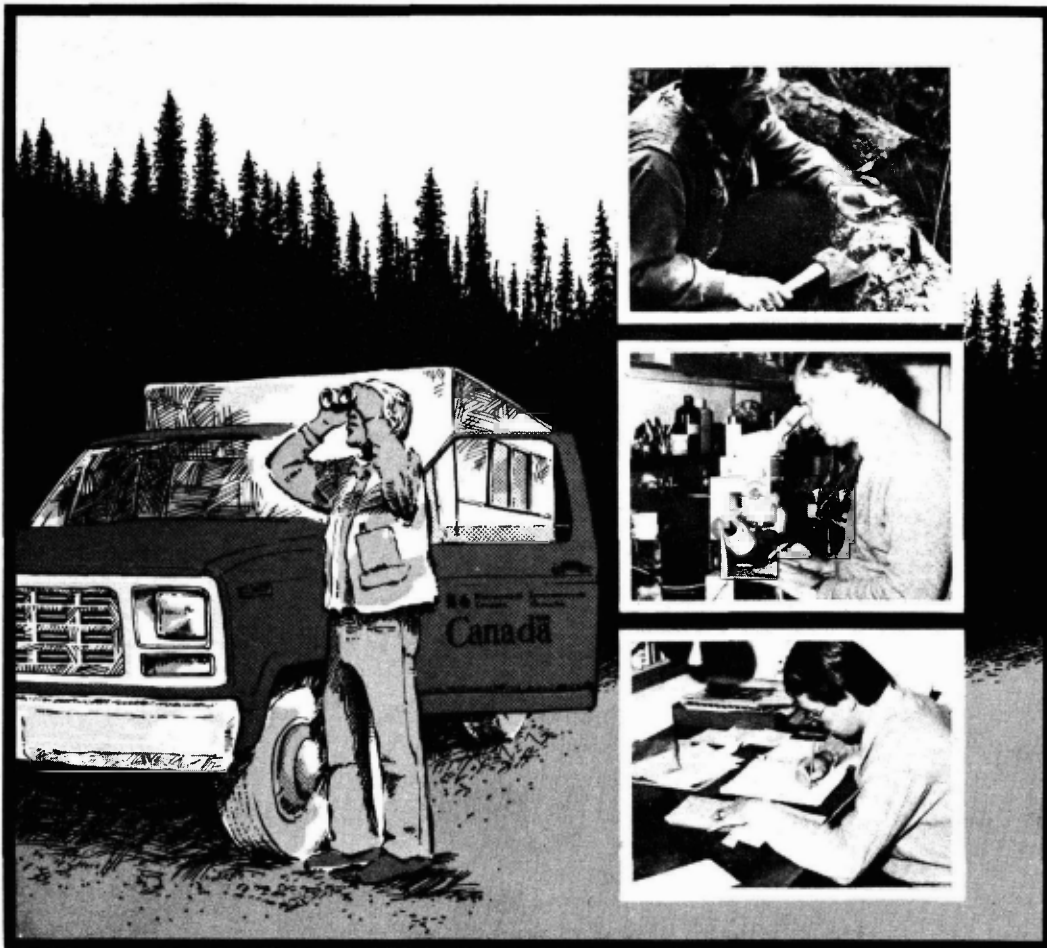


# Forest Insect and Disease Conditions

Kamloops Forest Region  
1983

R.D.Erickson and R.L.Ferris



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## SUMMARY

This report outlines the status of forest pest conditions in the Kamloops Forest Region in 1983. Emphasis is given to pests which are capable of sudden damaging outbreaks, and some population trends are forecast.

The most significant insect problem of mature forests was the mountain pine beetle which killed an estimated 5 710 000 pine trees (3 777 000 m<sup>3</sup>) over 43 960 ha in 530 infestations. Ponderosa pine was moderately infected by Elytroderma needle disease throughout most of its range. Infection of pines by Lophodermella needle casts and red band needle blight were common throughout the region.

Douglas-fir tussock moth outbreaks expanded twofold to 25 750 ha, historically the largest outbreak recorded in the Region. Douglas-fir stands in the Ashcroft-Cache Creek-Spences Bridge area were defoliated for the sixteenth successive year over 54 750 ha by Western spruce budworm, a fourfold increase from 1982. Western false hemlock looper outbreaks declined significantly to 250 ha in 1983 from 1 150 ha in 1982.

The number of mature Engelmann spruce recently killed by spruce beetle remained low in a few stands in the Thompson, Fraser and Okanagan regions. Black army cutworm re-infested an area in the North Thompson River Valley, defoliating up to 60% of the spruce seedlings.

Mature alpine-fir killed by western balsam bark beetle totalled 2 175 ha in higher elevation stands throughout the Region, slightly less than the 3 085 ha recorded last year.

Western hemlock looper defoliated 4 400 ha of western hemlock and western red cedar in the Shuswap-Sugar lakes area, the first time since 1973 in that area.

The 1983 Kamloops Region FIDS pest survey field season extended from mid-May to late September. There were 360 insect and disease samples submitted by FIDS rangers, B.C. Ministry of Forests and industrial personnel. Map 1 shows the locations where one or more samples were collected.

The percentage of insect collections which contained potentially damaging forest defoliators declined slightly to 82%, compared with 93% in 1982.

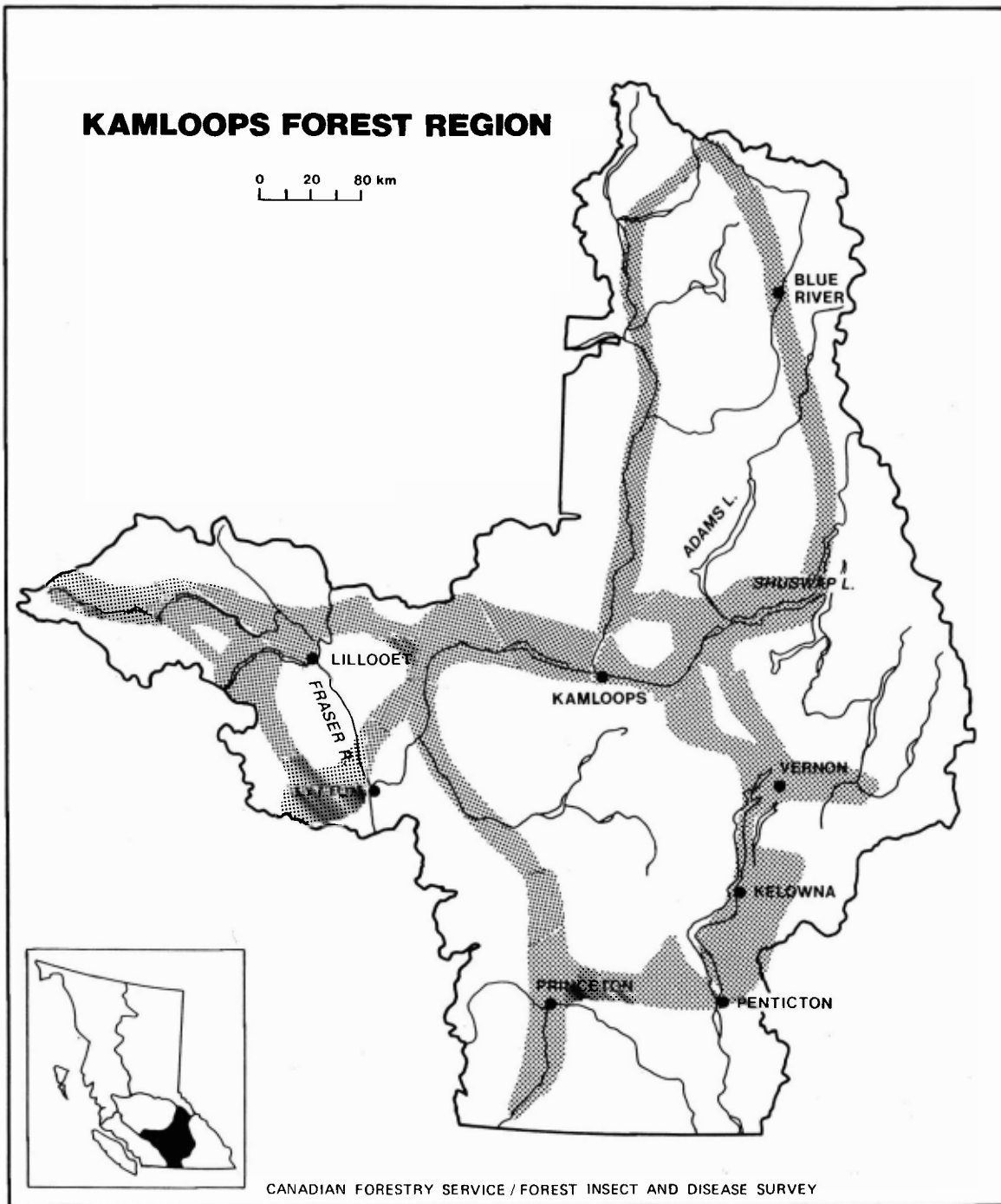
Several special collections were made of a variety of forest pests including western pine beetle, western spruce budworm and western false hemlock looper, for research personnel in the CFS and agriculture research centres.

A total of 23.2 hours of fixed wing flying time was used to map and photograph major pest problems through the Region (Map 2). Of

this total, 19.7 hours were supplied by CFS/FIDS and 3.5 hours by the B.C. Ministry of Forests, Protection Branch, Kamloops Region. This was 58% less flying time than the amount used in 1982.

