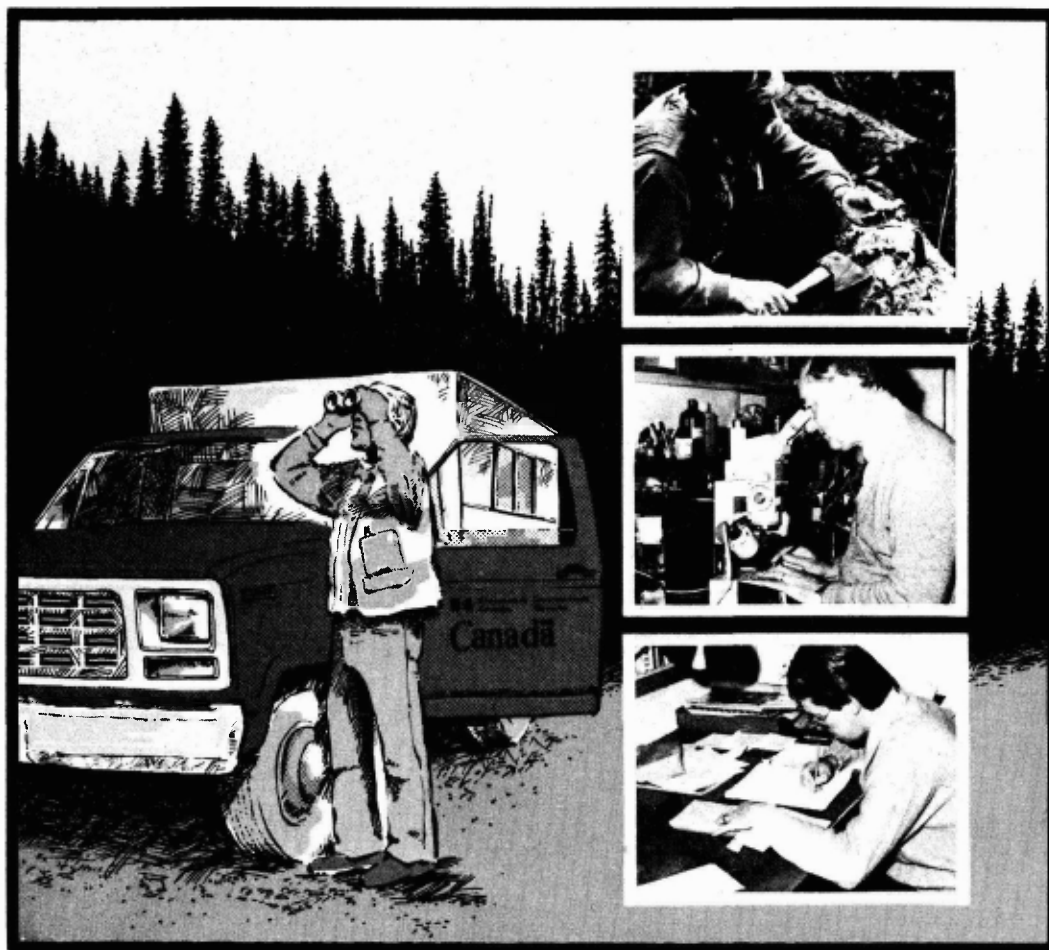


Forest Insect and Disease Conditions

Vancouver Forest Region
1983

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TABLE OF CONTENTS

	Page
SUMMARY OF PEST CONDITIONS	1
DOUGLAS-FIR PESTS	3
Western spruce budworm	3
Douglas-fir tussock moth	5
Rusty tussock moth	6
Cone and seed pests	6
Silver-spotted tiger moth	7
Douglas-fir beetle	7
Phellinus root rot	8
Swiss needle cast	8
Blackstain root disease	9
Armillaria root disease	9
WESTERN HEMLOCK PESTS	9
Phantom hemlock looper	9
Conifer sawfly	9
Western hemlock looper	10
Green-striped forest looper	10
Western blackheaded budworm	10
Terminal crook disease	11
AMABILIS FIR PESTS	11
Seedling weevil	11
PINE PESTS	14
Mountain pine beetle	14
European pine shoot moth	15
SPRUCE PESTS	15
Spruce weevil	15
DECIDUOUS TREE PESTS	16
Western oak looper	16
Winter moth	17
Fall webworm	18
Gypsy moth	18
Dogwood leaf blight	19
Armillaria root rot	20
A poplar canker	20
Poplar shoot blight	20
PESTS OF YOUNG STANDS	20
EMPLOYMENT BRIDGING ASSISTANCE PROGRAMS (EBAP)	20
NOT SUFFICIENTLY RESTOCKED (NSR) SITES	22

Summary of Pest Conditions

This report outlines forest insect and disease conditions in the Vancouver Forest Region in 1983 and forecasts population trends of potentially damaging pests.

