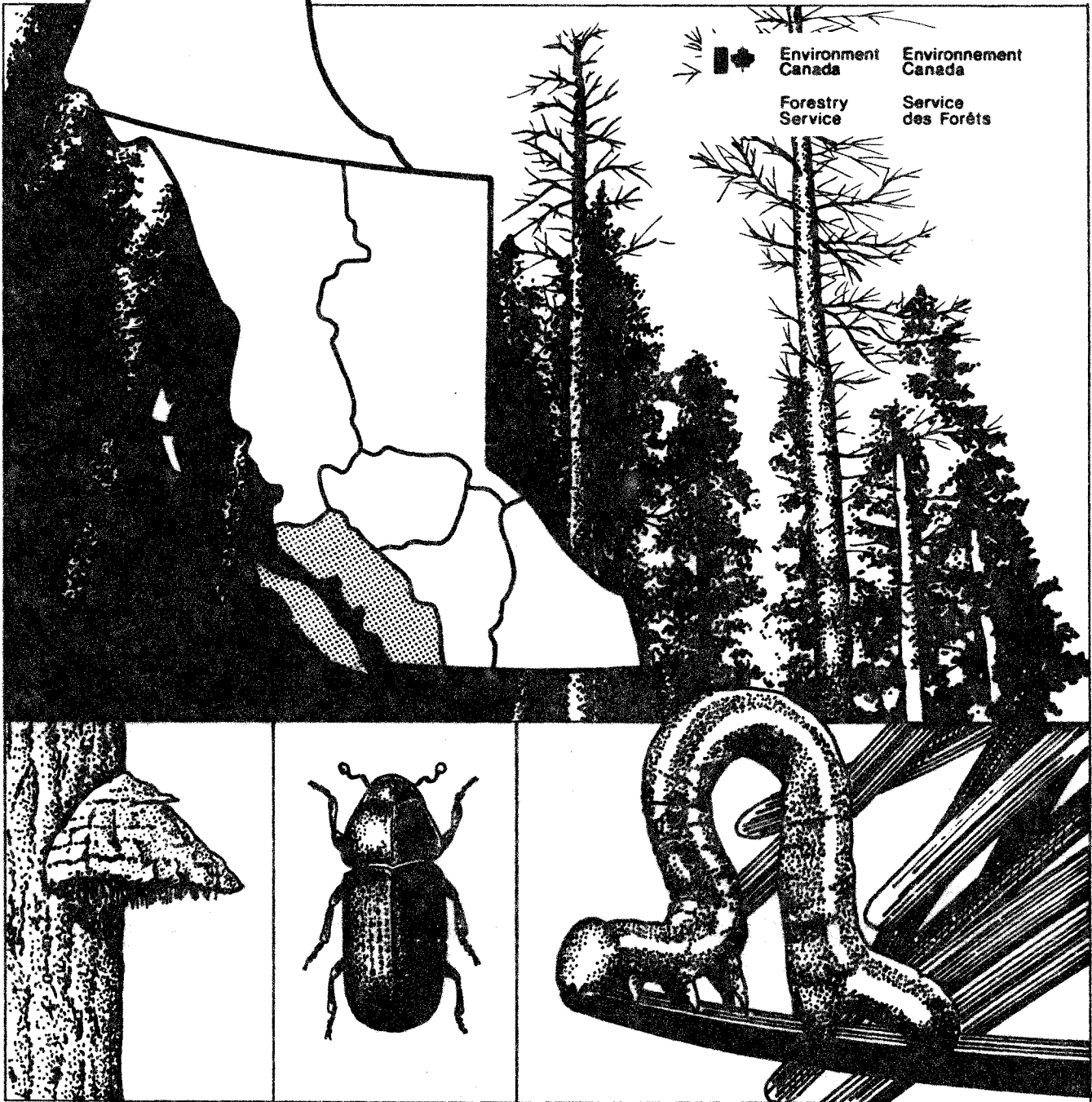



Forest Insect & Disease Conditions 1979

VANCOUVER FOREST REGION / E. V. MORRIS, R. O. WOOD



 Environment Canada / Environnement Canada
Forestry Service / Service des Forêts

SUMMARY

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

Regular field work in the Region commenced on May 14 and ended on October 24. Time expended on special surveys was as follows: 42 flying hours on aerial surveys in July, August and September (Map 1); 3 weeks on western spruce budworm egg and defoliation surveys in September; spruce budworm top-kill surveys in Douglas-fir stands at 37 localities during regular surveys and two weeks on winter moth for parasitism studies and defoliation mapping in May and June.

A total of 450 insect and disease collections from the Region were submitted to the Pacific Forest Research Centre. Map 2 shows regions and general locations of field collection points.

The number of collections containing larvae on Vancouver Island decreased from 80% in 1978 to 51% in 1979; on the Vancouver mainland there was a decrease from 68% in 1978 to 60% in 1979. These figures represent the lowest number of collections containing larvae since 1971.

Western spruce budworm infestations, primarily in Douglas-fir stands, showed a further decrease in areas of visible defoliation in 1979, although there was an increase in the area of heavy defoliation. Mountain pine beetle infestations collapsed in the Klinaklini River Valley where extensive tree mortality in lodgepole pine stands has occurred for the past several years. Conifer sawflies caused defoliation to amabilis fir and western hemlock near Keta Lake and Big Tree Creek on Vancouver Island. Winter moth larvae again defoliated deciduous trees in the Greater Victoria area.

Parch blight damage to coniferous trees was common in the Fraser Valley, Lower Mainland and southern Vancouver Island. Discoloration of broadleaf maple foliage was again widespread on Vancouver Island and the mainland.

Details on individual insect and disease problems appear under host tree in subsequent sections.

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1/ Appendix available from Pacific Forest Research Centre.

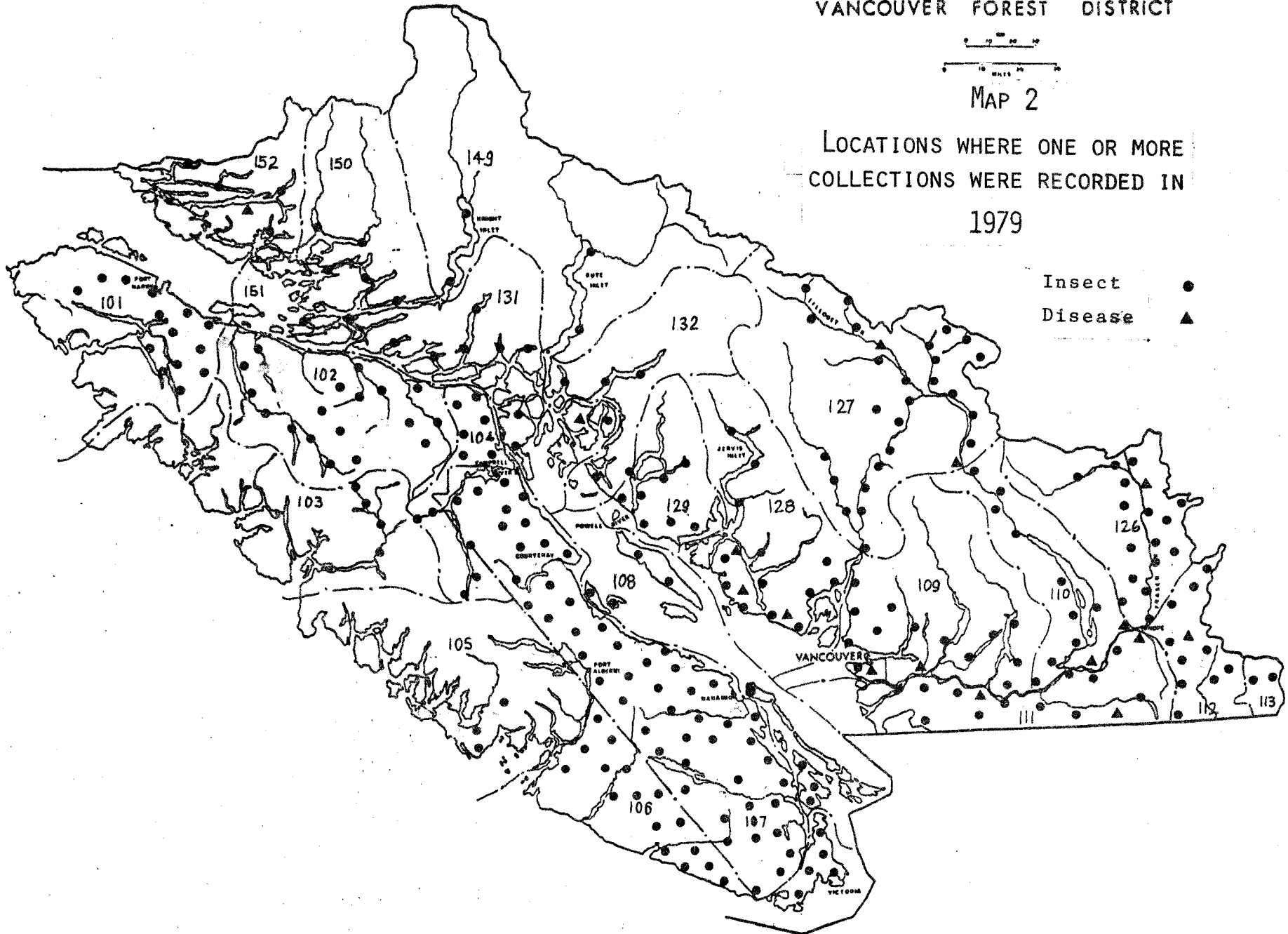
VANCOUVER FOREST DISTRICT



MAP 2

LOCATIONS WHERE ONE OR MORE
COLLECTIONS WERE RECORDED IN
1979

Insect ●
Disease ▲



DOUGLAS-FIR PESTS

Western spruce budworm, Choristoneura occidentalis

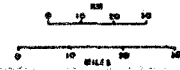
Defoliation of Douglas-fir stands occurred on a total of 19 800 ha in 1979 compared with 25 200 ha in 1978; a decrease of 5 400 ha. Heavy defoliation occurred along the Coquihalla and Skagit rivers and tributary valleys, Siwash Creek and near Keefers in the Fraser Canyon. Patches of light and moderate defoliation occurred along the east side of the Fraser River and tributary valleys from Yale to Boston Bar. Very little current defoliation was recorded west of the Fraser River (Map 3). The infestation in the Pemberton - Lillooet River collapsed with no current defoliation being recorded in 1979.