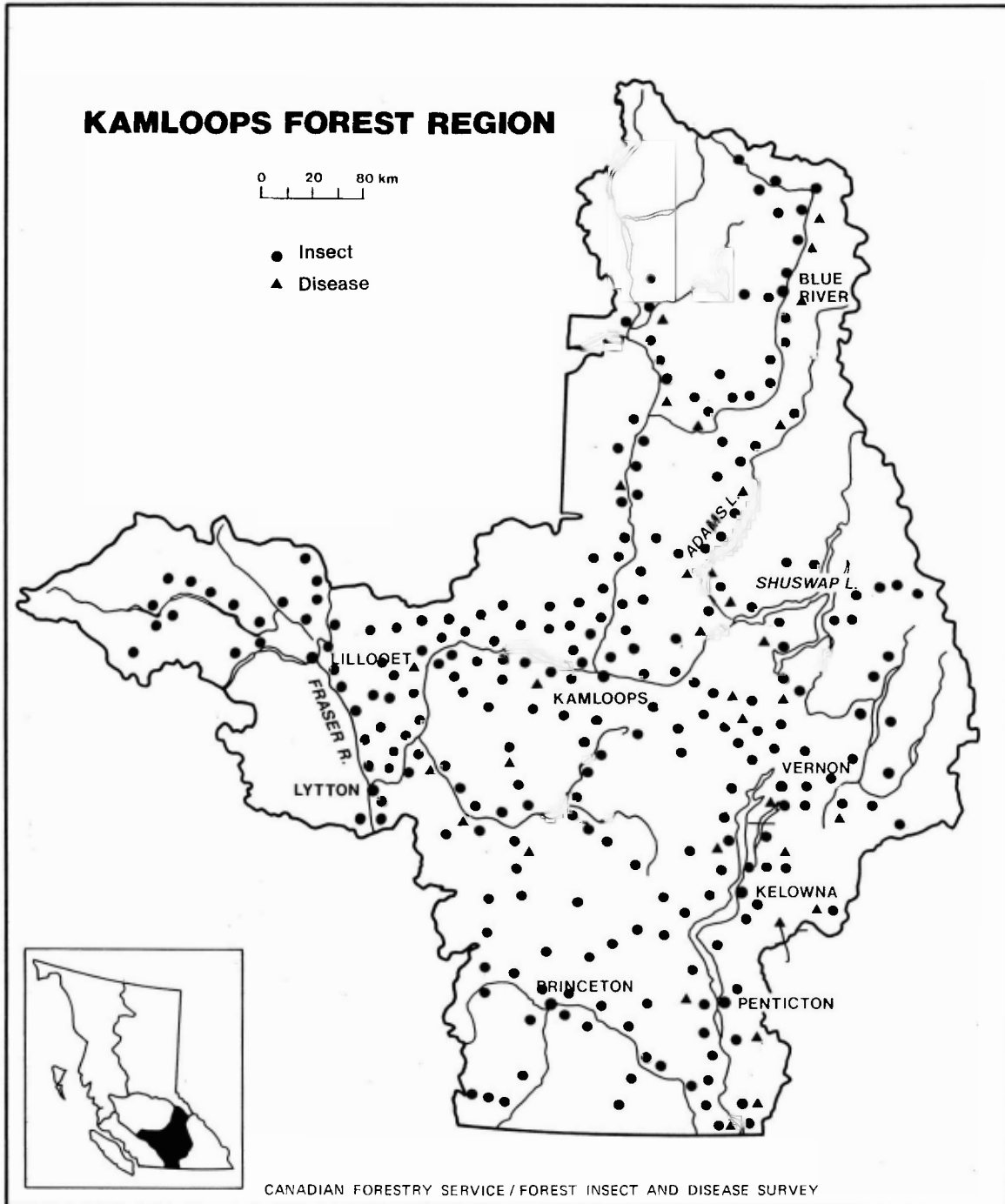
More than 270 contacts and extension services were made with provincial, federal and industrial agencies and the general public during the report period.

The annual survey of provincial parks on behalf of the B.C. Ministry of Lands, Parks and Housing identified six major insect pests and two major diseases in 14 of the 43 parks visited in six park districts.



Map 1

Areas covered by aerial surveys, 1983



Map 2

Locations where one or more forest insect and disease samples were collected, 1983

## PINE PESTS

Mountain pine beetle, Dendroctonus ponderosae

The number of recently killed lodgepole, ponderosa and western white pine trees increased more than threefold to 5 710 000 (3 777 000 m<sup>3</sup>), over 43 960 ha\* (MAP 3) compared to 920 000 trees over 22 000 ha in 1982. Approximately 82% of the total increase occurred in the Lillooet Forest District (Table 1).

Infestations were mapped from Mission-Belgo creeks in the Okanagan TSA to Kamloops, and west to Downton and Carpenter lakes in the Lillooet TSA (MAP 3).

TABLE 1. Location, area, number and volume of pine trees recently killed by mountain pine beetle, determined from aerial and ground surveys, Kamloops Forest Region, 1983.

Timber Sale Area	Area (ha)	Number of trees killed	Volume of host killed (m <sup>3</sup> )
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
TOTALS	43 960	5 710 000	3 777 000

In the Merritt and Okanagan TSA's along Hayes and Trout Creek valleys, the area of dead lodgepole pine declined to 1 680 ha from 1 890 ha in 1982. This was probably due to salvage logging plus fewer host pine available for attack. At nearby Summers Creek the infestation area increased slightly to 360 ha from 300 ha in 1982. Infestations along the Similkameen River from Eastgate to Princeton increased to 340 ha from 100 ha in 1982.

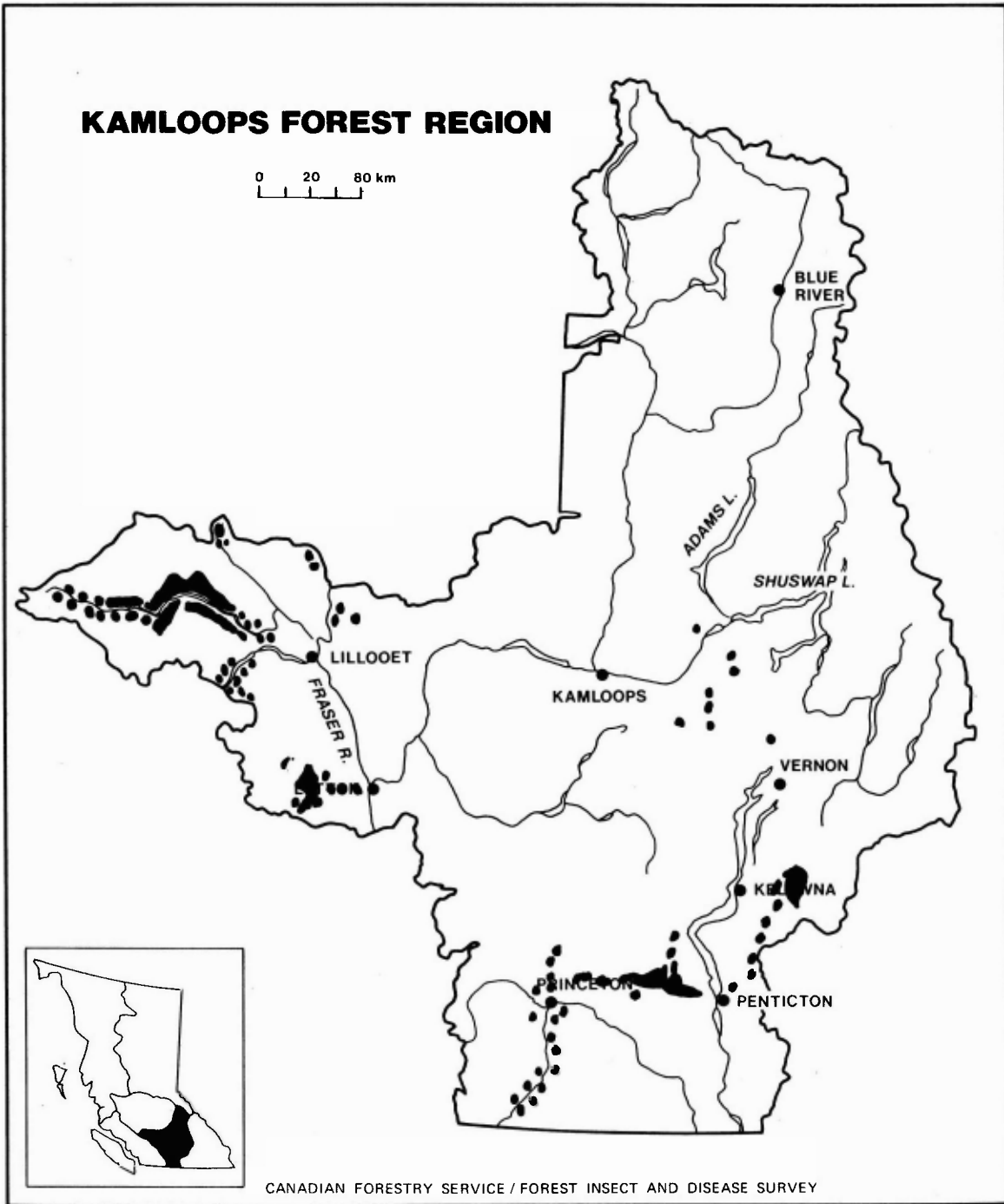
The Ashnola River - Cathedral Provincial Park area was not mapped during aerial surveys, however ground checks confirm the infestations are still active. There was a slight decrease to 210 ha from 400 ha in 1982, east of the Okanagan Valley at Dale and Clark creeks. At Mission and Belgo creeks the area of dead pine tripled to 1 800 ha. Mountain pine beetle has been epidemic in this area since 1972, resulting in the depletion of about 75% of the mature lodgepole pine in several stand types.

\*Aerial surveys, the source of this data, were reduced by nearly 60% in 1983 due to budget restraints. This resulted in widespread but less intensive surveys of the outbreaks.

