; high numbers of predator, Chilocorus tricyclus, 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.
1971	About 200 ha of pP near Nicola L were severely infested. "All sizes of pine were affected in a belt between 750 and 900 m elevation." A few trees had died.

Year	Remarks
1972	pP stands were heavily infested in many low-elevation locations in the Okanagan Valley. The most noticeable were at East Kelowna, Rutland, Glenmore, Winfield, and Oyama. The infestation near Nicola Lake collapsed.
1973-74	Common in the central and north Okanagan Valley especially near Winfield, Glenmore, Rutland and Kamloops.
1975	Populations were abundant in and around Kamloops but declined in the Okanagan Valley.
1976	Common near Kelowna, Summerland, Penticton, and Okanagan Falls. Some mortality of pole-sized trees occurred near Kelowna and east of Penticton.
1977	No damage reported.
1978	Small patches of damage in the southern Okanagan Valley.
1979	Severely infected pines occurred from Okanagan Falls to Oliver.
1980	pP trees only moderately infected from Okanagan Falls to Oliver. Mortality of mostly immature trees was noted.
1981	Moderate to severe infestations occurred near Okanagan Falls and Penticton. Damage occurred at the Agriculture Canada Research Station south of Summerland but was sprayed as a control measure.
1982-87	Not mentioned in reports.
1988	Light infestations causing up to 20% needle discoloration at Westbank and Shuttleworth Creek.
1989-91	No recorded activity.

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 Region.

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 Region at Lytton, where infestation was over 5 ha; 900 trees killed to date in Skaha L area (infestation in association with P. pinifoliae).
1958-59	Lytton infestation expanded along Botanie Valley; total of 1160 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.
1967-71	Low to moderate populations persisted on pP in Penticton and East Kelowna areas.
1972-73	Occurred on pP in the Penticton vicinity.
1974	Severe infestations occurred near Trout Cr, Summerland, and Penticton. Some tree mortality due to repeated attacks occurred southeast of Penticton.
1975	Severe infestations continued in all ages of pP near Summerland, Trout Cr, and Penticton. Numerous mature trees were killed near Penticton.
1976	Infestations reported near East Kelowna and Okanagan Falls.
1977	No damage reported.
1978	Heavy defoliation of pP from Okanagan Falls to Oliver particularly on east-facing slopes and on benches above the valley floor. Some mortality of smaller trees occurred.
1979	Stands of pP from Okanagan Falls to Oliver continued to be heavily infested. An estimated 50% of the trees had only 1979 foliage left on them.

Year	Remarks
1980	General decline in the amount of pP stands infested in the Okanagan Falls-Oliver area.
1981	Infestations continued in the South Okanagan. Some mortality was observed at Shuttleworth Creek, southeast of Okanagan Falls.
1982-91	Not mentioned in reports.

Oregon pine engraver, Ips oregoni

Attacks all pine 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, 1100 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 Centre, 250 pP were killed; at Chapperon L, 2300 immature pP in a 4-mile-square area were infested in association with mountain pine beetle. A low population existed in lP near 150 Mile House and Bosk and Meadow lakes.
1968	Scattered groups of immature pP; 500 trees at Ellison, 300 near O'Keefe, and 100 near Rutland.
1969-91	No damage recorded.

Engraver beetles, Ips pini and Ips plastographus

Attacks all pines, no record of extensive infestations.

Year	Remarks
1963	150 lP killed at Meldrum Cr (trees previously weakened by flooding).
1964	25 lP attacked at Soda Cr.
1965	200 pP killed on Anarchist Mtn in 1964.
1966	A few pP killed at Vernon and Summerland.
1967-80	No damage recorded.
1981	Occurred in 25% of 26 000 trees infected with Armillaria mellea in the North Thompson River area. Mortality is attributed to both pests as trees killed by the beetles were first weakened by the root rot.
1982	Common in mature lodgepole pine predisposed by black stain root disease and Armillaria root rot north of Vavenby in the Warbron-McMurphy creeks area.
1983-91	No significant damage reported.

Rusty tussock moth, Orgyia antiqua badia

Commonly a pest of many hosts both coniferous and deciduous. Has been observed in outbreaks of Douglas-fir tussock moth on secondary component species of stand.

Year	Remarks
1936	Defoliation of ornamental spruce in Salmon Arm and Vernon.
1975	Defoliated lP in the Monte Hills - Douglas plateau area near Dardanelles and Todd lakes. Infestation estimated to cover 2400 to 3200 ha of which 400 ha sustained moderate defoliation.
1976	Defoliation was very light in the Monte Hills infestation. The population collapsed in the fall due to a viral disease.
1977-91	No damage reported. Common in pheromone traps.

Sequoia pitch moth, Synanthedon 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 Region, especially in the North Thompson River drainage.

Year	Remarks
1959	lP N of McLure have suffered repeated attacks over several years; several trees have broken off at the base.
1960	Fresh attacks on lP at McLure; 18 lP attacked at Clearwater.
1961	Attacks continue at McLure and Clearwater; 22 lP killed over 5 ha at Squilax.
1965	Several small groups at lP infested at Barriere.
1975	Caused localized mortality of ponderosa and lodgepole pine in the Salmon Arm area.
1982-87	No recorded damage.
1988	Up to 10% incidence of attack in two 10-year old lodgepole pine plantations near James Lake, east of Kelowna; no tree mortality.
1989-91	No recorded damage, except occasional low incidence in lodgepole pine plantations.

Red terpentine beetle, Dendroctonus valens

Pine trees are the primary host but occasionally spruce, larch, and Douglas-fir are attacked. This 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.

DOUGLAS-FIR PESTS

Douglas-fir beetle, Dendroctonus pseudotsugae

A major pest of Douglas-fir. Severe outbreaks have occurred in Douglas-fir stands throughout the Kamloops Region, especially in the northwestern sections.

Year	Remarks
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 80 ha on Tranquille Forest Reserve; 1000 ha on E side of Blind Bay; 130 ha at Skimkin L; 50% of Douglas-fir infested over "three sections and parts of two more" at MacLeod Cr; 65 ha 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.
1930	Outbreaks along Upper hat Cr and Scottie Cr (70% kill over 1500 ha); on Tranquille Forest Reserve at Cultus L and Tobacco Flats; on Nicola Forest Reserve near Maiden Cr (90% kill over 5 ha) and Venables Valley; on Niskonlith Forest Reserve at McGillivray Cr (60% kill over 130 ha); Cahility Cr (infestation covered 500 ha); Blucher Hall (50% kill over 500 ha) and at Canough and Paul lakes; in Shuswap L area (20 ha near Celista and 65 ha long Ross Cr); on Fly Hills Reserve near Harper, Chum and Shimkin lakes and between Turtle Valley and Chase Cr roads; along Adams L (500 ha at Bush Cr and 10 ha between Bush Cr and Prospect Point); scattered areas near Barriere L. In the North Thompson drainage, infestations occurred opposite Blackpool (50% of trees over 260 ha were infested); near the mouth of Clearwater R (50% kill over 200 ha); and along Candle Cr (50% kill over 400 ha). 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.

Year	Remarks
1939	Thirty red tops along Bessete Cr; 100 dead trees along Cherry Cr.
1946	Horsefly L (10% kill over 800 ha); 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, N of Barriere and S of Likely.
1950	Moderate damage from Monte L to Monte Cr; small area at Pinantan L; in Squaw Valley, 40% of timber of 15 ha was killed over a period of several years.
1951	Mt. Ida infestation subsided; small infestation east of Lumby; 160 trees killed at Canim L.
1952	Bestwick (12% kill on 80 ha); Louis Cr ("several patches of red tops distributed for several kilometers around"); small groups of trees infested between Clinton and Maiden Cr; tree mortality for 15 km along both banks of Guichon Cr near Mamit L; 11 infestations with from four 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	Scattered infestations from Williams L to 30 km N; small outbreaks at Equesis, Shingle and Lawless creeks and near W boundary of Manning Park.
1954	Moderate to heavy attacks from Lac La Hache N to Soda Cr, along Timothy L and Canim L roads, near Horsefly and Canoe Cr. Small outbreaks through central parts of the District, and 160 red tops in southern areas.
1955	Active infestations present near 100 Mile House, Lac la Hache, Timothy L, Canim L Road, Williams L to Macalister, W and S of Helena L, N of Red L, SE part of Niskonlith Forest Reserve and SE of Bestwick. In the central and southern sections, a total of 2400 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.

Year	Remarks
1956	Total of 21,800 red tops; main areas were Macalister-Williams L (1580), San Jose R-Lac la Hache (4500), 100 Mile House (2200), Bestwick (1100), Tranquille Forest Reserve (2100), Niskonlith Forest Reserve (2600), Coldwater R Valley (2600), Kane Valley (1000); groups of up to 800 dead trees at Clinton, 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 5500 red tops recorded. Infestation intensity increased in winter-damaged stands near Williams L. Highest concentrations of red tops were near Williams L (1000), Lac la Hache (2615), and at 100 Mile House (1150). Smaller 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 18,000. Reports do not give distribution but presumably most of the 13,000 dead trees in the northwestern section were around Lac la Hache and Williams L. In other parts of the region, there were 1300 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 19,300 red tops, with 15,500 in W section. Other areas affected were as in 1958, with the addition of Douglas L, Falkland, Monte L, Cherryville and Mabel L.
1960	Total of 37,400 red tops recorded. Main areas were Cache Cr-Clinton (4300), Joes L-Springhouse (4600), Riske Cr (1500), Tranquille Forest Reserve (1100), Highland Valley (1200); 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 Mable 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. Overwintering beetle mortality was 27% at Lac la Hache, 40% at 100 Mile House, and 32% at Williams L.

Year	Remarks
1961	Unusually dry conditions caused many currently-attacked trees to drop their needles by August. Total of 23,600 red tops recorded with no localities for the 14,000 in the northwestern section. In other portions of the Region, there were 1200 red tops from Ingram Cr to Woods L, 1100 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.
1962	Total of 27,400 red tops recorded. Main areas were in Monte Cr-Upper Salmon R area (2200), Falkland-Westwold (1200), and Chilcotin R (1700). 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 and NW of Williams L.
1963	Total of 51,400 dead trees. Highest concentrations were in areas of Monte Cr-Upper Salmon R (2600), Douglas Plateau (2400), Bonaparte Plateau (2100), Tranquille Cr (1300), Chilcotin R, SW of Williams L and NW of Clinton (37,000). 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 Walachin.
1964	A total of 49,300 red tops was recorded. Main areas were Monte Cr-Upper Salmon R (1800), Douglas Plateau (3300), Tunkwa (1000), Bonaparte R (2200), Adams L (1150), Johnson L (1100), and 29,600 in unrecorded locations in the northwestern section of Region. 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 36,400 was recorded. Main areas were Bonaparte R (1900), Loon L (1800), and 26,000 in the northwestern section of Region. 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 6200. Highest concentrations were from Clinton to Dog Cr and in Chilcotin R Valley (5000). Groups of from 100 to 425 were noted at Loon L, Spanish L and Whiteman Cr.