For a preliminary evaluation of the infestation, one-hundred buds were examined on Douglas-fir trees at each of 22 locations in infestation areas in the latter part of May. Generally it was found that the numbers of infested buds were down compared with the 1978 counts (Table 1).

Photograph available from
Pacific Forest Research Centre

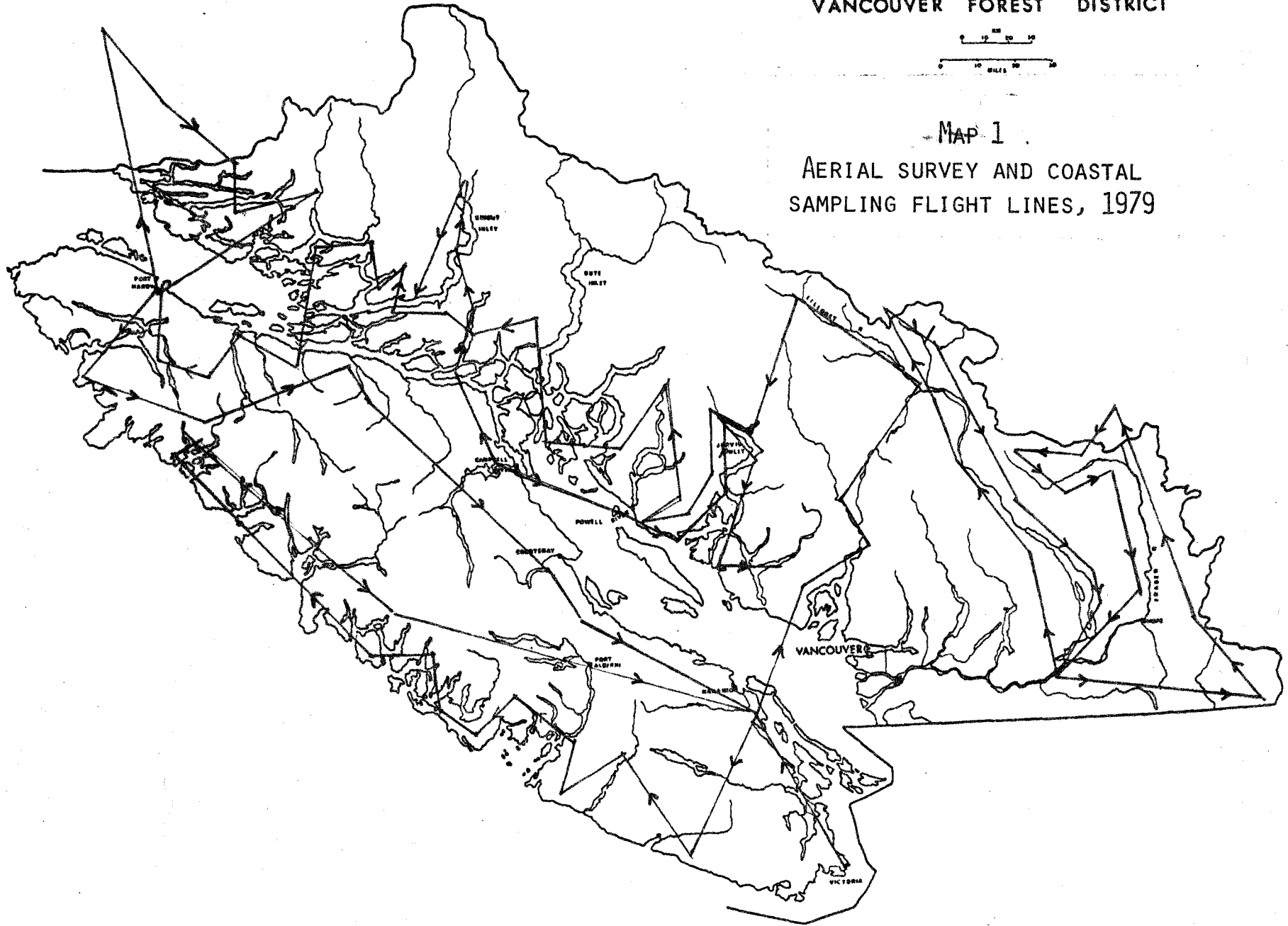
Heavy spruce budworm defoliation
Siwash Creek 1979

VANCOUVER FOREST DISTRICT




MAP 1

AERIAL SURVEY AND COASTAL SAMPLING FLIGHT LINES, 1979



MAP 3
WESTERN SPRUCE BUDMORM DEFOLIATION
OF DOUGLAS-FIR
VANCOUVER FOREST REGION
1979

Areas of defoliation 

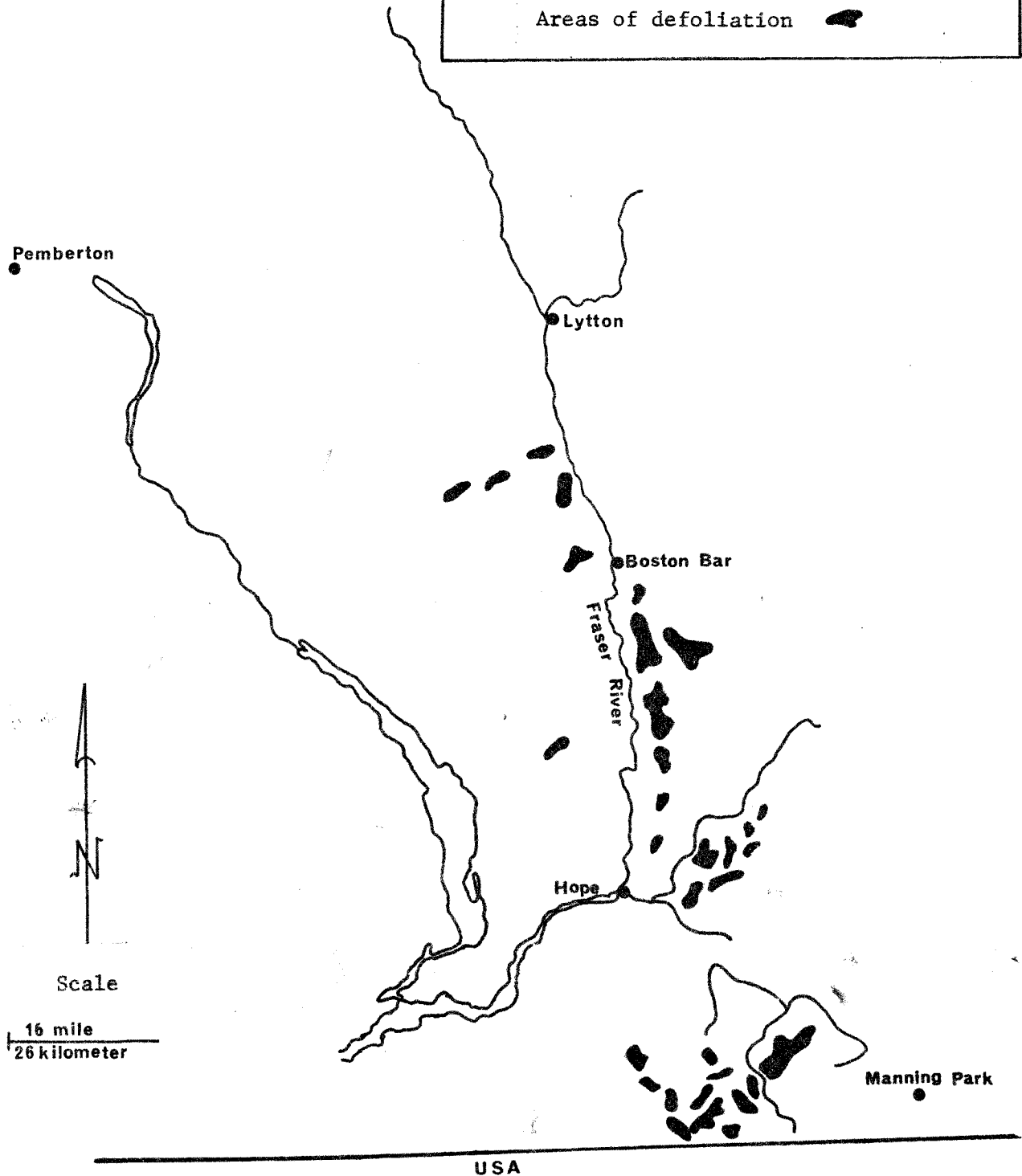


Table 1. Percentage of Douglas-fir buds infested with spruce budworm, Vancouver Mainland Section in 1979 with 1977-1978 printed for comparison

Locality	Percentage of buds infested			1979 defoliation
	1977	1978	1979	
<u>Fraser Canyon Area</u>				
Kookipi Creek	43	20	4	trace
Log Creek	47	23	5	trace
Nahatlatch River	16	10	0	nil
North Bend	14	4	0	nil
Mowhokam Creek	-	7	8	light
Anderson River	50	14	7	light
Gilt Creek	-	15	8	moderate
Spuzzum Creek	26	6	1	nil
Sawmill Creek		5	9	trace
<u>Hope-Princeton Hwy.</u>				
Sumallo River	31	0	1	trace
Rhododendron Flats	40	3	10	moderate
Snass Creek		3	10	moderate
<u>Coquihalla River</u>				
Boston Bar Creek	21	16	14	moderate
<u>Silver Skagit Area</u>				
Silver-Skagit Road (km 45)	17	20	7	light
Shawatum Creek	30	28	12	moderate
<u>Pemberton Area</u>				
Rutherford Creek	25	3	0	nil
Owl Creek	16	8	0	nil
Birkenhead Lake	30	6	1	trace
Haylmore Creek	-	5	1	trace
Twin One Creek	25	4	1	nil
Roger Creek	10	3	1	nil
Joffre Creek		3	0	nil

The number of larvae taken in 3-tree beating samples from Douglas-fir increased slightly, but the per cent positive collections decreased. Figure 1 shows a rise in budworm larval populations for the years 1952-58. During this period moderate to heavy defoliation occurred annually in the Lillooet Lake-Pemberton area peaking in 1957 with more than 12 000 ha being defoliated. In 1959 populations of budworm collapsed and from then until 1970 fluctuated annually with no defoliation recorded. From 1970 to 1979 populations again increased as did the areas of defoliation, peaking in 1977 at 90 000 ha and declining to 19 800 ha in 1979. Table 2 shows a summary of beating collection from Douglas-fir.

