

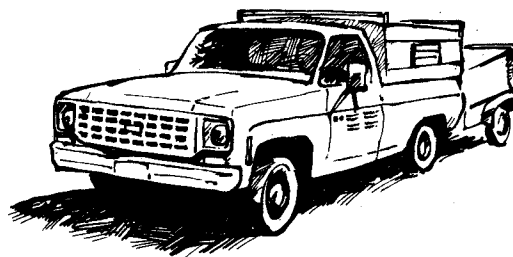


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1980 Forest Insect and Disease Conditions

Kamloops Forest Region
R.J. Andrews, L. Unger

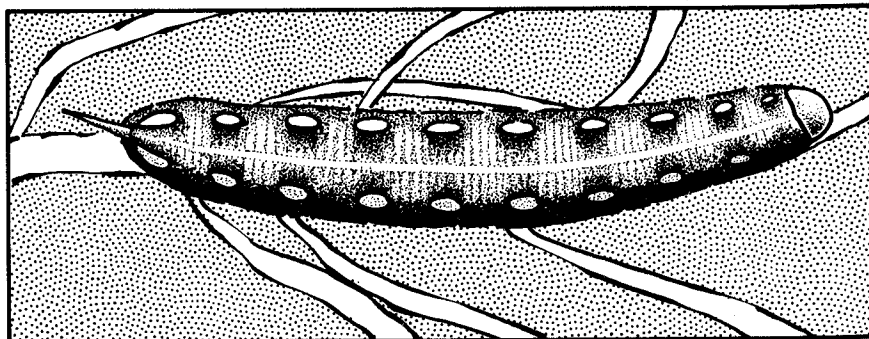
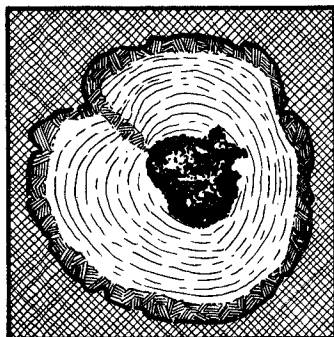


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SUMMARY

This report outlines the status of forest insect and disease conditions in the Kamloops Forest Region for 1980, and forecasts trends, emphasizing pests capable of sudden damaging outbreaks.

Mountain pine beetle continued to account for most of the tree mortality in 1980. Area of infested pine stands attacked by mountain pine beetle increased to 37 000 ha from 19 900 in 1979, mainly in the large infestations near Trout Creek, Mission-Belgo creeks, Stein and Ashnola rivers and Goldbridge. A high incidence of Armillaria root rot was evident near Vavenby in lodgepole pine stands, recently defoliated by a pine sawfly and also in western white pine along the Adams River currently showing an increasing population of mountain pine beetle. Cruise strips were completed in 27 lodgepole pine stands throughout the Region to determine the incidence of black stain root disease. A pine sheath miner severely defoliated the 1980 growth of immature lodgepole pine over approximately 5 600 ha near Clearwater. A special survey for European pine shoot moth in Kamloops and all Okanagan cities was continued in 1980.

Areas of Douglas-fir stands defoliated by western spruce budworm increased to 43 000 ha from 26 000 ha in 1979, primarily in the Cache Creek-Ashcroft and Lytton areas. Defoliation was recorded in the Stein River, west of Lytton and along Carpenter Lake, west of Lillooet after an absence of two years. Douglas-fir tussock moth larvae were more numerous throughout the Region and egg counts near Hedley indicate defoliation may be expected in 1981. Similar increases of false hemlock looper population were noted in the Shuswap Lake- Okanagan Valley area.

Spruce bark beetle infestations were limited to several locations in the Blue River and Lillooet areas but damage has remained at low levels. Two year cycle spruce budworm defoliated Engelmann spruce and alpine fir over 13 800 ha along the North Thompson near Barriere and Gosnell.

A total of 31 natural and managed second-growth stands were examined to determine insect and disease occurrence.

A total of 668 ^{insects} insect and disease collections were submitted to the Pacific Forest Research Centre from the Kamloops Forest Region by Pest Survey technicians and B.C. Ministry of Forests students: map 1 shows locations. Potentially damaging defoliators were evident in 83% of field collections in 1980, an increase from 77% in 1979. A total of 230 pheromone traps were set out at 21 locations to monitor western spruce budworm and Douglas-fir tussock moth male adult populations. A total of 30 hours flying time, provided by B.C. Ministry of Forests were used to map mountain pine beetle and western spruce budworm outbreak areas; map 2 shows the flight lines.