Year	Remarks
1967	Number of red tops decreased to 4400. Largest numbers were in the Williams L-Lac la Hache and Gaspard and Churn creeks areas (2900). 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 14,000. The largest numbers were noted in the 1966 frost-damaged stands in the Lac la Hache-Williams L area. From Lillooet along the Fraser R, NE of Williams L, and W to Alexis Cr there were 11,000 red tops. 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 14,500. Large groups of dead trees were noted on the plateau from Williams L south to Dog Cr (10,000). Smaller 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 1700. Beetle-killed trees were in scattered groups of up to 200, with the highest numbers in Adams L area and at Keremeos Cr and Alexis Cr.
1971	Only 195 red tops recorded - the lowest count in about 20 years.
1972	Total of 285 red tops recorded.
1973	Small infestations near Carpenter Lake, Brash Cr, and in the Monte Hills area.
1974	Groups of 5 to 50 red tops, reported at: Bridge River, S. Lillooet, Fountain, Pavilion Lake, Cornwall Cr, Paxton Valley, and Okanagan Landing.
1975	Slight increase in number of red tops: Fountain Valley (300), SW of Walhachin (170), Tranquille Cr (125), Botanie Cr (100), and Turnbull Cr (100).
1976	Light, scattered tree mortality. However, in seven of eight areas defoliated by Douglas-fir tussock moth up to 34% of the mortality was attributed to Douglas-fir beetles.

Year	Remarks
1977	Populations increasing. Total of 2729 red tops recorded. Infestations at Tranquille Cr, Kamloops Lake, Pass Valley, and at Jamieson and Dairy Creeks. Studies in the latter two areas show that there exists a high beetle hazard for trees recovering from severe tussock moth defoliation as well as for stands adjacent to damaged areas.
1978	Total of 2915 red tops. Increases occurred near Tranquille, Jamieson, Heffley, and Dairy Creeks, Mission Pass, Fountain Valley, Kwoiek Cr, and along Carpenter and Anderson Lakes.
1979	Total of 1350 red tops. Largest infestations at Tranquille Cr (100), Westsyde-Vinsulla (245), Shalath-Bob Cr (268), and McLure (130).
1980	Total of 820 red tops, most of which were located at Westsyde-Vinsulla (381) and Cache Cr-Pavilion Lake (264).
1981	Total of 700 red tops on 55 ha scattered throughout the region.
1982-83	Single or small groups of 2-5 trees killed totaling 30 per year.
1984	Small groups of 1-10 trees over 75 ha scattered throughout the host range, frequently in areas defoliated by Douglas-fir tussock moth.
1985	Small pockets of mortality east of Pavilion in association with road salt damage.
1986-87	No damage reported.
1988	Spot infestations of 10 trees each at Paul Lake, Maiden Creek, and west of Pritchard.
1989	A substantial increase to 320 pockets of beetle infestations with mortality occurring in small groups of 5 to 30 trees, were recorded in the region. Most incidences were in the Cache Creek area, with the remaining 50 pockets in the Deadman River Valley, Louis Creek Valley and the Clearwater-Vavenby area.
1990	Nearly 300 pockets recorded in groups of 5 to 30 trees each. Most infestations in the Cache Creek and surrounding area from Pavilion Lake east to Pass Valley and south to Venables Valley, including Barnes Lake. Other notable areas of lighter concentrations are Deadman River, and Durand and Louis creeks valleys. Elsewhere small pockets occur throughout the host range of D. fir.

Year	Remarks
1991	The number of small infestations increased to 700, mostly in the Cache Creek and surrounding area. Some of the more concentrated areas of attack include, Hat Creek Valley, Maiden and Allen creeks, Campbell Mtn., Pass Valley, Barnes Lake to Pennie Lake, upper Deadman River, Durand and Carabine creeks. Other smaller areas, with some expansion include, south of Spences Bridge, Stein River, south of Ashcroft and Louis Creek.

Douglas-fir tussock moth, Orgyia pseudotsugata

This is one of the most important insects of the defoliator group in the Kamloops Forest Region. It attacks Douglas-fir and sometimes ponderosa pine, and is capable of sudden outbreaks which usually cause tree mortality. Chronic outbreak areas are: the Okanagan Valley, Hedley, Monte Creek, Kamloops Lake, Clinton and Ashcroft. Infestations have ranged in size from small groups of trees to an area 50 by 25 km northeast of Okanagan Lake.

Year	Remarks
1918	First reported outbreak at Chase.
1921	Scattered infestations from Kamloops to Kelowna; 150 trees affected in Vernon.
1922	Many young larvae in spring in Vernon - no defoliation reported.
1930	Outbreak for 8 km along both sides of North Thompson R near McLure; infestations near Paul L, Heffley Cr (40 ha) and Gold Cr (20 ha).
1931	Infestations expanded at Vernon, Kamloops, Merritt, Monte Cr Valley, Campbell Cr, Knutsford, Stump L; severe infestation over 400 ha at Okanagan Ldg.
1932	Infestation subsided in all areas except at Stump L where sporadic tree mortality occurred over 5 ha; small patches of dead trees between Westwold and Falkland.
1936	Small infestation at Salmon Arm.
1937	Ornamental firs damaged at Salmon Arm.
1938	Defoliation occurred at Armstrong, Larkin, Vernon, Lavington, Coldstream Valley.
1939	Infestations expanded near Lavington, Armstrong, Vernon, and Okanagan Ldg; moderate defoliation occurred over a 50 x 25 km 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.

Year	Remarks
1948	Serious defoliation occurred at Monte Cr (1300 ha) Oregon Jack Cr (1600 ha), Monte L, Stump L, Wallachin, 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 (900 ha), Criss Cr (525 ha), Clemens Cr (120 ha); 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 tree mortality still occurring.
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 and Oyama.
1955	Low population at Olalla.
1956	Olalla infestation subsided (diseased larvae present).
1957	Up to 27 larvae per collection near Lillooet.
1958	Increase in population near Lillooet, Seton L and Bridge R.
1960	Only one larva collected in Region.
1961	Severe defoliation at Okanagan Ldg. and Armstrong.
1962	Okanagan Ldg. infestation expanded to 80 ha, outbreaks at Head-of-the-Lake (40 ha) and Armstrong (10 ha); small infestations in Okanagan and Similkameen valleys. Okanagan Ldg. infestation was sprayed with DDT. 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.

Year	Remarks
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 5 ha 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 infestation.
1972	Severe defoliation over about 690 ha. The largest infestation covered 405 ha, near Kilpoola Lake, west of Osoyoos. The majority of the other 40 infestations occurred near Winfield and Kelowna varying from 1 to 20 ha. Larvae were found for the first time near Hedley.
1973	Severe defoliation over about 2065 ha confined mostly to the Okanagan Valley. The largest infestations occurred in the Kelowna-Winfield-Oyama areas comprising some 1000 ha of which about 400 ha of trees were killed. The Kilpoola Lake infestation collapsed during the summer. Areas with large larval populations over the last 2 to 3 years had populations greatly reduced due to the polyhedral virus.
1974	Severe defoliation occurred near Kamloops Lake, south (320 ha) and in the Okanagan Valley (230 ha). There was also 2900 ha in the North Thompson Valley from Westsyde to McLure which was heavily defoliated by both Douglas-fir tussock moth and Western false hemlock looper Nepytia freemani. Many of the infestations recorded in 1973 have collapsed due to the nuclear polyhedral virus which was again found in several localities south of Kamloops Lake and near Jamieson Cr.
1975	Heavy defoliation resulting in considerable tree mortality was recorded at Kamloops Lake between Cherry Cr and Savona (2500 ha), and in the Thompson Valley from Westsyde to McLure (5700 ha). The BCFS sprayed approximately 12 400 ha with the bacteria Bacillus thuringiensis which reduced larval populations. The nuclear polyhedral virus appeared more widespread and was responsible for reduced populations resulting in fewer overwintering egg masses. The Okanagan Valley infestations collapsed.
1976	Severe defoliation occurred on 1782 ha despite the fact that 12 150 ha were sprayed to control tussock moth. Defoliated areas include North Thompson River from Westsyde to Dairy Cr, Kamloops Indian Reserve, Strawberry Hill, Heffley Cr. and Indian Garden Ranch, south of Savona. The polyhedral virus was recorded in these areas and responsible for reducing the number of adults. Surveys show low egg mass counts where defoliation was high.

Year	Remarks
1977	No damage recorded.
1978	Low adult population throughout region. Damage reported on a single tree.
1979	Populations remained low. A survey done to summarize damage from the infestations in the North Thompson from 1971-1976 showed significant tree mortality on 1530 ha.
1980	No damage reported by larval populations increasing. Egg mass survey results predict outbreak status near Hedley in 1981.
1981	Total of 1050 ha of defoliation observed from aerial surveys. Moderate to severe defoliation occurred near Monte Cr-Pritchard (670 ha), Salmon River (75 ha), Lions Head (50 ha); Carquille (50 ha), and Niskonlith (45 ha), and along the Similkameen River near Hedley (30 ha). An experimental nuclear polyhedral virus spray program was initiated in the Hedley area by BCFS. Initial egg mass surveys show the spray was successful.
1982	Light to severe defoliation over 12 000 ha of mainly private land which extended over 23 separate infestations, near Hedley and Olalla into the Okanagan Valley, the North Okanagan, from Chase west to Monte Creek, Kamloops, Deadman River to Cache Creek, and Carquille south to Spences Bridge. Aerial application of NPV reduced populations up to 93% in seven plots near Veasy Lake. A 120 ha stand on the Niskonlith Indian Reserve near Chase was successfully sprayed with SEVIN-4 OIL.
1983	The largest tussock moth infestation recorded in Kamloops Region to date covered 25 570 ha of light to severe defoliation in 670 separate infestations from the South Okanagan to Kamloops, along the North Thompson River to beyond Barriere and west of Kamloops to Spences Bridge. Previously defoliated areas with significant tree mortality, totaled 4 725 ha around Pritchard, Armstrong and Mount Swanson. The major expansion occurred around 1- and 2-year-old outbreaks, and new infestations developed between Spences Bridge and Ashcroft, near Pavilion, the North Thompson Valley, Kamloops to Savona, near Westwold and between Vernon and Lumby.
1984	Light to severe defoliation declined to only 160 ha near Cherry Creek, and localized high populations (no defoliation) occurred at Murray and Twaal creeks. Tree mortality from consecutive years of defoliation occurred on 5 490 ha from Falkland to Spences Bridge. The largest patches of Douglas-fir mortality were from Cache Creek to Scottie Creek and from Kamloops to Pritchard.

Year	Remarks
1985	Four small patches totaled 70 ha of severe defoliation at Six Mile Lookout west of Kamloops. Larval populations declined to an average of four per beating sample at Twaal and Cherry creeks and near Kamloops.
1986	No defoliation occurred and no larvae were found in beating collections. A total of 73 moths were caught in pheromone-baited traps at 17 locations (avg. <1 moth/trap).
1987	No larvae found in beating samples. Pheromone-baited traps at 17 locations caught 375 moths (avg. 4 moths/trap).
1988	The upper crowns of three Douglas-fir were severely defoliated in urban Kamloops, but no larvae were found in beating samples elsewhere. Pheromone-baited traps at 17 locations caught 1239 moths (avg. 12 moths/trap).
1989	Defoliation of single trees continued in the City of Kamloops but encompassing a larger area. Larvae were collected, 1-39 larvae per sample, between Savona and Chase, Kamloops to Vinsulla, and near Kelowna. The largest collection was at Jamieson Creek. Male moth captures increased to 18 per site.
1990	For the first time since the previous outbreak, there was severe defoliation of single trees in natural stands west of Kamloops. There was defoliation of ornamental spruce and D. fir in Kamloops, Penticton, Vernon, Kelowna, Peachland and Keremeos. Pheromone-baited traps at monitoring sites increased, averaging 25 moths/trap.
1991	Eight 10 to 40 ha patches of severe defoliation totalled 135 ha west of Kamloops at Indian Gardens, near Pat Lake, and at Brussels Lake. Elsewhere defoliation was limited to single D. fir and spruce in urban areas at Kamloops, Vernon , Kelowna and Penticton. There was evidence of virus and parasitism in reduced populations between Hedley and Keremeos.