FIGURE 1
POPULATION FLUCTUATIONS OF WESTERN SPRUCE BUDWORM
VANCOUVER FOREST REGION

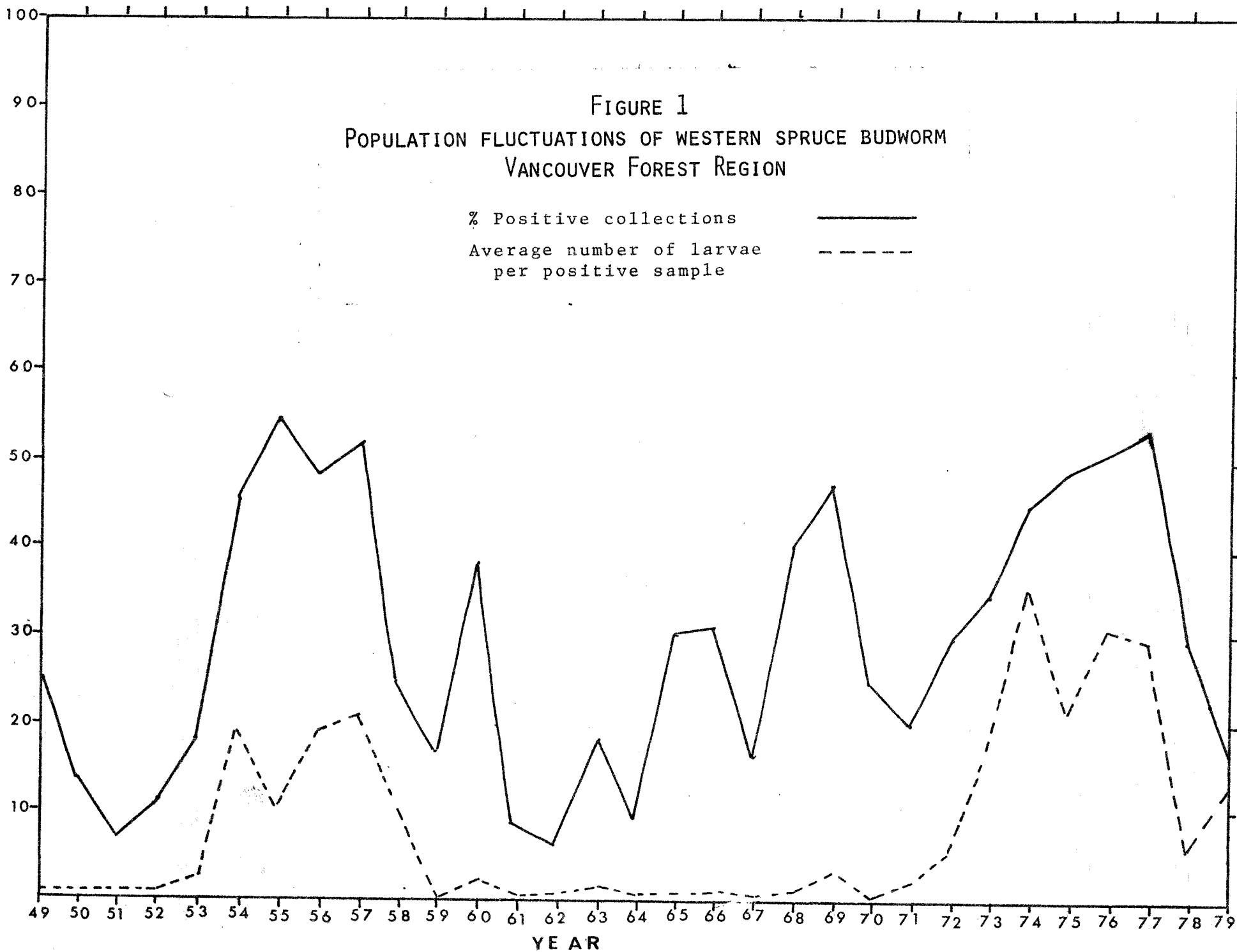


Table 2. Summary of spruce budworm beating collections from Douglas-fir Vancouver Forest Region, 1977-79

Region*	No. samples take during larval period			% samples containing larvae			Avg. no. larvae per positive sample			Avg. no larvae per sample		
	1977	1978	1979	1977	1978	1979	1977	1978	1979	1977	1978	1979
104	9	5	7	22	0	0	1	0	0	1	0	0
107	42	16	20	12	0	0	1	0	0	1	0	0
109	3	4	4	0	0	0	0	0	0	0	0	0
110	3	2	2	0	0	0	0	0	0	0	0	0
111	4	8	5	0	0	20	0	0	1	0	0	0
112	4	6	4	100	83	75	118	29	23	118	24	18
113	-	-	-	-	-	-	-	-	-	-	-	-
126	6	10	6	75	60	17	26	7	7	19	4	1
127	11	19	11	78	72	9	47	1	3	37	1	1
133	2	3	2	100	66	0	38	3	0	38	2	0

* See map 1

Parasitism and disease studies were done at five locations within the infestation to study the affects on budworm population levels. The plots were sampled at Skagit and Coquihalla rivers and Fraser Canyon. The results of these studies are shown in Tables 3 and 4. Spruce budworm parasites did not appear to have an impact on reducing budworm population levels at these localities.

Table 3. Percent parasitism of western spruce budworm reared in 1979 Vancouver Mainland Section

Location	Total budworm		% actual parasitism			overall % parasitism	
	collected	Reared	L3+L4	L5+L6	pupae	larvae	larvae and pupae
Skagit River	207	86	9	22	33	37	58
Rhododendron Flats	128	58	2	-	-	-	-
Hope slide	41	29	3	-	-	-	-
Gilt Creek	145	61	8	4	0	12	13

Table 4. Assessment of micro-organisms within western spruce budworm populations 1979, Vancouver Mainland Section.

Location	Date collected	No. of larvae	% infested	Remarks
Silver-Skagit	6-VII-79	25	12	<u>Beauveria</u> fungus
Rhododendron Flats	4-VII-79	25	58	<u>Beauveria</u> fungus
Boston Bar Creek	5-VII-79	25	24	<u>Entomophthera</u> fungus
Gilt Creek	5-VII-79	25	24	<u>Beauveria</u> fungus

Despite parasitism levels up to 58%, the egg survey in September indicated heavy defoliation at Rhododendron Flats, moderate at Gilt Creek and light at Silver Skagit and Boston Bar Creek in 1980.

Aerial surveys were done in August to map areas of current budworm defoliation and grey areas where top-kill and tree mortality has occurred. Current defoliation was classified as follows: 5 200 ha of heavy defoliation 11 500 ha moderate and 3 100 ha light (see Figure 2). A total of 5 700 ha were mapped where grey tops and tree mortality has occurred and were classified as follows: light (up to 10 percent top-kill and tree mortality) moderate (11-30 percent) and heavy (31+ percent). The highest concentration of gray areas was in the Fraser Canyon and tributary valleys from north of Yale to Boston Bar and Hope-Princeton Highway (Table 5). Ground surveys done in ten grey areas in the Fraser Canyon showed on average that 60 per cent of the Douglas-fir trees had top-kill and that 25 percent of the trees were dead from budworm feeding or a combination of budworm feeding and Douglas-fir beetle on the larger trees.