Map 1

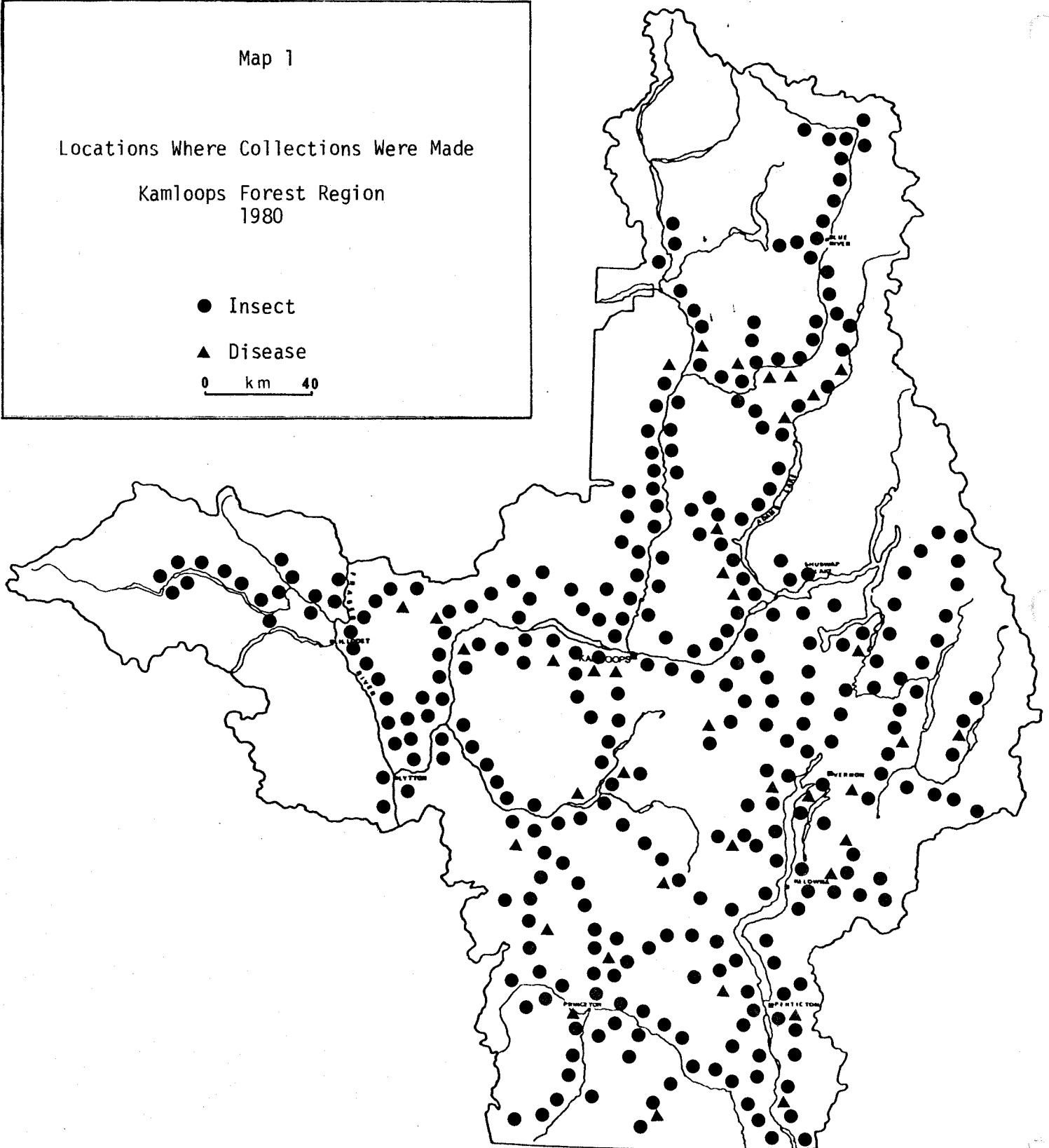
Locations Where Collections Were Made

Kamloops Forest Region
1980

● Insect

▲ Disease

0 km 40

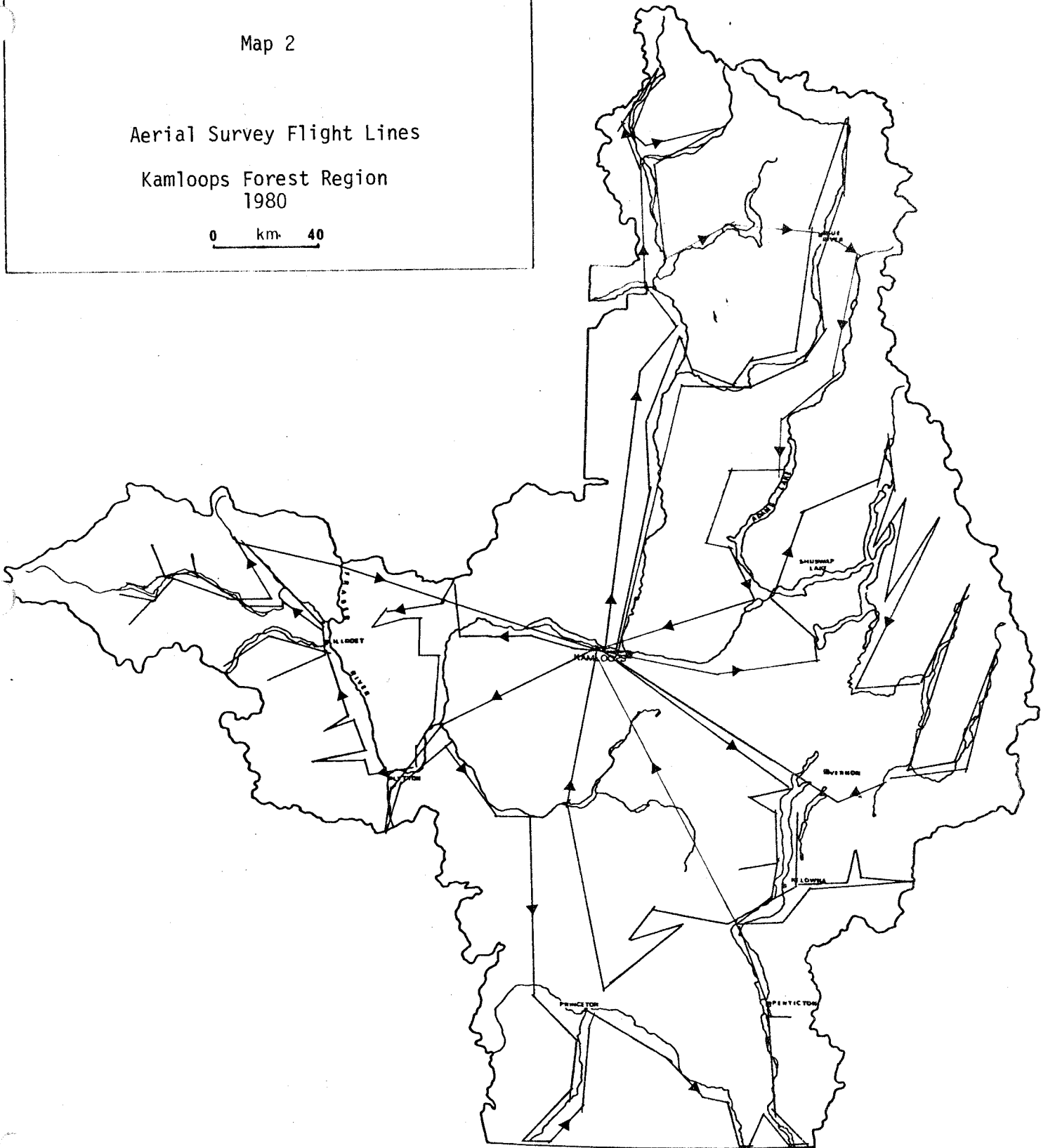


Map 2

Aerial Survey Flight Lines

Kamloops Forest Region
1980

0 km 40



PINE PESTS

Mountain pine beetle, Dendroctonus ponderosae

Mountain pine beetle increased to 37 000 ha from 19 900 ha in most established outbreak areas and expanded into many new spot infestations throughout the Region (Table 1, Map 3).

In the south and western portions of the Region, numbers of beetle killed trees was highest along Carpenter Lake west of Lillooet; along Trout, Mission-Belgo creeks in the Okanagan drainage; Ashnola River in the Similkameen drainage and along Stein River west of the Fraser River near Lytton. Other areas where increased tree mortality occurred was along the Kelly Lake road north of Pavilion Lake and along the Yalakom River north of Bridge River. Infestations in pure and mixed pine stands in the Goldbridge-Carpenter Lake area have expanded since 1975 to over 12 000 ha from northwest of Downton Lake to the east end of Carpenter Lake (Table 1).

