ANNUAL DISTRICT REPORT
FOREST INSECT AND DISEASE SURVEY
BRITISH COLUMBIA, 1977
PART I, VANCOUVER FOREST DISTRICT

by

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VICTORIA, BRITISH COLUMBIA

- FILE REPORT -

DEPARTMENT OF ENVIRONMENT
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INTRODUCTION

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

Regular field work in the District commenced on May 16 and ended on September 30. Time expended on special surveys was as follows: 25 hours on aerial surveys in July and August (Map 2); 3 weeks on western spruce budworm egg survey and damage appraisal in August and September.

A total of 567 insect and 30 tree disease collections were submitted to the Pacific Forest Research Centre. Map 1 shows regions and general locations of field collection points.

The number of collections containing larvae on Vancouver Island increased from 68% in 1976 to 85% in 1977; on the Mainland there was an increase from 74% in 1976 to 78% in 1977.

Western spruce budworm infestations, primarily in Douglas-fir stands, totalled 90 169 ha, an increase from the 1976 infested area. Mountain pine beetle infestations continued to cause extensive tree mortality in lodgepole pine stands in the Klinaklini River Valley. Douglas-fir beetle attacked small pockets of Douglas-fir trees in spruce budworm defoliated stands in the Pemberton and Fraser Canyon areas. Winter moth larvae defoliated deciduous trees in the Greater Victoria area.

Hemlock dwarf mistletoe infections in second growth western hemlock stands where juvenile spacing is being carried out by the British Columbia Forest Service and the forest industry, are causing concern as to the effect spacing will have on the mistletoe infections after the stand is opened up. Hemlock dwarf mistletoe infections were found for the first time on Douglas-fir in British Columbia near Redonda Bay on West Redonda Island.

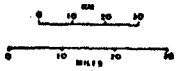
Phomopsis canker of Douglas-fir caused dieback and multiple leaders on second growth Douglas-fir at West Redonda Island.

Discoloration of broadleaf maple foliage was widespread throughout the District on Vancouver Island and Vancouver Mainland.

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

MAP 1

VANCOUVER FOREST DISTRICT



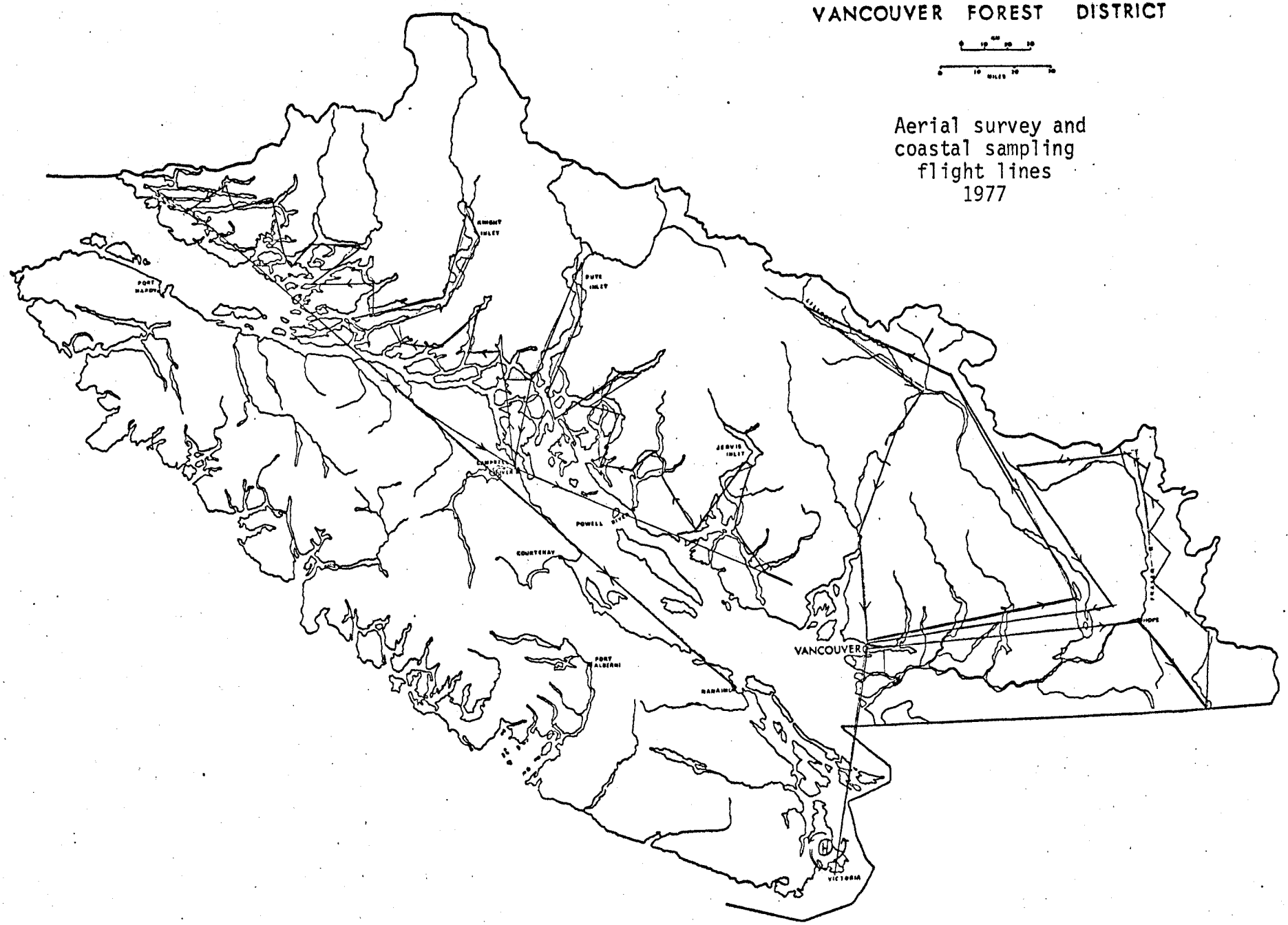
Locations where one or more collections were recorded in 1977

Insect ●

Disease ▲

MAP 2

VANCOUVER FOREST DISTRICT



Aerial survey and coastal sampling flight lines 1977

FOREST INSECT CONDITIONS

Western spruce budworm, *Choristoneura occidentalis*

Defoliation of Douglas-fir stands occurred on a total of 90 169 ha in 1977 compared with 71 378 ha in 1976. This represents an increase of 18 791 ha. The largest increase was in the heavy defoliation rating, which increased from 19 258 ha in 1976 to 33 360 ha in 1977. The largest increases occurred along the Nahatlatch and Skagit rivers in the Boston Bar - Hope area and at Owl Creek and Birkenhead River in the Pemberton area (Maps 3 and 4).