Western spruce budworm, Choristoneura occidentalis

An important defoliator of Douglas-fir. Severe outbreaks had been confined to the western portion of the Region, occurring mainly in the Fountain Valley and Anderson-Seton lakes area, but by 1984 had spread into the North Thompson Valley and Okanagan Valley in 1985.

Year	Remarks
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	Infestation 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 22 km 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	Populations declined to a low level.
1956	Light to severe defoliation over 48 600 ha along Anderson and Seton lakes to Bridge R.
1957	Above infestations 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.
1960-66	Low population.
1967	Moderate to severe defoliation of current year's growth on trees between the 1050 and 1200 m elevation on Mission Mtn.
1968	Up to 90% defoliation of current year's growth on Mission Mtn.

Year	Remarks
1969	Mission Mtn infestation increased to 160 ha.
1970	Anderson-Seton lakes infestation increased to 1720 ha with damage in the following areas: Mission Mtn (320 ha heavy defoliation); Whitecap Cr (140 ha heavy, 600 ha light); S of Seton L (650 ha, 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 4600 ha. 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	Total of 18 220 ha infested in areas around Anderson, Seton, Carpenter, Gun and Downton Lakes. Areas of heaviest defoliation occurred along Whitecap Cr, at Mission Mtn Pass, and southwest of Gun Lake. Mortality occurred only on smaller understory trees. There was also an infestation of heavy defoliation on 80 ha along Kwoiek Cr, south of Lytton.
1973	The infestation in the Anderson, Seton, Carpenter, Gun and Downton Lakes area remained static at 18 200 ha. Top kill occurred especially in Mission Pass. The infestation along Kwoiek Cr increased in area to 650 ha but was rates as light and moderate defoliation.
1974	Total of 34 000 ha were defoliated. Infestations continued at Anderson-Downton Lakes and Kwoiek Cr. New outbreaks appeared between Pavilion and Fountain, along Fountain Valley at Botanie and Skaist Creeks, and along the Adams River north of Adams Lake.
1975	Infestations have continued and increased in the following areas: Anderson to Downton Lakes, Cayoosh Cr, and the Fraser Valley from Fountain to Kwoiek Cr (34 000 ha), Adams lake and Adams River (3800 ha) and Manning Park (2800 ha).
1976	Total of 121 095 ha affected. Areas of defoliation include: Southwest of the Region (42 930 ha), Clinton-Ashcroft-Big Bar area (40 500 ha), Adams Lake (17 010 ha), and Shuswap Lake-Sicamous area (20 655 ha).
1977	Total of 124 020 ha of defoliation was mapped. Moderate to severe defoliation continued in the Fraser Canyon and its tributaries and expanded into the Carpenter Lake, Yalakom River and Ashcroft areas. Light defoliation was recorded in the Adams-Shuswap lakes area and in the Merritt-Princeton districts. New lightly defoliated infestations were noted at East Barriere Lake, White Lake and Barnes Lake.

Year	Remarks
1978	Areas of defoliation were greatly reduced. Mainly light defoliation in the Ashcroft-Lytton-Lillooet areas (5200 ha), moderate defoliation south of Walhachin (420 ha), and a trace of defoliation at Spius Cr, August lake, and along Anarchist Mtn.
1979	Total of over 26 000 ha of mostly lightly defoliated trees. Areas include Oregon Jack Cr to Carquile, Hat Cr, East side of Thompson River from Barnard Cr to Nesbitt and Penny Lakes to Indian Gardens Cr, Spence Bridge, North of Nicola River, and south of Lytton. Moderate defoliation was recorded along Cornwall Cr, and in pole sized trees near Indian Gardens Cr.
1980	43 000 ha of defoliated stands extended from the Kamloops Forest Region boundary north of Cache Cr, south along the Bonaparte River to Cache Cr, south along the west side of the Thompson River to Oregon Jack Cr, east of Ashcroft along Barnard Cr to Penny Lake and east to Indian Gardens. Also, Hat Cr to Cashmere Cr and Pavilian Lake, near Spences Bridge and Lytton, and west of Lillooet on the north and south sides of Carpenter Lake and near Marshall Cr.
1981	Total of 16 350 ha defoliated. Severe defoliation occurred on 600 ha from Cache Cr-Campbell Hill and Cornwall Cr-Oregon Jack Cr. Moderate defoliation occurred on 11 15 ha mostly near Barnes Lk, Carquile, Hat Cr, Cache Cr, Cornwall Cr, and Oregon Jack Cr. 4635 ha of light defoliation was recorded near these areas also.
1982	The area of light to severe defoliation declined to 1 300 ha in the Spences Bridge-Ashcroft-Cache Creek-Kamloops Lake areas. The largest reduction of 2 500 ha to 12 600 ha, was in the Ashcroft-Cache Creek-Savona area. Defoliation in the Soap Lake-Pimainus Hills area declined by 300 ha to 700 ha. Light defoliation on 700 ha occurred for the first time at Sabiston Creek.
1983	Infestations expanded fourfold to 54 750 ha in the Spences Bridge, Ashcroft, Cache Creek, Savona and Carquile areas where there was light defoliation on 44 000 ha, moderate on 9 000 ha and severe over 1 750 ha. Bud, branch and leader mortality was evident on up to 50% of understory trees severely defoliated for two or more years from Pimainus Ridge almost to Clinton. Larval parasitism averaged 18% from six locations.

Year	Remarks
1984	Approximately 43 000 ha of mostly light to moderate defoliation. Declines in defoliation intensity and area were mainly in the Cache Creek-Spences Bridge-Savona area. Infestations occurred for the first time north of Kamloops, along the North Thompson River to Knouff Lake. On average 6% of mixed-age Douglas-fir were killed by repeated years of moderate to severe defoliation in study plots near Savona, Cache Creek and Clinton. Larval parasitism averaged 20% from 13 locations. An NPV infected 5% of larvae from eight locations.
1985	Infestations increased fourfold to 180 400 ha of which 139 000 ha were light, 36 250 ha moderate, and 4 600 ha severe, mainly from Kamloops to Little Fort, east to Adams Lake and west of Kamloops to Lillooet including Highland Valley and Scottie Creek. Light and moderate defoliation occurred for the first time since 1976 along the north shore of Anderson and Seton Lakes and south side of Carpenter Lake. Light defoliation totaled 250 ha in the south Okanagan near Mt Kobau and Anarchist Mtn. Larval parasitism averaged 14% at 11 locations.
1986	Areas of defoliation doubled to 408 000 ha of which 327 900 ha were lightly defoliated, 73 000 ha moderate, and 7 150 ha severe. Defoliation extended from west of Lillooet to the southern Okanagan and north to Vavenby. Major expansions occurred near Avola, around Falkland, Westwold, Salmon Arm, Chase and west of Osoyoos to near Summerland. Light defoliation expanded along the north shores of Anderson and Seton lakes, the south side of Carpenter Lake and between Pavilion and Lytton. Larval parasitism averaged 9% at 23 locations.
1987	Defoliation doubled to 821 360 ha, with light defoliation on 622 000 ha, moderate on 177 000 ha and severe on 22 000 ha. Douglas-fir mortality was mapped over 540 ha near Ashcroft. The majority of defoliation occurred from Cache Creek to Chase and north to Wells Gray Park and Avola in Kamloops TSA, along Carpenter-Anderson-Seton lakes and Lytton-Lillooet-Spences Bridge area in Lillooet TSA; from Seymour Arm south to Vernon east and west of Kelowna, Keremeos area and from Penticton south to Osoyoos, including Anarchist Mtn in Okanagan TSA; light to severe defoliation continued in Merritt TSA in Pimainus Ridge-Soap Lake area, resulting in some tree mortality. Areas of decline (59 000 ha) occurred between Savona and Ashcroft. Larval parasitism increased to 20% at 14 locations.

Year	Remarks
1988	After three successive years of expansion, defoliation declined in intensity and area to 345 000 ha. Of more that 1 100 areas mapped, 283 810 ha had light defoliation, 57 250 ha had moderate and 3 420 ha had severe. In Kamloops TSA, defoliation occurred over much of the same area defoliated previously with large reductions along Adams Lake and River, east and north of Clearwater and in Wells Gray Park. Defoliation expanded in Okanagan TSA near Vernon, Whiteman Creek, Okanagan Mountain Park, west of Kelowna and Penticton and along Vaseux Creek. Light to moderate defoliation occurred over a reduced area south of Soap Lake and along Pimainus Hills in Merritt TSA. Defoliation intensity and area declined dramatically in Lillooet TSA to 8 530 ha with no severe defoliation recorded and only 780 ha of moderate defoliation along Murray Creek and Blackhill Creek. Large reductions occurred in the Carpenter-Anderson-Seton lakes areas and along Fountain Valley, Pavilion Lake and Hat and Twaal creeks. Larval parasitism declined to 13% at 22 locations.
1989	Defoliation declined in intensity and area to 143 000 ha, of which 114 390 ha were lightly defoliated, 25 410 ha moderately and 3500 a severely. The decline was predominantly in Kamloops TSA and included the Thompson River drainages from Cache Creek to Chase and Kamloops north to Avola; Okanagan TSA at Shuswap Lake and surrounding areas. Infestations expanded by almost 50% to 12 750 ha in Lillooet TSA mostly along Bridge River and the Fraser River south, of Lillooet. Larval parasitism increased to an average of 15% at 12 locations.
1990	After two years of decline, defoliation increased to 193 000 ha, of which 4 050 ha were severe, 84 750 moderate, and 92 550 light. Defoliation occurred primarily in the Okanagan Valley, Shuswap Lake area and the drainages of the Thompson and Fraser rivers. In the Lillooet TSA, infestations expanded most noticeably along the Stein River, Carpenter Lake and in Fountain Valley. Increases in Okanagan TSA were in the Shuswap Lake area, east of Sicamous, and along Okanagan Lake. The most severe defoliation totalling 4 000 ha were in The North Okanagan and near Vernon, Kelowna and Penticton.
1991	Infestations doubled in size from 1990 to 386 000 ha, which includes 13 500 ha defoliated by budworm in association with pine needle sheathminer. Severe defoliation accounted for 13% of the area infested, as compared to only 2% in 1990. In the Okanagan TSA, intensity decreases in large infestations between Osoyoos and Penticton were offset by major expansions between Glenemma and Penticton on the west side of Okanagan Lake. Major expansions occurred in Kamloops TSA along the upper slopes of

Year	Remarks
1991 (Cont'd)	the Thompson Valleys between Chase and Deadman Creek, south of Kamloops to Stump Lake and north to McLure. Most expansions in Lillooet TSA occurred along Seton, Anderson, and Carpenter lakes, Cayuse Creek and Fountain Valley. In Merritt TSA new infestations covered 1700 ha near Peter Hope Lake and north of Nicola Lake.

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. Damage recorded in the Kamloops Region occurred near Chase in 1963-64, from Vernon to Salmon Arm from 1972-74, and scattered throughout the Shuswap Lake area 1981-83.

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 Region 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.
1963-64	Moderate to heavy defoliation of D near Chase.
1965-70	Low populations.
1971	Populations increased; up to 52 larvae collected near Hidden L, 453 along Kingfisher Cr and 27 at Noisy Cr. No defoliation was recorded.
1972	Light to severe defoliation of semi-mature Douglas-fir trees on 1300 ha in the Salmon Arm-Enderby area. The largest infestations occurred on the South (245 ha) and west (245 ha) slopes of Bastion Mtn near Sunnybrae. Moderate to severe defoliation also occurred near Celista, White Lake, Gleneden, and between Salmon Arm and Canoe. Light defoliation occurred in seven infestations between Enderby and Mara Lake.
1973	Infestations expanded at 2000 ha with new outbreaks recorded near Vinsulla, Chase, and Lavington. Mortality has occurred on 120 ha since this epidemic began. An experimental control program using bacteria was carried out over 160 ha at Carlin, Sunnybrae, and Canoe.