FIGURE 2
WESTERN SPRUCE BUDWORM DEFOLIATION
VANCOUVER FOREST REGION
1971 - 1979

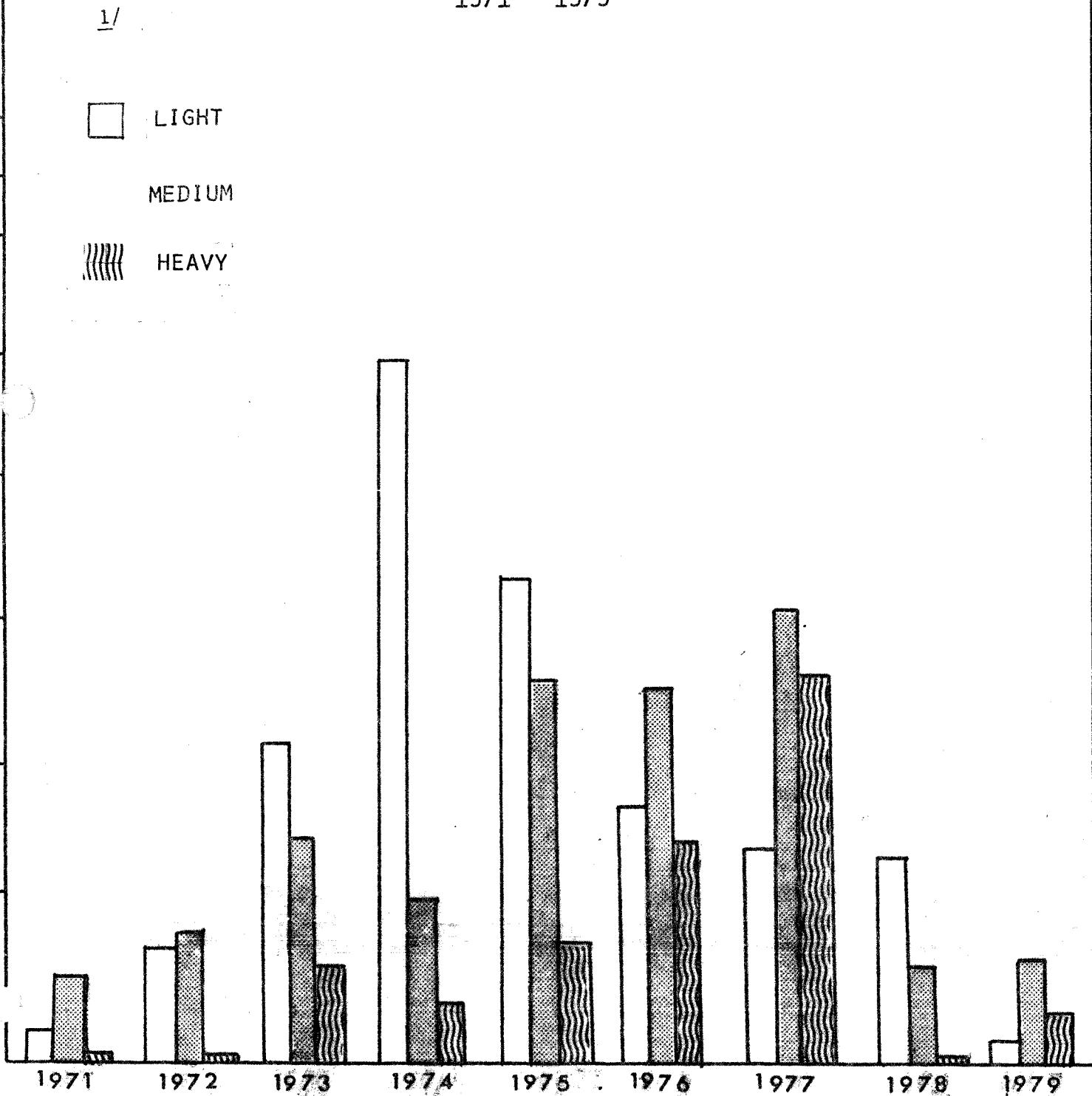


Table 5. Areas of spruce budworm defoliation and grey areas in Douglas-fir stands Vancouver Forest Region 1979.

Location	No. hectares defoliated			No. hectares of "grey areas" ^{1/}		
	Light	Moderate	Heavy	Light	Moderate	Heavy
Silver-Skagit	2112	2496	128	0	0	0
Hope-Princeton Hwy.	320	2688	1728	0	448	320
Coquihalla River	0	640	2560	0	0	0
Fraser Canyon (Hope to Keefers)	128	3200	768	384	1296	512
Nahatlatch Lake	448	448	0	0	0	0
Anderson River Drainage	128	1920	0	0	640	0
Lillooet Lake	0	128	0	0	0	0
Anderson Lake	0	0	0	0	640	0
D'Arcy	0	0	0	320	0	0
Birkenhead Lake	0	0	0	320	0	0
Upper Lillooet River	0	0	0	320	0	0
Salal Creek (Abies sp.)	0	0	0	512	0	0
Totals	3136	11520	5184	1856	3024	832
<u>Grand totals</u>		<u>19840 ha</u>			<u>5712 ha</u>	

^{1/} See text for description of classes.

The criterion used to classify the three defoliation categories from the air was as follows: light, discolored foliage barely visible from the air, some branch tip and upper crown defoliation; moderate, pronounced discoloration, noticeably thin foliage, top third of many trees severely defoliated, some completely stripped; heavy, bare branch tips and completely defoliated tops, most trees more than 50 percent defoliated.

An assessment of the egg population was made in September by counting egg masses on two 50 cm branches from the mid-crown of each of 10 Douglas-fir trees at each of 23 locations. The prediction for 1980 defoliation is based on the criterion that up to 50 egg masses per 10 m² of foliage could result in light defoliation; from 50 to 150 egg masses in moderate defoliation and more than 150 egg masses in heavy defoliation.

Spruce budworm eggs were present at 16 of the sample plots (Table 6). The highest number of eggs were found in the Coquihalla and Skagit river areas which could result in moderate to heavy defoliation occurring in these areas in 1980. Lower numbers of eggs were found along the east side of the Fraser River from Yale to north of Boston Bar which

could result in patches of light to moderate defoliation. The only area where eggs were found west of the Fraser River was near Keefers where moderate defoliation could occur in 1980. Egg surveys in the Pemberton area showed no eggs present.

Defoliation estimates taken on 10 trees at each egg sample plot showed that the heaviest defoliation occurred at Skaist Creek, Coquihalla River, Siwash Creek and Rhododendron Flats (Table 6).

Table 6. Spruce budworm egg masses and defoliation estimates on Douglas-fir, Vancouver Forest Region, 1979

Location	Avg. no egg masses per 10 m ² of foliage			Estimated loss of current year's foliage %			Estimated total defoliation %			Predicted defoliation for 1980
	1977	1978	1979	1977	1978	1979	1977	1978	1979	
<u>West of Fraser River</u>										
Log Creek	161	0	0	95	10	7	15	5	1	nil
Spuzzum Mtn.	-	-	0	-	-	0	-	-	15	nil
Spuzzum Mtn.	-	-	0	-	-	0	-	-	15	nil
Keefers	-	-	54	-	-	10	-	-	3	moderate
Birkenhead Lake	62	0	0	75	2	trace	45	3	26	nil
Haylmore Creek	197	0	0	60	trace	trace	20	trace	trace	nil
Owl Creek	54	0	0	80	0	0	15	0	0	nil
Twin One Creek	39	0	0	5	trace	0	5	trace	0	nil
<u>East of Fraser River</u>										
Mowhokam Creek	123	20	7	80	2	5	20	22	2	light
Stoyoma Creek	104	0	12	95	trace	0	30	15	0	light
Anderson Ridge	-	-	22	-	-	trace	-	-	20	light
Anderson Ridge (north)	-	-	67	-	-	trace	-	-	20	moderate
Gilt Creek	123	7	52	85	3	9	25	24	4	moderate
Boston Bar Creek	60	16	11	65	trace	15	10	2	6	light
Siwash Creek (Mi. 10)	-	-	75	-	-	69	-	-	25	moderate
Siwash Creek (Mi. 65)	-	-	58	-	-	69	-	-	28	moderate
Ladner Creek	114	6	215	75	4	50	25	22	15	heavy
Coquihalla River	-	-	45	-	-	67	-	-	32	light
Rhododendron Flats	101	52	243	100	21	29	45	28	29	heavy
Cedar Creek	62	0	163	70	33	35	10	16	14	heavy
Skaist Creek	-	-	275	-	-	85	-	-	51	heavy
Shawatam Creek	74	0	65	80	30	37	30	16	17	moderate
Skagit River	59	0	16	40	20	7	15	8	3	light

A survey to determine top-kill incidence and severity on Douglas-fir trees in spruce budworm infestation areas was done in 1979. A total of 37 plots was examined in areas where light, moderate and heavy defoliation had occurred. The plots were randomly selected within the infestation, in sapling, immature and thrifty mature stands. One hundred randomly selected Douglas-fir trees were examined in groups of 20 trees at 2-chain intervals within defoliated stands. At each plot the following information was recorded; slope, stand type, site, maturity, aspect, elevation, crown class, healthy, length of top-kill and dead. Tables 7 and 8 shows the results of this survey.

Photograph available from
Pacific Forest Research Centre

Table 7. Spruce Budworm Top-kill Survey (Douglas-fir) Vancouver Forest Region - 1979

Location	Elev. (m)	Slope %	Site	Aspect	Age	Aerial Defoliation Rating										Percent	
						1970	71	72	73	74	75	76	77	78	79	Top-kill	Mortality
Cedar Creek	1000	40	Moderate	South	135	-	-	-	-	-	-	L	L	M	M	6	2
Rhododendron	700	0	Moderate	Southwest	95	-	-	-	L	M	-	H	H	L	L	21	4
11 Mile Creek	700	25	Good	South	80	-	-	-	-	-	M	L	-	-	0	0	
Skaist Creek	800	10	Moderate	South	141	-	-	-	L	M	M	L	M	M	H	25	6
Sumallo River	800	25	Moderate	South	64	-	H	H	H	M	L	M	-	-	-	24	4
Shawatum Creek	900	30	Moderate	South	72	-	-	-	-	L	L	L	H	M	M	25	0
19 Mile Creek	800	30	Moderate	South	136	-	-	-	L	M	L	M	M	-	-	0	0
Sumallo River	800	35	Good	West	64	-	L	M	M	H	M	H	-	-	-	40	0
Coquihalla R.	600	0	Moderate	South	77	-	-	-	-	L	L	M	H	M	H	14	8
Ladner Creek	800	50	Moderate	Southwest	81	-	-	-	-	-	-	M	H	M	H	2	0
Sawmill Creek	600	40	Moderate	Southeast	64	-	-	-	-	L	L	M	M	L	-	12	0
Spius Cr. Road	1100	25	Moderate	Southwest	98	-	-	-	-	L	L	H	H	L	-	14	1
Anderson River	700	15	Good	Northwest	28	-	-	-	-	L	M	H	H	L	M	26	0
Scuzzy Creek	600	10	Moderate	Southwest	103	-	-	-	-	-	L	M	L	L	-	0	0
Keefers	600	50	Moderate	Southwest	61	-	-	-	M	M	L	H	H	M	M	10	3
Ainslie Cr Rd.	900	10	Moderate	Southwest	98	-	-	-	-	-	L	M	L	L	-	3	0
China Bar	400	25	Moderate	Southeast	84	-	-	-	-	L	L	L	L	L	-	0	0
Mowhokam Cr.	900	30	Moderate	Southwest	113	-	-	-	-	-	-	M	H	M	-	15	1
E. Anderson R	800	35	Moderate	Southwest	54	-	-	-	M	L	M	H	H	L	-	63	0
Uztluis Creek	800	15	Moderate	Southwest	108	-	-	-	-	L	M	H	L	L	-	4	0
Gilt Creek	700	30	Moderate	South	63	-	-	-	-	L	M	H	H	L	M	25	3
Joffre Creek	1100	25	Moderate	South	77	-	-	-	L	L	L	M	L	-	-	0	0
Tisdall	300	0	Moderate	South	71	-	-	-	L	L	L	M	M	-	-	14	2
Haylmore Creek	800	30	Moderate	South	68	M	L	L	L	L	M	H	M	-	-	5	2
McGillivray Cr	1000	30	Moderate	Southeast	111	-	L	L	M	L	M	H	H	-	-	19	0
Birkenhead Lake	700	0	Poor	South	76	-	-	L	M	L	H	H	L	-	-	41	14
McKenzie Basin	800	40	Moderate	South	65	M	M	-	H	M	L	M	H	-	-	19	5
Spuzzum Creek	800	10	Poor	South	48	-	M	M	M	M	L	H	H	M	-	93	4
Spuzzum Mtn.	800	80	Moderate	South	79	-	-	-	H	M	L	H	H	M	-	73	13