Table 1. Mountain pine beetle infestations.
Kamloops Forest Region, 1980

Pine species	Map and* location	Number of infestations	Area (ha) infested
lodgepole ponderosa	Bridge River Pemberton	157	13 405
lodgepole ponderosa	Lytton Lillooet	85	1 660
lodgepole ponderosa	Ashcroft Kamloops	10	230
lodgepole ponderosa	Princeton Merritt	100	950
lodgepole	East of Okanagan Lake	235	5 480
lodgepole	West of Okanagan Lake	338	14 330
lodgepole	Ashnola River	65	1 000
western white	Blue River	70	600
TOTAL		1,060	37 000

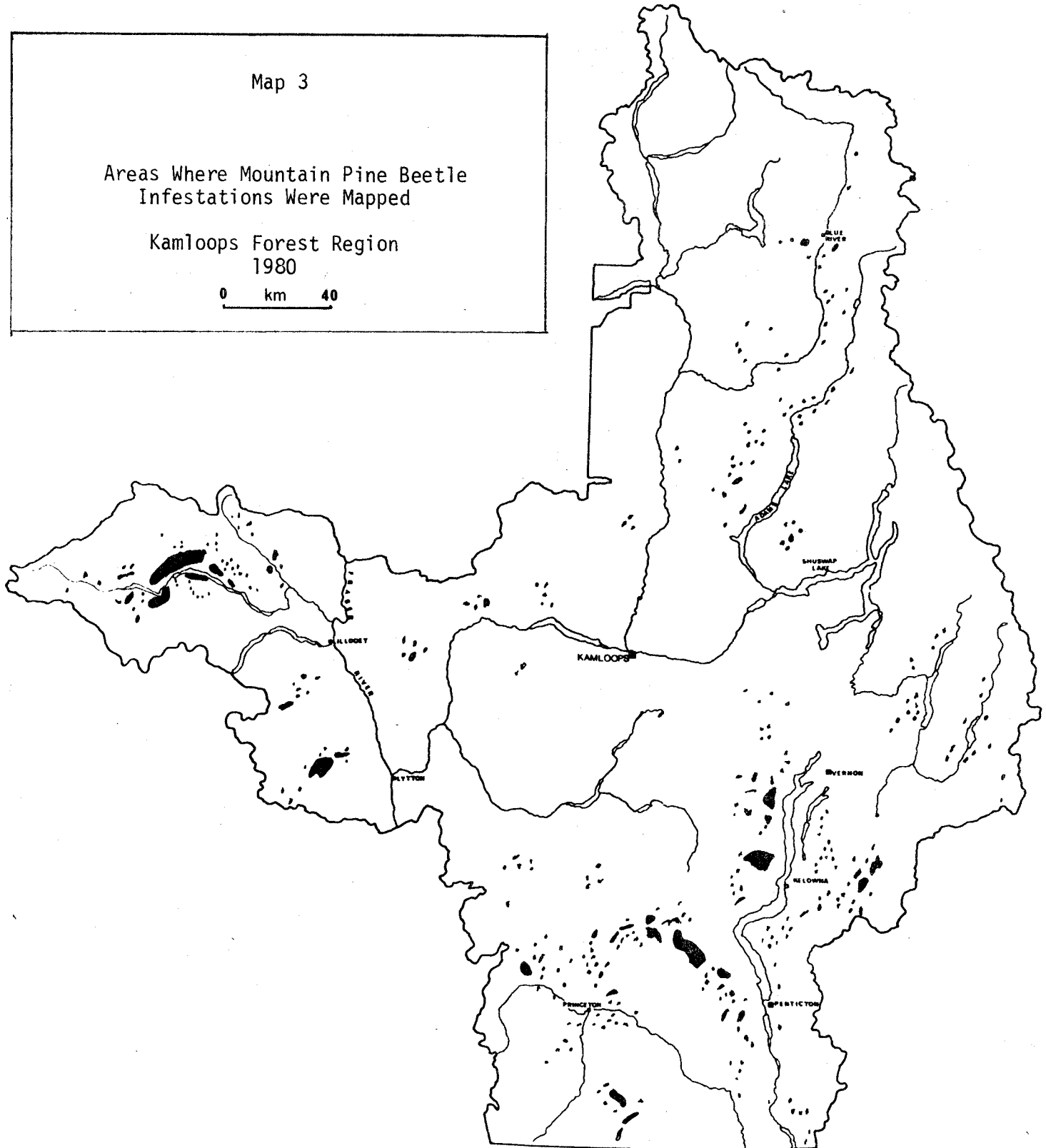
* See Appendix 1 for more detailed locations.

Map 3

Areas Where Mountain Pine Beetle
Infestations Were Mapped

Kamloops Forest Region
1980

0 km 40



A total of 15 cruise strips were established in infested areas of the Region in pure and mixed stands in which damage was new or had been monitored for two or more years. Near Goldbridge, cruise strips were established at McDonald Creek in a pure mature stand, near Brexton in an immature stand and two strips along the north side of Gun Lake. The McDonald Creek area was designated as a permanent strip and will be monitored for 3 to 4 years. Eight strip cruises were conducted in the Okanagan Valley area, three along Mission-Belgo creeks and five in the Trout Creek-Chain Lake infestation. Single cruise strips were established near Ashnola River on the Cathedral Park side of the river and along the Yalakom River where increased numbers of recently killed trees were observed during aerial surveys.

Results of the cruising indicated a continuing healthy population in all areas (Table 2). Near Goldbridge more than 50% of the pine in 3 of 4 cruise strips were killed by the mountain pine beetle. At McDonald Creek attack increased from 3% in 1979 to 49% in 1980. At Brexton-Goldbridge in an immature stand, 41% were killed prior to 1980 and 10% attacked in 1980. Attacks were in the lower bole of smaller diameter trees (7-12 cm). At the Yalakom River drainage attack increased from 2% in 1979 to 13% in 1980. While Douglas-fir predominates in this portion of the drainage, higher pine component stands nearby are susceptible. Along the Kelly Lake Road north of Pavilion Lake, 22% of the stems examined were attacked in 1980 and 27% in 1979. Current attack was patchy but vigorous.

In eight areas of the Okanagan Valley cruise strips indicated a continuing population although strips at Thirsk Lake, Trout and Isintok creeks showed little difference in percentage of stems attacked from 1979. The expansion trend of the infestation appears to be from Trout Creek westward to Osprey Lake and Hayes Creek. Tributary drainages such as Kathleen and Siwash creeks have scattered groups of pine infested, but limited attack may be expected above 1 200 m elevation.

In the Ashnola River drainage spread is largely confined to the main valley and Young Creek. The 1980 attack is concentrated on the eastern side of the river and into Cathedral Provincial Park where there are large areas of susceptible 100+ year old lodgepole pine. However the higher elevation could have a slowing effect on the expansion.