Lodgepole pine killed by mountain pine beetle, Tyaughton Lake, 1983.

Photograph available from Pacific Forest Research Centre.





Map 3

Mountain Pine Beetle Areas of recently killed pine, as determined by aerial surveys, 1983

In the Lillooet Forest District there was a threefold increase in infested area to 36 000 ha and a fivefold increase in the number of dead lodgepole and ponderosa pine to 4 428 000 trees. Part of this increase may be an artifact of different aerial coverage between years, however, there were real increases in the infestations themselves. In the Lillooet TSA along the Fraser River at French Bar, South French Bar and Watson creeks, the infestations increased to 2 300 ha from 650 ha in 1982. These infestations were among the fastest expanding in the Lillooet District. In Upper Tyaughton and Gun creeks, the infested area increased to 1 200 ha from 80 ha in 1982. Along lower Tyaughton Creek and Marshall Creek to Carpenter Lake 6 700 ha of recently killed lodgepole and ponderosa pine were mapped. There was 7 000 ha of pine killed from Tyaughton Lake to Gun Lake including Lower Gun Lake. This is the twelfth year of the outbreak in this area and the tenth year in the Goldbridge area.

Adjacent infestations increased to 713 400 trees over 5 800 ha from 177 100 trees over 1 440 ha along both sides of Downton Lake and along Bridge River to Bridge Glacier. This outbreak has resulted in many hectares of dead standing trees near Gold Bridge and along both sides of Carpenter Lake. Above Gold Bridge from Brexton to Bralorne the infestation is more active (more current attack) and has increased tenfold to 1 650 ha this year from 160 ha in 1982. A prism cruise in the area indicated 21% of the stand was currently attacked. In the Stein River Valley near Lytton, the area of lodgepole and ponderosa pine killed by mountain pine beetle increased to 2 140 ha from 1 380 ha in 1982. Along Scudamore and Cottonwood creeks, tributaries of the Stein River, there was also an increase to 1 170 ha from 220 ha last year. In the Duffey Lake area west of Lillooet, the number of recently killed pine increased slightly to 130 ha from 100 ha.

Beetle infested stands were examined at four locations in the Region, two each in the Okanagan and Lillooet TSA's, showed an average of 17% current attack, range 10-23% (Table 2).

In the Okanagan TSA at Trout Creek, mountain pine beetle has killed mature lodgepole pine since 1972; 20% of the volume is gray and more than half the total volume has been depleted. At Mission Creek east of Kelowna, the infestation has also been continuing since 1972. The infestation developed in the lower part of the drainage and has progressed annually up the creek. A prism cruise in the upper part of the drainage showed that only 10% of the volume was gray; however, with 26% red and 27% currently attacked, the total depletion in volume was 63%. In the Lillooet TSA south of Gold Bridge, a new active infestation has resulted in 21% current attack by volume. This was one of the last remaining stands in the immediate Gold Bridge area that was susceptible and yet still uninfested. At Marshall Lake north of Carpenter Lake in a two-year-old infestation, 60% of the lodgepole pine component was dead or attacked.

TABLE 2. Mountain pine beetle cruise data, Kamloops Forest Region, 1983.

Location	Healthy	Green Attack	Partial Attack	Red	Grey	Dead Other Causes	Total
OKANAGAN TSA							
<u>Trout Cr.</u>							
Stems/ha	1168.3	197.1	161.0	124.1	245.3	69.0	1964.8
Volume/ha (m <sup>3</sup> )	142.0	43.8	26.6	28.7	61.9	5.3	308.3
% of stems	59.5	10.0	8.2	6.3	12.5	3.5	100.0
% of volume	46.1	14.2	8.6	9.3	20.1	1.7	100.0
<u>Mission Creek</u>							
Stems/ha	275.8	244.4	97.9	210.6	132.9	120.0	1081.6
Volume/ha (m <sup>3</sup> )	94.7	123.9	44.0	118.4	48.1	21.6	450.7
% of stems	25.5	22.6	9.0	19.5	12.3	11.1	100.0
% of volume	21.0	27.5	9.7	26.3	10.7	4.8	100.0
LILLOOET TSA							
<u>Marshall Lake</u>							
Stems/ha	667.4	273.5	56.7	124.8	96.3	0.0	1218.7
Volume/ha (m <sup>3</sup> )	89.9	75.1	8.7	45.4	32.2	0.0	251.3
% of stems	54.8	22.4	4.7	10.2	7.9	0.0	100.0
% of volume	35.7	29.9	3.5	18.1	12.8	0.0	100.0
<u>Brexton (Gold Bridge)</u>							
Stems/ha	467.6	131.9	90.0	128.4	61.3	75.4	954.6
Volume/ha (m <sup>3</sup> )	189.8	116.3	50.0	134.5	51.2	8.8	550.6
% of stems	49.0	13.8	9.4	13.4	6.5	7.9	100.0
% of volume	34.5	21.1	9.1	24.4	9.3	1.6	100.0

Based on the number of currently attacked trees and healthy progeny recorded in the representative areas during cruises, there probably will be an increase in red tree count next year.

#### Lodgepole pine dwarf mistletoe, Arceuthobium americanum

Dwarf mistletoe infections in lodgepole pine stands result in significant accumulated volume loss in the Kamloops Region, where infections commonly exceed 50% of the pine in mature stands of 250 ha or larger. Severely infected (more than 15%) understory regeneration was common in stands in drainages east of Penticton.

Elytroderma needle disease, Elytroderma deformans

Light to severe infection of the previous year's needles of ponderosa pine occurred for the third consecutive year throughout much of the host range, resulting in severe brooming, premature needle loss and probably some increment loss. Infection intensities ranged from 1% to 80% of the 1982 needles in up to 90% of the mixed age class trees in areas from 2 to 100 ha. The most severely infected stands were at Paul Creek, near Oliver; Princeton, Blue Lake, Anarchist Mountain, Dairy and Campbell creeks, Pritchard, Indian Gardens, the north side of Little Shuswap, Heffley Creek and in the Pass Valley between Deadman River and Cache Creek.

Lophodermella needle cast, Lophodermella concolor

Thirty-three percent of the previous year's needles on lodgepole pine trees were infected on 80% of the mixed age class trees over 500 ha from the Big White turnoff on Highway #33 to Beaverdell. Lodgepole pine to 12 m in height were 30% discolored in 0.5 to 1 ha pockets in the Paxton Valley from Monte Lake to Chase Creek and along the west side of Tyaughton Lake in the Lillooet TSA.

Infections have occurred for the previous two years and have resulted in significant premature needle loss. Similar infections could be repeated in 1984 if moist warm weather conditions dominate the spring weather.

Red band needle blight, Dothistroma pini

There was widespread infection of one-year old lodgepole and white pine needles throughout the northern part of the Region. From Clearwater to Wells Gray Park, an average of 60% of the foliage in 1-10 ha patches was discolored, similarly, along Peterson and Phinetta creeks and from Rushton Creek to Bob Creek. An average of 30% discoloration on 80% of the lodgepole pine occurred over 100 ha on the north side of Mt. Boyssé near Chase. Infection is favoured by damp spring weather. Severe infection and needle loss could cause marginal growth loss.

Black stain root disease, Verticicladiella wagnerii

Scattered pockets of 0.5 to 2 ha containing 5 to 10 dead Douglas-fir and lodgepole pine were common at 1 200 m elevation for 3 km along the O'Connor Lake Road. The incidence of this disease has increased since first detected and identified in the Region, near Vernon in 1977.

Orange stalactiform blister rust, Cronartium coleosporioides

There were 25, 10 m high lodgepole pine over 3 ha above Bralorne that were infected and exhibiting stem cankers. Cankers ranged in length from 1-2 metres, some of which had been partially chewed by porcupines. Some tree mortality will probably occur as a result of infection and girdling.

DOUGLAS-FIR PESTS

Douglas-fir tussock moth, Orgyia pseudotsugata

Defoliation of Douglas-fir by the Douglas-fir tussock moth increased more than twofold to 25 750 ha of light\*, moderate, severe and gray, from 12 000 ha in 1982 (MAP 4). Historically this is the largest tussock moth infestation ever recorded in the Kamloops Region. The 670 different infestations ranged in size from approximately 5 ha to 1 850 ha in low elevation stands (less than 750 m) throughout the Region from the Okanagan to Kamloops; along the North Thompson River Valley to Barriere and west of Kamloops to Spences Bridge.

The outbreak expanded beyond the 33 areas predicted from egg mass samples taken in 50 locations in 1982. One of the largest increases, from 124 ha in 1982 to 2 400 ha this year, occurred in the North Thompson River Valley from Kamloops to Barriere. A new 30 ha infestation, occurred approximately 20 km north of Barriere near Sanborn Lake. This was the northern extremity of the outbreak, surpassing the limit of the previous outbreak by approximately 40 km. Another large increase of light to severe defoliation to 2 200 ha from none in 1982, occurred from Kamloops to Savona on both sides of Kamloops Lake including Cherry Creek. In the Cache Creek area, the increase in defoliation was threefold to 9 390 ha from new infestations and expansion of existing ones.

\*light: 25% defoliated  
 moderate: 26-65% defoliated  
 severe: more than 65% defoliated  
 grey: areas of successive defoliation, some tree mortality.

Douglas-fir defoliated by tussock moth, Campbell Creek, 1983.

Photograph available from Pacific Forest Research Centre.

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TABLE 3. Location and area of Douglas-fir stands defoliated by Douglas-fir tussock moth, determined from the aerial survey, Kamloops Forest Region, 1983.