(Cont'd)

Table 7. (Cont'd)

Location	Elev. (m)	Slope %	Site	Aspect	Age	Aerial Defoliation Rating											Percent	
						1970	71	72	73	74	75	76	77	78	79	Top-kill	Mor-tality	
S. of Tsileuh Cr	800	20	Moderate	East	99	-	-	M	H	M	L	H	H	M	-	90	6	
Anderson Ridge	900	25	Poor	South	36	-	-	-	-	L	L	H	H	L	M	79	5	
Anderson Ridge (N)	1000	35	Poor	Southwest	70	-	-	-	M	L	L	H	H	L	M	94	4	
Spuzzum Mtn.	900	40	Moderate	Southeast	50	-	-	-	H	M	L	H	H	M	-	41	31	
Tsileuh Creek	1000	70	Moderate	South	68	-	M	M	H	H	H	H	H	-	-	5	94	
Siwash Creek	900	50	Moderate	South	35	-	-	-	M	L	-	H	H	L	-	53	2	
Anderson Ridge	1000	60	Moderate	Southwest	40	-	-	-	-	L	L	H	H	L	M	31	45	
Spuzzum Mtn.	900	40	Poor	Southeast	67	-	-	-	H	L	L	H	H	M	-	37	42	

L = light

M = moderate

H = heavy

- = no defoliation

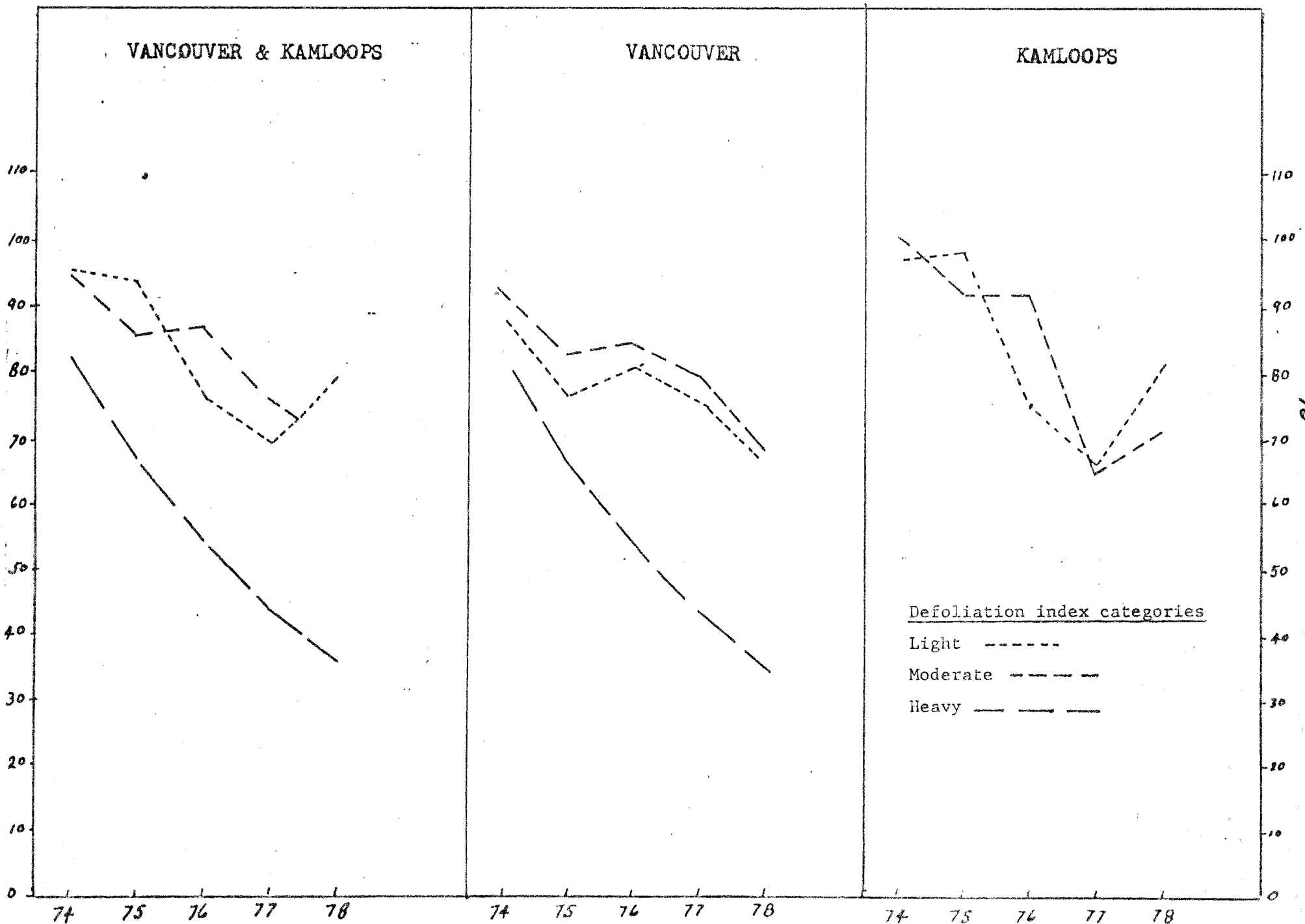
Table 8. Summary of spruce budworm top-kill and tree mortality survey (Douglas-fir) Vancouver Forest Region 1979 (All areas - 37 plots)

No. of trees by top-kill group and crown class																									
Healthy				Less than 1.0 m				1.0-2.9 m				3.0-4.9 m				over 5.0 m				Dead			1/	Total	
D	CD	I	S	D	CD	I	S	D	CD	I	S	D	CD	I	S	D	CD	I	S	D	CD	I			S
721	1004	532	156	89	173	177	80	70	117	86	23	60	87	22	2	20	17	2	4	57	103	73	68		3743

Percent of trees by top-kill group and crown class																									
Healthy				Less than 1.0 m				1.0-2.9 m				3.0-4.9 m				over 5.0 m				Dead			1/	Total	
D	CD	I	S	D	CD	I	S	D	CD	I	S	D	CD	I	S	D	CD	I	S	D	CD	I			S
19	27	14	4	2	5	5	2	2	3	2	1	2	2	1	1	1	1	1	1	1	2	3	2		2
65%				14%				8%				4%				1%				8%					

1/ D = dominant
 CD = co-dominant
 I = intermediate
 S = suppressed

Figure 3 Average annual increment loss 1974-1978 in western spruce budworm defoliated Douglas-fir stands, Vancouver and Kamloops Forest Regions (Red lines = through 1974-1978 values).



On average it was found that 65 percent of the trees had no visible top-kill, 14 percent had less than a metre of top-kill, 8 percent had from 1.0-2.9 metres, 4 percent had from 3.0-4.9 and 1 percent had over 5 metres of top-kill. Eight percent of the trees were dead from budworm feeding or a combination of budworm and bark beetles on the larger trees. The top-kill and tree mortality usually occurred in areas where budworm feeding was moderate to heavy for more than two years and increased in severity by the number of years of moderate to heavy defoliation.

Increment cores were taken from five representative Douglas-fir trees at each of the 37 plots. The cores were analysed at the Victoria Laboratory for increment loss (Figure 3). The greatest increment loss occurred in stands that had been heavily defoliated for several years, with less increment loss occurring in the moderate and light defoliation categories.

Flight traps baited with three concentrations of pheromone were used to assess adult male budworm populations and to assist research into the use of pheromones as a survey method to monitor adult budworm populations. Table 9 shows a comparison of the number of adults caught.

Table 9. Western spruce budworm* adult males in pheromone-baited traps, Vancouver Forest Region, 1979

Location	Pheromone concentration (Avg. no. per trap)			1979 Defoliation
	5.0%	0.5%	0.05%	
Skagit River	58	45	31	light
Rhododendron Flats	67	80	72	moderate
Boston Bar Creek	70	92	72	moderate
Gilt Creek	55	59	43	moderate
Kookipi Creek	91	84	52	trace
Haylmore Creek	1	24	19	trace
Birkenhead Lake	38	33	22	trace
Owl Creek	24	21	18	nil
Twin One Creek	19	14	23	nil
Highland Road (Victoria)	11	12	15	nil

* Assumed to be C. occidentalis

Douglas-fir beetle, Dendroctonus pseudotsugae

There was an increase in the number of Douglas-fir trees attacked by bark beetles within stands heavily defoliated by spruce budworm although the overall number of beetle-infested trees throughout the defoliated stands remained relatively low. Of 37 spruce budworm top-kill plots examined throughout the budworm infestation, current bark

beetle infested trees were found at four locations at Birkenhead Lake, Spuzzum Mountain, above Spuzzum townsite and Anderson Ridge. The beetles did not appear to be successful in establishing broods in most trees examined at these localities.