Table 2. Condition of lodgepole pine in cruised areas.
Kamloops Forest Region, 1980

Location	Percentage pine component	Percentage				
		Healthy	1980 attack	Partial 1980 attack	1979 attack	Prior to 1979
McDonald Creek	100	34	38	11	3	14
Gun Lake #1	69	61	13	4	12	10
Gun Lake #2	89	32	31	30	-	7
Brexton-Goldbridge	90	49	4	6	26	15
Yalakom	33	79	13	-	2	6
Kelly Lk Rd (Pavilion L)	85	50	19	3	27	1
Ashnola River	100	32	45	3	1	19
Belgo Creek	95	55	18	4	7	16
Mission Creek	65	82	8	0	2	8
Pearson Creek	63	47	39	4	8	1
Kathleen Creek	100	78	13	0	8	1
Isintok Creek	97	39	24	3	20	14
Osprey Lake	84	50	34	1	1	14
Thirsk Lake	91	59	13	3	13	12
Trout Creek	80	46	20	4	20	10

Armillaria root rot, Armillaria mellea

Three undetermined sized areas of western white and lodgepole pine recently killed by the root rot were recorded in the Clearwater area. Two of the areas, west of Clearwater area near Star Lake and near Vavenby were defoliated by a pine sawfly, Neodiprion sp. in 1977 and 1978. The third area along the upper Adams River between Adams and Tum Tum lakes contained scattered groups of western white pine killed by mountain pine beetle in 1979 and 1980.

Cruise data from the area north of Vavenby showed that an average of 26% of the pines were dead or dying of which 23% were infected by Armillaria root rot (Table 3).

Along the upper Adams River between Adams and Tum Tum lakes 53% of the western white pine was infected by Armillaria root rot and 36% killed by mountain pine beetle: 19% by a combination of beetles and root rot and 17% by beetle only.

Table 3. Incidence by percent of root rot in lodgepole and western white pine, Clearwater District.
Kamloops Forest Region, 1980

	Percent Pine component	Number of plots	Total No. of pine stems	Percent dead or dying	Percent root rot infestations
Vavenby (east)	80	40	245	28	23
Vavenby (west)	50	36	145	24	22
Adams River	36	25	47	62	53

Observations in the past suggest that an increase in incidence of root rot infection is often associated with drought or defoliation induced stress. Where bark beetle populations are increasing the beetles are commonly attracted to root rot infected trees and may act as centres from which bark beetle infestations start and expand.

Pine needle sheath miner, Zellaria haimbachi

This pest defoliated 5 400 ha of lodgepole and ponderosa pine in 1980 compared to 1 100 ha in 1979.

Defoliation covered 1 250 ha from Clearwater to Batholith Rapids, 800 ha in the McLeod Lake area and 3 350 ha in patches from Clearwater along the North Thompson River to Vavenby. Light defoliation was also recorded in the Princeton area on 32 ha near Pothole Creek, 32 ha near Shrimpton Creek and 16 ha near Elliot Creek and on 95 ha along Little Shuswap Lake east of Kamloops. Traces of defoliation was also noted in the Monte Hills and near Cornwall Creek.

A total of 100 larvae and 25 pupae were examined for parasitism. The larvae died from unknown causes but two Hymenopterous parasites and one Diptera parasite emerged from the pupae.

High population levels are expected to continue in the Clearwater area in 1981.

Black stain root disease, Verticicladiella wagnerii

A special survey was conducted in the Kamloops Forest Region to determine the incidence and spread of the root disease in 80+ year-old stands.

The root disease was found at only two of 27 areas examined in the survey; along Aurora Lake road west of Little Fort and at km 20 East

Barriere Lake road. The disease was suspected to be present, but not confirmed, along the Bonaparte Lake road and near Todd Mountain.

Two types of insect traps were located in a known blackstain root disease infected area, in the Naswhito Creek drainage near the west arm of Okanagan Lake, to trap two beetles, Dryocoetes spp. and Hylastes spp. suspected of being vectors of the disease.

The trap of lodgepole pine bolts were buried in the duff from the beginning of June until the end of July and sampled at two-week intervals. Neither Hylastes spp. or Dryocoetes spp. were caught, but Hylurgops porosus, a species closely related to Hylastes spp. was caught and a Verticicladiella sp. was cultured from five of the twelve Hylurgops beetles.

Traps for Sternnius spp. failed to attract any of the weevils or any other vector.

European pine shoot moth, Rhyacionia buoliana

A cooperative survey by B.C. Ministry of Forests, Federal and Provincial Departments of Agriculture and Canadian Forestry Service was conducted in all cities and towns of the Okanagan Valley from Osoyoos to Vernon and in the Shuswap area from Sicamous to Kamloops to locate European pine shoot moth infested shoots on native and ornamental pines. The survey conducted for the past five years was timed in 1980 to coincide with the most easily detected larval period. The number of infested trees in residences has remained relatively constant over the last five years (Table 4), with none found in 1980 at Peachland, a decrease at Summerland and Kamloops, static at Kelowna and increasing at Vernon.

Table 4. Location and number of residences where infested pine are found.

Kamloops Forest Region, 1976-1980

Location	1976	1977	1978	1979	1980
Summerland	-	-	-	17	3
Peachland	-	-	1	-	-
Kelowna	40	39	30	42	40
Vernon	10	-	-	-	14
Kamloops	-	20	17	3	1
Totals	50	59	48	62	58

In 1979 some infested shoots were missed on first examination and spray applications were not fully effective. Additional infestations in 1980 may have been started by the importation of infested pine stock. A cost benefit analysis of the survey will be done by 1981.

Pheromone traps to determine adult populations were not set out in 1980 because of the inconsistency of the attractant in 1979.

Pine needle scale, Phenacaspis pinifoliae and Nuculaspis californica

Ponderosa pine in the Oliver to Okanagan Falls area were again moderately infested by the two pineleaf scales although less severely than in 1979, however tree mortality of mostly immature trees was noted. Less damage is expected in 1981 after the relatively wet year.

The western pine shoot moth, Eucosma sonamana

Pheromone traps were set out at Summerland and Kelowna to determine the presence of adult pine shoot moth. The larvae cause stunting and at times kill terminal shoots. Only seven adults were caught at Summerland which indicates a low endemic population.