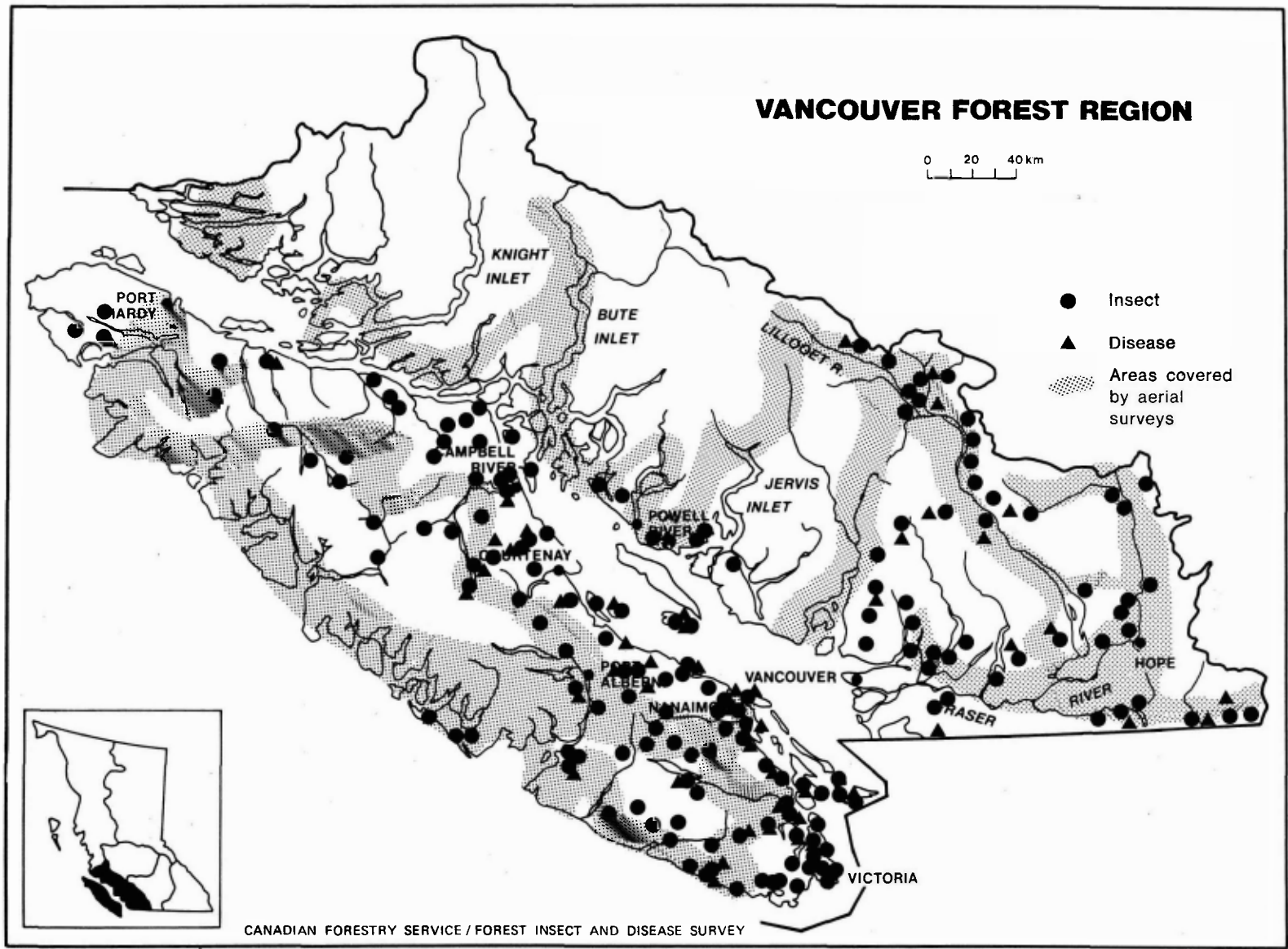
Western spruce budworm populations remained low with no defoliation recorded in the Region. Douglas-fir tussock moth moderately defoliated localized Douglas-fir stands near Chilliwack, Clearbrook, Abbotsford, Cassidy and Victoria. There was an increase in mortality of Douglas-fir by Douglas-fir beetle, notably in the Fraser Canyon and Pemberton areas. Phellinus root rot continued to be a major problem in Douglas-fir stands throughout the Region. Phantom hemlock looper populations at Coquitlam Lake collapsed as predicted and no defoliation occurred in 1983. Mortality and damage of amabilis fir and western hemlock seedlings by a seedling weevil increased in the Holberg area on Vancouver Island. Mountain pine beetle infestations increased in the Homathko River Valley, Lillooet Lake, and Fraser Canyon areas. Defoliation of deciduous trees in the Greater Victoria area by winter moth was moderate to severe, similar to 1982 but larval parasites were more evident. Western oak looper moderately defoliated Garry oak in the Mount Maxwell Ecological Reserve on Saltspring Island for the third consecutive year. Dogwood leaf blight was severe in Golden Ears Provincial Park at Alouette Lake and was recorded at several other locations from White Rock to Powell River on the Mainland and from the Saanich Peninsula to Nanaimo on Vancouver Island.