During aerial surveys only occasional recently dead Douglas-fir were observed in the Pemberton and Fraser Canyon areas.

A trap tree program carried out at Shovelnose Creek in the Squamish River area proved successful. A drought-damaged Douglas-fir stand 50-80 years old infested with Douglas-fir beetle was selectively logged in March to remove infested trees on 40 ha. A total of 387 currently infested trees and trees with dead tops were removed. In April 25 trap trees were felled. Examination of the trap trees in June showed an average of three attacks per 1000 square cm of bark surface with up to six attacks on some trees. These trees were removed in July and a subsequent examination of the area in September failed to find any currently infested trees.

Douglas-fir tussock moth, Orgyia pseudotsugata

There was no noticeable defoliation by tussock moth larvae in the Vancouver Forest Region in 1979. No larvae were taken in beating samples.

Pheromone traps were set out at five locations on the Mainland for distribution records. The traps at D'Arcy and Pemberton caught 4 and 1 moth respectively and the traps at Chilliwack, Squamish and Powell River were negative.

Silver spotted tiger moth, Halisidota argentata

Numerous enquiries from homeowners were received by Pacific Forest Research Centre and the B.C. Ministry of Forests ranger offices, at Squamish, Sechelt, Pender Harbour and Powell River concerning tiger moth larval colonies on small groups of Douglas-fir on residential properties. Damage was limited to one or two large branches on individual trees.

Coolley spruce gall aphid Adelges cooleyi

Conifer seed orchards on the Saanich Peninsula sustained aphid damage in 1979. At the Tahsis seed orchard, all foliage of the Douglas-fir seed trees planted adjacent to Sitka spruce were heavily attacked by aphids and by late May the new foliage was shrivelling and turning brown. The 1979 cone crop was also heavily attacked. Early in June winged adults were leaving the Douglas-fir trees and attacking the adjoining Sitka spruce, which results in the aphid forming galls on the spruce the following year.

In the Dewdney seed orchard, where only Douglas-fir were planted, the trees were only lightly attacked. At the Pacific Logging orchard light to moderate damage was found on Douglas-fir.

At Rayoniers Lost Lake orchard, where Sitka spruce is to be the main tree species for seed, it was recommended that approximately 100 recently planted Douglas-fir trees should be removed to prevent the aphid from becoming a problem.

Moderate to heavy aphid damage on Douglas-fir occurred at the Koksilah nursery Duncan and light to moderate aphid damage was noted at the Harmac seed orchard near Nanaimo.

Parch blight damage to conifers

Numerous coniferous trees and shrubs in forested and residential areas in the Lower Fraser Valley, Lower Mainland and southern Vancouver Island were damaged by cold dry outflow winds from the interior of the province in January. In particular, Douglas-fir, western red cedar, amabilis and grand fir trees were damaged. Symptoms were a reddening of the foliage usually on the north and east sides of the trees. Severity ranged from some to all foliage reddened, and from minor foliage discoloration to mortality of buds and twigs. No tree mortality was noted and as the summer progressed damage became less apparent, as the new foliage tended to mask the damage.

Phellinus root rot Phellinus weirii

Following a survey by the Canadian Forestry Service in 1975, the B.C. Ministry of Forests carried out a stump extraction project in an area near Okeover Arm (Powell River) where Phellinus root rot was present in a second growth Douglas-fir stand. The treated area was 15 ha and cost \$585.00 per ha for a crawler tractor to remove and windrow the stumps. The area was planted with Douglas-fir in the spring of 1979.

Phellinus root rot surveys were conducted on Vancouver Island by the B.C. Ministry of Forests to determine areas of high root rot infection in second growth Douglas-fir stands.

Frost damage

In a 40 hectare plantation at km 3.2 Cottonwood Creek Road (Cowichan Lake) 1-2 Douglas-fir and 2-0 cedar seedlings showed high mortality from frost damage. The seedlings were planted in April 1978 on a steep slope alder site. In April 80 to 90 per cent tree mortality had occurred, and the remaining living seedlings were under stress, dying from the top down and some adventitious budding had occurred.

Swiss needle cast, Phaeocryptopus gaeumannii

A needle cast affected planted regeneration Douglas-fir trees, three to ten metres in height, on 1000 ha in the Upper Klanawa River Valley. Severe needle drop occurred, with many trees retaining only 1979 foliage. The disease has not been a serious problem in the Vancouver Forest Region in naturally regenerated stands.

Needle cast, Rhabdocline sp.

Two hundred hectares of planted and naturally seeded Douglas-fir saplings were lightly to moderately affected by needle cast at Harris Creek near Cowichan Lake.

PINE PESTS

Mountain pine beetle, Dendroctonus ponderosae

Mountain pine beetle infestations which have persisted since 1974 in the Klinaklini River drainage collapsed after killing most of the lodgepole pine. A total of 25 recently killed lodgepole pine trees were recorded west of Klinaklini Lake.

At Haylmore and Spruce creeks near Anderson Lake 1,500 recently killed lodgepole pine were recorded. Scattered recently killed lodgepole pine were also noted at Spetch Creek north of Pemberton and at Mowhokam Creek in the Fraser Canyon.

Scattered recently killed western white pine were again noted in the Birkenhead Lake area and at Joffre Creek near Lillooet Lake.

Lodgepole pine needle sheathminer, Zelleria haimbachi

Small isolated patches of young lodgepole pine in the Fraser Canyon from Yale to Spuzzum had foliage discoloration from sheathminer damage. The size of the infested patches was less than one hectare, usually enclosed by Douglas-fir stands.

European pine shoot moth, Rhyacionia buoliana

Shoot moth larvae continued to damage shoots of ornamental pine trees on southern Vancouver Island and in some southern areas of the mainland section of the Vancouver Forest Region.

Flight traps were used as in previous years to determine the presence of the insect at five locations in the Victoria and Mainland areas. Shoot moth adults were only found in traps at Victoria.

The traps set out at Hope, Sechelt, Powell River and Westview are outside the known range of shoot moth on the mainland section of the Region.

Pheromone traps were also set out in known infestation areas to measure population levels. Table 10 shows the results of this survey.

Table 10. European pine shoot moth pheromone traps, Vancouver Forest Region 1979

Location	Avg. no. moths per trap
Deas Island Tunnel	
- North End	18
- South End	29
Langara Golf Course	
- Cambie St.	22
- Ontario St.	26
U Vic	
- North of Henderson	6
- South of Henderson	31

These moth counts indicate high population levels at all locations except North of Henderson where low moth counts were recorded.

WESTERN HEMLOCK PESTS

A conifer sawfly Neodiprion sp.

Conifer sawfly larval populations were found at high levels in mature and overmature western hemlock - amabilis fir stands in the Keta and Haihte lakes area near Kelsey Bay, and at Big Tree Creek near Menzies Bay on Vancouver Island. Moderate to heavy defoliation occurred on 7 000 ha at Keta Lake, 600 ha at Big Tree Creek and light defoliation on 1 200 ha at Haihte Lake and Memekay River.

Larval sampling during the summer, produced collections of 500 to 3,000 larvae from understory trees and defoliation to individual trees ranged from 30 to 80 per cent after feeding was complete in September.

Some tree mortality in the heavily defoliated areas could occur especially on the amabilis fir which appeared to have suffered the heaviest defoliation. These trees could be susceptible to attack by Pseudohylesinus sp. bark beetles, although no evidence of bark beetle attacks were found during examination of the stands in the fall.

Cocoon and egg sampling on hemlock and balsam foliage showed an average of four cocoons per 50 cm branch sample from both Keta Lake and Big Tree Creek and an average of 14 egg niches at Keta Lake and four niches at Big Tree Creek. Most cocoons were empty on the foliage samples. Numerous cocoons, mostly empty, were found on the forest floor and in the duff which indicates a large adult sawfly population emerged in the fall of 1979, to lay eggs which could hatch in 1980.

Based on the large number of empty cocoon and the egg counts, the sawfly infestation can be expected to continue in these areas in 1980 providing weather conditions remain favorable to the insect.

Western blackheaded budworm, Acleris gloverana

The percentage of samples from western hemlock containing budworm larvae on Vancouver Island remained at a low level in 1979. The average number of larvae per positive 3-tree beating sample decreased slightly from 1978. The highest populations were found on the Brooks Peninsula where 15 larvae were taken in one sample. Larval populations remained at low levels on the mainland part of the Region. No visible defoliation was noted throughout the Region.

Figure 4 shows larval population fluctuations of western blackheaded budworm on western hemlock on Vancouver Island for the period 1949 to 1979. During the larval buildup 1953-57 moderate to heavy defoliation occurred in the Holberg-Port McNeill area on western hemlock, and in the larval buildup from 1968-73 moderate to heavy defoliation occurred on hemlock from Jordan River in the south to Holberg Inlet in the north.

Pheromone traps were again used to measure the population levels of male budworm using three different concentrations of pheromone (Table 11).