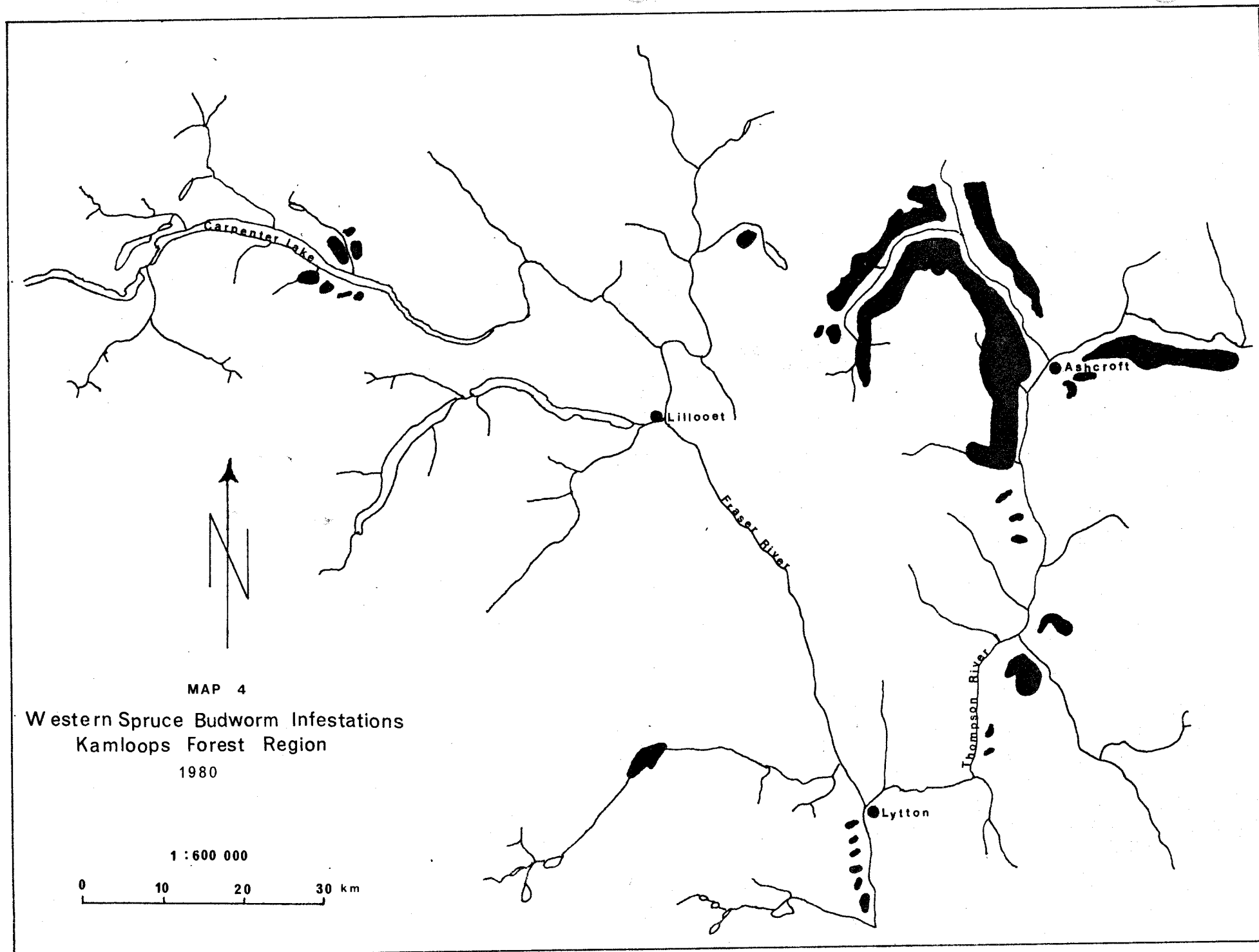
DOUGLAS-FIR PESTS

Western spruce budworm, Choristoneura occidentalis

Defoliation of Douglas-fir by western spruce budworm continued in 1980 for the 13th year, when defoliation was first recorded. Areas of defoliation covered 43 000 ha compared with 26 000 ha in 1979 (Map 4).

Areas of defoliated stands in 1980 extended from the Kamloops Forest Region boundary, north of Cache Creek south along the Bonaparte River on the east and west slopes of the Bonaparte Valley to Cache Creek; south along the west side of the Thompson River to Oregon Jack Creek and in patches to Venables Valley; east of Ashcroft along Barnard Creek northeast to Penny Lake and east to Indian Gardens, south of Savona. West of the Bonaparte River defoliation occurred on both slopes of Hat Creek to Cashmere Creek on the south to Pavilion Lake and to Pavilion Lake to the west. Near Spences Bridge and Lytton there was defoliation along Pimainus Creek, Soap Lake, Botanie Creek, six areas southwest of Lytton and along Stein River; west of Lillooet, on the north and south sides of Carpenter Lake and near Marshall Creek.

There was severe defoliation and some tree mortality over 1 712 ha along Cornwall Creek with moderate defoliation on 864 ha. Moderate defoliation also occurred along Maiden Creek north of Cache Creek (1 296 ha); Scottie Creek (144 ha) and in five areas along the south side of Hat Creek (1 184 ha). Light defoliation was most common at Oregon Jack and near Botanie creeks south of Cache Creek and near Lytton respectively;



along Carpenter Lake at Marshall, Tommy, Bobb and Keary creeks; between Pavilion and Pavilion Lake and along Stein River west of Lytton. At Marshall Creek near Carpenter Lake defoliation was light, however tree mortality and top kill resulted from repeated severe defoliation in 1976-77. Tree mortality is apparent along Cornwall Creek west of Ashcroft and Jimmies Creek south of Wallachin, areas which have been defoliated for the past four years.

Defoliation of Douglas-fir by western spruce budworm has remained at epidemic levels in the Kamloops Forest Region since 1967, although not continuously in the same locations (Appendix 2, western spruce budworm defoliation, 1967-1980). Since 1977, at the height of the outbreak, infestations of varying intensity and size extended over 120 000 ha from the east slopes of the Coast Mountains west of Lillooet east to Shuswap Lake and from the Regional boundary north of Ashcroft and Pavilion south to Lytton and Princeton. In 1978 defoliation decreased dramatically to 5 300 ha and a collapse of the infestation was expected, however in 1979 the area of damage was 26 000 ha and increased in 1980 to 43 000 ha.

In May, Douglas-fir buds were examined at 19 locations to determine the current budworm population (Table 5) and 14 areas indicated defoliation would continue based on the criteria that over 20% buds infested would result in apparent defoliation.

Table 5. Locations and percentage of Douglas-fir buds infested by spruce budworm.
Kamloops Forest Region, 1979 - 1980

Location	Percent buds infested		Location	Percent buds infested	
	1979	1980		1979	1980
Indian Gardens	-	58	Fountain Valley	3	5
Jimmies Creek	66	77	McDonald Creek	-	16
Penny Lake	-	61	Marshall Creek	24	50
Studhorse Creek	75	54	Mission Pass	2	2
Barnard Creek	30	51	Pimmainus Creek	4	8
Cornwall Creek	66	70	Spius Creek	17	3
6 km-W of Cargville	20	40	Prospect Creek	0	0
Hat Creek	-	31	Anarchist Mtn.	8	20
Oregon Jack Creek	-	63			
Botanie Creek	-	5			

Collections of 200 - 4th instar larvae from eight locations in the Ashcroft area were examined by Forest Pest Management Institute for disease but none was isolated.

Routine three tree beating samples from Douglas-fir trees yielded from 100 to 300 larvae in the defoliated stands of Ashcroft, Kamloops and Lillooet and less than 100 larvae in non defoliated stands (Table 6) indicating a continuing healthy population in 1980.