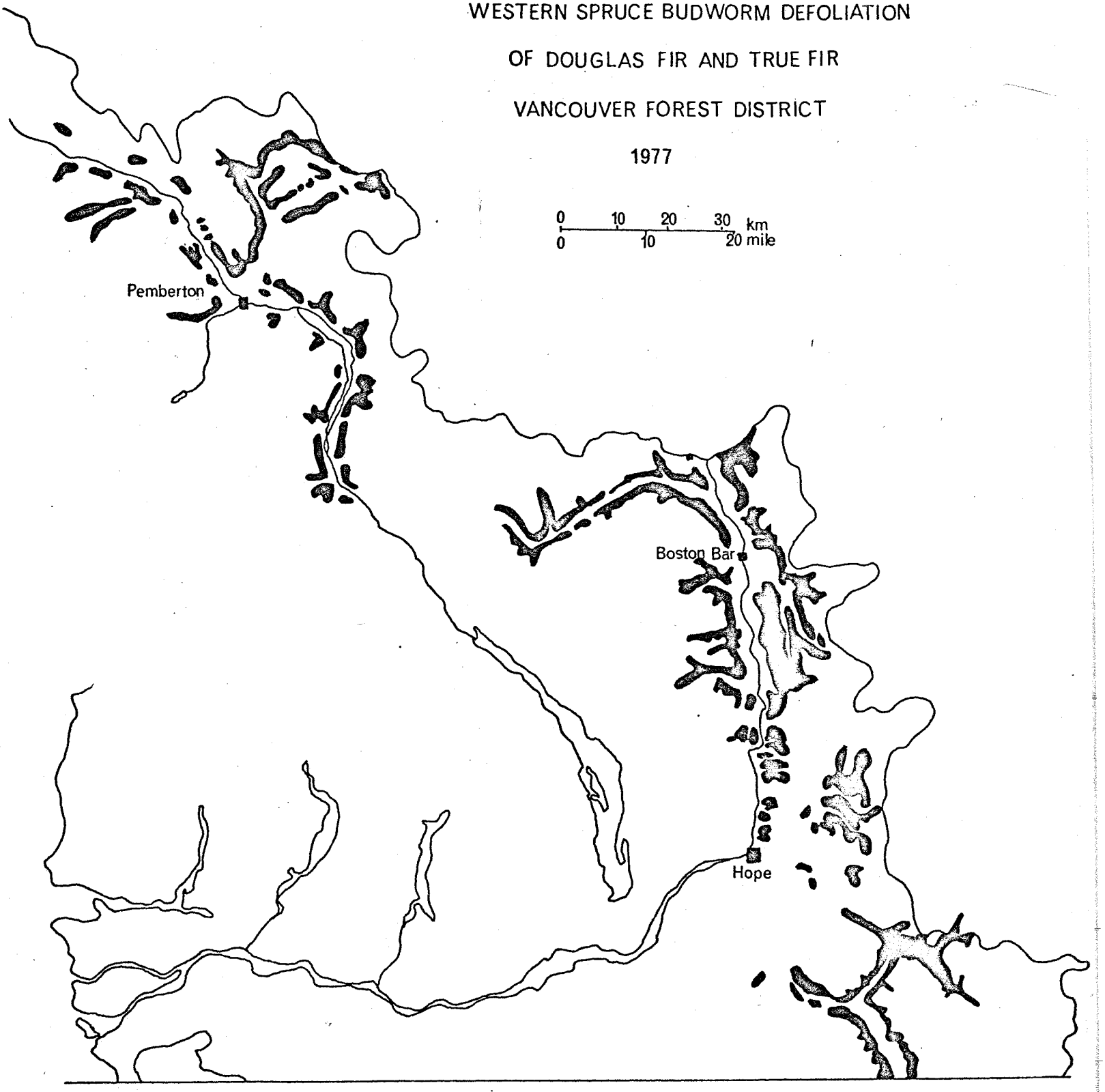
One hundred bud counts were taken on Douglas-fir trees in infestation areas in the latter part of May, at 17 locations, for a preliminary evaluation of the infestation. Table 1 shows the results of this examination.

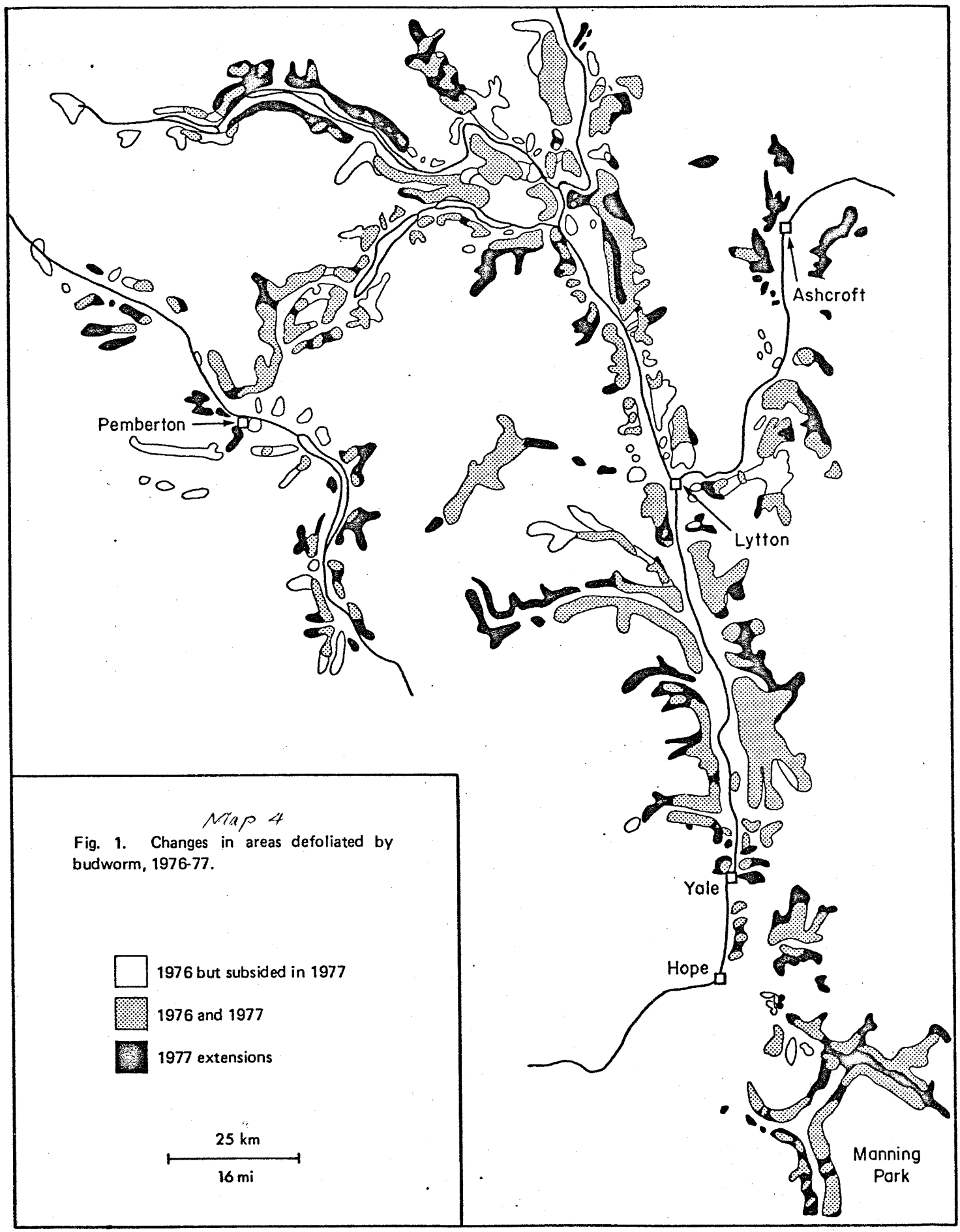
Table 1. Percentage of Douglas-fir buds infested with spruce budworm, Vancouver Mainland District, 1976 and 1977.

Locality	Percentage of buds infested	
	1976	1977
Fraser Canyon area		
Log Cr	-	47
Kookipi Cr	-	43
Nahatlatch Bridge	-	16
North Bend	-	14
Anderson R	-	50
Spuzzum Cr	-	26
Hope - Princeton Hwy. area		
Sumallo R	26	31
Rhododendron Flats	20	40
Boston Bar Cr	-	21
Silver-Skagit area		
Silver-Skagit Road (mile 28)	25	17
Centennial Trail	-	30
Pemberton area		
Rutherford Cr	34	25
Railroad Cr	22	12
Twin One Cr	-	25
Roger Cr	-	10
Owl Cr	-	16
Birkenhead L	40	30

Map 3

WESTERN SPRUCE BUDWORM DEFOLIATION OF DOUGLAS FIR AND TRUE FIR VANCOUVER FOREST DISTRICT 1977





Map 4

Fig. 1. Changes in areas defoliated by budworm, 1976-77.

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

Regions*	No. samples taken during larval period	% samples containing larvae	Avg no. larvae per positive sample	Avg no. larvae per sample
109	3	0	0	0
110	3	0	0	0
111	4	0	0	0
112	4	100	118.0	118.0
113	-	-	-	-
126	6	75	25.6	19.2
127	11	78	47.2	37.1
133	2	100	38.0	38.0
104	9	22	1.0	less than 1
107	42	12	1.0	less than 1

*See Map 1.