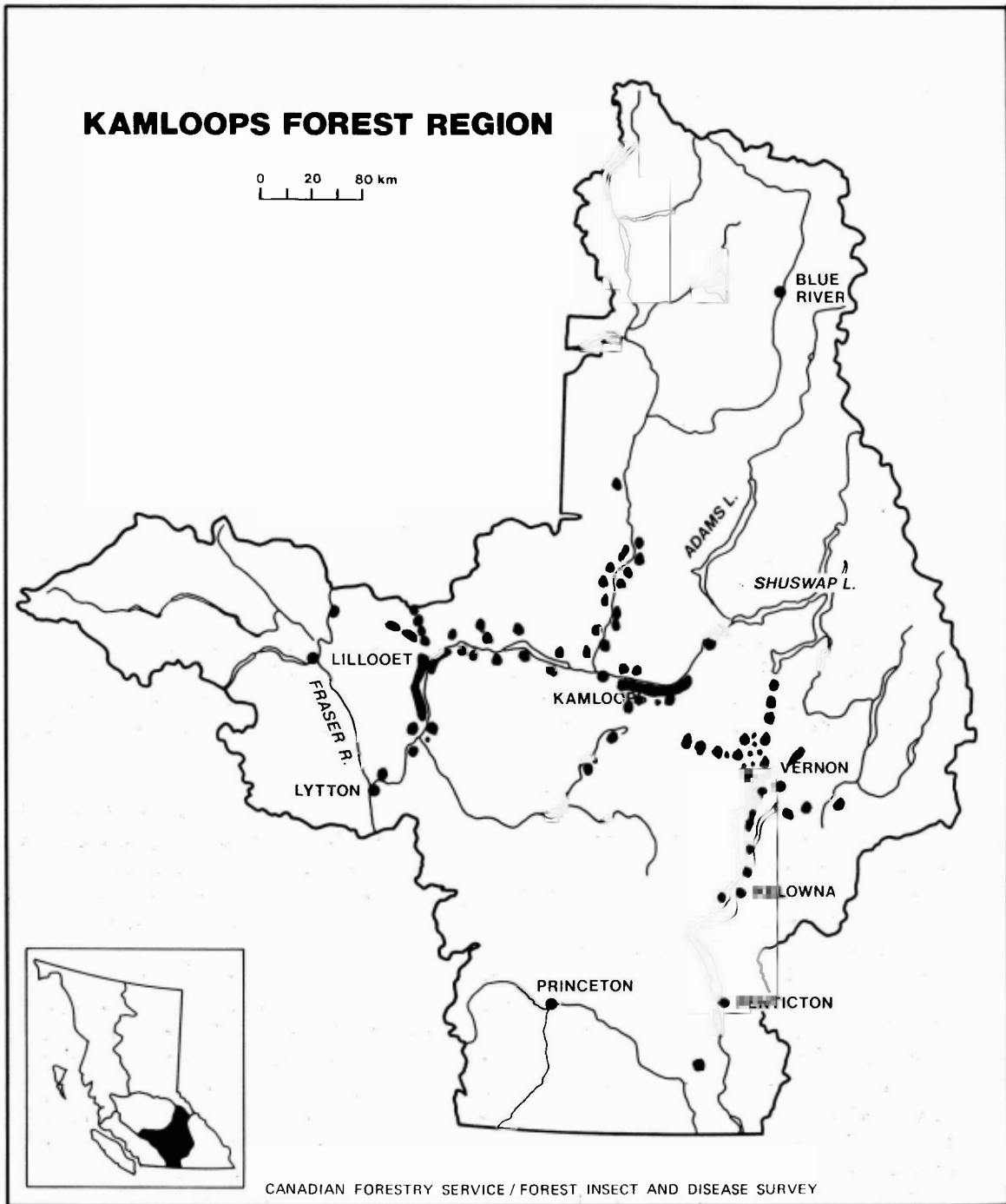
Location (TSA and geographic)	Area of Defoliation (ha)				Total
	Light	Moderate	Severe	Grey	
<u>KAMLOOPS TSA</u>					
Cache Creek	-	-	860	25	885
Deadman River	50	50	910	110	1 120
Heffley Creek	80	210	785	-	1 075
Westsyde	-	30	270	-	300
Juniper Heights	30	255	65	-	350
Sanborn Lake	-	30	-	-	30
McLure-Barriere	35	80	545	-	660
Shumway Lake	-	50	-	-	50
Barnhartvale	-	15	1 600	175	1 790
Aberdeen	30	65	-	-	95
Paul Cr.	30	-	80	-	110
Rayleigh	15	15	50	-	80
Jamieson Cr.	-	30	-	-	30
Rampage	-	110	-	-	110
Basque	-	-	2 625	180	2 805
Ashcroft	-	-	625	25	650
Separating Lake	25	50	910	105	1 090
Carquile	-	-	3 355	600	3 955
Roper Hill	-	15	400	-	415
Six Mile Point	-	110	130	-	240
Tranquille	15	175	415	-	605
Copper Creek	150	240	-	-	390
Savona	30	320	210	-	560
<b>TOTALS</b>	<b>490</b>	<b>1 850</b>	<b>13 835</b>	<b>1 220</b>	<b>17 395</b>
<u>LILLOOET TSA</u>					
Spences Bridge	30	160	860	30	1 080
Pavilion	-	40	30	-	70
<b>TOTALS</b>	<b>30</b>	<b>200</b>	<b>890</b>	<b>30</b>	<b>1 150</b>
<u>MERRITT TSA</u>					
Stump Lake	60	-	-	-	60
<b>TOTALS</b>	<b>60</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>60</b>

....

TABLE 3 continued.

Location (TSA and geographic)	Area of Defoliation (ha)				Total
	Light	Moderate	Severe	Grey	
<u>OKANAGAN TSA</u>					
Winfield	180	175	-	-	-
Rattlesnake Pt.	-	130	-	-	130
Ellison Park	130	560	-	-	690
Okanagan Landing	-	80	-	-	80
Lavington	25	155	-	-	180
Equesis	25	80	155	-	260
Armstrong	-	155	50	235	440
Round Lake	-	-	30	-	30
Mt. Swanson	-	25	-	575	600
Sweetbridge	-	80	25	415	520
Falkland	50	330	25	75	480
Westwold	-	25	-	-	25
Lumby	-	100	-	-	100
Yankee Flats	30	65	110	15	220
Pritchard	15	-	575	2 160	2 750
Chase	95	30	50	-	175
Adams River	15	-	30	15	60
Tappen	-	-	-	15	15
<b>TOTALS</b>	<b>565</b>	<b>1 990</b>	<b>1 050</b>	<b>3 505</b>	<b>7 110</b>
<u>SUMMARY</u>					
KAMLOOPS TSA	490	1 850	13 835	1 220	17 395
LILLOOET TSA	30	200	890	30	1 150
MERRITT TSA	60	-	-	-	60
OKANAGAN TSA	565	1 990	1 050	3 505	7 110
<b>TOTALS</b>					





Map 4

Douglas-fir Tussock Moth Areas of defoliated Douglas-fir, as determined by aerial surveys, 1983

New infestations were recorded and the existing ones expanded to 2 250 ha, south of Cache Creek from Oregon Jack Creek to the south end of Venables Valley. There was a fourfold increase in areas lightly to severely defoliated to 3 300 ha from Cache Creek north to Loon Cr. along Hwy. 97, including Scottie Cr., and west of Carquille to Hat Creek. A small 40 ha infestation was recorded for the first time near Pavillion townsite. The area of defoliated Douglas-fir stands doubled to 1 100 ha along the Deadman River north of Savona, where starvation reduced the larval population. Infestations expanded to 2 200 ha, from Kamloops east to Monte Creek including Campbell Creek, Barnhartvale and Juniper Heights. There was a slight reduction in defoliated area to 2 980 ha from 3 670 ha in 1982 east of Monte Creek to Chase, including Pritchard. Approximately 75% of the damage in this area was grey, and contained some tree mortality but little current defoliation. A slight decrease to 240 ha from 620 ha in 1982 occurred from Yankee Flats to Sorrento including Salmon Arm in scattered infestations intermingled with suburban development. The area of defoliation doubled to 3 700 ha from Westwold to Armstrong and south to Winfield particularly from Westwold to Falkland. Within this area, there was a 25% decrease in the defoliated area in urban Douglas-fir stands from Falkland to Armstrong. New infestations were mapped north and south of Okanagan Landing and also in 1-20 ha patches east of Vernon to Lumby and west of Winfield along Okanagan Lake. A total of 175 ha of Douglas-fir were lightly to severely defoliated from Penticton to Kelowna, a slight increase from 145 ha in 1982. There was a total collapse of infestations at Bromley Rock Provincial Park, Hedley, Stenwinder Provincial Park, Okanagan Falls and in the Penticton, Summerland and Kelowna residential areas. Some of these reductions are probably due to the chemical or viral control measures that were implemented in 1982. A small 5 ha infestation persisted with moderate defoliation at Olalla.

An egg mass survey was conducted in September by CFS and BCMF crews at 57 locations throughout the epidemic to aid in prediction of damage for 1984. Three branches were examined from each of 20 to 70 trees per location in a sequential sampling system. The average number of egg masses per tree per location was determined (Table 4) and predictions for 1984 made on this basis (Shepherd<sup>1</sup> et al in press). The results predict a collapse of the population except at Cherry Creek, Venables Valley, Barnes Lake, Twaal Creek, Stump Lake, Barriere and Olalla where small populations may persist. This predicted decrease is supported by the incidence of nuclear polyhedrosis virus (NPV) in populations at 25 locations sampled in late July, where an average of 15% sixth instar larvae were killed. Larvae collected at 42 locations in the Region in July by CFS and BCMF crews were 70% infected by the virus which was present at all the locations. Cocoons, collected in September by FIDS at eight locations near Cache Creek and south to Soap Lake, were 58% parasitized by a species of Diptera and 6% killed by NPV.