Year	Remarks
1974	Total of 5600 ha affected. Infestations in the North Thompson valley, near Chase, and near Lavington greatly increased in size. A large portion of the infestation in the Thompson River valley was due to combined feeding of the western false hemlock looper and the Douglas-fir tussock moth. Infestations in the Salmon Arm and Enderby areas declined.
1975	Infestations declined to 720 ha. They occurred at Monte Lake (300 ha), between Louis Cr, and Barriere (320 ha), Larkin (40 ha), Lavington (40 ha), and Pritchard (20 ha).
1976	All populations collapsed due to parasitism on the overwintering eggs.
1977-79	No damage recorded.
1980	No noticeable defoliation but an increase in larval populations similar to the one in 1971 occurred in the north Okanagan valley and Shuswap Lake area.
1981	Total of 350 ha of light defoliation at the following locations: Carlin (100 ha), Herald-Paradise (100 ha), Ginrod (100 ha), Sunnybrae (25 ha), and White Lake (25 ha).
1982	Infestations increased threefold to 1 150 ha in the Salmon Arm-Shuswap Lake area on mainly private forest, extending from White Lake south to Enderby. Overwinter egg mortality at Tappen and Sunnybrae was 22% and 33% respectively.
1983	Defoliation declined to 250 ha in the Shuswap Lake-Salmon Arm area. Infestation areas ranged from 12 to 80 ha each at Tappen, Sunnybrae, Blind Bay, Salmon Arm, Squilax and Scotch Creek. NPV killed up to 75% of late instar larvae.
1984	Infestations in the Shuswap Lake area collapsed due to NPV infection in 1983. There was only 1.6 larvae per positive beating compared to 6.1 in 1983 in the region.
1985-88	Low populations - no damage.
1989	Larval populations increased substantially in Spences Bridge, Savona to Falkland, including Cherry Creek and Pritchard, and north of Kamloops to Barriere. Sampling determined that there were an average of 12 larvae per positive collection. Despite the increase defoliation was not apparent.

Year	Remarks
1990	Larval populations increased slightly throughout the region without causing any defoliation. Highest numbers were found between Falkland and Cache Creek, and north to Barriere. Up to 33 larvae/beating were collected in permanent sample sites, up from 20 in 1989.
1991	Populations increased throughout much of the IDF and PP biogeoclimatic zones in the region, causing some light defoliation in association with Douglas-fir tussock moth in stands near Savona at Indian Gardens and Six Mile Point. There was some trace defoliation at Jamieson Creek.

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 Region.

Year	Remarks
1952-54	Widespread in Okanagan Valley; 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 Valley.
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, Equesis 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 (84%); 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 Valley in 1970.
1971	Infestation at sample plots ranged from 2 to 34%.
1972	Exceptionally severe infestations from Kelowna to Winfield, and near Okanagan Lake from O'Keefe to Whiteman Cr. Up to 50% needles infested.
1973	1972 infestations remained static and additional moderate infestations occurred near Falkland.
1974	Extensive damage occurred throughout the Okanagan Valley. Up to 90% of the needles were infested near Shuttleworth Cr.

Year	Remarks
1975-81	Not mentioned in reports.
1982	Low populations.
1983	Needle-mining and discoloration common over 10 km² between Kelowna and Penticton, affecting about 20% of the foliage of scattered regeneration and intermediate size trees.
1984-90	Low populations.
1991	Light infestation on D. fir in Dunn Lake area.

Spruce spider mite, Oligonychus unmunguis

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 discolouring 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; damaged occurred to D at Harper L.
1966-74	Not reported.
1975	Severely affected the new foliage on 800 ha of immature D from Winfield to Kelowna which was recently defoliated by Douglas-fir tussock moth.
1976-91	No damage reported.

Black army cutworm, Actebia fennica

Is an important pest of coniferous plantations in recently burned areas, causing defoliation, deformity and mortality of planted seedlings. BAC has been reported defoliating seedlings in Kamloops Region at Redsands (Blue River), 1973; "Eden Fire" (Salmon Arm), 1975; north of Blue River, 1982-83; Clearwater, 1984; Otter Creek and Larch Hills, 1987.

Year	Remarks
1973	Defoliated D and eS seedlings planted near Redsands in the North Thompson River Valley.
1974	No damage observed due to alternate food source.
1975	Only very light defoliation of Engelmann spruce and lodgepole pine in 0.2 ha-0.4 ha areas scattered over 240 ha of the "Eden fire." Patches of herbaceous growth were heavily defoliated. Small numbers of larvae reported from Mt St. Anne, Finn, Hellroar, Lempriere and Scotch creeks.
1976	Populations declined to low levels; only traces of feeding on herbaceous growth near Salmon Arm, Scotch Creek, Blue River and Wiley Creek.
1977-81	Low populations.
1982	About 20 000 1-0 lodgepole pine seedlings were killed in a 1982 plantation near Bobo Creek, northwest of Blue River. About 50% of 27 000 seedlings were killed by complete defoliation and 25% were severely defoliated and not expected to recover, but with the terminal bud in place. The remaining 25% were on a moist flat area and only lightly damaged.
1983	Up to 60% of Engelmann spruce were severely defoliated in parts of a 15 ha plantation devoid of herbaceous vegetation near Adolph Creek north of Blue River.
1984	Light defoliation of herbaceous growth at a fall 1983 burned site north of Clearwater and small numbers of larvae at three other nearby locations. The infestation at Adolph Creek collapsed.
1985	Low populations.
1986	Low populations. Average 3.5 moths per pheromone-baited trap near Clearwater.
1987	Six areas of Douglas-fir seedlings in 0.5 to 1 ha were infested on ridge tops on a 150 ha clear-cut at Otter Creek. Seedlings were up to 50% defoliated and herbaceous growth 100%. About 10% of Engelmann spruce and Douglas-fir seedlings were 30-100% defoliated on 4 ha in the Larch Hills near Salmon Arm.

Year	Remarks
1988	Decreased populations. Light feeding of herbaceous ground cover observed in 2 of 10 areas examined near Clearwater. Only 20% of pheromone-baited traps were positive, averaging 2 moths each.
1989	There were no reports of larvae or damage, however 60 male moths were caught in each of 15 pheromone-baited traps in the Clearwater Forest District. These catches reflect a low population level.
1990	No reports of larvae or damage. Numbers of male moths caught in pheromone-baited traps declined to 26 per trap in Clearwater District.
1991	No reports of larvae or damage. Male moths captured in pheromone-baited traps increased marginally to 29 per trap.

SPRUCE PESTS

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 1969.

Year	Remarks
1927	Small infestation (100 trees) in Bush Cr at Adams L.
1928-48	Not mentioned in reports.
1949	Severe infestation over 150 ha near Bolean L.; 54 Mbf killed on 5 ha cruised.
1950	Populations at Bolean L declined, due mostly to woodpecker predation.
1951	Not mentioned in reports.
1952	Infestation of 2 ha at Murphy L. (145 trees killed).
1953	132 trees killed near Princeton.
1954	Murphy L infestation subsided.
1955-56	Not mentioned in reports.
1957	Small infestation at Murphy L.
1958	No attacks recorded.
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 10 ha 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.
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 Hills plateaus; 200 trees infested in seed blocks near Vavenby.

Year	Remarks
1965	Small infestation at Moira L; 40 dead trees at Spa L; increased population in decked logs and standing timber in Horsefly District.
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 and in right-of-way logs near Likely.
1968	Not mentioned in reports.
1969	Severe infestations at several locations: 12 750 ha in Quesnel and Cariboo lakes area (cruise strips showed 81% mortality at Weaver Cr and 40% at Spanish Mtn); 2200 ha in Dunsapie-Allan lakes area (14% tree mortality); 1000 ha at Lumbly 1 (4% tree mortality).
1970	The expansion of the infestation to 26 300 ha in Quesnel and Cariboo lakes areas was due mostly to mapping of 1968-attacked trees which had not changed color in 1969. Estimated 40 ha at Shorts Cr (23% of trees in cruise strip were currently attacked).
1971	Infestations increased to 870 ha in Okanagan and Barton Hill forests; up to 41% of the trees in prism plots on Whiterocks Mtn were attacked. In Quesnel L area, infestations declined to 80 ha at Blackbear Cr, 100 at Spanish L, 240 at Abbot Cr, and 40 at Tasse L.
1972	The foliage of many trees attacked in 1970 did not discolor until the winter of 1971-72 and thus were not counted until 1972. These trees were included in 1972 surveys as well as 1971 attacked red trees. Areas where increased mortality occurred are: Dome Rock Mtn. (525 ha), Whiterocks Mtn (610 ha), Cameo Lake-Mt. Gotfriedson (280 ha), and Little White Mtn. (325 ha).
1973	Continued epidemic in high elevation Engelmann spruce. Mt. Gotfriedson (610 ha), Whiterocks Mts (610 ha), Little White Mtn (120 ha), and smaller infestations totalling 80 ha from Mt. Chapperon to Bouleau Mt.
1974	Apparent collapse of population. No standing trees were attacked, and only a few windfalls were infested. There are few suitable host trees left in the overmature spruce areas.

Year	Remarks
1975	Only one recorded infestation occurred on 100 ha near the headwaters of the Chu Chau and Birks Creeks.
1976	Scattered infestations occurred in leave blocks and along perimeters of cut blocks near Camoo, Van Harlick and Casper Creeks and tributaries of Bridge River and Cayoosh Cr.
1977	A general increase in activity of spruce beetle. A new outbreak occurred near Tadpole Lake in the Lambly Cr drainage on 300 ha. Population buildups were recorded near Thyne Mtn, Fly Hills, Prospect Cr, and Bouleau Lake. Successful trap tree program at Thyne Mtn. has contained the spread of beetles.
1978	Beetle hazard persisted at Van Horlick Cr and Dome Mtn but is being combatted by trap tree programs. Scattered infestations occurred near Lawless Cr, Olivine Cr, Placer Cr, and on 80 ha near Chu Chau Cr.
1979	Decrease in beetle activity with scattered infestations near Fly Hills, Tadpole Lake, Thyne Mtn, and Cathedral Provincial Park. Significant attacks on windfall and tree stumps occurred near Olivine, Lawless, and Minor Creeks, Well Gray Park from Helmcken Falls to Clearwater Lake, and Monticola Lake.
1980	Total of 750 red tops occurring near McKay Cr (60 ha), Blowdown and Cayoosh Creeks (260 ha), Raft R.-Thunder R.-Miledge Cr. near Clearwater (170 ha), and Tod Mtn (250 ha). Much of these areas were logged in the fall and winter.
1981	Only 70 red tops on 10 ha recorded. Collapse due to logging and trap tree programs.
1982	Little change. Single and small groups of 2-20 trees totaling 75 trees: Miledge Creek 15 trees; Hurley Creek 5 trees; Van Horlick Creek 15 trees; Lambly Creek 20 trees; Shorts Creek 20 trees.
1983	A fourfold increase to 300 ha of light mortality of Engelmann spruce from Blue River to Anderson Lake. The largest infestation of 238 ha at Connel Creek was associated with blowdown. Other smaller infestations include Chappell Creek, 60 ha.; West Raft River and Adolph Creek, 1 ha each.
1984	Infestations doubled to 695 ha and include: McGillivray Creek, 245 ha; Connel Creek, 240 ha; Whitecap Creek, 50 ha; Noel Creek, 50 ha; Lost Valley Creek, 15 ha; upper Adams River, 95 ha; Cayenne Creek, 50 ha; Cold Creek, 25 ha; and Harper and Harbour Creeks, 10 ha each.