Parasitism and disease studies were done at a number of localities within the infestation in the Skagit River and Fraser Canyon areas. Tables 3, 4 and 5 show the results of these studies.

Table 3. Parasitism of western spruce budworm larvae and pupae, Vancouver Mainland District, 1977.

Area	% parasitism[1/]			
	3rd-4th instar larvae	5th-6th instar larvae	Pupae	Total
Skagit R	35.8	10.1	10.0	48.1
Coquihalla R	16.7	10.5	0.0	25.4
Fraser Canyon	33.5	19.0	2.6	47.5
Anderson R	30.1	17.6	12.0	49.3
Average	29.0	14.3	6.1	42.5

[1/] See Appendix 1.

Table 4. Parasitism of western spruce budworm pupae, Vancouver Mainland District, 1977.

Area		No. of pupae collected	No. of parasites[1/]			% parasitism	
			Ichneumonidae	Diptera	Total	Total	Total non-larval
Skagit R	Totals	150	15	20	35		
	Averages	50.0	5.0	6.7	11.7	23.3	10.0
Coquihalla R		16	0	0	0	0.0	0.0
Fraser Canyon	Totals	292	6	34	40		
	Averages	48.7	1.0	5.7	6.7	13.7	2.1
Anderson R	Totals	150	12	17	29		
	Averages	50.0	4.0	5.7	9.7	19.3	8.0
Nahatlatch R		50	0	4	4	8.0	0.0
Totals		658	33	75	108	-	-
Averages		42.9	2.0	4.4	6.4	12.8	4.0

[1/] See Appendix 2.

Table 5. Assessment of micro-organisms within western spruce budworm populations, Vancouver Mainland District, 1977.[1/]

Area	Date		No. of larvae and/or pupae	Remarks
	Coll.	Sent		
Skagit R	6/20	6/20	245	Negative
Fraser Canyon	6/17	6/21	350	"
Anderson R	7/12	7/13	185	"
Nahatlatch R	6/21	6/21	50	"

[1/] See Appendix 3.

Aerial surveys in late August showed a further increase in areas of heavy defoliation in 1977 compared to 1976, and a reduction in areas of light defoliation (see graph). The heaviest defoliation was concentrated more in the Fraser Canyon and tributary valleys from Yale to Nahatlatch River and Lake, Skagit River and Owl Creek, and Birkenhead River near Pemberton, with lighter defoliation occurring in the Lillooet River Valley northwest of Pemberton (Table 6).

An assessment of the egg population was made in August by counting egg masses on two 46-cm branches from mid-crown of each of 10 Douglas-fir trees at each of 20 locations and three Douglas-fir trees at each of 14 locations. Prediction for 1978 defoliation is based on the criterion that up to 50 egg masses per 10 m^2 of foliage could result in light defoliation (up to 30% of the foliage lost); from 50 to 150 egg masses in moderate defoliation (from 35 to 70% of foliage lost); and more than 150 egg masses in heavy defoliation (more than 75% of foliage lost).

Defoliation estimates taken on trees at each of the egg sample plots showed that the heaviest defoliation occurred in the Anderson River, Nahatlatch River, and Spuzzum Creek in the Fraser Canyon area; Skagit River in the Hope area; and at Owl Creek and Birkenhead River in the Pemberton area (Table 7).

SPRUCE BUDWORM DEFOLIATION
VANCOUVER FOREST DISTRICT

1970-1977

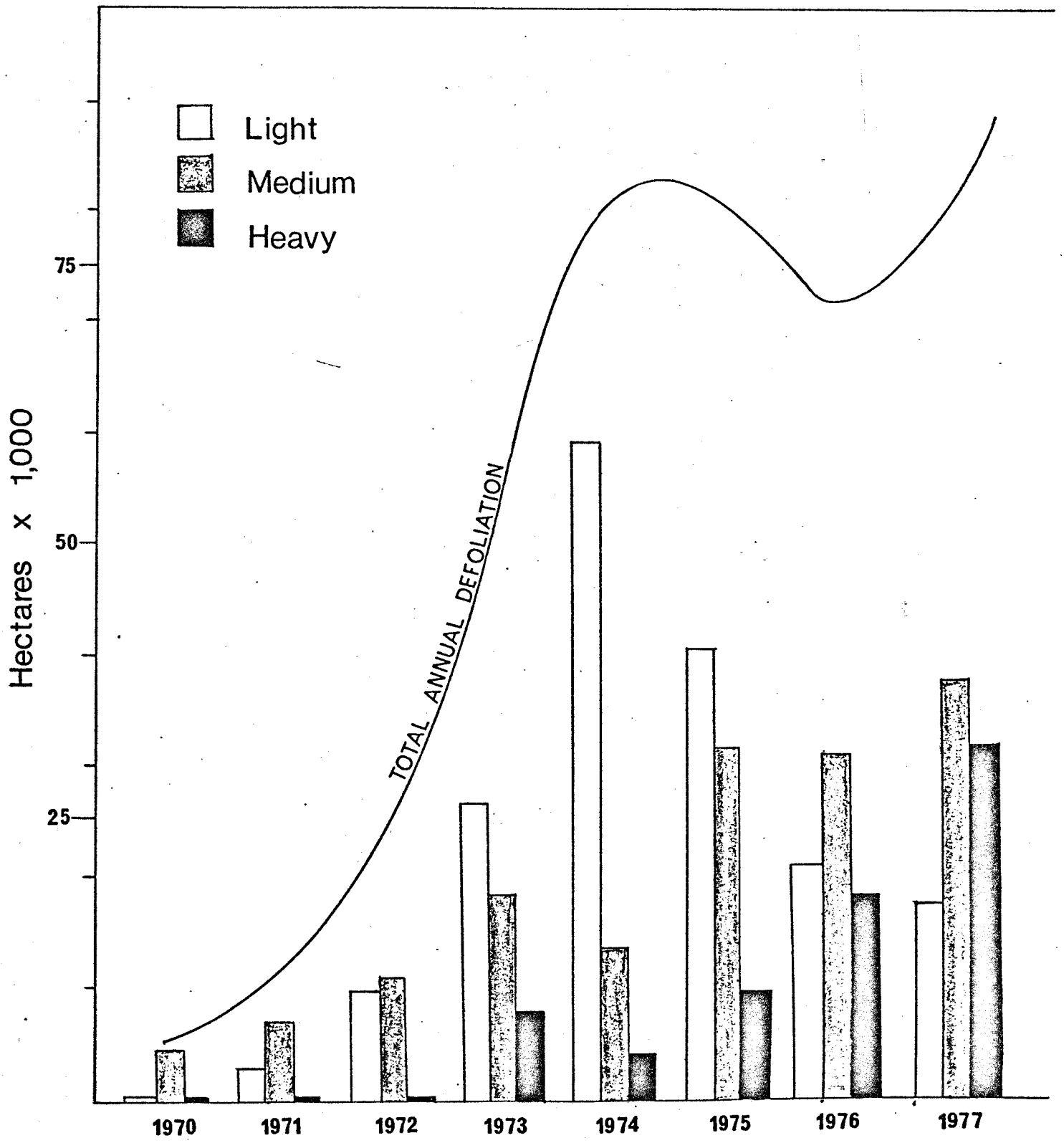


Table 6. Areas of spruce budworm defoliation of Douglas-fir, Vancouver Forest District.