<sup>1</sup>Shepherd, R.F., I. Otvos and R.J. Chorney. A sequential survey method to determine density of Douglas-fir tussock moth egg masses Can. Ent.

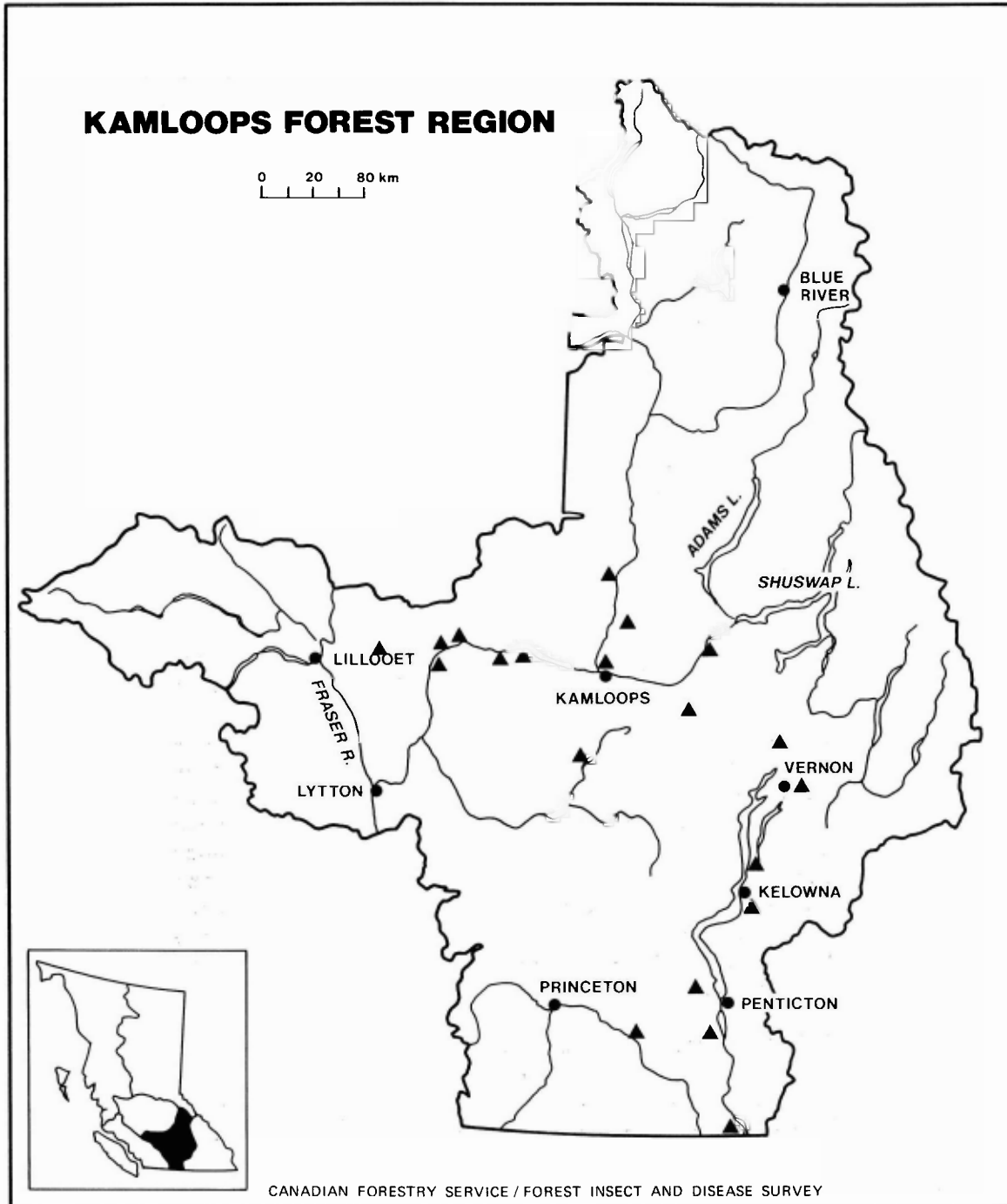
TABLE 4. Location and average number of Douglas-fir tussock moth egg masses on three lower crown branches per tree, per plot and predicted defoliation in 1984, Kamloops Forest Region, 1983.

Location	Avg. No. egg masses/tree/plot	Predicted 1984 defoliation*
Venables Valley	0.1	trace
Barnard Cr.	0.04	none
Barnes L. (west)	0.2	trace
Twaal Cr.	0.3	trace
Stump Lake	0.1	trace
Barriere	0.1	trace
Cherry Cr.	1.5	light
Indian Gardens	0.04	none
Hunters Ranch (Scottie Cr.)	0.02	none
Olalla	0.2	trace
Lopez Cr. (Cache Cr.)	0	none
Cornwall Cr.	0	none
Oregon Jack Cr.	0	none
Studhorse Cr.	0	none
Soap Lake	0	none
Carquile	0	none
East of Pavilion	0	none
Chase	0	none
Gulch Cr.	0	none
Dairy Cr.	0	none
Kaneta	0	none
Fishtrap Cr.	0	none
Heffley Cr.	0	none
Kamloops (Braemar Meadows)	0	none
Scottie Cr.	0	none
Battle Cr.	0	none
Rolling's Lake Rd. (Lumby)	0	none
Ellison Prov. Park	0	none
Round Lake (E. of Falkland)	0	none
Rattlesnake Pt. (Kalmalka L.)	0	none
3.5 Km south of Winfield	0	none
Hudson Rd. Elem. School	0	none
2.5 Km north of Olalla	0	none

\*0.1 - 0.7 trace

0.8 - 2.0 Light to Moderate

2.1+ Severe



Map 5

Douglas-fir Tussock Moth Locations of pheromone attractant traps to monitor adult male population (Pheromone strength 0.01%)

A total of 67 damage appraisal plots were established by CFS and BCMF in a cooperative project. They will be used to study the effects of Douglas-fir defoliation caused by Douglas-fir tussock moth.

Douglas-fir beetle, *Dendroctonus pseudotsugae*, is attracted to weakened Douglas-fir in severely defoliated stands, and will be a potential factor causing tree mortality. Sixteen percent of 30 stands examined, that were severely defoliated in 1982 and 1983, had an average of 60% of trees larger than 20 cm dbh, successfully attacked by this beetle.

The tussock moth male sampling program was continued, using sticky traps baited with the pheromone (z)-6-heneicosen-11-one, at .01% concentration by weight. Traps were set out in groups of seven, 20 m apart at 20 locations (Table 5) from Stemwinder Provincial Park to Heffley Creek, and west to Pavillion (MAP 5). There was an average 20% increase this year in male moths caught at the same locations as last year. The average number of male moths per trap ranged from 0 to 100 and averaged 47. The lowest counts were at Vernon, Armstrong, Stemwinder Provincial Park, St. Andrews, Blue and Darke lakes; all areas where infestations collapsed this year. Some of the highest average catches were at Indian Gardens, Battle, Heffley and Cherry creeks; areas of severe defoliation this year.

TABLE 5. Location and number of adult male Douglas-fir tussock moths in pheromone traps, Kamloops Forest Region, 1983.

Location	Average number of moths per trap at 0.01% pheromone concentration
Vernon	9
O.K. Mission	54
Armstrong	4
McKinley Rd. (Winfield)	45
Stemwinder	0
St. Andrews	5
Blue Lake	11
Darke Lake	1
Stump Lake	37
Carquile	65
Cherry Cr.	81
Braemar Meadows	57
Chase	41
Monte Lake	38
Heffley Cr.	89
Battle Cr.	89
Pavilion	68
Barnes Lake	72
Kaneta	79
Indian Gardens	100
AVERAGE	47

Western spruce budworm, Choristoneura occidentalis

About 54 750 ha of multi-age class Douglas-fir stands in the Spences Bridge, Ashcroft, Cache Creek, Savona and Carquile areas, were lightly to severely defoliated\* (Table 6). This was the sixteenth successive year of defoliation by budworm in the Thompson and Fraser river drainages west of Savona (MAP 6).