Year	Remarks
1985	Infestations increased to 1020 ha at: Connel Creek, 500 ha; McGillivray Creek, 350 ha; Cayoosh Creek, 70 ha; Whitecap Creek, 50 ha and Harper Creek (Clearwater District), 50 ha.
1986	Beetle activity increased to cover 2 100 ha in 51 infestations in Merritt TSA. Largest infestations in Lillooet TSA were Noel Creek, 570 ha; Whitecap Creek, 110 ha; Connel Creek, 380 ha; McGillivray Creek, 300 ha. Infestations in Merritt TSA were concentrated near the headwaters of the Tulameen River. Areas included: Arrastra Creek, 260 ha; Champion Creek, 150 ha; Packers Creek, 110 ha; Podunk Creek, 190 ha..
1987	Infestations were mapped over 2 930 ha, of which 1 380 ha were infested at Connel and McGillivray creeks and 670 ha at Noel Creek in Lillooet TSA. In Merritt TSA, infestations occurred on 830 ha including Arrastra, Packers and Champion creeks. A further 50 ha were recorded on Lawless Creek near Princeton.
1988	Areas of beetle infestation were reduced to 1 450 ha, mostly in Lillooet TSA (1 020 ha). Recent beetle kill comprises about 20% of Engelmann spruce at Connel and McGillivray creeks. Reductions also occurred in Noel Creek. Two spot infestations in North Kwoiek Creek. Fourteen pockets of light tree mortality occurred on 379 ha in Merritt TSA at Arrastra, Champion, Hubbard, Buchanan and Holding creeks. Of this area 84 ha are now included in Manning Provincial Park.
1989	Populations declined to 940 ha with recent mortality confined mostly to infested stands at Connel, McGillivray and Noel creeks in the Lillooet TSA. Attack densities averaged 20%. Smaller infestations occurred along East Barriere Lake and upper Harper creek.
1990	Infestations covered 1 000 ha, having levelled off after declining the past three years. Infested areas in Lillooet TSA totalled 900 ha, which included Noel, McGillivray and Connel creeks. Incidence of attack varied from 5 to 30%. Scattered pockets persisted in the Tulameen River drainage, including occasional presence in recent blowdown in the Mt. Thynne area. A new infestation in Kamloops TSA affected 30% of spruce on 100 ha along Nikwikwaia Creek near Adams Lake. Infestation originated from high stumps.
1991	The areas of infestation declined to 335 ha in previously attacked stands. Recent tree mortality ranged from 10 to 20% along Noel and Cadwallader creeks and declined further, along McGillivray and Connel creeks. Along Nikwikwaia Creek, infestation is restricted along stand fringes. Trap trees are being used. Infestations in the Mt. Thynne area have mostly been removed through salvage.

Two-year-cycle 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 South Thompson River, near McGillivray and Bolean lakes, and in the Monashee areas near Lumby. No serious outbreaks have been recorded in the Region.

Year	Remarks
1944	Larvae present on alF and eS along the lower Clearwater R, Skaist Cr, and at Bolean and Arthur lakes.
1945	Light to severe defoliation of alF at Sock L and W of Clearwater.
1946	Light defoliation of alF and eS at Sock L, Martin Cr, Bolean, Johnson and Parky lakes.
1947	Not mentioned in reports.
1948	From 10 to 20% of the 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 defoliation 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.
1957-59	Low population.

Year	Remarks
1960	Light defoliation of alF in Jamieson Cr area; average of 0.3 larvae per collection in central parts of Region.
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 defoliation at Jamieson Cr; low population elsewhere.
1968-73	Very low populations.
1974	Approximately 1200 ha along Lempriere Cr and near the headwaters of the North Thompson River were moderately defoliated.
1975	No damage - off year.
1976	Heavy defoliation occurred on 7980 ha at Lempriere Cr. Mostly Engelmann spruce was affected as well as some alpine fir. Top stripping occurred on both overmature and pole-sized trees.
1977	No damage - off year.
1978	No damage recorded by a medium population persisted at Lempriere Cr.
1979	Total of 6350 ha defoliated in the upper North Thompson River Valley: 5150 ha of heavy defoliation at Lempriere Cr; 380 ha of moderate defoliation at Gasnell; and 820 ha of light defoliation near North Thompson River west of Gasnell, Clemiha Cr, Allan Cr, and Chappel Cr.
1980	Defoliation was recorded over 13 680 ha along the North Thompson River north of Blue River, and over 160 ha near Fishtrap Cr west of Barriere.
1981	No damage recorded.
1982-85	Low populations.

Year	Remarks
1986	Light to moderate defoliation of Engelmann spruce and alpine fir over 22 680 ha from the upper North Thompson River Valley to Hobson Lake, and south near Taweel Lake, west of Clearwater.
1987	Infestations declined to 16 950 ha of light defoliation over the same area defoliated in 1987 with several new areas, including: Hobson Lake, Harper Creek near Clearwater, Keefer lake east of Vernon, and along upper Shuswap River to Tswino Creek.
1988	Increase. Light to moderate defoliation occurred on 44 450 ha, along the North Thompson Valley and adjacent drainages from Kamloops to Albreda, including Wells Gray Provincial Park, Adams Lake-Shuswap Lake area, Keefer Lake, and between Mabel Lake and Shuswap River. New areas of light defoliation include, Gisborne Lake to Jamieson Creek, near Bonaparte Lake, Louis Creek-Hyas Lake area. Other new areas of light to moderate defoliation include Scotch Creek-Seymour Arm area, Mahood, Azure and Murtle lakes. Light feeding damage of less that 50% defoliation of the current growth was common in many stands but frequently not visible from the air.
1989	Area of defoliation declined to 4140 ha, of which 2700 ha were light and 1440 ha were moderate. The majority occurred east of Cherryville at Keefer Lake, with small patches west of Barriere along Peterson, Fishtrap and Poison creeks.
1990	Defoliation over 6750 ha was equally split between Wells Gray Park and Keefer Lake, east of Lumby. Moderate defoliation of 2350 ha occurred at Keefer Lake. Stands along Clearwater Lake were lightly defoliated, but showed signs of repeated damage.
1991	Larvae defoliated 6775 ha in 11 areas east of Lumby, between Keefer and Sugar lakes. Defoliation was severe on 280 ha at Holmes Lake, moderate on 3820 ha at Keefer, Holmes and Kate lakes, and Monashee, Currie and Cherry creeks, and light on 2675 ha around Keefer and Holmes lakes and along Cherry Creek.

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.

Year	Remarks
1940-41	Damage to spruce in BX District and at Armstrong.
1942-43	Not reported.
1944	High population near Kelowna.
1945-48	Not reported.
1949	High population at Alexis Cr.
1950-58	Not reported.
1959	Severe infestation on D at Alexis Cr, Soda Cr, 150 Mile House, Horsefly L and Lytton; light damage near Bridge L.
1960	Not reported.
1961	Up to 28% of eS tips infested throughout the Region; 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.

Year	Remarks
1972	A general increase in populations. The highest percentage of needles infested were at Coalmont (61%), Cherry Cr (53%), Lumby (45%) and Keremeos (42%).
1973	A general decline in all areas.
1974	Aphids were abundant on immature D trees in the Kamloops, Shuswap, and Okanagan areas. Along Kamloops Lake there was a complete loss of 1974 foliage over an extensive area.
1975-82	No damage reported.
1983	Increased incidence throughout region. Of note was up to 50% incidence of galling of current growth of Engelmann spruce in 1-5 ha patches in Jamieson Creek drainage.
1984	Common throughout. Up to 5% of branch tips galled on 20 ha of Engelmann spruce at BCFS seed orchards at Skimikin and Vernon and in a plantation near Merritt.
1985	About 40% of the current growth was galled on all white spruce 1-3 m high from the Bulkley Valley and Central Plateau provenances at Skimikin Seed Orchard. Only 10% of branch tips were galled on 80% of Engelmann spruce from the West Kootenay provenance.
1986	Control actions at Skimikin resulted in reductions. Ten to twenty percent of shoots were infested from Bulkley valley and Central Plateau provenances and up to 10% were infested from West Kootenay provenances.
1988	Seven Engelmann spruce stands were 20-90% affected. Heaviest infestations of 98 and 96% incidence occurred at Coldscaur Lake and Vavenby, respectively. Average of 25% of trees with more than 1 gall per branch.
1989	At Skimikin Seed Orchard 42% of high- and low-elevation provenances of white spruce were severely galled. No other recorded activity throughout the Region.
1990	Infestation levels similar to 1989 at Skimikin Seed Orchard. Light to moderate galling on all 3-11-year old spruce at Eagle Rock Seed Orchard.
1991	Infestations were found on 22% of Engelmann spruce in 31 young stands examined, and on 30% of D. fir sampled. The most severe infestation occurred on Engelmann spruce at Bigg Creek in Vernon District, where stunting and deformity were a threat to the spruce.

White pine weevil, Pissodes strobi

Preferred host in Kamloops Region 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 4 ha near headwaters of Ellis Cr.
1957	15 trees infested at Big L; 49% of 54 trees examined were infested at Horsefly L.
1959	20% of trees on 4 ha were infested at McMurphy; 50 trees infested on upper Clearwater R; infestation over 2 ha at Tunkwa L.
1963	8% of reproduction eS attacked in Horsefly area.
1964	10% of examined reproduction eS infested in Horsefly Bay area.
1965	Up to 18% of trees in plots in Clearwater area were infested; new locality record at Hendrix Cr.
1966	Up to 25% current attack on examined trees 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%.
1971-81	Not recorded.
1982	A summary of surveys between 1967 and 1982 showed that weeviled terminals were present in 50% of 56 stands examined. Current attack averaged 16% in 68% of these stands.
1983	Current attack varied from 0 to 4% in 11 areas examined, the highest being at O'Connor Lake, near Kamloops.
1984-88	Not mentioned in reports

Year	Remarks
1989	Old and new attacks on 30% of spruce at Upper South Barriere Lake.
1990	Not mentioned in reports
1991	Weevil damage was recorded in only 2% of more than 1000 spruce surveyed during examinations of young stands.

TRUE FIR PESTS

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 alpine fir. 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 8500 ha between 1300 and 1400 m elevation surrounding McGillivray L; a few trees killed at Bolean and Spa lakes.
1958	Infestations reported as follows: McGillivray L (8500 ha); east of Knouff and Badger lakes (1800 ha); Johnson L to East Barriere L (2800 ha); Barriere to Heffley (3900 ha).
1959	From Kamloops to Murtle L infestations covered 18 200 ha with estimated volume loss of 945 000 m^3; dead and dying trees were counted at Bolean L (400) and Scotch Cr (500).
1960	Very few trees attacked.
1961	On Hunter Rge, 60% of alF over 1500 ha 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 3000 ha on Cherry Ridge (Sugar L area); 100 dead trees on Kiskonlith Forest Reserve and 500 on Tranquille Forest Reserve.
1962	Scattered red tops from headwaters on 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 2300 distributed between Whitewood, Jamieson and Watching creeks.
1963	Red tops scattered over 12 500 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.