Location	No. hectares defoliated					
	Light		Moderate		Heavy	
	1976	1977	1976	1977	1976	1977
Lillooet R (NW of Pemberton)	2 715	2 591	1 389	2 072	0	453
Rutherford Cr	252	0	1 010	0	315	0
Soo R	505	0	568	0	0	0
Cheakamus L	189	0	0	0	0	0
Birkenhead L and R	1 894	1 036	3 663	1 805	1 452	2 655
Blackwater Cr	-	-	-	-	-	-
Haylmore Cr	0	0	0	388	821	0
Gates R	505	1 101	1 073	1 165	0	0
Owl Cr	631	0	509	453	0	1 813
Lillooet L - Green R	2 463	1 425	315	4 985	0	518
Lillooet R (south of Lillooet L)	2 147	1 165	505	1 295	0	0
Tuwasus Cr	1 263	388	0	0	0	0
Fraser Canyon (Hope to Boston Bar)	0	2 395	3 284	6 931	5 115	6 809
Nahatlatch L and R	1 326	5 060	3 978	3 757	1 768	2 720
Anderson and East Anderson rivers	1 073	1 036	2 905	1 813	6 189	7 263
Fraser Canyon (north of Boston Bar)	0	712	1 263	1 943	1 263	2 720
Eight Mile Cr	0	129	0	194	0	0
Skagit R - Silverhope Cr	3 031	842	3 473	3 951	189	3 197
Sumallo R - Rhododendron Flats	694	347	1 010	1 000	884	2 000
Coquihalla R	315	323	2 842	3 904	1 010	2 461
Snass and Skaist creeks	2 299	300	3 031	2 303	252	751
Totals	21 302	18 850	30 818	37 959	19 258	33 360
Grand Totals:	1976 - 71 378 ha;		1977 - 90 169 ha			

Table 7. Spruce budworm egg masses and defoliation estimates on Douglas-fir trees, Vancouver Forest District.

Location	Avg no. egg masses per 10 m^2 of foliage		Estimated loss of current year's foliage %		Estimated total defoliation %		Predicted* defoliation for 1978
	1976	1977	1976	1977	1976	1977	
Nahatlatch L (west end)	759	44	75	0	10	0	L
Nahatlatch	759	95	18	45	13	15	M
Log Cr	481	161	78	95	10	15	H
Kookipi Cr	1 147	434	75	95	8	15	H
Uztlius Cr (km 27)	849	102	93	80	30	20	M
Stoyoma Cr Rd.	804	104	95	95	26	30	M
East Anderson R	899	207	72	95	25	30	H
Anderson R (km 8.8)	639	128	93	95	41	25	M
Alexandria	201	123	93	85	45	25	M
Spuzzum Cr (km 4.8)	934	0	91	90	56	25	L
Spuzzum Cr (km 16.8)	1 031	0	63	90	15	20	L
Scuzzy Cr (km 15.2)	473	243	93	95	50	45	H
Sawmill Cr	489	0	86	70	36	10	L
Cedar Cr	644	62	63	70	31	10	M
Rhododendron Flats	230	101	84	100	17	45	M
Boston Bar Cr	64	60	86	65	11	10	M
Ladner Cr	247	114	91	75	20	25	M
Sumallo R (1) (Hope Slide)	13	54	1	5	13	25	M
Sumallo R (2)	286	63	91	20	21	40	M
Snass Cr	180	214	71	85	10	20	H
Centennial Trail	206	74	79	80	15	30	M
Nepopekum Cr	34	0	60	1	5	1	L
Silver-Skagit Rd (km 44.8)	169	59	60	40	5	15	M
Mowhokam Cr	-	123	-	80	-	20	M
Birkenhead L	398	62	94	75	63	45	M
Gates R	483	118	55	25	13	10	M

cont'd..

Table 7 - cont'd.

Table 7. Spruce budworm egg masses and defoliation estimates on Douglas-fir trees, Vancouver Forest District.

Location	Avg no. egg masses per 10 m^2 of foliage		Estimated loss of current year's foliage %		Estimated total defoliation %		Predicted* defoliation for 1978
	1976	1977	1976	1977	1976	1977	
Haylmore Cr	576	197	49	60	13	20	H
Owl Cr	1,403	54	83	80	11	15	M
Rutherford Cr	1,244	132	75	55	26	15	M
Green R	878	22	85	45	16	10	L
Twin Cr	365	39	11	5	1	5	L
Roger Cr	93	30	0	1	0	1	L
Skookumchuk	33	0	0	0	0	0	L
Railroad Cr	296	19	25	45	28	20	L

*L - light; M - moderate; H - heavy.

Douglas-fir beetle was found in some stands that had been defoliated by spruce budworm for several successive years, but its general absence in most stands as indicated by plot cruising suggests no close relationship between budworm defoliation and Douglas-fir beetle attack. In the Fraser and Skagit river areas, of 15 plot cruises in 1977, Douglas-fir beetle was found on only two cruises. In one of these at Siwash Creek, 33% of the trees had been attacked prior to 1977; on the other, 17 and 44% of trees had current (1977 attack) and old attack, respectively. Of eight plot cruises in the Pemberton area, beetle was found in five. The beetle was present in significant numbers at North Creek, McKenzie Basin, and on the Birkenhead Lake Road.

At Tsileuh and Trafalgar creeks in the Fraser Canyon area, a ground examination was made in areas where tree mortality has occurred for the past several years. It was found that up to 80% of the Douglas-fir trees were dead at Tsileuh Creek on an area of 250 ha; and 61% at Trafalgar Creek on an area of 40 ha. This tree mortality probably occurred as a result of severe defoliation by spruce budworm followed by Douglas-fir beetle attack. Over 50% of the dead trees examined had evidence of old bark beetle attacks at both foregoing locations. No current bark beetle activity was found.

Sap rot was evident on most trees examined and Polyporus volvatus conks were common on dead trees throughout the stand.

The general infrequency of Douglas-fir beetle in the budworm defoliated stands together with evidence of low brood productivity, suggest that factors other than budworm defoliation may be responsible for the presence of the beetle. However, the beetle should continue to be regarded as a potential hazard to defoliated stands. Table 8 shows the incidence of attack by Douglas-

fir beetle in defoliated stands, in the Pemberton area.

Table 8. Incidence of attack by Douglas-fir beetle in budworm-defoliated stands, Pemberton District, July 1977.

Location	No. of plots	No. of trees	% trees attacked	
			1977	before 1977
North Cr (km 3.2)	13	47	0.0	0.0
North Cr (km 5.1)	6	43	9.3	9.3
McKenzie Basin	5	44	13.6	0.0
Rutherford Cr (km 9.2)	12	98	1.0	2.0
Lizzie Cr	13	62	0.0	0.0
Birkenhead L Rd. (N) (km 5.7)	4	42	16.7	9.5
Birkenhead L Rd. (N) (km 4.4)	4	27	11.1	22.2
Birkenhead L Rd. (S)	13	84	0.0	0.0
Railroad Cr		331	0.0	10.0
Total	70	778	4.7	3.6

For a more detailed report on Douglas-fir beetle attacks in spruce budworm defoliated stands see Les McMullen report September 1977 (Appendix 4), Douglas-fir Beetle in Stands Defoliated by Western Spruce Budworm.

Flight traps baited with a sex attractant, (Trans-11-tetradecenal, 3 per cent by weight), were used to assess adult male budworm populations. The attractant was impregnated into plasticized cylindrical cores 4 mm in diameter, then cut into 10 mm lengths with each length containing 4 mg of attractant. One section was placed in each trap, which consisted of 2-quart milk cartons with the ends cut out. Each trap was 4 x 4 x 9 5/8 inches and had a sticky trapping surface of 1 000 cm^2. The traps were set out in mid July and retrieved in late August after the moth flight was over. Table 9 shows a comparison of the number of adults caught in 1976 and 1977.

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

Location	Larval population density		No. adults in traps					
			range		total		avg	
	1976	1977	1976	1977	1976	1977	1976	1977
Thetis L	nil	nil	74-122	10-31	511	97	102	19
Green Mtn	nil	nil	8-17	16-61	67	163	13	33
Fuller L	nil	nil	19-60	8-29	160	90	40	18
Skagit R	moderate	moderate	29-39	22-38	139	162	28	32
Sumallo R	heavy	heavy	15-27	44-56	86	254	17	51
Spuzzum Cr	moderate	moderate	48-134	28-53	377	204	75	41
Rutherford Cr	moderate	moderate	35-64	23-45	222	164	44	33
Haylmore Cr	heavy	moderate	29-135	19-35	348	135	69	27
Birkenhead L	heavy	heavy	18-26	17-26	110	115	22	27
Harrison L (km 42)	-	nil	-	4-13	-	44	-	9
Weaver Cr	-	nil	-	7-13	-	54	-	11
Haig Hwy. (Hope)	-	light	-	29-42	-	171	-	34
Chilliwack L	-	nil	-	12-27	-	103	-	21

*Assumed to be C. occidentalis.