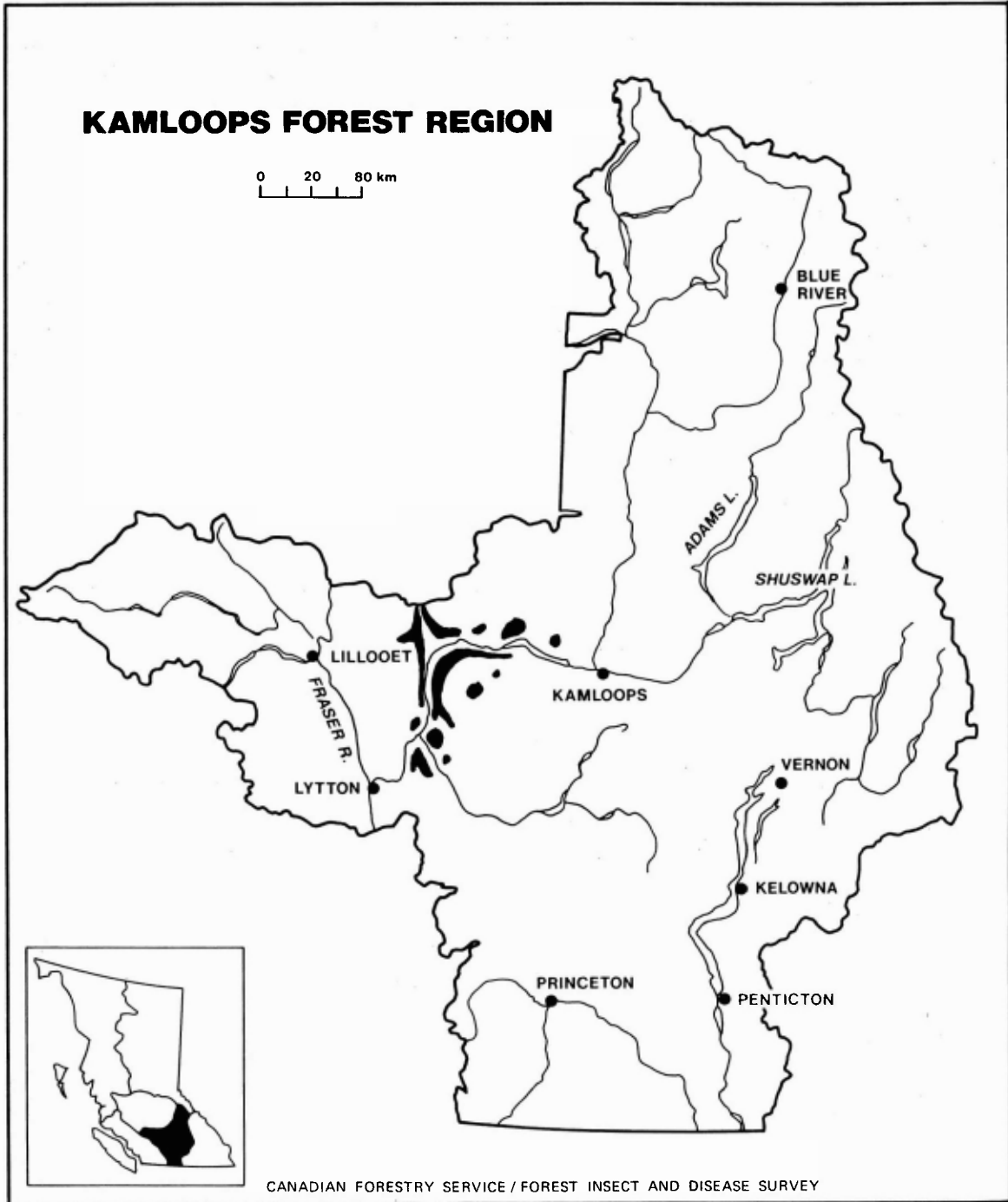
The defoliated stands, determined from aerial surveys, quadrupled in area from 13 000 ha in 1982 to 54 750 ha in 1983. Defoliation intensities were light over 44 000 ha (80% of the defoliated area), moderate over 9 000 ha (16% of the defoliated area), and severe over 1 750 ha (4% of the defoliated area).

In May, as early instar western spruce budworm were mining in the buds, estimates of percent infested buds were made based on 100 bud counts at nine locations to give preliminary indications of defoliation. The percent infested buds ranged from 18-60 and averaged 29. The results were as follows: Carquile, 20; Medicine Creek, 30; Campbell Creek, 15; Bonaparte I.R., 18; Barnard Creek, 20; Oregon Jack Creek, 25; Barnes Lake, 25; Indian Gardens, 50 and Pass Valley, 60. Based on criterion developed from past infestations, light defoliation would occur where 15% or more of the buds were infested. All the areas examined experienced at least light defoliation of Douglas-fir, caused by spruce budworm.

\*light : 0-25% defoliated  
moderate: 26-65% defoliated  
severe : 65+% defoliated

TABLE 6. Location and area of Douglas-fir stands defoliated by western spruce budworm, as determined from the aerial survey, Kamloops Forest Region, 1983.

Location (TSA and geographic)	Area of defoliation (ha)				Total
	Light	Moderate	Severe	Grey	
<u>KAMLOOPS TSA</u>					
Finney Lake	1 060	-	-	-	1 060
Marble Range	5 200	-	180	-	5 380
Edward Gulch	540	-	-	-	540
Trachgte Hills	4 100	4 470	220	-	8 790
Jim Black Lake	12 790	675	155	-	13 620
Cultus Lake	960	210	-	-	1 170
Tsolin Lake	545	390	600	-	1 535
Scottie Cr.	540	2 420	450	-	3 410
Bose Hill	910	-	-	-	910
Tunkwa Cr.	160	-	-	-	160
Savona	2 175	190	-	-	2 365
Sabiston Lake	5 870	145	145	-	6 160
Tranquille River	50	-	-	-	50
Lac Du Bois	270	-	-	-	270
McQueen Lake	225	-	-	-	225
<b>TOTALS</b>	<b>35 395</b>	<b>8 500</b>	<b>1 750</b>	<b>-</b>	<b>45 645</b>
<u>LILLOOET TSA</u>					
Pavilion	350	-	-	-	350
<b>TOTALS</b>	<b>350</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>350</b>
<u>MERRITT TSA</u>					
Soap Lake	5 100	315	-	-	5 415
Pimainus Cr.	2 315	185	-	-	2 500
Scoonka	50	-	-	-	50
Curnow Cr.	340	-	-	-	340
Shushten Cr.	30	-	-	-	30
Botanie Cr.	80	-	-	-	80
Papsilqua Cr.	340	-	-	-	340
<b>TOTALS</b>	<b>8 255</b>	<b>500</b>	<b>-</b>	<b>-</b>	<b>8 755</b>
<u>SUMMARY</u>					
KAMLOOPS TSA	35 395	8 500	1 750	-	45 645
LILLOOET TSA	350	-	-	-	350
MERRITT TSA	8 255	500	-	-	8 755
<b>TOTALS</b>	<b>44 000</b>	<b>9 000</b>	<b>1 750</b>	<b>-</b>	<b>54 750</b>



Map 6

Western Spruce Budworm Areas of defoliated Douglas-fir, as determined by aerial surveys, 1983



The largest increase in area of defoliation was tenfold to 7 900 ha in the Pimainus Ridge-Soap Lake area near Spences Bridge. Similar increases were noted to over 6 100 ha at Sabiston and Carabine (Copper) creeks north of Savona. New infestations occurred in four areas; 500 ha from Lac du Bois to McQueen Lake northwest of Kamloops, 1 000 at Bose Hill and Tunkwa Creek south of Savona; 360 ha in two small spots at the north and south ends of Pavilion Lake west of Cache Creek and approximately 100 ha in Tyaughton and Marshall creeks, near Carpenter Lake. Defoliation over 13 600 ha, double the 1982 area, was 90% light with 10% moderate and severe from Barnes Lake south to Highland Valley on the east side of the Thompson River Valley. A similar increase to 6 200 ha occurred from Cache Creek to Carquile on the west side of the Bonaparte River Valley. The area of 1983 defoliation also doubled to 3 500 ha along the north side of Hat Creek to Carquile and north of there to the new Kamloops Forest Region boundary at Loon Creek. A threefold increase to 12 200 ha from 4 100 ha in 1982 occurred from Pass Valley north of Walhachin, along the east side of the Bonaparte River Valley to Scottie and Loon creeks. The smallest increase of one-half the area defoliated in 1982 to 6 700 ha was mapped south of Cache Creek to Oregon Jack Creek. Other severely defoliated stands were located at TsoLin Lake (600 ha), Scottie Creek (450 ha), Cornwall Hills (220 ha), Marble Range (180 ha), Penny Lake (150 ha), and Sabiston Lake (140 ha). Two permanent study plots were established in 1983, at Indian Gardens south of Savona and Separating Lake east of Ashcroft. The purpose of the plots was to tie related data on host and pest together to provide a detailed assessment of the effects of western spruce budworm defoliation on Douglas-fir. Preliminary results showed the average defoliation of plot trees in 1983 was 80% at Separating Lake and 53% at Indian Gardens. The average dbh of the affected Douglas-fir was 26 cm, and both plots had an average topkill of 0.4 m.

Male adult populations were monitored in eight undefoliated stands outside of major outbreak areas from August Lake near Princeton to Mission Pass west of Lillooet (Table 7). At each location 15 traps were set out, five baited with 0.1% concentration, five with 0.01% and five with 0.001% of the pheromone consisting of 96% trans-11-tetradecenal and 4% cis-11-tetradecenal. The average number of adults attracted into the traps with the weakest concentration ranged from 0-52, average 16; catches using .01% pheromone concentration ranged from 1-58, average 30; and those with 0.1% concentration ranged from 1-88, average 47. The trend was consistent in numbers of moths caught at locations trapped in 1982 and 1983, which indicates an increasing population.

TABLE 7. Location and number of western spruce budworm male adults trapped in pheromone-baited traps, Kamloops Forest Region, 1981-83.

Location	Average number of male adults per trap								
	0.1%			0.01%			0.001%		
	1983	1982	1981	1983	1982	1981	1983	1982	1981
Botanie Valley Rd. Km 7.2	88	61	51	58	79	32	16	21	5
Fountain Valley	35	32	-	42	56	-	40	68	-
Marshall Creek	70	55	-	68	55	-	52	26	-
Mission Pass (Carpenter Lk.)	69	59	-	57	45	-	17	39	-
Burton Creek (Adams Lake)	1	16	-	1	5	-	1	1	-
August Lake (Princeton)	36	59	69	13	13	24	0	1	4
Spius Creek (Merritt)	32	19	55	1	2	10	0	1	1
Scotch Creek Rd. 1 Km	48	30	54	2	8	11	1	0	0

Egg masses were sampled at 10 locations adjacent to currently infested stands from Indian Gardens to Marshall Creek, and the data used to predict population trends in 1984 (Table 8). Two 45 cm branch tips were clipped from the mid-crown of each of 10 trees per location. The counts were extrapolated to the number of egg masses per 10 m<sup>2</sup> of foliage area. Number of masses varied from 8 per 10m<sup>2</sup> at Mission Pass to 405 per 10m<sup>2</sup> at Pimainus Ridge. Based on predetermined criteria, all locations sampled will sustain light to severe defoliation in 1984, precluding adverse climatic conditions. There will be a small increase in area and a substantial increase in defoliation.