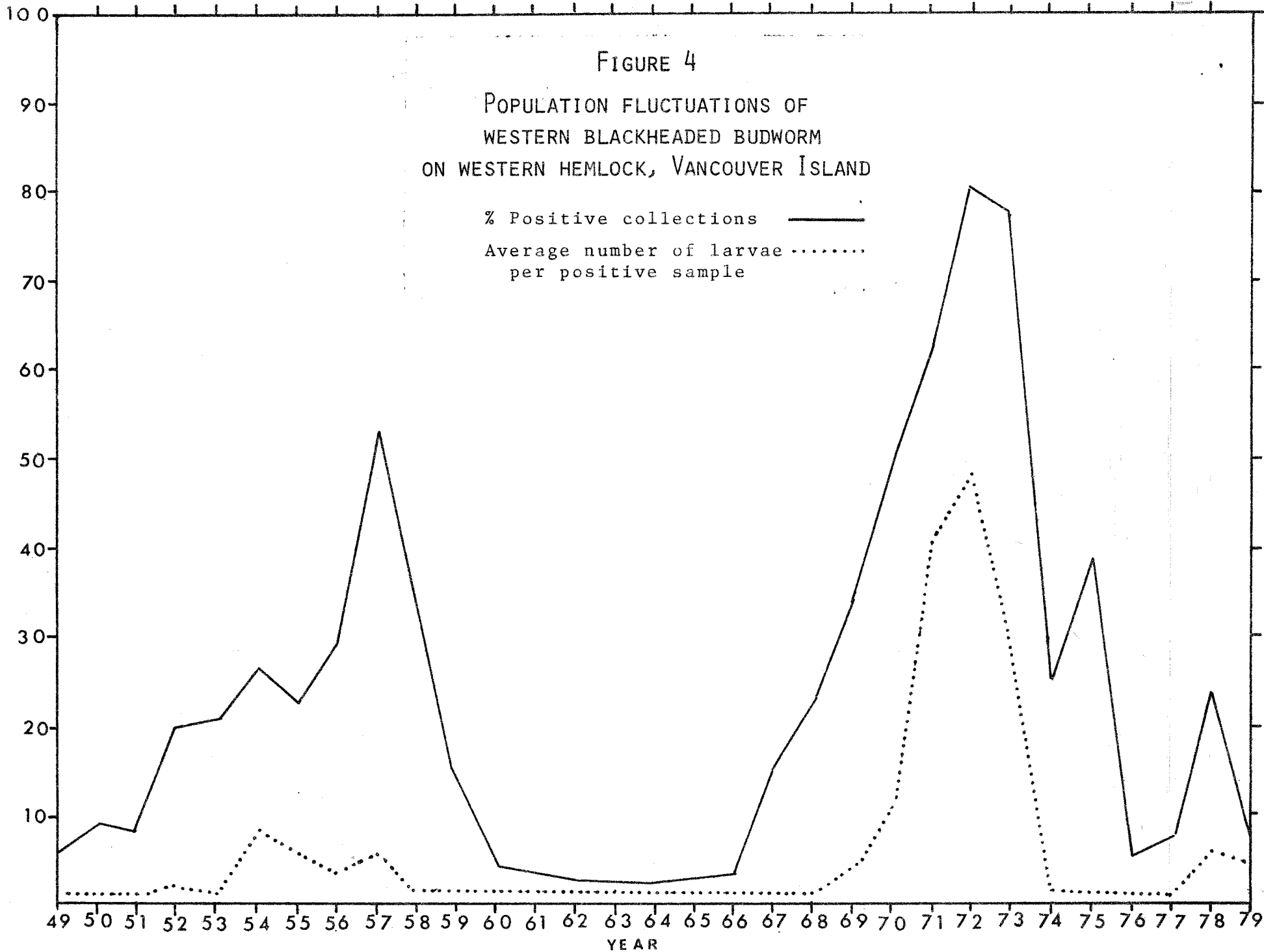


Table 11. Western blackheaded budworm adult males in pheromone-baited traps Vancouver Island 1979.

Location	Pheromone concentration*		
	5%	0.5%	0.05%
Loss Ck.	4	4	1
Marshall Ck.	18	12	12
Dunsmuir Ck.	9	8	5
Gracie Lk.	16	34	13
Kelsey Bay	7	6	2
Zeballos	-	2	1
Port McNeill	7	5	2
Port Alice	8	10	4
Holberg	2	1	-

* Average number of male moths caught per trap.

These three pheromone concentrations were used to better detect rising populations when budworm are at low levels. Pheromone traps placed at four localities on the Mainland, caught moths at only one locality, East Capilano River, where an average of 1.6 moths per trap were taken.

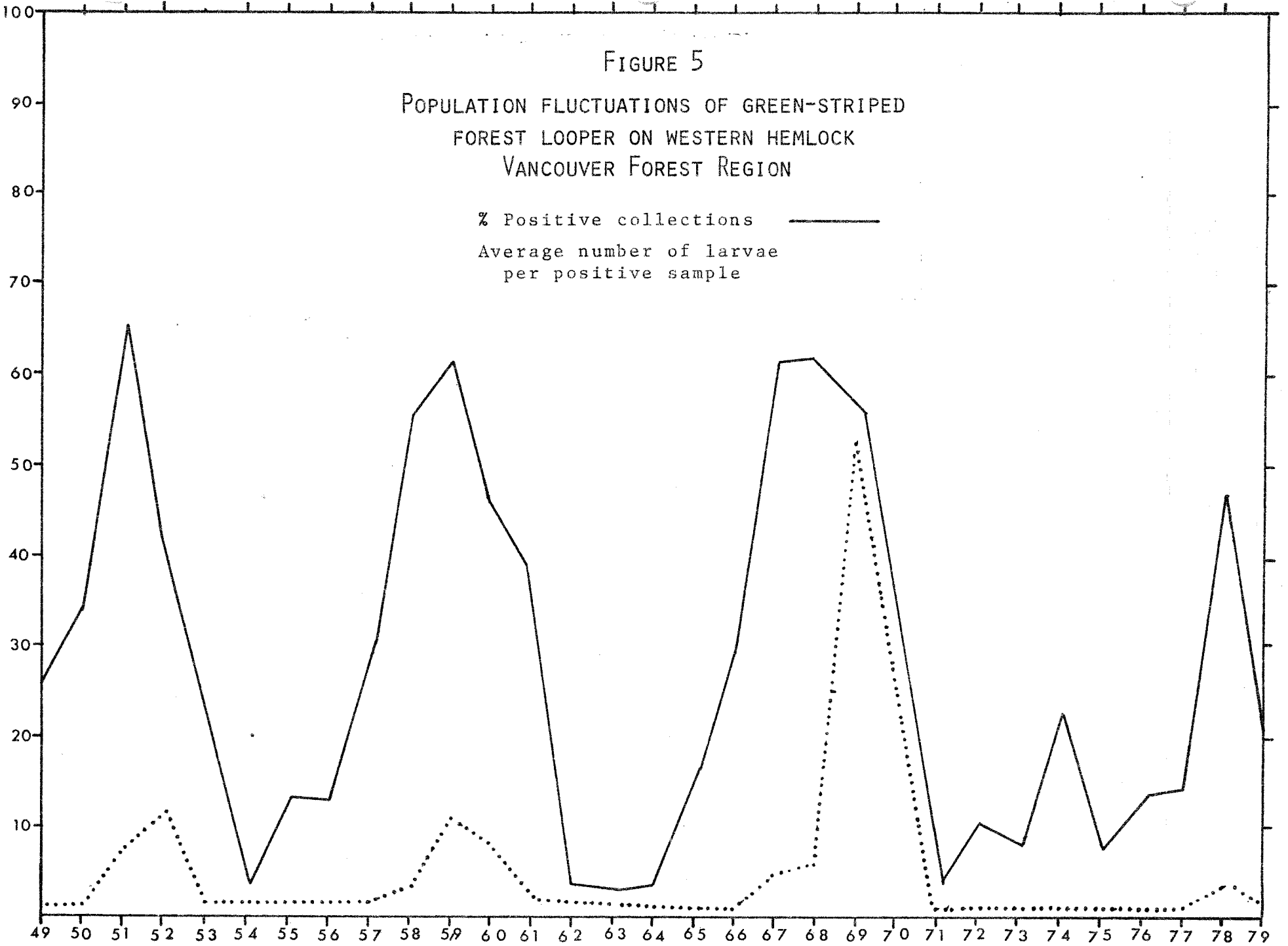
Green-striped forest looper Melanolophia imitata

Populations of this defoliator in 1979 did not increase as expected following the 1978 survey, but in fact decreased to 1977 levels. Figure 5 shows larval population fluctuations of green striped forest looper on western hemlock from 1949 to 1979. During the larval buildup 1950-53 in the Barkley Sound area no visible defoliation occurred. In the larval buildup 1958-61 moderate defoliation occurred on western hemlock in the Nootka and Clayoquot area and in the period 1967-71 heavy defoliation occurred on hemlock in the Quatsino Sound-Port Alice area.

FIGURE 5

POPULATION FLUCTUATIONS OF GREEN-STRIPED
FOREST LOOPER ON WESTERN HEMLOCK
VANCOUVER FOREST REGION

% Positive collections ———
Average number of larvae
per positive sample ·····



The following summary shows a three-year comparison of the number of larvae in three-tree beating samples from western hemlock in the Vancouver Forest Region .

	Year		
	1977	1978	1979
No. samples taken during larval period	142	91	112
% samples containing larvae	20	43	23
Avg. no. larvae per positive sample	2	3	2

Western hemlock looper Lambdina f. lugubrosa

Beating samples throughout the Region showed hemlock looper larval populations at low levels, except at a few isolated areas. At Coquitlam Lake in an overmature hemlock-cedar stand beating samples produced 11 larvae from cedar and five from hemlock. At Golden Ears Provincial Park three larvae were taken from hemlock and five from cedar.

On Vancouver Island at Stamp Falls Park 12 larvae were collected from Douglas-fir and four and six larvae respectively from hemlock and cedar. No defoliation was observed in the Region.

Subsequent egg sampling carried out at Coquitlam Lake in November showed low egg numbers present, which indicates low larval populations for 1980.

Saddleback looper Ectropis crepuscularia

Saddleback looper larval populations remained at a low level in 1979. One or two larvae were collected from western red cedar and western hemlock at sample areas throughout the Region. At Coquitlam Lake 12 larvae were taken from cedar and one larva from hemlock. These larval numbers represent low population levels. No visible defoliation has occurred throughout the Region.