Year	Remarks
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; general increase in Horsefly and 100 Mile House districts.
1966	Relatively low numbers of red tops: Anstey Mtn (200), Tsius Cr (200), Whiteman Cr (200), Harris Cr (250), Moira L (500), Moffat L (250).
1967	Decrease in tree mortality recorded: Olivine Mtn (100), Lambly Cr (200), Moira L (75), Bosk L (300).
1968	Total of 8000 red tops counted. Increase due mostly to better air coverage. Highest concentrations of dead trees at Chase Cr (1000) and Louis Cr (1000); 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, Thuja L, Terrace Mtn (1000 trees each); Harris Cr to McAuley Cr (1700); from 400 to 500 red tops were recorded at Quesnel L, Moira L, Beauregard L, Bartlett 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 (2000), Mt Lolo (1000), Sullivan L (3000), Community L (1500), Mt Leslie (1000), North Queest Mtn (1000), Mission Cr (1000), Queest Mtn (3000), Cariboo Plateau (5000), Terrace Mtn (1000), Whiteman Cr (1000), and Bouleau Cr (1500); 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 2100 were estimated at Bob Cr, Jamieson Cr, Queest Mtn, Hunters Rge, Bouleau L, Terrace and Copper Creeks.
1972	Total of 12,600 red tops recorded. Heaviest mortality occurred near Mann Cr. (550), Community Lake (600), Hunters Range (2000), Fly Hills (700), Spa Hills (900), Tuktakamin Mtn (1000) and Shorts Creek (750).
1973-75	No attacks recorded.

Year	Remarks
1976	Infestations recorded at: from Jamieson Cr. north to Mann Cr (1053 ha), Yard Cr (729 ha), Legerwood Cr (275 ha), and scattered attack between Klo Creek and McCulloch Lake, and east of Kelowna, and near Bouleau Lake, west of Vernon.
1977	Total of 9500 ha affected. Largest concentrations of damage occurred in Fly Hills, Hunters Range, Bonaparte Plateau and near Stoyoma Mtn.
1978	Occurrence of alpine fir killed were similar to 1977 with the addition of Upper Trout Cr. (130 ha) and near Kingvale (49 ha).
1979	Decreasing populations. Trees that were attacked were usually the secondary stand component.
1980	No attacks recorded.
1981	Total of 1435 red tops scattered over 1870 ha. The larger infestations occurred at Wentworth Lake, Devick Lake, Penticton Cr, and Trout Cr.
1982	The number of recently killed mature alpine fir increased slightly to 2 975 trees, scattered over 3 085 ha. Mortality extended from North Barriere Lake in Kamloops TSA ,to the Bridge River drainage and Duffy Lake in Lillooet TSA, to Greyback Lake in the Okanagan TSA.
1983	There was a slight increase in the number of recently killed mature alpine fire, 3 650 trees, scattered over a smaller area, 2 175 ha. Tree mortality was concentrated in 4 major areas; near Bridge River in Lillooet TSA and in Perry, Blais and Bolean creeks in Okanagan TSA.
1984	Infestations increased slightly to 3 900 trees over 2550 ha. The highest mortality occurred in Okanagan TSA and the least in Lillooet TSA.
1985	A total of 600 ha of dead alpine fir were mapped during aerial surveys. This decline can be accounted for in part by reduced aerial coverage.
1986	Infestations increased to 2 290 ha, with the largest infestation covering nearly 1 000 ha in Lillooet TSA southeast to Lytton to the Nicomen River, including Kanaka Mountain. This overall increase is partly due to greater aerial coverage of the region.
1987	A total of 550 trees over 1 750 ha were mapped, marking a decrease in both numbers of trees and area affected.

Year	Remarks
1988	The area of infestation decreased substantially to 46 ha at Holmes Lake and in the Mabel-Sugar lakes area.
1989	Increase to 310 ha, mainly due to additional aerial surveys into more remote areas of the region. The largest occurred at Twaal Lake west of Clearwater.
1990	Increased surveillance in remote areas detected 1000 ha of infestation. The largest infestations were at Wentworth Cr and Blanc Cr, totalling 780 ha. A new infestation of 180 ha was located between Mabel and Sugar lakes.
1991	Infestations totalled 1710 ha, mostly in chronic areas north of Kamloops at Wentworth Cr, Tranquille L, and Taweel L, and at Blanc Cr east of Pritchard. Infestations up to 70 ha occurred near Monashee Cr, Trout Cr, Munro L, Fly Hills, and Anstey Arm, in Okanagan TSA, and McGillivray and Hurley creeks in Lillooet TSA.

Balsam Woolly Adelgid, 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 Region have been received and none has been detected.

Year	Remarks
1982-91	No addition required to original statement.

LARCH PESTS

Larch Casebearer, Coleophora laricella

This insect poses a major threat to western larch stands in the Region. 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 Region.

Year	Remarks
1968	First record in the Region 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.
1972-74	Populations remained low.
1975	No activity reported.
1976	Low populations resulting in light browning of wL east of Okanagan Falls along Shuttleworth Cr. Larvae were collected near Heckman Cr, east of Cherryville for the first time which extended the known range west of the Monashees and north of Penticton.
1977	Light defoliation on 600 ha near Anarchist Mtn. Larval distribution was extended to Lavington.
1978	Infestations remained at Anarchist Mtn and increased at Shuttleworth Cr and Cherryville. Moderate browning occurred on 40 ha at Heckman Cr.
1979	Damage decreased near Cherryville and Shuttleworth Cr and remained static along Anarchist Mtn.
1980	Light defoliation was recorded at Cherryville and Shuttleworth Cr and moderate defoliation occurred at Anarchist Mtn where a portion of the damage was caused by western spruce budworm.
1981	All infestations remained static and defoliation ratings remained the same.

Year	Remarks
1982	Populations throughout the region plunged to almost zero. The decline in intensity and extent of defoliation was attributed to introduced and native pupal parasites including Dicladocerus sp., Chrysocharis sp., and Mesopolobus sp.
1983	No recorded defoliation.
1984	Populations increased in the King Edward Main area, southeast of Vernon, resulting in moderate defoliation of 1 150 ha of western larch.
1985	Defoliation by larch casebearer was not visible throughout the region. However, damage by this pest may have been masked by that caused by larch budmoth.
1986	Populations remained low.
1987	Populations remained low, with light defoliation recorded along King Edward Main, east of Vernon.
1988	Light defoliation continued in the King Edward Main area, east of Vernon.
1989	No recorded activity.
1990	Up to 50% defoliation of small area between Sicamous and Canoe; the most northerly extension recorded. Populations increased along King Edward Main, causing light to moderate discoloration.
1991	Light to moderate defoliation, up to 30% occurred at Gregoire and Shuttleworth creeks, Trinity Valley, and along the King Edward Main and Harris Creek roads. The infestation between Sicamous and Canoe declined to 20% defoliation.

Larch sawfly, Pristiphora erichsonii

A defoliator of western larch. In the Kamloops Region, 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 at 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.
1946	Small infestation near Lavington.
1947	Not mentioned in reports.
1948	Populations collapsed at Trinity Valley, possibly due to parasites Tritneptis klugii and Mesoleius tenthredinis, 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 5400 ha along E side of Okanagan Valley from Osoyoos to Vernon. The largest area was 500 ha near junction of Pearson and Mission creeks.
1968	Population declined, partly due to Tritneptis klugii.
1969	Population collapsed.
1970	Low population.

Year	Remarks
1971	Scattered pockets of defoliation in E Okanagan Valley.
1972-73	Small pockets of light defoliation near Vernon.
1974-91	No recorded damage.

A Larch budmoth, Zeiraphera improbana

An enemy of western larch in the Kamloops Region. There are no records of attack prior to 1965. Damage is restricted to stands above 1200 m 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.
1966	Degrees of defoliation occurred as follows: Putram Cr (heavy over 600 ha), Vance Cr (heavy - 200 ha), Harris Cr (heavy - 400 ha), Creighton Cr (light to heavy - 500 ha), Echo L. (moderate to heavy - 400 ha), Ferry Cr (light - 80 ha), and Nicklen L (light - 20 ha).
1967-72	Low populations.
1973	Severe defoliation of high elevation mature wL on 500 ha in south part of Silver Star Park.
1974	Infestations increased at Silver Star Park (800 ha), and east of Silver Star Mtn. (400 ha). New infestations were reported at Heckman Cr (2300 ha), Vernon Hill (200 ha), and Dutton Cr, southeast of Okanagan Falls, (200 ha).
1975	No damage reported.
1976	Light defoliation of overmature wL along Shuttleworth Cr, east of Okanagan Falls. Populations collapsed at all other areas in 1975-76.
1977-81	Not mentioned in reports.
1982-84	No recorded activity.
1985	Light to severe defoliation occurred on 8 900 ha of western larch in the southern part of the region.
1986	Although spring populations were abundant in parts of the region, mortality from unknown causes eliminated the population before any feeding occurred.
1987	Populations remained at low levels.
1988-91	No recorded activity.

HEMLOCK PESTS

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. Areas of serious defoliation have been restricted to the wet belt - Lumby, Mable lake, and Shuswap Lake in the south, and Quesnel Lake in the northern portion of the region. Severe infestations occurred in these areas from 1965 to 1967.

Year	Remarks
1952	Low population.
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; 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 Valley and averaged 11 near Mt Lolo; average of 32 larvae from eS at Tunkwa L and 15 from alF at McGillivray L.
1959-62	Low population.
1963	Increase in population in E area of Region - 45% of collections from wH averaged 5 larvae.
1964	General increase in population throughout Region.
1965	Serious defoliation occurred between 900 and 1200 m 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, Tsuis, Holstein, Reiter, Curwen, Vanwyk, Gates and Lindmark creeks.
1966	Larval populations high in overmature wH in Enderby and Lumby areas. Defoliation occurred above 1000 m in following areas: Perry R (light to moderate defoliation over 6700 ha), headwaters of Crazy Cr (moderate defoliation over 1200 ha and moderate to heavy over 2500 ha).

Year	Remarks
1967	Areas of defoliation of wH increased from 15 000 ha to 19 000. Light to moderate damage occurred along 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 1200 ha); Cherry and Outlet creeks (1000 ha light to moderate); Sugar L (400 ha light to moderate, 200 moderate to heavy); Shuswap R (600 light to moderate, 2800 moderate to heavy); Wap Cr (1200 light to moderate, 2225 moderate to heavy); Shuswap L (200 light to moderate, 400 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	Infestation at Quesnel L collapsed. 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 Nicoaman 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	No damage reported.
1973	Moderate defoliation of wH on 40 ha Tsuius Cr. Elsewhere in the Region larvae were scarce.
1974-75	No damage reported.
1976	Moderate defoliation of wH on 6400 ha in three areas near Blue River.
1977	Blue River infestation collapsed despite indications of high populations based on 1976 egg mass surveys.
1978-84	No damage reported.
1985	Light defoliation extended over 3100 ha of overmature western hemlock. Infestations occurred from the west side of Hobson Lake in Wells Gray Provincial Park to Monashee Creek near Cherryville with the largest and most numerous in Okanagan TSA.
1986	Populations collapsed.

Year	Remarks
1987	Populations increased causing light defoliation of 1100 ha of western hemlock. The majority, 970 ha, occurred in Wells Gray Provincial Park, along Azure River and Lake.
1988	Light defoliation occurred over 880 ha in Wells Gray Provincial Park, marking a slight decline from the previous year. Defoliation elsewhere in the region was not noted.
1989-91	No recorded activity.

Western hemlock looper, Lambdina f. lugubrosa

Western hemlock is the preferred host 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 Region 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 (6000 ha), Azure L (2000 ha), Hobson L (4400 ha), East Arm Quesnel L (1000 ha), Blue R (10 400 ha).
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 40 ha 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 Region, 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.
1972	Larvae found from Enderby to Sicamous. 45% of the collections were positive with an average of 8.4 larvae.
1973	Heavy defoliation of wH and wC occurred on 245 ha along Tsius Cr. Moderate defoliation was evident on wH from Avola to Lempriere in the North Thompson Valley and in the Perry River drainage.