Adult budworm populations on Vancouver Island at Thetis Lake, Green Mountain and Fuller Lake were moderate, but only a few larvae were taken in beating samples in 1977. Egg sampling at Thetis Lake showed no spruce budworm eggs present which indicates no significant defoliation is expected in 1978.

Tree mortality and top-kill has been evident in areas where up to 8 years' defoliation has occurred in Douglas-fir stands, notably at Tsileuh and Trafalgar creeks in the Fraser Canyon area, and at Rutherford and Railroad creeks in the Pemberton area. Egg counts taken in 1977 are down compared to the 1976 counts but still indicate that moderate to heavy defoliation will occur in areas that were infested in 1977, if weather is favourable to the insects' development in 1978.

For more detailed reports on spruce budworm in the Vancouver Forest District, see R. Shepherd, J. Harris, A. Van Sickle, L. Fiddick and L. McMullen Pest Report September 1977 (Appendix 5), Status of Western Spruce Budworm on Douglas-fir in British Columbia; R.L. Fiddick and E.V. Morris report October 1977 (Appendix 6), Examination of Douglas-fir Stands Defoliated by Western Spruce Budworm in the Fraser Canyon and Sumallo River Areas; and Don Collis and Allan Van Sickle report January 1978 (Appendix 7), Damage Appraisal Cruises in Spruce Budworm Defoliated Stands 1977.

Mountain pine beetle, *Dendroctonus ponderosae*

Mountain pine beetles killed an additional 4,000 lodgepole pine trees on 2 560 ha in the Klinaklini River drainage. The heaviest damage occurred from Klinaklini Lake west and south to 8 miles south of Knot Creek Junction. This is the fourth year mortality has been recorded in this area. In 1974, 10,300 red-tops were recorded; in 1975, 40,000 and in 1976, 18,000.

At Spruce Creek, near Anderson Lake, 300 lodgepole pine red-tops were counted and 25-30 western white pine trees were recorded at each of the following localities: Birkenhead Lake, Skagit River and Nahatlatch River and Lake.

Scattered, red-topped lodgepole and western white pine trees killed by bark beetles occurred on 300 ha along Mowhokam Creek, and 75 ha on Ainslie Creek in the Fraser Canyon area (see Appendix 7).

Douglas-fir beetle, *Dendroctonus pseudotsugae*

A total of 325 red-topped Douglas-fir trees were recorded during aerial surveys, as follows: Railroad Creek (100), Wolverine Creek (75), Anderson River (60), Uztlius Creek (40), Snass Creek (25) and Skagit River (25). All are within spruce budworm defoliated Douglas-fir stands.

Prism plot cruises in budworm defoliated stands in 1977 give little evidence of an association between budworm defoliation and Douglas-fir bark beetle attacks. However, some new areas of beetle damage were found in the Fraser and Skagit rivers areas and in the Pemberton District in spruce budworm defoliated stands. In the Fraser and Skagit rivers areas, of 15 cruise lines run in 1977, involving 1,189 trees, Douglas-fir beetle was found on only two. In one of these, at Siwash Creek, 33% of the trees had been attacked prior to 1977; on the other, 17 and 44% of trees had current (1977) and old attack, respectively. Of eight strips in the Pemberton District, beetles were found in five. The beetle appears to be present in significant numbers at North Creek, McKenzie Basin, and on the Birkenhead Lake Road. The current beetle attack appears to be primarily on trees most severely defoliated by spruce budworm in 1976.

For a more detailed report on Douglas-fir beetle in stands defoliated by western spruce budworm, see Les McMullen report October 1977 (Appendix 4), Douglas-fir Beetle in Stands Defoliated by Western Spruce Budworm.

Light attacks by Douglas-fir beetles were recorded on Vancouver Island in the Buttle Lake area in recent windthrown Douglas-fir trees at widely scattered locations. Populations have remained low and no standing trees have been found infested. Current attacks also occurred on right-of-way Douglas-fir logs adjacent to MacMillan Park. Past years' observations would

indicate no damage to adjacent mature and overmature stands is likely. Light attacks occurred in downed and windthrown material at widely scattered locations in the southern regions of Vancouver Island.

Salvage logging of infested Douglas-fir trees (1976 attack) was done by the B. C. Forest Service during the late summer and fall of 1976, on several small patches of infested trees in the Centre Creek area on Chilliwack River. All infested trees were removed and milled at the Thurston Forestry Camp. All stumps were peeled and logging slash burned. In April 1977, 12 Douglas-fir trap trees were felled in the same area. The trap trees had attracted a moderate to heavy beetle population when examined on May 17. The trees were removed in June and milled. Examination of the standing green Douglas-fir trees in this area revealed no 1977 attacks.

Spruce beetle, *Dendroctonus rufipennis*

Beetle attacked Engelmann spruce trees were found at km 24 Mowhokam Creek mainline. The infested trees are in a balsam-spruce type with spruce comprising 28% of the stand in the two prism plots examined. Nine per cent of the spruce trees examined were currently infested (1977 attack). The diameter range of the trees is 35 to 70 centimeters. The extent of currently infested spruce in this area is not known, but probably is confined to a small area, as the host range is fairly restricted. Parent adults and half-grown larvae were present in the currently infested trees.

Between km 19 and 20 approximately 150 trees have been killed prior to 1976. No beetles were present in these trees (see Appendix 7).

Balsam bark beetle, *Dryocoetes-Ceratocystis* complex

Alpine fir tree mortality was evident on 400 ha along Mowhokam Creek and 50 ha on Ainslie Creek in the Fraser Canyon. In five prism plots examined between km 19 and km 24 Mowhokam Creek mainline, alpine fir comprised 27 per cent of the stand; 12 per cent of the alpine fir were currently infested and 23 per cent were old grey. In the currently infested trees only adult beetles were found (see Appendix 7).

Bruce spanworm and winter moth, *Operophtera bruceata* and *Operophtera brumata*

Defoliation of Garry oak, maple, willow and fruit trees was severe and widespread throughout the Greater Victoria region in 1977: the eighth successive year of infestation. Prior to 1977 defoliation was attributed solely to Bruce spanworm, however, in the Fall of 1977, the winter moth was identified as being the major defoliator. The winter moth is an introduced pest from Europe and only previously known to occur in the Maritime provinces.

The 1977 Fall adult population was the highest observed since the outbreak was first recorded. If climatic and/or natural control factors are not detrimental to the early 1978 larval population, widespread, severe defoliation is expected to occur in 1978 throughout the Greater Victoria region, the Saanich Peninsula, and the Western Communities.

Several studies were carried out during 1977 and are listed in Appendix 16.

Western blackheaded budworm, *Acleris gloverana*

Larval populations in former infestation areas in the Vancouver Forest District continued at low levels since their initial decline in 1972. Only two larvae were taken on the west coast of Vancouver Island and the north side of the Fraser River on the Mainland section of the District.

Testing of sex attractants to measure the male adult populations continued for the fourth year. Eleven locations were sampled with five traps containing the pheromone trans-11-tetron decenal (CSC 72) set out at each location. Results are shown in Table 10.

Table 10. Numbers of male adult western blackheaded budworms collected in pheromone traps, Vancouver Forest District

Location		Total no. traps		Bait	No. adults trapped			
					total		avg	
		1976	1977		1976	1977	1976	1977
Vancouver Island	Marshall Cr	5	5	CSC 72	3	27	0.75	5.4
	Dunsmuir Cr	5	5	"	5	29	1.0	5.8
	Loss Cr	5	5	"	10	41	2.0	8.2
	Gracie L	5	5	"	18	153	3.6	30.6
	Zeballos	5	5	"	35	6	7.0	1.2
	Kelsey Bay	5	5	"	33	87	6.6	17.4
	Port McNeill	5	5	"	12	66	2.4	13.2
	Port Alice	5	5	"	125	418	25.0	83.6
	Holberg	4	5	"	12	32	3.0	6.4
Vancouver Mainland								
Lost Cr (Fraser R)		-	5	"	-	36	-	7.2
Silver Tip (Sumallo R)		-	5	"	-	0	-	0

European pine shoot moth, *Rhyacionia buoliana*

Shoot moth traps were set out in three localities in the Vancouver Mainland District. Five traps, each baited with Daterman's pheromone, were set out at the B.C. Forest Service Nursery at Chilliwack River, Hope and Chilliwack River Road, in natural growing young lodgepole pine stands. No shoot moth adults were trapped at these localities. These areas are outside the known range of European pine shoot moth on the Mainland section of the Vancouver Forest District.