The forest pest field survey was conducted from May 12 to September 15 and included several special surveys: to collect winter moth larvae for parasitism studies on Vancouver Island; to monitor provincial parks and campsites; to set attractant-baited apple maggot traps in the Comox area in co-operation with Agriculture Canada; to locate and assess pest conditions in 7 EBAP projects and 9 NSR sites in the Region; to examine western hemlock plantations in the Northwest Bay area on Vancouver Island for terminal crook disease.

A total of 613 insect and disease samples from throughout the Region were submitted to the Pacific Forest Research Centre in 1983. CFS-FIDS personnel submitted 542 samples and other agencies or individuals submitted 76. Locations of samples collected and areas of the Region covered during 22 hours of aerial survey from fixed-wing aircraft are shown on Map 1.

The number of samples from all hosts which contained larvae in Mainland forest collections increased to 86% from 78% in 1982, and increased to 80% from 67% in 1982 on Vancouver Island.

Details on 1983 forest pests are described by host in order of importance.



Map 1

Area covered by aerial surveys and locations where one or more forest insect or disease samples were collected, 1983

DOUGLAS-FIR PESTS

Western spruce budworm, Choristoneura occidentalis

Defoliation of Douglas-fir by western spruce budworm was not recorded in the Region for the third consecutive year in 1983. Significant numbers of larvae (12) were found only in residential areas of Abbotsford, in association with localized defoliation by Douglas-fir tussock moth. Throughout the Mainland, only 13% of 52 standard beating samples from Douglas-fir contained an average of 5 larvae, about the same as in 1982.

Budworm populations and areas of defoliation fluctuated annually since 1973 with a maximum of 90 000 ha of defoliation in 1977. These fluctuations and the average number of larvae per positive sample, percent positive collections, and the counts of egg masses on branch samples, are shown in Figure 1.

Pheromone-baited traps at eight locations on the Mainland and at three on Vancouver Island showed low populations (Table 1). Fifteen traps were set at each location, using five traps at each of three different pheromone concentrations by weight (.001%, .01%, .1%). There was a slight increase from 1982 in the average number of adults per trap for three locations at the 0.1% concentration: Haylmore Creek from 67 to 73, Owl Creek from 33 to 51 and Fuller Lake from 5 to 9. At the other eight locations combined averages were lower, from 25 in 1982 to 9 in 1983 (at highest bait concentration).

TABLE 1. Number of adult male western spruce budworm in pheromone-baited traps, Vancouver Forest Region, 1983.

Location	Average number and range of adults per trap by pheromone concentration					
	.001%		.01%		0.1%	
	No. of Adults		No. of Adults		No. of Adults	
	Range	Average	Range	Average	Range	Average
<u>Fraser Canyon</u>						
Kookipi Cr.	0-0	0	0-6	3.5	15-28	22.8
Gilt Cr.	0-0	0	0-1	0.2	0-7	1.6
Rhododendron Flats	0-0	0	0-1	0.4	1-7	2.6
Skagit R.	0-0	0	0-0	0	0-0	0
<u>Pemberton</u>						
Haylmore Cr.	0-4	2	11-34	21	43-93	72.7
Twin-One Cr.	0-1	0.5	3-11	5.8	10-34	21
Owl Cr.	0-2	0.6	10-26	19.8	18-82	50.6
Railroad Cr.	0-0	0	0-1	0.5	2-11	5.4
<u>Vancouver Island</u>						
Highlands Rd.	0-0	0	0-2	0.4	2-20	10.4
Fuller L.	0-1	0.3	0-4	1.2	1-14	8.8
Green Mtn.	0-0	0	0-4	1.2	2-6	4.6