Table 6. Analysis of Douglas-fir collections containing spruce budworm. Kamloops Forest Region, 1979 and 1980

District	Number of beating samples		Percent positive		Average number of larvae per positive sample	
	1979	1980	1979	1980	1979	1980
Kamloops	45	54	53	69	63	8
Ashcroft	30	35	76	97	122	69
Lillooet	29	46	79	85	76	37
Merritt	54	18	54	67	13	22
Vernon-Penticton	39	47	51	32	16	9
Salmon Arm	26	11	35	18	3	1

A program to monitor spruce budworm larval populations was devised by Dr. R. Shepherd of Pacific Forest Research Centre, to obtain data to develop a low population density system based upon the proportion of trees with at least one larva on three lower crown branches. The foliage of three 50 cm lower crown branches per tree was beaten individually over a beating cloth, 60 cm x 90 cm, and the number of larvae recorded and the results tabulated (Table 7).

Table 7. Sequential sampling of Douglas-fir for western spruce budworm. Kamloops Forest Region, 1980

Location	Percent of trees with larvae	Average number of larvae per 50 cm branch
Studhorse Creek	100	6.36
Marshall Creek	100	3.62
Botanie Creek	88	0.85
August Lake	84	0.90
Spilus Creek	66	0.50
Fountain Valley	50	0.23
Mission Pass	24	0.12

Table 8. Defoliation prediction for 1981 from egg counts based on 100 m² foliage from 3 and 10 samples.
Kamloops Forest Region, 1980

Location	3 tree samples		10 tree samples	
	Egg mass density per 100 m ² of foliage	Expected defoliation in 1981	Egg mass density per 100 m ² of foliage	Expected defoliation in 1981
<u>Wallachin</u>				
Indian Garden Creek	100	Moderate	43	Light
Jimmies Creek	119	Moderate	158	Severe
<u>Ashcroft</u>				
Barnard Creek	26	Light	27	Light
Cornwall Creek	608	Severe	531	Severe
Studhorse Creek	0	Nil	10	Light
Penny Lake	26	Light	24	Light
Oregon Jack Creek	539	Severe	411	Severe
<u>Cache Creek-Carquille</u>				
McLean Lake Road	0	Nil	27	Light
4 Mi Pavilion Lake Road	412	Severe	359	Severe
Upper Hat Creek	342	Severe	346	Severe
Robinson Creek	1000	Severe	625	Severe
Scottie Creek	269	Severe	226	Severe
<u>Spences Bridge</u>				
Soap Lake	222	Severe	248	Severe
Pimainus Creek	113	Moderate	156	Severe
<u>Lillooet</u>				
Marshall Creek	54	Moderate	80	Moderate

(Cont'd)

Table 8. (Cont'd)

Location	3 tree samples		10 tree samples	
	Egg mass density per 100 m ² of foliage	Expected defoliation in 1981	Egg mass density per 100 m ² of foliage	Expected defoliation in 1981
<u>Merritt</u>				
Spius Creek	0	Nil	28	Light
Prospect Creek	51	Light	38	Light
<u>Princeton</u>				
August Lake	30	Light	9	Light
<u>Shuswap Lake</u>				
Sicamous	0	Nil	0	Nil
Scotch Creek	0	Nil	0	Nil

Categories

Light = 1-50 egg masses per 100 m² of foliageModerate = 51-150 egg masses per 100 m² of foliage

Severe = 151 + " " " " "

Predictions of spruce budworm populations and defoliation potential for 1981 was based on the number of egg masses on two 50 cm branches from the mid crown of each of 10 dominant or co-dominant Douglas-fir trees in the interior and three trees in coastal forests and the predicted defoliation assessed (Table 8). Based on the premise that 10 tree samples were most accurate, 59% of the three tree samples predicted the same category of defoliation, 34% predicted less and 6% more.

Acknowledging the fact that 32 samples is a limited number to base a recommendation, it would appear that 10 tree samples should be continued, however, rather than sampling 10 trees at one location, three trees at two locations and four trees at the third location within one drainage would give more accuracy.

Douglas-fir beetle, Dendroctonus pseudotsugae

Numbers of recently killed Douglas-fir remained low in the Kamloops Forest Region in 1980, however infestations continue in Tranquille Creek, Jamieson Creek to McLure area, west and north of Kamloops and in the Bonaparte-Hat Creek area north of Cache Creek (Table 9).

Both mature and immature trees on Vernon Hill, damaged by fire in 1979, were attacked and killed in 1980. Although most of the attacked trees were removed after attack, populations persist in infested trees on private property posing a threat to adjacent stands in 1981.

Table 9. Location and numbers of recently killed Douglas-fir trees.
Kamloops Forest Region, 1979-1980

Location	Numbers of recently killed trees	
	1979	1980
Tranquille Cr	100	77
Deadman Cr	35	12
Tunkwa L	45	25
Westsyde-Vinsulla	245	381
Cache Cr Pavilion L	150	264
Yalakom River	40	10
Manning Creek	-	5
Dry Lake	-	7
Allison Lake	3	4
Guilford Lake	5	5
McDougall Cr	-	15
Ellis Cr	-	5
Niskonlith L	-	10
Total	623	820

Douglas-fir tussock moth, Orgyia pseudotsugata

Douglas-fir tussock moth populations increased in the Region in 1980, but no damage was recorded. Larvae were common in small numbers from two - 20 per three-tree beating sample in the Kamloops-Ashcroft-Okanagan areas, and up to 30 larvae per sample occurred along Duck Range, east of Kamloops, McLure, Scottie Creek, Oregon Jack Creek, near Pavilion and near Hedley (Table 10).

Table 10. Numbers of Douglas-fir Tussock moth larvae in three tree beating samples, June 1-July 31.
Kamloops Forest Region, 1979 and 1980

District	Number of beating samples		Percent positive		Average number larvae per positive collection	
	1979	1980	1979	1980	1979	1980
Kamloops	45	50	2	24	1	3
Ashcroft	30	35	0	43	0	9
Lillooet	29	45	0	11	0	3
Shuswap	20	16	10	67	1	4
Okanagan	32	13	0	23	0	2
Princeton-Merritt	40	27	0	9	0	28

A sequential sampling method, more sensitive in detecting low larval populations, was used in 1980 at Duck Range, Indian Gardens Creek, Rose Mountain, and Blue Lake. Results indicated a low hazard.

Pheromone traps, to attract male adults and to assist in monitoring population levels, were set out at 13 locations in the Region; ten of the locations were sampled in 1979. Three concentrations of the pheromone 2-6-Henie Cosen-11-1 in percent by weight were used at ten locations and results show a potential increase in population levels in 1981 (Table 11).