At the University of Victoria, of 12 pine spp. examined, all were infested, with larvae in 20% of the new shoots on each tree. Pine shoot moth has been at low levels in the Victoria region in recent years. Two areas were sprayed with the insecticide Dimethoate, which was successful in controlling the shoot moth larvae (see appendix 8).

Douglas-fir tussock moth, *Orgyia pseudotsugata*

There was no noticeable defoliation by tussock moth larvae in the Vancouver Forest District in 1977. No larvae were taken in beating samples.

Five traps made from 2-quart milk cartons and each baited with a pheromone to attract adult males, were set out at each of four locations. Moths were caught at all locations (Table 11).

Table 11. Numbers of male Douglas-fir tussock moths collected in pheromone traps, Vancouver Mainland District, 1977.

Location	No. adults trapped*	
	Totals	Average
Clearbrook Road (Clearbrook)	49	9.8
Fraser River Bridge (Hope)	12	2.4
Alexandria (Fraser Canyon)	34	6.8
Boston Bar (" ")	7	1.4

*Some moths could be *Orgyia a. badia* as positive identification was not verified.

Balsam woolly aphid, *Adelges piceae*

The infestation boudary on Vancouver Island was expanded for the second consecutive year in 1977 (see map). A collection of aphid infested amabilis fir was taken at Bear Creek Reservoir near Jordan River, and at Honeymoon Bay on Cowichan Lake.

A special balsam woolly aphid survey is planned for 1978 on Vancouver Island (see Appendix 9).

Striped alder sawfly, *Hemichroa crocea*

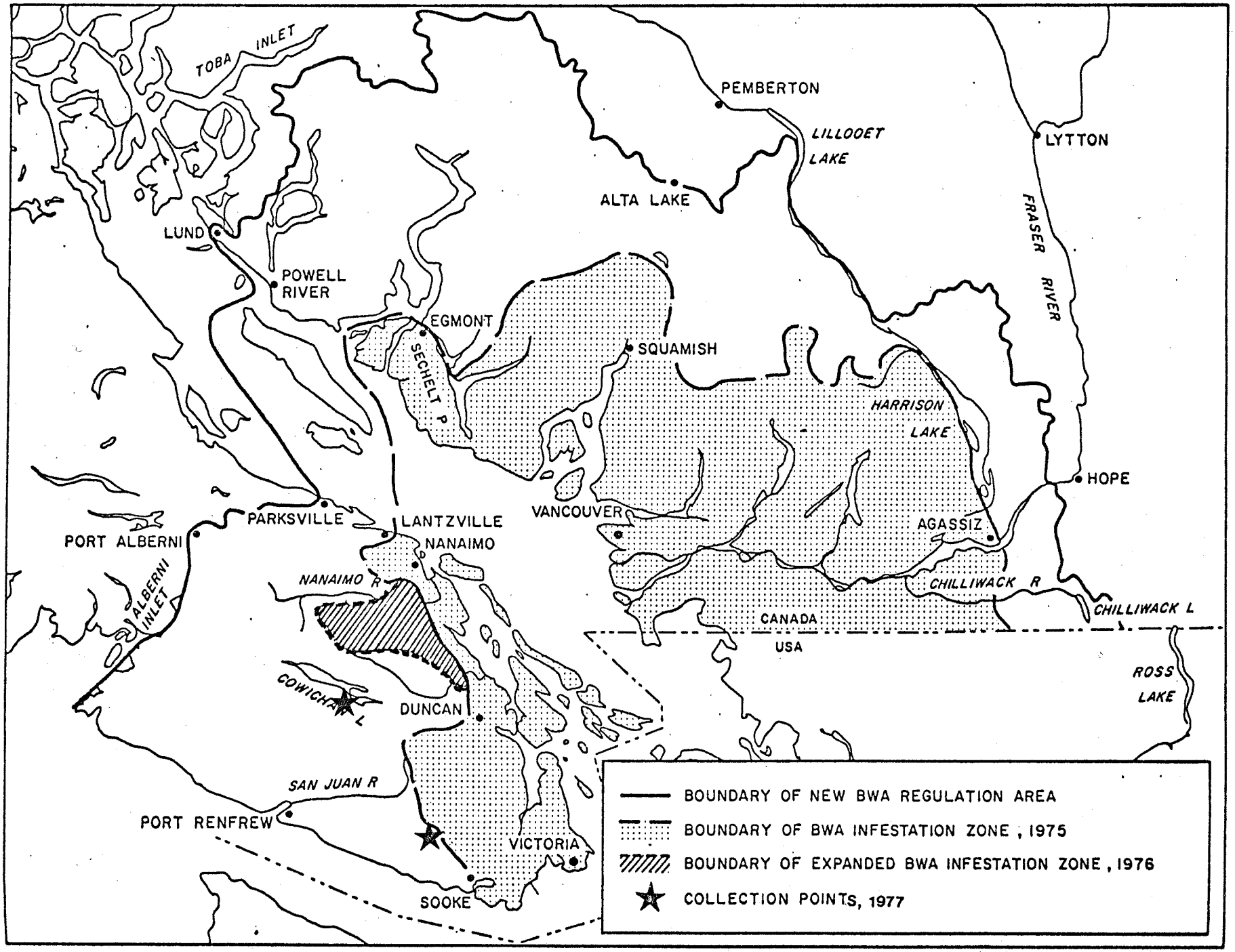
Larvae of the striped alder sawfly defoliated alder trees in stands within 5 miles of the coastline from Mill Bay north to Nanoose on Vancouver Island, and on Saltspring and Gabriola islands. Up to 100% defoliation occurred in localized areas on southern Saltspring Island; moderate defoliation (25%-75%) in localized areas around Cherry Point on Vancouver Island, and light to moderate defoliation (10%-50%) elsewhere in the coastal region and on Gabriola Island.

Defoliation will probably recur for 2 to 3 successive years until natural control factors reduce the population (see Appendix 17).

Leather jacket, *Tipula paludosa*

Leather jacket larvae damaged or killed approximately 50,000 (2-0) spruce and Douglas-fir seedlings at the British Columbia Forest Service nursery at Surrey during April and early May. Most damage occurred in localized patches but was dispersed over 6 to 7 hectares.

Control measures were undertaken on May 10, when two pounds of Diazinon per acre were applied to control the infestation. Examination of the infested area on May 16, after spraying, failed to find a single leather jacket larva. Damage to the seedlings occurred on the root collar and roots.


TOBA INLET
PEMBERTON
LILLOOET LAKE
LYTTON
ALTA LAKE
FRASER RIVER
LUND
POWELL RIVER
EGMONT
SECHELT P
SQUAMISH
HARRISON LAKE
HOPE
PARKSVILLE
LANTZVILLE
NANAIMO
VANCOUVER
AGASSIZ
PORT ALBERNI
NANAIMO R
ALBERNI INLET
CHILLIWACK R
CHILLIWACK L
CANADA
USA
ROSS LAKE
COWICHAN L
DUNCAN
SAN JUAN R
PORT RENFREW
VICTORIA
SOOKE
BOUNDARY OF NEW BWA REGULATION AREA
BOUNDARY OF BWA INFESTATION ZONE, 1975
BOUNDARY OF EXPANDED BWA INFESTATION ZONE, 1976
COLLECTION POINTS, 1977

A leaf blotch miner, *Lyonetia saliciella*

Leaf blotch miners heavily mined western white birch leaves along both sides of the Fraser River from Agassiz to Yale, with the heaviest damage along the Haig Highway and in the Hope area. Up to 100% of the leaves were damaged in these areas, giving the foliage a brown, scorched appearance by mid-summer. Blotch miner damage was also evident along the Deas Island Freeway in the Municipality of Delta. This is the fourth consecutive year that damage has occurred in these areas.