Year	Remarks
1974	Populations increased to near outbreak levels in cedar-hemlock stands in the North Thompson Valley north of Blue River, but decreased in the Shuswap drainage. No damage recorded.
1975	Populations in the North Thompson Valley collapsed. Light defoliation of semi-mature Douglas-fir was reported to be caused by western hemlock looper in association with the western false hemlock looper, Nepytia freemani, near Barriere.
1976	Heavy defoliation in western hemlock stands near Clearwater River south of Donald Cr and from the end of Clearwater Lake to Azure Lake covered 10 500 ha.
1977	Clearwater Lake populations collapsed for unknown reasons.
1978-81	No damage recorded.
1982	Larval populations remained at non-damaging levels in "wet-belt" western hemlock-western red cedar stands in the North Thompson Valley.
1983	Populations increased causing severe defoliation to western hemlock and western red cedar covering 3 200 ha in the Scotch Creek area and 800 ha in the Humamilt Lake area. Moderate defoliation occurred at Myoff Creek northeast of Adams Lake and Whip Creek near Mabel Lake, totaling 450 ha.
1984	Light to severe defoliation occurred on western hemlock and western red cedar over 7 960 ha, from Mabel Lake east of Vernon, to Ratchford Creek north of Seymour Arm on Shuswap Lake. The increase from 4 450 ha in 1983 was due mainly to expanded aerial coverage.
1985	A combination of larval and pupal parasites and nuclear polyhedrosis virus caused a collapse of the existing population.
1986-89	No recorded activity.
1990	Increased larval populations in hemlock-cedar stands in the North Thompson Valley and south end of Wells Gray Park.
1991	More than 36 000 ha of hemlock and cedar were defoliated in the North Thompson and Adams River drainages and Wells Gray Park. Severe defoliation occurred on 4200 ha from Blue River to Albreda, near Tumtum Lake; moderate on 17 900 ha in the same areas and upper Adams and North Thompson river drainages and near Messiter Summit; there was light defoliation on 14 000 ha south of Tumtum Lake, along Oliver, Gold, and Gollen creeks, and Azure Lake in Wells Gray Park.

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 Region, mostly in the wet belt, but has never been a serious problem.

Year	Remarks
1952	Light defoliation of wH from Thunder R to Albreda.
1953	Highest population from Albreda to Angushorn; wH in Thunder R from 60-100% defoliated, lighter on wC.
1954-58	Low populations.
1959	Slight increase in North Thompson Valley; collections averaged 3.5 larvae from wC and 1.3 from wH in the Quesnel-Horsefly area.
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.
1964-91	Low populations.

DECIDUOUS PESTS

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
1937	Severe infestation between Williams L and Quesnel.
1938-40	Not reported.
1941	Heaviest damage at Lac la Hache and in Beaver Valley; outbreaks from 100 Mile House-Soda Cr-Beaver L and Fraser R-Horsefly-Forest Grove.
1942-43	Outbreaks continued in Cariboo; larvae so numerous on railway tracks between Lone Butte and Horse L that a train was delayed for 2 hours.
1944	Low populations.
1945	Numerous larvae near Three Valley Gap.
1946-51	Low populations.
1952	Defoliation from Birch I to Vavenby; sporadic damage in belt 22 km wide from Likely to 150 Mile House.
1953	Heavy defoliation on Canoe Mtn (Blue R), Vavenby - Birch I and Likely - Knife Cr.
1954	Infestations near Soda Cr, Williams L-Horsefly, E of Lac la Hache, and 5200 ha along Horsefly L; 75% defoliation over 12 ha at Bear L.
1955	Cariboo infestations collapsed, probably due to cold, wet spring.
1956-59	Infestation at Barton Cr (Adams L) covered 160 ha and expanded to 300. Defoliation was up to 100% for consecutive years and resulted in mortality of from 5 to 10 trees per ha in centre of infestation. High larval parasitism in 1959.
1960	Barton Cr infestation collapsed.
1961-63	Low populations.

Year	Remarks
1964-69	Infestation in tA along Wells Gray Park Rd covered 130 ha and expanded to 6500 by 1969.
1970	Wells Gray Park infestation collapsed.
1971	Scattered pockets of heavy defoliation near Raft and Mad rivers and at Winfield.
1972	1600 ha of moderate to heavy defoliation at tA occurred at mad River.
1973	Infestation remained static at Mad River.
1974-75	Raft River infestation collapsed. Low populations.
1976	Moderate defoliation on tA was observed northeast of Haylmore Lake on 120-200 ha.
1977	2000 ha of tA defoliated in isolated stands south of Heffley lake, west of little Fort, west of Barriere, and north of Gosnell.
1978	Low populations.
1979	Heavy defoliation of tA occurred on 565 ha in Well Gray Park and 250 ha adjacent to the south park border.
1980-86	No activity recorded.
1987	Scattered, total defoliation of poplar, willow, birch and alder occurred along Chase Creek from Falkland to Charcoal Creek. A similar 5 ha mixed stand, south of Monte Lake, was 80-100% defoliated.
1988	No recorded activity.
1989	Defoliation of trembling aspen occurred over 1000 ha, of which 170 ha was attributed to forest tent caterpillar and the remainder to Malacosoma spp. Damage by the latter occurred south of Clearwater, west of Ashcroft and along Cornwall Creek, upper Hat Creek and upper Deadman River.
1990	Defoliation of trembling aspen, black cottonwood, birch, and willow increased to 3200 ha, mostly along the North Thompson Valley from Barriere to Avola, including Wells Gray Park. Up to 100% defoliation occurred along the Clearwater River in Wells Gray Park and along the Mad and Raft rivers. The largest single infestation of light to moderate defoliation covered 1000 ha near Blackpool. Aspen stands near Salmon Arm and Tappen were refoliated by mid-summer.

Year	Remarks
1991	Defoliation continued on 6500 ha along the North Thompson Valley between Barriere and Avola, and in Wells Gray Park, similar to 1990. The largest infestation covered 1400 ha of moderate defoliation at Hemp Creek, followed by 1000 ha of light to moderate defoliation at Blackpool, and up to 750 ha at Clearwater and Mad rivers.

Satin moth, Leucoma salicis

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

Year	Remarks
1944-45	Small infestation near Lytton in Botanie Valley.
1946	Botanie Valley infestation expanded to 80 ha; light infestation at Maiden Cr S of Clinton.
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.
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 de Bois; two new infestations at Pritchard (200 bCo 30-40% defoliation) 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.
1959	High mortality of tA over two acres near Knutsford; some defoliation at Pritchard (70% on bCo and 25-50% on tA); 2 ha of tA 25 km 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 Centre.

Year	Remarks
1961	Severe defoliation at Ashton Cr (parasite Meteorus versicolor abundant); moderate damage to bCo at Okanagan Centre; 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	Not recorded in reports.
1972-73	No recorded activity
1974	Severe defoliation in several small isolated groves of tA and bCo near Allison and Dry lakes, north of Princeton.
1975	Severe defoliation of several dozen large groves of tA was recorded near Merritt and 12 miles beyond. Other areas of spotty, light defoliation of tA and silver poplar were observed near Tranquille and along the South Thompson River from Dallas to Monte Creek.
1977	Defoliation varied from 50-100% in groves of tA over 1 500 ha near Douglas-Nicola lakes and Merritt-Aspen Grove areas.
1978-82	No activity reported.
1983	Small infestations, ranging from 1-30 ha with 70-100% defoliation, occurred northwest of Princeton. The largest infestation occurred along the Nickelplate Mine Road, northeast of Hedley.
1984	Spot infestations continued in the Coalmont area, where aspen and poplar clones were lightly defoliated.

Year	Remarks
1985	Area of defoliation increased to 200 ha of black cottonwood and aspen, in 0.25-5 ha patches south of Merritt. Small patches of defoliation also occurred elsewhere throughout the region.
1986	Several small patches, 0.5 ha., in the Nicola area experienced 60-90% defoliation.
1987	Severe defoliation occurred in small localized areas around Stump Lake and Mt Lolo.
1988	No recorded activity.
1989	No defoliation, but adults and egg masses found at Clearwater.
1990	Moderate defoliation of a 5 ha pocket along Coldwater R. Rd. Increase in number of moths at Clearwater, Salmon Arm, Mabel Lake and Penticton.
1991	Some light defoliation mixed with forest tent caterpillar damage at Clearwater. Moths noted at Salmon Arm.

Gypsy moth, Lymantria dispar

This introduced pest has caused severe defoliation of hardwood forests in eastern Canada and northeastern U.S.A. In order to prevent similar damage to the forests of British Columbia a pheromone-baited trap program commenced in 1976. This program is administered by Agriculture Canada, Plant Quarantine and is carried out in cooperation with FIDS and BCFS to detect the presence of male adult populations. It is suspected that any moths captured are a result of the transportation of egg masses by recreational vehicles etc. from infested areas. Intensive monitoring and scheduled control, where necessary, has kept this pest from becoming a major defoliator in British Columbia.

Year	Remarks
1982	Seven pheromone traps containing a total of 10 adults were collected in the Lower Mainland.
1983	A total of 37 moths were collected in the Lower mainland area and Vancouver island.
1984	For the first time, 1 male moth was trapped in the interior of B.C., in an area east of Chase.
1985	Although 50 traps were placed at 23 locations throughout Kamloops Region by FIDS, none were found. One moth was collected north of Cache Creek by Plant Health.
1986	A total of 8 moths were trapped in Kelowna, and one at Knutsford, south of Kamloops.
1987	Over 236 male and female moths, 27 live pupae and 15 old egg masses and 36 new egg masses were collected in the southeastern section of Kelowna. This led to a decision to apply B.t. over a 130 ha. area, in the spring of 1988.
1988	One male moth was caught at Yard Creek Provincial Park and 4 moths in Kelowna. The decline in the Kelowna area indicates that the aerial application of B.t. was successful.
1989	One male moth was captured by Agriculture Canada at Kelowna. Other traps, located at 41 locations throughout the region, had negative results.
1990	No adults were caught in any of 1352 pheromone-baited sticky traps distributed throughout the Region in cooperation with Plant Health and the BCFS.
1991	No moths caught in any traps in Kamloops Region.

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 Region and is not uncommon as far north as Williams lake. 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.

Year	Remarks
1946	Severe defoliation of bCo along Deadman R; webs numerous at Vernon and Larkin.
1947-51	Common along Shuswap L, throughout Okanagan Valley 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; new location at Hawks Cr N of Williams L.
1957	100% defoliation of roadside shrubs in Kamloops.
1958	81 webs per km at Williams L; webs present at Pavilion; common at Savona and Okanagan Valley.
1959	Webs averaged 16 per km near Spences Bridge and 43 at Savona.
1960	Webs averaged 26 per km at Spences Bridge, 20 at Savona, and 102 at Duck L.
1961-62	Population declined at Spences Bridge and Savona; webs numerous throughout Okanagan Valley.
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; webs present at Dog Cr and Williams L.
1966-67	High populations at Okanagan L, Savona, Spences Bridge and Seton L. Average of 247 webs per km at Okanagan L in 1966 and 289 in 1967.
1968	Populations remained high; average of 301 webs per km at Okanagan L.