Table 11. Number of Douglas-fir tussock moth male adults in pheromone traps.
Kamloops Forest Region, 1979 - 1980

Location	Average number of male moths trapped by pheromone concentration					
	.001		.01		.1	
	1979	1980	1979	1980	1979	1980
Rose Mtn.	10	9	26	41	14	45
Winfield	0	<1	4	15	13	22
Okanagan Mission	<1	<1	3	7	9	11
Vernon	<1	<1	6	17	6	10
Kaleden	0	0	6	12	6	21
Blue Lake	<1	<1	5	5	11	16
Scottie Creek	0	<1	3	17	3	10
Duck Range	0	15	1	26	2	25
Barnes Lake	<1	0	11	4	10	7
Indian Gardens	2	0	10	3	7	11
Botanie Creek	-	-	-	-	-	0
Fountain Valley	-	-	-	-	-	4
Pavilion	-	-	-	-	-	0

for
5/6500 cm² Egg surveys in September to assist in the prediction of 1981 defoliation at Scottie Creek, Duck Range, Rose Mountain and near Hedley showed that populations are low at all locations except near Hedley, where an average of .57 egg masses per 5600 cm² of foliage from 15 trees indicated a population approaching outbreak status in 1981. Egg surveys repeated in the Hedley area in November substantiated earlier results, and precluding winter mortality, virus infection or parasitism, moderate defoliation of Douglas-fir stands in this area may be expected in 1981.

Over wintering egg masses are being reared at Pacific Forest Research Centre to determine possible virus infection.

Western false hemlock looper, Nepytia freemani

Random Douglas-fir collections containing false hemlock looper larvae increased from 9% in 1979 to 37% in 1980 (Table 12). The most significant increases occurred near areas with a history of outbreaks in the north Okanagan Valley and Shuswap Lake area. Although not sufficient to cause noticeable defoliation in 1981, their increase is similar to the buildup in 1971 when up to 56 hectares were defoliated in the North Thompson, Chase, Enderby and Vernon areas.

Table 12. Numbers of three-tree beating samples containing false-hemlock
looper larvae.
Kamloops Forest Region, 1980

Location	Number of samples	Percent positive	Average number larvae per positive collection
Kamloops	62	26	2.0
Ashcroft	43	32	2.6
Lillooet	42	42	4.6
Chase	12	75	7.6
Okanagan Valley	36	30	6.5
Shuswap	20	50	6.2
Princeton Merritt	25	4	2.0

Scolytids in Douglas-fir

Two Scolytids, Scolytus tsugae and Pseudohylesinus nebulosus, killed young Douglas-fir trees on a 30 hectare area near Winfield, also groups of one to five trees in the Silver Star Mountain area and along the Nicola River near Clapperton. Attacks were also common in spaced stands along the Coalmont road and in Meadow Valley near Summerland. The attacks, were not considered to be of current concern but could cause a problem if the remaining trees in the spaced areas became sufficiently stressed or where slash is allowed to accumulate.

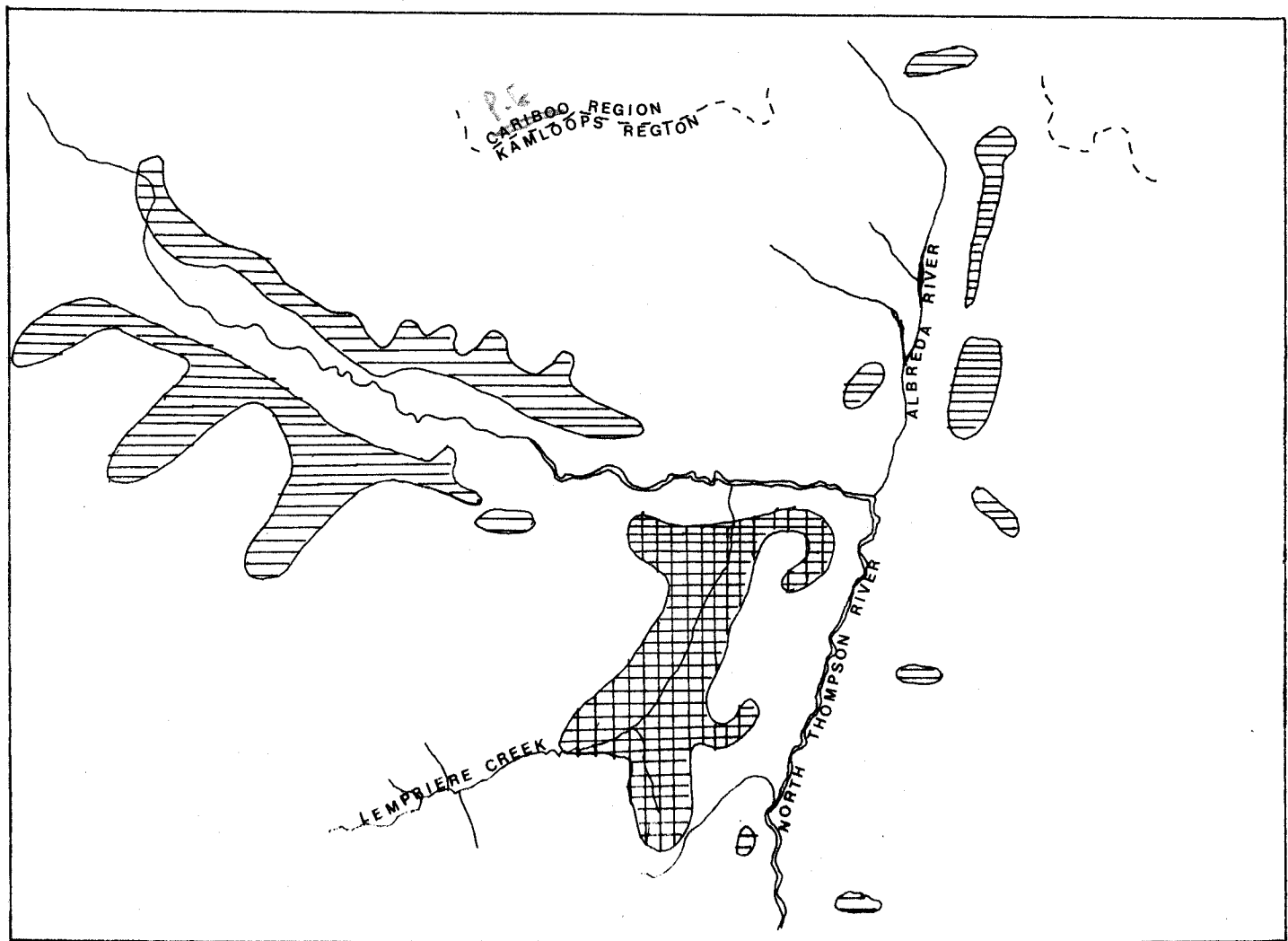
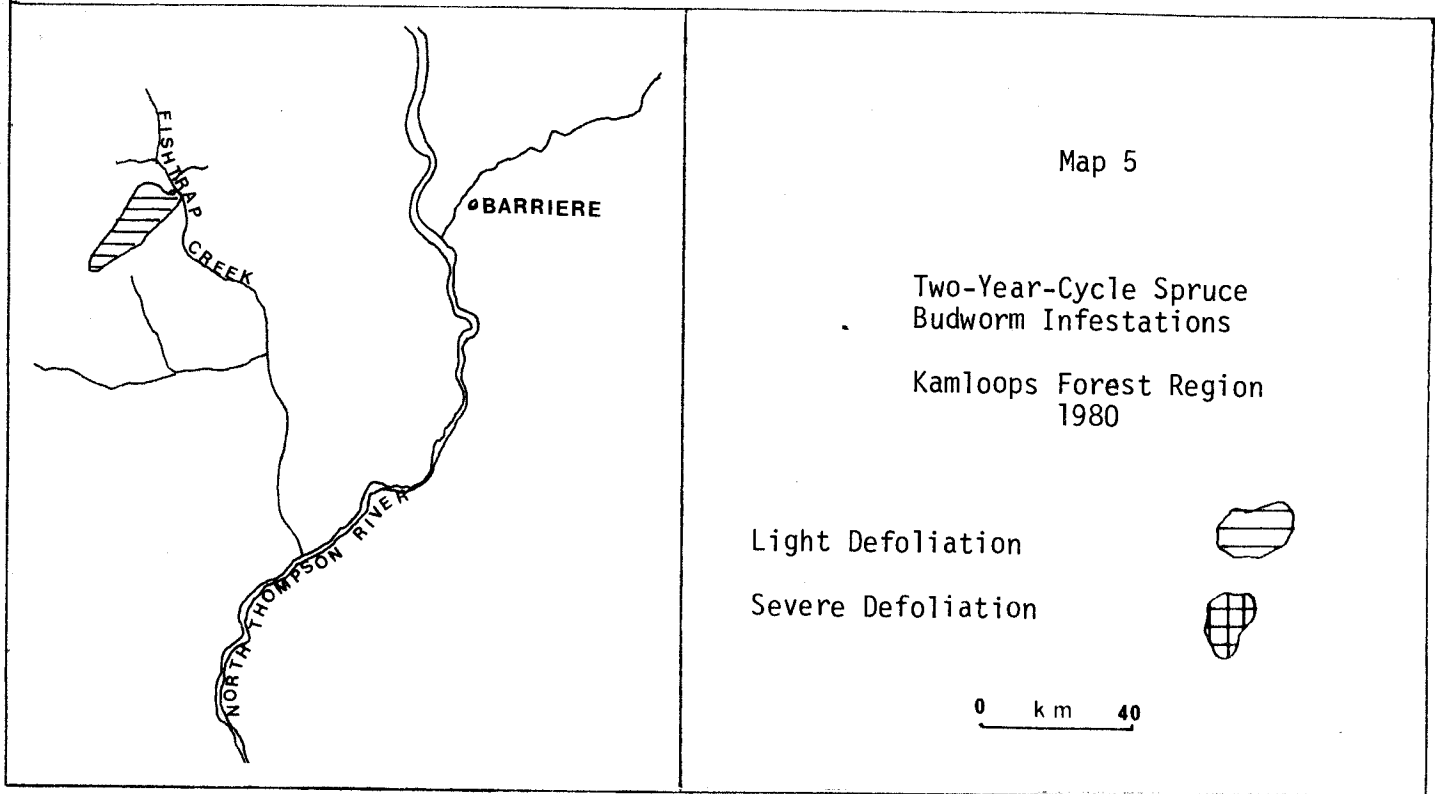
SPRUCE PESTS