To determine parasitism, 400 larvae were collected at 13 locations throughout the infested area from Kamloops to Spences Bridge and reared at PFRC (Tables 9 & 10). Additional collections were made at six locations to compare the rates of parasitism in II (early) and VI (late) instars (Table 10).

TABLE 8. Location and average number of Western spruce budworm egg masses and predicted defoliation\* in 1984, Kamloops Forest Region, 1983.

Location	Average number egg masses/10 m <sup>2</sup> of foliage/plot	Predicted 1984 Defoliation
Indian Gardens	42	light
Spatsum Cr.	108	moderate
Oregon Jack Cr.	360	severe
Pimainus Ridge #1	80	moderate
Pimainus Ridge #2	405	severe
Marshall Cr.	44	light
Mission Pass	8	light
Barnes Lake	45	light
Pavilion	177	severe
Copper Cr.	105	moderate
Scottie Cr.	275	severe

\* 1 to 50 egg masses/10m<sup>2</sup> - light defoliation  
 51 to 150 egg masses/10 m<sup>2</sup> - moderate defoliation  
 151+ egg masses/10 m<sup>2</sup> - severe defoliation

TABLE 9. Location and results of western spruce budworm rearings for parasites, Kamloops Forest Region, 1983.

Location	Avg. Percent Parasitism		Total
	Hymenoptera <sup>1</sup>	Diptera <sup>2</sup>	
Soap Lake	12	0	12
E. Bonaparte	6	2	8
Scottie Creek	8	1	8
Iron Mask Hill	10	0	10
Campbell Hill	9	3	12
Sabiston Creek	25	1	26
Beaton Lake (Savona)	8	7	15

<sup>1</sup>These parasites were Glypta sp.; Apanteles spp.  
<sup>2</sup>No identification to species.

TABLE 10. Location and average percent parasitism in early and late<sup>1</sup> instar larvae, Kamloops Forest Region, 1983.

Location	Avg. Percent Parasitism		
	Hymenoptera <sup>2</sup>	Diptera	Total
Separating Lake	Early: 9	0	9
	Late : 27	0	27
Oregon Jack Cr.	Early: 16	8	24
	Late : 42	7	49
Veasey Lake	Early: 12	1	13
	Late : 46	1	46
Barnard Creek	Early: 10	1	11
	Late : 20	1	20
Indian Gardens	Early: 11	0	11
	Late : 10	0	10
Hat Creek	Early: 9	0	9
	Late : 33	1	33

<sup>1</sup>Early instar larvae were mostly II collected June 11 and late instar larvae were mostly VI collected June 22.

<sup>2</sup>These parasites were Glypta sp. and Apanteles spp.

The overall average percent parasitism was 18%, (range 8-26%) which included 13% by the hymenopterous parasites Glypta fumiferanae and Apanteles fumiferanae and 5% by dipterous parasites. Two collections were infected by Beauvaria spp., a fungus which affected 4% of the larvae/pupae. The average rate of 18% parasitism will not be enough, by itself, to reduce the populations. The late instar collections were not included in this calculation to avoid sampling bias, because some pupation had already occurred when the larvae were collected.

Near Barnes Lake east of Ashcroft, PFRS and FPMI began a cooperative project in 1982 to compare the effects of aerially applied nuclear polyhedrosis virus (NPV) and granulosis virus (GV) on western spruce budworm. The greatest impact was in 1982 when the virus was applied. NPV had a larger initial impact than GV with 52% population reduction compared to 35%. There were no additional applications in 1983, however there was a 34% population reduction from NPV carry-over, compared to 15% for GV.

Western false hemlock looper, Nepytia freemani

The area of Douglas-fir stands defoliated by this insect, in the Chase-Salmon Arm area, decreased to 250 ha from 1 150 ha in 1982 (Table 11), in the third year of infestation.

Larval populations developed normally until about the IV instar when a nuclear polyhedrosis virus (NPV) killed 75% of them. This occurred after the major period of feeding and resulted in light to moderate localized defoliation.

TABLE 11. Location, area and intensity of defoliation of Douglas-fir stands by western false hemlock looper, as determined by aerial survey, Kamloops Forest Region, 1983.

Location	Area (ha) and Intensity of Defoliation				
	Light	Moderate	Severe	Grey	Total
Tappen	-	13	-	-	13
Sunnybrae	-	-	25	25	50
Blind Bay	-	12	-	-	12
Salmon Arm	80	-	-	-	80
Squilax	30	-	-	-	30
Scotch Cr.	40	25	-	-	65
TOTAL	150	50	25	25	250

Defoliation intensities varied in six infestation areas, from severe (more than 65% defoliation) over 25 ha; to moderate (26-65%) over 50 ha, and light (less than 25%) over 150 ha.

Because of the high rate of NPV infection in larval populations, there will be few loopers and no defoliation in 1984.

A previous infestation in the same area began in 1971, lasted six years with maximum defoliation of 5 600 ha in 1974.

Based on limited surveys of previous infestations, increment loss is the main impact of successive years of defoliation. Mature trees can be susceptible to Douglas-fir beetle, Dendroctonus pseudotsugae attack, but none were evident in affected areas in 1983.

Douglas-fir beetle, Dendroctonus pseudotsugae

Single or small groups of 2-5 Douglas-fir trees killed by the beetle, were widely scattered throughout the host range. There has been a decline in number of dead trees recorded during aerial surveys from 2 915 trees in 1978, to 700 in 1981, to 30 in 1982 and 1983. This scattered mortality is often associated with root rots such as Armillaria mellea reflects Douglas-fir beetle in an endemic state.

The beetle attacked mature Douglas-fir which were severely defoliated by Douglas-fir tussock moth in several areas of the outbreak (see tussock moth, page 11). There could be more trees attacked in 1984 as an increased population will be emerging in the spring of 1984.

Douglas-fir needle midge, Contarinia pseudotsugae

Needle mining and discoloration of current foliage in regeneration<sub>2</sub> and intermediate Douglas-fir was common over approximately 10 km<sup>2</sup> between Kelowna and Penticton. The foliage of scattered individuals and small groups of trees was 20% infested, which resulted in premature needle loss. The damage is mainly of concern when it is on ornamentals and other trees in urban areas.

The most recent severe damage was in 1974 at Shuttleworth Creek east of Okanagan Falls where 90% of the needles of Douglas-fir in the area were infested.

Armillaria root rot, Armillaria mellea

Single and small groups of immature to overmature Douglas-fir were infected and killed throughout much of the host range in the Shuswap, Adams Lake and North Thompson River areas. The highest incidence of mortality was near Stump Lake where 12-20 m high Douglas-fir, 20-30 cm dbh were evident in 5 ha centres. Scattered 0.5 to 1 ha pockets were also common along the west side of Adams Lake from the south end, north to Brennan Creek.

## SPRUCE PESTS

Spruce beetle, Dendroctonus rufipennis

There was a fourfold increase to 300 ha of light mortality of Engelmann spruce in 1983, from near Blue River to Anderson Lake west of Lillooet.

The largest infestation covered 238 ha of mature Engelmann spruce at Connel Creek, west of Anderson Lake and was associated with very light, scattered blowdown. However, the majority of the recently beetle killed trees were distant from it. Other infestations in the

North Thompson area were smaller and usually adjacent to logging operations. At Chappell Creek, north of Blue River approximately 60 ha of Engelmann spruce were killed. Two other smaller 1 ha pockets were located along the West Raft River and along the North Thompson River above Adolph Creek.

Ground surveys of spruce beetle infestations were not conducted, however predictions of infestations and trends based on local infestation histories indicates a potential for outbreaks depending on host availability.

Attention to right-of-way slash, prompt removal of blowdown and use of trap trees in new harvesting areas have become standard practice for the forest industry in the Kamloops Forest Region. Successful pest management techniques such as these have contributed to the low level of spruce beetle activity in the Region, since the last major infestation from 1971 to 1973.

#### Spruce gall aphid, Adelges cooleyi

Throughout the Kamloops Region, the warmest winter in 25 years\* contributed to many pest problems, one of which was spruce gall aphid. Populations proliferated damaging up to 50% of the current growth of Engelmann spruce regeneration in 1-5 ha patches in the Jamieson Creek drainage north of Kamloops. When these galls mature and brown in 1984 the extent of the damage will be more visible.

#### Spruce weevil, Pissodes strobi

Mortality of Engelmann spruce leaders was common at low attack levels, throughout the host range in the Kamloops Region. Along O'Connor Lake Road north of Kamloops, approximately 4% of the leaders of spruce regeneration up to five metres in height were currently attacked in 0.5 to 2 ha patches, the highest incidence recorded in 1983. Elsewhere at 10 locations examined, mortality was 0-3% in smaller areas.

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

There was no apparent defoliation of Engelmann spruce or alpine fir stands in the Region in 1983. However, an average of 15 II instar larvae were collected in two three-tree beating samples at Lempriere Creek north of Blue River; light to moderate defoliation occurred there in 1976, 1978 and 1980.

\*Atmospheric Environment Service Monthly Meteorological Summary

Pheromone-baited moth traps attracted an average of less than one moth per trap at Lempriere Creek, indicating a small population. However, based on the larval beating data and that 1983 was not a flight year for moths, some trace defoliation could occur in localized stands in 1984.

Black army cutworm, Actebia fennica

A 15 ha plantation near Adolph Creek in the North Thompson River Valley, logged and burned in 1981 and infested in 1982, was re-infested in the spring of 1983. Up to 60% of the Engelmann spruce seedlings were severely defoliated in parts of the logged area devoid of preferred herbaceous<sub>2</sub> vegetation. An average of 15 pupae were collected per 1 000 cm<sup>2</sup> of duff and five pheromone baited traps caught an average of three adults per trap. Based on pupal and adult numbers a small population may persist in the area in 1984, however damage to the seedlings will be reduced by an increase in herbaceous ground cover.