Year	Remarks
1969	Highest numbers at Okanagan L; present along South and North Thompson rivers; Little Shuswap L and Nicola R.
1970	Webs numerous but less than in former years; common throughout Okanagan Valley.
1971	Common in Okanagan Valley.
1972-78	No activity recorded.
1979	Severe defoliation was noted on roadside deciduous shrubs from Kelowna to Enderby and near Sunnybrae.
1980	No activity recorded.
1981	Severe defoliation occurred along roadsides from Salmon Arm to Kamloops and south to Kelowna.
1982	Defoliation ranged from 10-100% on various deciduous trees and shrubs in the Okanagan-Shuswap, Thompson and Fraser River drainages.
1983	Populations continued in the Okanagan-Shuswap, Thompson and Fraser River drainages with defoliation intensities ranging from 10-100%.
1984	Light to severe defoliation continued in the Okanagan-Shuswap and Kamloops-Lillooet-Lytton area.
1985	Infestations persisted in the Okanagan-Shuswap area from Kamloops to Lillooet.
1986	Populations remained in Okanagan TSA causing 50-80% defoliation on various trees and shrubs.
1987	No recorded activity.
1988-91	Scattered defoliation of roadside trees and shrubs widespread through the region.

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.
1968	Nests common along Little Shuswap L.
1970	Low populations.
1971	Defoliation near head of Okanagan L.
1972-89	Low populations.
1990-91	Common on roadside shrubs north of Kamloops.

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 6 ha S of Kelowna; light damage in Trepanege Cr Valley.
1960	Small infestation on Al near Larkin; severe damage on 1 ha near mouth of Salmon R; light damage near Kelowna Airport and west side of Kalamalka Lake.
1962	Moderate to severe damage to Al at Sicamous and Chase, and near Lillooet at Texas Creek, Izman Cr, Yalakom R and Applespring Cr; on bCo between Shuswap and Mara lakes.
1963	Severe damage to bCo in Monte Cr, Shuswap, and Monte 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 Rd.
1969	Severe damage to Al and bCo in localized areas on west 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 damage in scattered pockets throughout the Okanagan and Shuswap valleys.
1973-75	Not mentioned in reports.
1976	Light to moderate browning of bCo was prevalent in the Salmon Arm - Shuswap Lake area and along Mara Lake.
1977-82	Not mentioned in reports.
1983	Moderate to severe defoliation of chokecherry and other deciduous shrubs on 2 ha at Okanagan Falls Provincial Park. Aesthetics could affect the use of campsites.
1984-91	Not mentioned in reports.

Aspen leafminer, Phyllocnistis populiella

This insect commonly infests the leaves of trembling aspen. High populations occur sporadically throughout the range of the host in the Region.

Year	Remarks
1954-57	From 25 to 100% of leaf surfaces were infested in the following areas: Big Bar L, Adams L, 100 Mile House, Horse L, Robbins Range, Pillar L, Lac la Hache, Cache Cr, Clinton, Horsefly, and Canim lakes, Enderby to Shuswap L, and from Salmon Arm south through the Okanagan Valley.
1958-61	Moderate to severe infestations at Hat, Oregon Jack and Cache creeks, Horsefly, Williams Lake to Nimpo L, Wells Gray Park, North Thompson Valley, Deadman R, Le Jeune L, Stump L, Coldwater R Valley, Vernon to Salmon Arm, Robbins, Campbell and Glenemma ranges, Falkland and Aspen Grove.
1962-64	Generally low populations; some heavily infested groves in Princeton area.
1965	High populations from Sicamous to Three Valley Gap, at Aspen Grove and Carlin.
1966	Highest populations in Chase, Salmon Arm and Sicamous areas.
1967	Low populations.
1968	Moderate to heavy damage between Horsefly and Quesnel L and at Carlin.
1969-91	Low populations.

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
1926	Damage to bCo in Kelowna city park.
1927-36	Not reported.
1937-38	Damage to W at Okanagan Landing and Head-of-the-Lake.
1939-57	Not reported.
1958	Heavy mortality of W over 100 ha at Tranquille.
1959	Sporadic damage to W at North Kamloops.
1960	Heavy mortality of W over 2 ha at Larkin; scattered attacks west of Falkland, Squilax, and south 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 infestation 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 1,300 m 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; northern record at Blue R (for Region).
1965	Moderate W mortality in Enderby-Shuswap L area; present at Oregon Jack Cr, 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.
1968	Heavy attacks on W in Merritt-Coldwater R area.
1969	Mortality of W over 40 ha near Heffley L.

Year	Remarks
1970	Scattered dead W in North Thompson R area, especially along road to Mt Tod.
1971-87	Low populations
1988	Common on roadside B and W along Scotch Cr.
1989	Localized severe attacks in young stands of B and W south of Pritchard.
1990-91	No reports of damage.

Other deciduous pests of minor significance

Insect	Year	Remarks
Altica bimarginata Alder leaf beetle	1932	Severe defoliation of Al, B, and tA in China Valley.
	1947	Common in Salmon Arm; infestation in Trinity Valley.
Archips conflicatana Large aspen tortrix	1952-53	Sporadic defoliation from Likely to Knife Cr, and Lac la Hache to Quesnel L.
Arge pectoralis Birch sawfly	1951	Severe defoliation of 7 trees at Hidden L.
Bucculatrix nymphaea Birch skeletonizer	1955	Small infestation in Salmon Arm affecting from 15 to 100% of foliage on some trees.
Chrysomela scripta Cottonwood leaf beetle	1952	Up to 50% defoliation of bCo in small outbreaks between Princeton and Hedley.
Erranis vancouverensis Western winter moth	1959	M, B, and Al defoliated over 4 ha near Agate Bay.
	1972	Localized defoliation of M near Lavington.
	1986	Up to 100% defoliation of M on 20 ha along Eakin Cr.
	1988	Light to severe defoliation of B, M, and W in localized patches in Shuswap Lake area, including Turtle Valley. Understory defoliated between Little Fort and Vavenby.
Hemichroa crocea Alder sawfly	1961	Defoliation over 10 ha near Winfield.
Lithocolletis sp. A leaf blotch miner	1958	Abundant on bCo at a few localities in the Okanagan; highest populations at Kalamalka and Woods lakes.
	1959	General decline at all locations.
	1966	Infestations on bCo in localized spots at Salmon Arm, Kelowna and Penticton.

Other deciduous pests of minor significance (Cont'd)

Insect	Year	Remarks
Malacosoma pluviale Northern tent caterpillar	1951	Infestations on Anarchist Mtn. and N of Osoyoos.
	1952-53	Infestations on Anarchist Mtn., Cherryville and O'Keefe.
	1986	10% defoliation on 1 ha at Chute L.
	1987	Severe defoliation in 1 ha pockets near Vernon and along Mission Creek - Belgo Cr Rd.
	1988	Light defoliation in localized areas near Vernon, east of Kelowna and Kamloops. Severe defoliation of tA along Irish Cr Rd and at Round L.
Nematus nigriventris Eagle Poplar sawfly	1940-50	Severe defoliation of bCo at and Shuswap rivers, from Three Valley to Grinrod, and at Mabel L.
Nymphalis antiopa Morning cloak butterfly	1949	Severe defoliation in Sicamous area.
	1951	Sporadic damage near Princeton.
	1957	Light damage to tA and W in Thompson R Valley, in Vernon, Enderby, Salmon Arm, and Sicamous areas.
	1958-61	Defoliation of W at Blue River and Mile 108, Cariboo Hwy.
	1990	Single elm defoliated at Mt Kobau.
Phytodecta americanum American polar leaf beetle	1948	Common between Salmon Arm and Notch Hill; 100% defoliation of tA on 1 ha at Tappen.
Pyrrhalta carbo Pacific willow leaf beetle	1944	Damage to W at Albas.
	1957	Severe damage to W, NE of Kamloops.

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, Dioryctria abietivorella. The following infestation ratings are based on examples of 50-cone samples.

Year	Remarks
1957	Walker L - 8% cones infested; Greenstone Mtn - 96%; Tranquille Mtn - 71%; Hughes L - 48%.
1958	Moderate populations in Okanagan Valley: Kamloops - 20% cones infested.
1959	Craigellachie - 37%; Grandview bench - 55%; Keremeos - 62%; Anarchist Mtn - 41%; <25% at Tranquille, Nicola, Merritt, Lytton, Canoe Point, Sweetbridge and Princeton.
1960	Generally light cone crop; Grandview Bench - 62%.
1961	Olalla - 64%; Armstrong - 82%; low populations 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 southern areas.
1967-81	Not mentioned in reports.
1982	Up to 20% cones infested at Stump L, Indian Gardens, Barnes L, Twaal and Hat creeks.
1983	D cones 10 - 35% infested at Slok Cr, Campbell Cr, and Carquille.
1984-87	Low populations.
1988	An average of 13% of cones infested in 5 areas.
1989	Low populations.
1990	Widespread light to moderate infestation of cones.
1991	Low populations.

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 Range - 73%; Westsyde, Merritt, Little Shuswap L - <25%;
1958	Keremeos - 52%; Richter Pass - 72%; Anarchist Mtn - 36%; Oliver 68%; Winfield 74%; Glenemma Range - 76%; Little Shuswap L - 58%; Savona - 98%.
1959	Keremeos - 38%; Richter Pass - 62%; Anarchist Mtn - 27%; Oliver - 73%; Winfield - 71%; Glenemma Range - 54%; Savona - 94%; Nicola - 36%; <25% at Little Shuswap L, Mamit L and Merritt.
1960	Glenemma Range - 31%; Savona 28%; Nicola 36%; low population at Anarchist Mtn, Oliver, Merritt and Mamit L.
1961	Light cone crop; <25% of cones infested at Winfield and Princeton.
1962	Average of 13% of cones infested at 4 locations.
1964	Average of 30% of cones infested at 4 locations.
1965	Infestation of cones ranged from 26 to 63% at 20 plots in the Region.
1966	From 60 to 100% of cones were infested at Mamit L, Nicola, Savona, and Little Shuswap L.
1967-91	Not mentioned in reports.

LOG PESTS

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 Region.

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 L, 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 of damage.
1969	Up to 62 holes per sq ft in alF killed by balsam bark beetle in Fly Hills; moderate attacks on beetle-killed eS at Quesnel L.
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.
1971-87	No mention in reports.
1988-91	Common in stumps and standing mountain pine beetle infested lodgepole pine on east side of Okanagan Valley.

Woodborers

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

Insect	Year	Remarks
Monochamus spp. Sawyer beetles	1966	Log decks of eS and alF infested at Clearwater.
	1967	High populations in standing fire-killed pP in Paxton Valley and in log decks in Penticton.
Tetropium sp. A round headed woodborer	1967	High populations in fire-killed eS and pP in Paxton Valley.
	1969	Moderate population in fire-killed eS, pP and alF at Ross Cr.
Sirex cyaneus Blue horntail	1969	High population in fire-killed eS and alF at Ross Cr.
Melanophila drummondi Flatheaded fir borer	1921	A number of mature D killed
	1932	Larvae numerous in windfalls and beetle-killed D at Chase.
	1990	Numerous attacks to recently felled D near Skwaam Bay and at Louis Creek.
Buprestis rusticorum A flatheaded borer	1932	Larvae numerous in windfalls and beetle-killed D at Chase. Small infestation at Aspen Grove.

APPENDIX I. HOST TREE ABBREVIATIONS

Abbreviations	Common Name
eS	Engelmann spruce
wS	White spruce
bS	Black spruce
sS	Sitka spruce
alF	Alpine fir
gF	Grand fir
aF	Amabilis fir
D	Douglas-fir
wL	Western larch
aL	Alpine larch
tL	Tamarack
wC	Western red cedar
yC	Yellow cedar
roJ	Rocky Mtn juniper
wH	Western hemlock
mH	Mountain hemlock
lP	Lodgepole pine
sP	Shore pine
pP	Ponderosa pine
wwP	Western white pine
wbP	Whitebark pine
tA	Trembling aspen
bPo	Balsam poplar
bCo	Black cottonwood
Al	Alder general
B	Birch general
M	Maple general
W	Willow general
O	Oak general