A spruce tip feeder, *Griselda radicana*

Spruce tips were damaged by this tip feeder for the third consecutive year in stands adjacent to Long Beach in Pacific Rim National Park. Damage to current green foliage varied from light to moderate throughout the stand, but did not exceed 50%.

Green spruce aphid, *Elatobium abietinum*

Green spruce aphids caused widespread damage to Sitka spruce trees in the east and north coastal regions and Quatsino Sound on Vancouver Island. The most damage occurred in immediate coastal areas, with up to 80% loss of 2- and 3-year-old needles. There was an unconfirmed report of severe damage in the Kyuquot region on the west coast of Vancouver Island.

On the Mainland section of the Vancouver District, spruce aphids caused heavy defoliation of Sitka spruce trees on residential property, parks and along roadways in the Lower Mainland from Vancouver to Hope and in the Sechelt Peninsula area.

Alder flea beetle, *Altica ambiens*

Alder flea beetles were found in localized areas at widely separated localities on Vancouver Island. Defoliation was limited to stunted trees in isolated, poor gravel sites, with a maximum of 10% defoliation of the trees in any one-quarter acre site. A small localized population has persisted in the southern Gordon River Valley for the past 3 years.

A hemlock sawfly, *Neodiprion* sp.

Defoliation of coastline western hemlock trees occurred for the third year at Cliffe Point, Raft Cove, and Neroutsos Inlet on Vancouver Island. Larvae were common throughout the Island for the third consecutive year, however, no other significant or noteworthy damage was evident

Western tent caterpillar, *Malacosoma c. pluviale*

Tent caterpillars were common on the east coast of Vancouver Island from Victoria to Kelsey Bay, inland to Port Alberni, and on the Gulf Islands. Numbers of tents and larvae varied consierably from high numbers per deciduous host such as alder and fruit trees on Saltspring Island, to isolated individual tents and few larvae elsewhere. Damage is minimal in most areas.

Satin moth, *Stilpnotia salicis*

Satin moth larvae defoliated silver poplar and other poplar species in Victoria near the I.C.B.C. claims centre, with up to 95% defoliation of ten silver poplar and up to 25% on 25 poplar sp. A few larvae persisted on Lombardy poplars at P.F.R.C. causing minimal defoliation.

Black vine root weevil, *Brachyrhinus sulcatus*

Root weevils killed 6% of 1,570 (1-0) Douglas-fir seedlings in containers at P.F.R.C. greenhouse. After Diazinon application, 62 larvae, 10 pupae and 5 adults were removed from container soil (see Appendix 10).

Striped ambrosia beetle, *Trypodendron lineatum*

Ambrosia beetles in dry land sort areas at Port McNeill, Beaver Cove and other north Island regions caused light to moderate degrade of logs. They were present in varying intensities in felled and bucked timber. Major hosts infested were western hemlock and amabilis fir.

Gypsy moth, *Porthetria dispar*

Attempts to trap male adults of the gypsy moth were made at 11 locations in the District in 1977. The traps used were the 3M type and baited with a sex pheromone in a laminated strip. Traps and pheromone were provided by the headquarters office of Plant Protection, Canada Department of Agriculture.

The traps were set singly at Harrison Lake, Cultus Lake, and Goldstream Provincial Park, Kamp Grounds of America at Hope, Sidney and Malahat, Cultus Lake Trailer Park and Townsite, Harrison Lake Trailer Park and Townsite, and Sumas Border Crossing. All traps were on site from July 8 to August 31. All traps had negative results.

Table 12. Other insects of current minor significance.

Insect	Host(s)	Locality	Remarks
Adelges cooleyi Spruce gall aphid	Douglas-fir Spruce, Sitka	widespread	Sucking insect. A number of enquiries from residential properties and parks.
Ectropis crepuscularia Saddleback looper	Hemlock, western Cedar, western red	West coast Vancouver Island, Vancouver Mainland	Defoliator. Larval population remained low.
Halisidota argentata Silver-spotted tiger moth	Douglas-fir	E coastal region Vancouver Island, Victoria to Campbell River	Defoliator. More common than past 5 years. Only light damage resulted.
Lambdina f. lugubrosa Western hemlock looper	Hemlock, western Douglas-fir Cedar, western red	Drainage Divisions: 104,109,110, 127,128,149	Defoliator. Out of 330 collections, 3% contained larvae, averaging one larva per positive collection.
Melanolophia imitata Green-striped forest looper	Hemlock, western Douglas-fir	general	Defoliator. Of 290 collections, 24% contained larvae, averaging 1.7 larvae per positive collection.
Pissodes strobi Sitka spruce weevil	Spruce, Sitka	Vancouver Island at Port McNeill, Kennedy Lake and W coastal regions; Vancouver Mainland at head Knight Inlet.	Terminal weevil, causing damage in natural and replanted areas.
Laspeyresia pseudotsugae Bark miner	Douglas-fir	Koksilah seed orchard (Duncan)	Bark miner. Larval activity evident for a number of years, but has not been considered a problem on the orchard trees.
Argyresthia cupressella Cypress tip moth	Juniper, ornamental	Greater Victoria area	Needle miner, causing noteworthy browning of foliage in suburban areas.

cont'd....

Table 12 - cont'd.

Insect	Host(s)	Locality	Remarks
Agonopterix costosa	Broom, *Cytisus scopanus*	E coastal region Victoria to Campbell River	Defoliation light to severe, scattered locations.
Hyphantria cunea Fall webworm	Miscellaneous deciduous hosts	Duncan Cowichan	Occasional tent at widely scattered locations.

Number of collections containing larvae

1970 - 1977

Insect	District	Year							
		70	71	72	73	74	75	76	77
Acleris gloverana	VI	200+	135	200+	200+	30	5	4	1
	VM	90	35	100	80	20	8	3	1
Choristoneura occidentalis	VI	8	8	10	20	5	5	10	13
	VM	30	50	60	140	150+	150+	45	28
Ectropis crepuscularia	VI	11	1	4	12	9	2	5	0
	VM	12	8	13	32	5	22	0	7
Lambdina f. lugubrosa	VI	21	9	10	9	2	0	2	1
	VM	33	31	34	46	11	16	19	11
Melanolophia imitata	VI	62	4	8	17	17	4	19	23
	VM	18	7	23	70	34	57	15	47

1977 Annual Report

VANCOUVER FOREST DISTRICT

Forest Disease Conditions

Currently Important Diseases

Dwarf mistletoe on western hemlock

Phomopsis canker of Douglas-fir

Discoloration of broadleaf maple foliage

Broadleaf maple stem dieback

A needle blight of shore pine

Branch flagging on Douglas-fir

Fume damage - sulphur dioxide

Bear damage to western red cedar

Nursery pests,Vancouver Forest District, 1977

Nursery pests, Surrey Nursery (B.C.F.S.)

Drought damage

Hemlock dwarf mistletoe, *Arceuthobium tsugense*

At the request of the British Columbia Forest Service, Vancouver District office, several areas were examined in Seymour and Kingcome inlets to determine the presence or absence of dwarf mistletoe infections on residual western hemlock trees over 10 feet in height left after recent logging, to clarify some points in the "ten foot clause" in timber sale contracts where hemlock dwarf mistletoe occurs.

In three hemlock-cedar-balsam settings examined in Seymour Inlet at Warner Bay, scattered individuals or groups of four to six residual hemlock trees 10 to 20, and occasionally up to 35 feet in height, remained throughout the logged areas often on the higher ground or ridges. Up to 50% of the trees had branch swellings or brooms typical of long standing mistletoe infections, but aerial shoots were found on only about 10% of those trees that could be closely examined.