ALPINE FIR PESTS

Western balsam bark beetle, Dryocoetes confusus

There were 3 650 recently killed mature alpine fir (2 750 m<sup>3</sup>) observed in widely scattered high elevation stands during aerial surveys (Table 13), about the same as recorded in 1982. However, the trees were scattered over a slightly smaller area, 2 175 ha, compared to 3 085 ha in 1982.

Tree mortality was concentrated in four major areas: near Bridge River in the Lillooet TSA and in Perry, Blais and Bolean creeks in the Okanagan TSA, ranging in size from 48 ha to 1 200 ha.

TABLE 13. Location, area, number and volume of alpine fir recently killed by western balsam bark beetle, determined from aerial surveys, Kamloops Forest Region, 1983.

TSA and Location	Area (ha)	Number of trees killed	Total volume of trees killed
<u>LILLOOET TSA</u>			
Bridge River	127	450	200
<u>OKANAGAN TSA</u>			
Perry Creek	1 200	2 000	1 600
Blais Creek	800	1 000	800
Bolean Creek	48	200	150
TOTAL	2 048	3 200	2 550
<u>SUMMARY</u>			
LILLOOET TSA	127	450	200
OKANAGAN TSA	2 048	3 200	2 550
TOTAL	2 175	3 650	2 750



Tree mortality has occurred at fluctuating levels throughout much of the mature host range in the Region for the last decade. Between 1971 and 1975, 17 600 m<sup>3</sup> of alpine fir were killed (15 975 trees). In 1976 mortality occurred over 2 050 ha, increasing to 9 500 ha in 1977 and 1978 before declining to 2 340 ha in 1979. In 1980 alpine fir mortality was not recorded and in 1981, 3 720 ha were mapped. Ground surveys were not conducted in 1983 so predictions of mortality in 1984 are not available, but based on the history of chronically infected stands in the Region, tree mortality is expected to continue.

Fir-fireweed rust, Pucciniastrum epilobii

This foliage rust moderately infected the current year's needles at widespread locations throughout the Kamloops Forest Region.

At Gorman Lake near Bonaparte Lake, 30% of the 1983 foliage on 100% of the alpine fir regeneration up to 4 m high was infected in 20 ha patches. Unconfirmed reports also indicated infected natural regeneration in cut blocks at Van Horlick Creek in the Lillooet TSA.

HEMLOCK PESTS

Western hemlock looper, Lambdina f. lugubrosa

Moderate and severe defoliation of western hemlock and western red cedar was mapped over 4 450 ha in wetbelt forests on the eastern boundary of the Region, the first outbreak since 1973. Severely defoliated stands were recorded in Scotch Creek over 3 200 ha; Humamilt Lake, 800 ha and moderate defoliation at Myoff Creek northeast of Adams Lake over 400 ha. Moderate defoliation also occurred over 50 ha at Whip Creek near Mabel Lake. Previous outbreaks were in 1946 and 1976 when 23 800 ha and 10 500 ha respectively were lightly to severely defoliated in the Clearwater Lake area.

Burlap pupal traps were placed around the bole of 11 hemlock and cedar trees at Scotch Creek and collected approximately 800 pupae for parasite rearing. The pupae were 27% parasitized by Dipterous insects and 3% by Hymenopterous insects.

Lichens were collected from hemlock and cedar trees at Scotch Creek, Whip Creek and Greenbush Lake to determine the number of overwintering eggs and predict population levels for 1984. Using established criteria, the results of egg washing indicate light defoliation at Scotch and Whip creeks and none at Greenbush Lake in 1984.

## LARCH PESTS

Larch casebearer, Coleophora laricella

Western larch stands in the Region were not affected by the casebearer for the second year. Previously, light to moderate defoliation had occurred from 1976-81 in the Cherryville area, Shuttleworth Creek Valley east of Okanagan Falls and near Anarchist Summit, east of Osoyoos.

Based on pupal rearing data, the decline in intensity and extent of defoliation, particularly at Shuttleworth Creek and Anarchist Mountain has been attributed to introduced and native parasites, including Di cladocerus sp., Chrysocharis sp., and Mesopolobus sp.

Five pheromone baited traps, located for the first time at Anarchist Mountain and Shuttleworth Creek, did not attract any adults. Little increase is expected in 1984 but population assessment will continue.

## CONE AND SEED PESTS

Cone crops were moderate to heavy on Douglas-fir and Engelmann spruce in much of the Region and moderate for most other species.

Cone and seed pests were assessed from 50 cone samples at six locations (Table 14).

TABLE 14. Host, location and percentage of cones infested by major cone and seed pests, Kamloops Forest Region, 1983.

Host	Location	Percent cones infested			
		<u>B. colfaxiana</u>			
		<u>D. abietivorella</u>			
		<u>H. anthracina</u>			
		<u>C. youngana</u>			
		<u>Contarinia</u>			
Douglas-fir	Slok Creek	35			
	Campbell Creek	10			5
	Carquile	15	5		
Engelmann Spruce	Gorman Lake		35		
	Logan Lake		negative		
	Paxton Valley	20	25	30	

The Douglas-fir cone moth Barbara colfaxiana, the coneworm Dioryctria abietivorella and a cone midge Contarinia sp. infested 25% of the Douglas-fir cones from three locations.

A spruce cone maggot Hylemya anthracina, a cone seedworm Cydia youngana and a midge Dasineura sp. infested 33% of the Engelmann spruce cones from three locations.

#### FOREST PESTS IN PROVINCIAL PARKS

Six major insect pests and two major diseases were identified in 14 of 43 provincial parks in six regional park districts during the FIDS annual park survey.

Mountain pine beetle, Dendroctonus ponderosae, outbreaks persisted in four mature pine stands adjacent to Gun Lake, East Gate Manning Park, Buckhorn Campsite and Cathedral Park.

There was an increase in Douglas-fir tussock moth, Orgyia pseudotsugata, defoliation; light in Niskonlith Lake Recreational Area, moderate in Monte Lake Park and severe in Ellison Park. In 1984, populations are expected to decrease because of infection by nuclear polyhedrosis virus, NPV.

Western spruce budworm, Choristoneura occidentalis

The budworm lightly defoliated Douglas-fir stands in Marble Canyon and was found in small numbers, 1-5 in three-tree beating samples at Seton Portage. Budworm populations increased dramatically on non-park lands in 1983 and based on egg sampling will expand in 1984; intensifying on some park lands in the Spences Bridge-Loon Creek area.

Western hemlock looper, Lambdina f. lugubrosa was common in small numbers (1-5/beating sample) in Wells Gray Park but did not cause any defoliation. Numbers of larvae also increased elsewhere in the Region indicating expansion into Wells Gray Park is possible.

Western false hemlock looper, Nepytia freemani severely defoliated immature Douglas-fir at Shuswap Lake Park. The infestation collapsed in late summer, 1983, due to a nuclear polyhedrosis virus (NPV).

Red band needle blight, Dothistroma pini severely discolored lodgepole and western white pine in Wells Gray Park.

Dwarf mistletoe, Arceuthobium americanum continued to cause severe branch flagging and brooming on mature lodgepole pine at Lac Le Jeune Park.

Adult gypsy moths were not attracted to any of the single pheromone baited traps in 13 parks in the Region, in an annual program to monitor the potential introduction of this damaging pest into British Columbia.

#### DECIDUOUS PESTS

##### Fall webworm, Hyphantria cunea

Light to severe defoliation of western chokecherry, poplar, willow, saskatoon and other deciduous shrubs was widespread in the Okanagan-Shuswap and the Thompson and Fraser river drainages. Defoliation intensity ranged from 10-100% resulting in unsightly roadside shrubs but causing little permanent damage. It will probably continue in 1984, since damage has been reported in Kamloops Forest Region yearly for 30 of the last 37 years.

##### Gypsy moth, Lymantria dispar

A pheromone baited trap program to monitor adult male populations continued for the eighth year in co-operation with Plant Quarantine, Agriculture Canada. However, none were attracted to any of the single traps located in 15 provincial parks and campgrounds throughout the Region. However 37 moths were collected in the Lower Mainland and Vancouver Island, an increase of 28 adults from 1982.

Trapping programs will continue in the Region in 1984 to monitor the possible introduction of this destructive hardwood pest.

##### Satin moth, Leucoma salicis

One to 10 ha sized aspen and poplar clones were severely defoliated by the satin moth between Kamloops and Hedley for the first time since 1977. Defoliation was between 70 and 100% in the Thyme Lake and Coalmount areas north of Princeton and west of Stump Lake. A 30 ha stand was 80% defoliated along the Nickleplate Mine Road, northeast of Hedley.

Defoliation probably will continue in 1984, based only on the size and vigor of the population in 1983.

##### Alder flea beetle, Altica sp.

Chokecherry and other deciduous shrubs were moderately to severely defoliated over 2 ha at Okanagan Falls Provincial Park. The damage slightly affected the aesthetic value of the campsite which could affect the use of the area.

Localized infestations with some light mortality of deciduous trees and shrubs have been reported frequently in the Kamloops Region since 1932, and are expected to continue in 1984.

Birch leaf miner, Lyonetia sp.

Discoloration of birch stands in the Skwaam Bay - Louie Creek area west of Adams Lake, occurred for the third consecutive year. All of the trees were 80% discolored in the widespread infestation. The discoloration, caused by larval feeding between the upper and lower leaf surfaces, is highly visible but has no apparent affect on tree growth or form.

Canada

Environment Canada  
Canadian Forestry Service  
Pacific Forest Research Centre  
506 West Burnside Road  
Victoria, B.C., V8Z 1M5  
(604) 388-3811

1984