Spruce beetle, Dendroctonus rufipennis

Spruce beetle attacks in the Kamloops Forest Region has been restricted to small areas adjacent to recent logging. Scattered infestations occurred in the Lillooet area: McKay Creek - 60 ha, Blowdown and Cayoosh creeks - 260 ha; in the Clearwater area: Raft and Thunder rivers and Miledge Creek - 170 ha, and in the Kamloops area: Tod Mountain - 250 ha. Small groups of 1 to 20 trees were attacked in 1980 at Smith, Placer and Prospect creeks in the Merritt-Princeton areas.

Two-year-cycle spruce budworm, Choristoneura biennis

Defoliation of Engelmann spruce and alpine fir stands was recorded over 13 678 ha along the North Thompson River north of Blue River and over 160 ha near Fishtrap Creek west of Barriere (Map 5).



Defoliation was light in all areas except in the Lempriere Creek drainage which has had severe defoliation every second year since 1974. Severely defoliated trees may be subject to attack by spruce beetle, as occurred in 1978 and since removed by logging operations.

Egg counts in 1980 indicated low to moderate populations will continue in 1981 at Lempriere Creek and high populations at Fishtrap Creek.

LARCH PESTS

Larch casebearer, Coleophora laricella

Larch casebearer caused light defoliation of western larch at Cherryville and near Shuttleworth Creek and moderate defoliation along Anarchist Mountain where a portion of the damage was caused by western spruce budworm.

Collections of 200 pupae from each of the locations were reared for the presence of parasites and results showed that pupae parasitism was caused mainly by Chrysocharis laricinella. This parasite was introduced in the western United States in 1972 and at Shuttleworth Creek in the Okanagan Valley and in adjacent portion of the Nelson Forest Region in 1980. 96

Results of sampling overwintering larval populations to determine population trends for 1981 indicated only light defoliation may be expected in all areas; based on the factor that less than 60 larvae per 100 fascicle results in light defoliation the following year^{1/}.

Larch needle blight, Hypodermella laricis

This needle blight continued to discolor western larch stands over 1 300 ha in the Monashee-Mabel Lake area and at White Lake. The major damage is growth loss and some bud and twig mortality of trees severely infested for the last two years.

PESTS OF NATURAL AND MANAGED SECOND GROWTH STANDS AND PLANTATIONS

A survey was initiated in 1980 to examine intensely managed second growth stands and natural regeneration stands for insect and disease pests: a wide range of pest problems were recorded (Appendix 3, Pests of natural and managed second growth stands and plantations).

^{1/} Ciesla, W.M. and W.E.B. Bousfield, Forecasting Larch Casebearer Defoliation in the Northern Region - Progress Report, 5 pp. USFS, 1971.

Bark beetles and engraver beetles were most consistently found as a direct result of thinning and could present a hazard to surrounding stands. In 17 thinned stands, eight had beetles present compared to only one of eight natural stands. Lodgepole pine terminal weevil, Pissodes terminalis, was present in three of 10 lodgepole pine plots causing up to 50% tip mortality.

Root rots, Armillaria root rot and Phellinus weirii, were present in eight and four, respectively, of 15 Douglas-fir areas examined. Endocronartium harknessii, was a minor problem in four of 10 lodgepole pine areas.

CONE AND SEED PESTS

Insect damage to cone crops in the Kamloops Forest Region was evaluated at 93 locations with 20 cones collected at each location (Appendix 4: Pest Report, Cone and Seed Pests, D.S. Ruth et al., November, 1980).

Thirty-three percent of the Douglas-fir cones were damaged mainly by: Douglas-fir cone moth, Barbara calfaxiana; the coneworm, Dioryctria abietivorella and the Douglas-fir cone gall midge, Contarinia oregonensis.

Eighty-seven percent of the Engelmann spruce cones at eight locations were damaged by the spruce seedworm, Laspeyresia youngana and the spiral spruce cone worm, Hylemyia anthracina.