At the MacDonald Cedar operation at Seymour Inlet, brooms and swellings were evident on the old growth hemlock, but no current aerial shoots were found. In Kingcome Inlet at Satsalla, Atlatzi and Clear rivers, brooming was evident on the old growth hemlock at the first two localities, but not in the Clear River area (see Appendix 11).

At Blind Channel, on East Thurlow Island, Tree Farm Licence No. 2, an area was examined that had been logged 5 years ago, in a heavily infected hemlock dwarf mistletoe hemlock-balsam type. All residual hemlock trees over 10 feet in height were cut. Examination of the hemlock regeneration revealed no infections present except on a few residuals, under 10 feet in height, left after logging.

Surveys are being carried out, by the Damage Appraisal Group, where juvenile spacing is being done in second growth western hemlock stands heavily infected with dwarf mistletoe, to study the effects of spacing on the mistletoe infections. Mistletoe plants and non-productive or dormant mistletoe swellings were tagged for observation on the effects of spacing on shoot and seed production. The number of shoots per swelling in September 1977 averaged 14.0, compared to 7.0 in May 1977; of 45 previously dormant swellings, 80% had produced aerial shoots averaging 7.3 shoots per swelling and 0.8 cm in length, after spacing had been done. (See Appendix 12).

The first recorded infection of hemlock dwarf mistletoe on Douglas-fir was found on West Redonda Island at two locations. One tree each location was infected in a second growth hemlock-Douglas-fir type. The hemlock trees were heavily infected. One western white pine tree was also infected in the same area (see Appendix 13).

Phomopsis canker of Douglas-fir, *Diaporthe lokoyae*

Douglas-fir trees growing in a second growth western hemlock-Douglas-fir type were infected by this canker at Redonda Bay on West Redonda Island. The approximate area was 50 ha on a southwest-facing slope, where juvenile spacing is being carried out by the British Columbia Forest Service. Up to 25% of the D ouglas-fir have multiple leaders. Height of the Douglas-fir ranges from 15 to 25 feet.

Broadleaf maple stem dieback, *Nectria* sp.

Branch cankers were common on broadleaf maple throughout the host range, resulting in mortality of single branches on individual trees. Dying branches were readily evident by prominent leaf discoloration. Cause of the stem dieback is unknown. The incidence was widespread and common, resulting in "staghead"-like appearance and long term tree mortality.

A needle blight, *Lophodermium pinastri*

A needle blight of shore pine was evident in the Ucluelet, Tofino and Pacific Rim National Park areas, with small pockets (1/4-acre) of infection at widely scattered locations. Maximum infection was 80% of the needles of any one tree, and 50% of the trees at any one location. Infection is on 1975 and 1976 needles. Also found in widespread locations in other areas on Vancouver Island.

Branch flagging on Douglas-fir

Douglas-fir trees in the Hope - Laidlaw area of the Vancouver Mainland District had moderate to heavy branch flagging on roadside and natural forest trees ranging in size from 10 to 100 feet in height. Most of the flagging occurred on the north side of the trees, suggesting climatic damage. Other coniferous and deciduous trees in the same area showed no signs of flagging. The roadside trees could have been damaged by salt or a herbicide but the trees growing on the hillsides are well removed from the roads. (See Appendix 15).

Fume damage - sulphur dioxide

Fume damage was evident on non-forest shrubs on 250 ha north-northeast of the Port Alice pulpmill. Up to 80% of the foliage of the indicator plants showed interveinal browning. Coniferous trees and alder do not exhibit damage signs.

On August 30, a Canadian National Railway sulphur train derailed near Hope at Hunter Creek. The sulphur caught fire and the resulting fumes caused some damage to the foliage of deciduous trees growing in the immediate area and for about 1 km towards Hope from the Hunter Creek Bridge. No coniferous trees appeared to be affected at the time of examination in early September. The sulphur fire was put out within 24 hours after starting.

Bear damage to western red cedar

Bear damage to cedar trees was noted at several localities during aerial surveys of the permanent sample stations north of Lund on the Mainland coast. The trees are 60-70 feet in height and occur in groups of three or four trees at each locality. The bears climb part way up the trees and pull strips of bark off the upper stem, which causes the up crown to die. This damage has also been noted along the Seymour River watershed road. It is assumed this is bear damage by the claw marks on the sapwood. The occasional tree had the bark stripped off at the base, causing the whole tree to die.

Discoloration of broadleaf maple foliage

Leaf necrosis of broad-leaf maples, which caused discoloration and swarfing of leaves, was widespread on Vancouver Island and the Mainland portion of the Vancouver Forest District. The condition has persisted for 3 years but was more noticeable in 1977. Initial discoloration appears as a marginal chlorosis, gradually intensifying to browning and contraction of leaves, often affecting 100% of the foliage. The cause is unknown; however, mineral and moisture deficiencies are possible causes. The presence of numerous leaf hoppers and aphids may be coincidental, or they may be attracted by the condition of the leaves. (See Appendix 14).

Drought damage

Drought conditions caused by below normal rainfall and above normal temperature resulted in mortality and dieback of young Douglas-fir trees in the east coastal region of Vancouver Island. Trees up to 10 years old on gravel and rocky sites and roadsides were affected the most. The largest single group of trees killed were 5-year-old and less Douglas-fir at the south end of Cassidy Airport.

Fir - Lady fern rust, *Uredinopsis longimucronata*

Common on *Abies amabilis* in host range in northern and west coast regions of Vancouver Island.

Compiled by W. Lock

NURSERY PESTS

VANCOUVER FOREST DISTRICT

1977

Pest	Stock
SURREY	
Sirococcus strobilinum	sS container, wH 1-0.
	eS 1-0,
Crane fly larvae	sS plugs; D-fir 1-1,
Fusarium sp.; *Botrytis* sp.	sS 2-0
Pythium sp.	Spruce containers 1-0,
Pendroma sp.	Spruce beds 1-0, spruce conts. 1-0,
Aphids, Thrips, *Noctuidae*	Spruce containers 1-0,
Tortricidae, Weevils	" bare root 2-0, wH 1-0,
Nematodes	" " " " ,
Frost damage	D-fir 1-0, sS 2-0,
Fertilizer injury	wH container 1-0, pP 1-0,
Chemical injury	Spruce " 1-0,
Unknown rust	pP mudpack 1-0.
GREEN TIMBERS	
Sirococcus strobilinus	eS containers
Fusarium sp.	D-fir 1-0,
Botrytis sp.	D-fir 1-0,
Herbicide (Propazene)	" 1-0,
Frost	" 2-0,
CHILLIWACK	
Sirococcus strobilinus	sS 2-0
Botrytis sp.	" "
Fertilizer burn	" "
" "	D-fir 2-0
Mechanical injury	" "
Drainage	" "
KOKSILAH	
Fusarium sp.	D-fir 1-0
Phoma sp.	wrC
Insect damage	wH 1-0, container
Chemical"(Pentachlorophenol)	wH 1-0,
Mechanical damage	" " ,
Physiological	sS 1-0,
Stress	wH (5 trees) 1-0
Heat injury	D-fir 1-0
Desiccation	" , 1P

Nursery Pests - cont'd.

Pest	Stock
CAMPBELL RIVER	
Fusarium sp.	gF container
Chemical injury	Abies 1-0 container
Genetic	" 1-0 (5 trees)
"	" 1-1 (20 trees)
Phenacaspis	--
Stress	aF 2-0 (4 trees)
Herbicide or fertilizer injury	D-fir
Unknown	Abies (4)
OTHER NURSERIES	
MacMillan Bloedel, Nanaimo	*Steremnius carinatus* in container stock
MacMillan Bloedel, Menzies Bay	*Botrytis* - bacteria in wH (12 trees)
Rayonier - Saanich	Frost - C. *occidentalis* in D-fir
PFRC - Mel Hughes	High temp. damage, Abies containers
" "	Diazinon burn, wL 2-0 containers
" "	*Halisidota*, wH, D-fir
" Al Mitchell	Nutrient burn (flooding), wH 1-0
G.V.W.B.	*Diaporthe lokoyae*, 5 yr. D-fir