Hemlock dwarf mistletoe Arceuthobium tsugensis

Mountain hemlock along the Hollyburn Ridge Trail in Cypress Bowl Provincial Park had moderate to heavy brooming caused by dwarf mistletoe infections. The infected stand is a mature mountain hemlock-yellow cedar stand with some western hemlock present. An examination along the trail for one km, showed brooming common, indicating the mistletoe infection covers a fairly extensive area. Mistletoe infection on mountain hemlock is not common in the Vancouver Forest Region.

The British Columbia Ministry of Forests initiated two dwarf mistletoe surveys in 1979, one in the Squamish area and the other in the Chehalis River area (see appendix 1 and 2). (A hemlock mistletoe sanitation proposal at Mashiter Creek by A. Renwick and J. Gilliam.) (Dwarf mistletoe survey at Chehalis Drainage by L. Mitchell.)

An inspection of a young western hemlock - amabilis fir stand at Gray Creek (Sechelt) where juvenile spacing was being carried out showed fairly good results in taking out dwarf mistletoe infected residual hemlock trees. The overall appearance of the stand after spacing looked good with most of the heavily infected trees removed. The cost per hectare for spacing this stand was \$464.00.

BALSAM PESTS

Fir engraver beetle, Scolytus ventralis

Aerial surveys in September revealed recently killed amabilis fir trees in valley bottom stands along the Phillips River and tributary valleys on the mainland coast. About 145 dead trees were counted in two areas. No ground checks were made and the tree mortality was attributed to Scolytus beetles. Another 25 dead trees were recorded near the mouth of the Clayoquot River on Vancouver Island.

These beetles have recently contributed to the mortality of grand-fir in the Ardmore area on the Saanich Peninsula. About 75 dead trees were noted with fresh attacks observed on scattered trees. The infestation was probably caused by two successive years of dry weather and drainage changes from land development. The beetle has been a problem in the Saanich Peninsula area in previous years.

DECIDUOUS TREE PESTS

Winter moth, Operophtera brumata

Defoliation caused by the winter moth was again evident in 1979 on Garry oak, broadleaf maple, ornamental birch, hawthorn and a variety of fruit trees throughout the city of Victoria and on the Saanich Peninsula north to the Sidney - Brentwood areas and west to Colwood and Metchosin

(Map 4).

In 1979, a program for biological control of the winter moth was begun. Two parasites were used in the program, an ichneumonid wasp, Agrypon flaveolatum and a fly, Cyzenis albicans. The program was funded by the British Columbia Ministry of Agriculture and coordinated by the Winter Moth Committee which was composed of personnel from the Provincial and Federal Departments of Agriculture and the Canadian Forestry Service. About 10,000 parasitized winter moth cocoons were shipped from Nova Scotia's Annapolis Valley to S.F. Condrashoff of Professional Ecological Services in Victoria. The cocoons were individually dissected and the parasite pupae placed in 3/4-inch polystyrene rearing cubes. After emergence, male and female Cyzenis adults were combined in mating cages, 150 pairs per cage. A total of 1371 male and 1382 females were reared in Victoria. Another 466 males and 453 females were reared in Ottawa and air-shipped to Victoria. In addition to this, 159 males and 180 females were obtained from Germany through the Commonwealth Institute of Biological Control, making a total of 1996 male and 2014 female Cyzenis adults which were liberated at 14 pre-selected sites on the Saanich Peninsula. (See appendix 3).

Agrypon adults were handled similarly to Cyzenis, except that only 50 pairs of adults were placed in each mating cage. Material reared in Victoria yielded 1253 males and 1234 females. Shipments from Ottawa added 404 males and 416 females. Thus a total of 1657 males and 1650 females were released at 33 locations, 14 of which were shared with Cyzenis. Release sites were selected on the basis that they had a goodly quantity of host material for winter moth, showed evidence of defoliation by winter moth, contained populations of winter moth larvae and were relatively free from contact with chemical insecticides. (See appendix 3) Biological Control of the Winter Moth on the Saanich Peninsula by S.F. Condrashoff.

Gypsy moth Porthetria dispar



Gypsy moth pheromone traps were set out at 20 locations in the Fraser Valley and Lower Mainland, one trap per location and at two locations on southern Vancouver Island, five traps per location. All traps showed negative results.


The Plant Quarantine Section of Agriculture Canada carried out a pheromone-trap survey throughout the Lower Mainland, Fraser Valley and southern Vancouver Island. All traps showed negative results. They also carried out a spray project in the Kitsilano area where gypsy moth adults and eggs were found in 1978. In a four block area, where moths and eggs were discovered, 85 percent of the properties were sprayed with the insecticide carbaryl. The majority of the other properties in this area were sprayed with insecticidal soap.

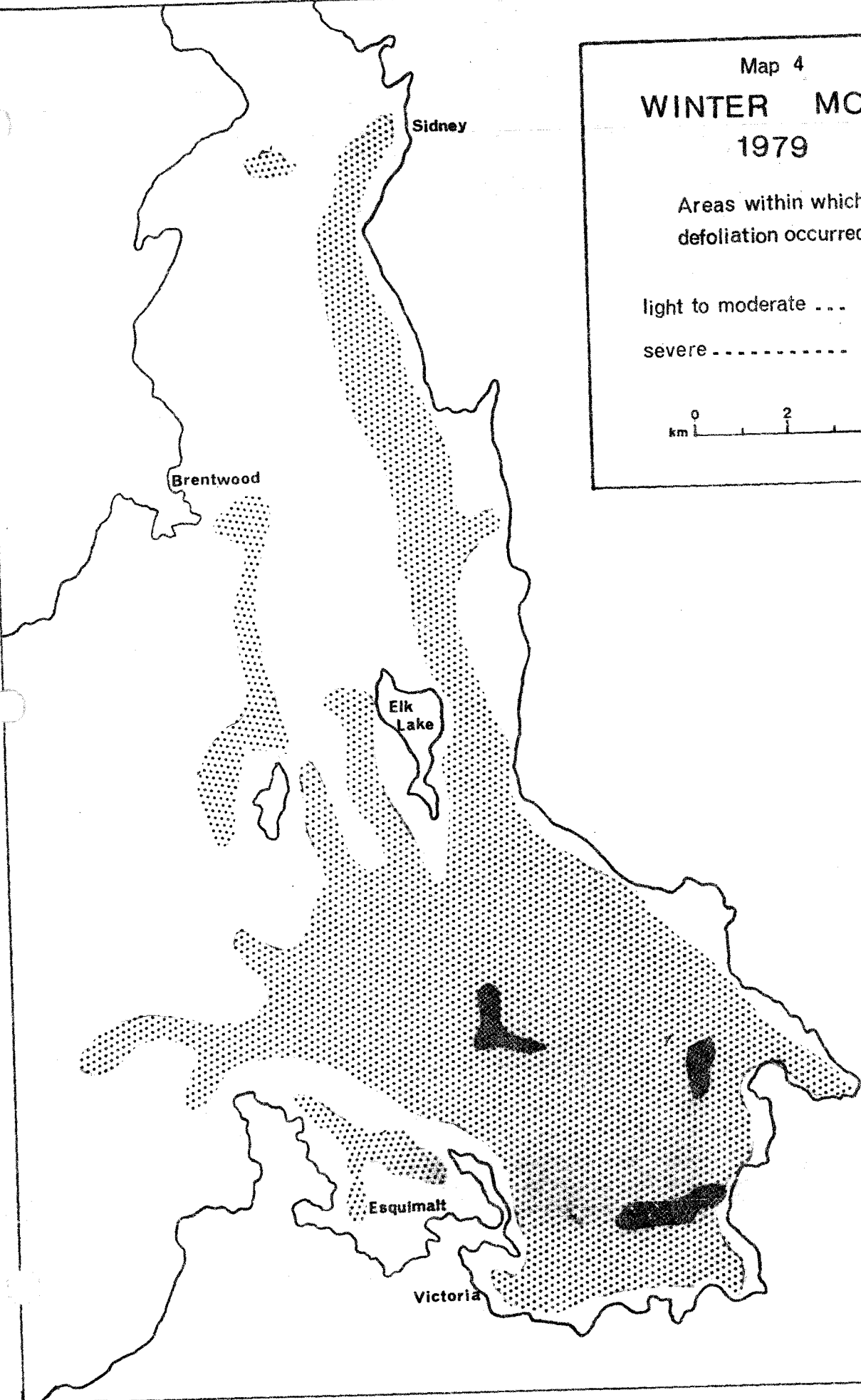
Subsequent egg surveys in October and November in the Kitsilano

Map 4
WINTER MOTH
1979

Areas within which
defoliation occurred

light to moderate ... 
severe 

0 2 4
km 



area failed to find any gypsy moth eggs.

Fall webworm Hyphantria cunea

Fall webworm tents were common on deciduous trees and shrubs on private and public properties at numerous localities throughout the Fraser Valley and Lower Mainland. Areas of heavy infestation were along the Haig Highway (Agassiz to Hope) and the Agassiz-Harrison Lake area.

Birch leaf miner Lyonetia sp.

Birch leaf miner damage to white birch foliage was again evident in the upper Fraser Valley in the Agassiz, Hope and Yale areas. The infestations have declined from 1978.

Birch casebearer, Coleophora sp.

Birch casebearers damaged and discolored white birch foliage along the Deas Island Freeway in the Delta and Richmond municipalities. Sporadic damage also occurred on birch trees throughout the Lower Mainland and Fraser Valley.

European elm bark beetle Scolytus multistriatus

Pheromone traps for elm bark beetle were set out at five locations in the Victoria area and four locations in the Fraser Valley to see if this bark beetle occurs in these areas. Locations selected were near areas where elm trees were growing. All traps showed negative results.

Discoloration of broadleaf maple foliage

The foliage of broadleaf maple trees was discolored throughout many parts of the coastal areas of the Forest Region. This condition has persisted for the past 5 years but did not appear as heavy in 1979. No causal agent has been found to date.