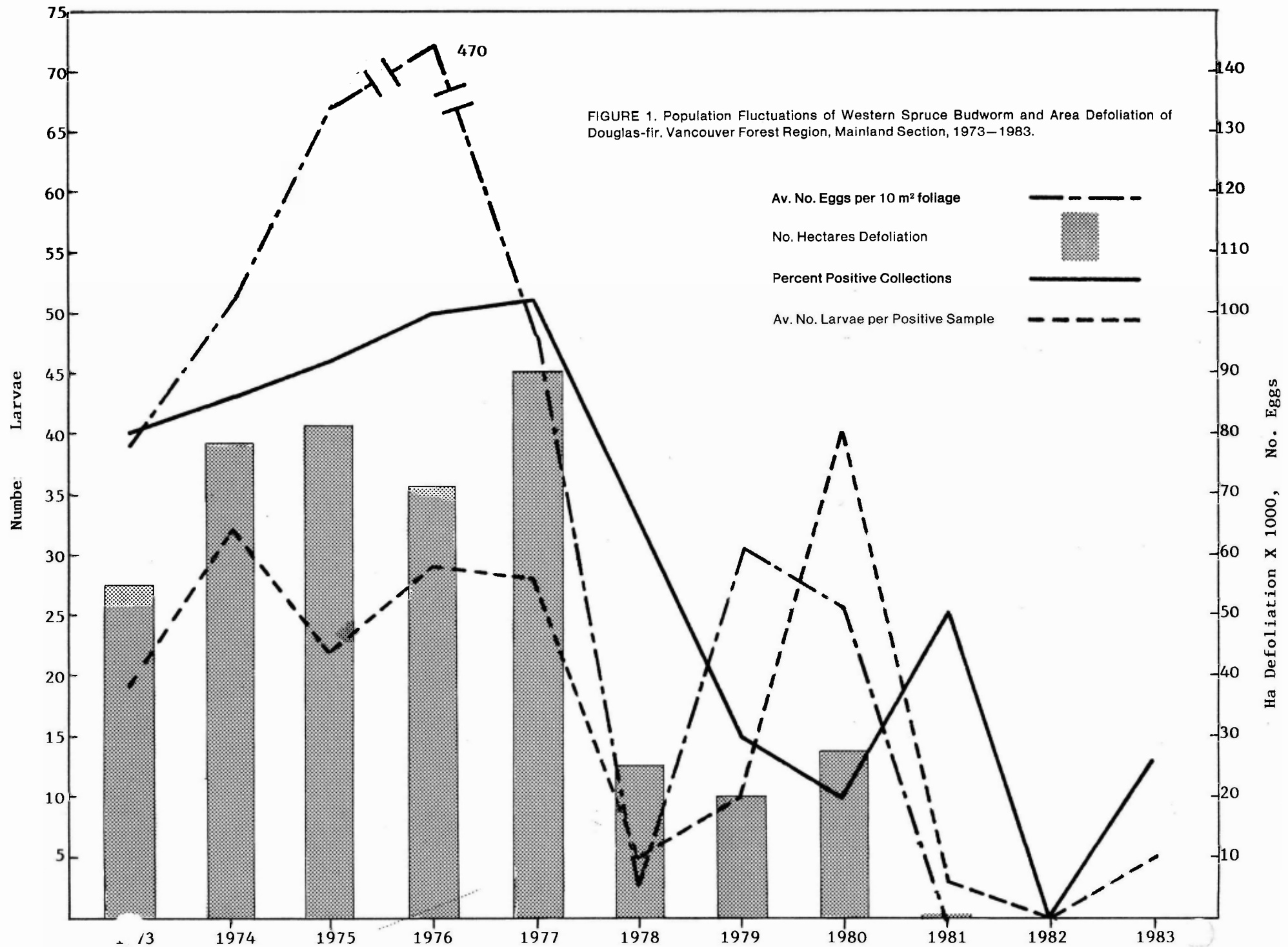


FIGURE 1. Population Fluctuations of Western Spruce Budworm and Area Defoliation of Douglas-fir. Vancouver Forest Region, Mainland Section, 1973—1983.

Av. No. Eggs per 10 m² foliage
 No. Hectares Defoliation
 Percent Positive Collections
 Av. No. Larvae per Positive Sample

470

There were no egg masses in branch samples from Douglas-fir stands at Rhododendron Flats, Skagit River, Kookipi, Gilt, Haylmore, Owl, Twin One and Railroad creeks, indicating populations will remain low in 1984.

Douglas-fir tussock moth, Orgyia pseudotsugata

High populations occurred on mature and immature Douglas-fir near the Chilliwack golf course and in scattered residential areas in Clearbrook and Abbotsford. However, defoliation was lighter than in 1982, and ranged from complete defoliation of 30% of the crown to a few defoliated branches.

On Vancouver Island, the tussock moth severely defoliated one Douglas-fir tree at Cassidy and two immature trees at one location in Victoria.

The localized infestation at Chilliwack golf course was treated twice with aerial applications of Orthene by commercial operators, once from a fixed-wing aircraft on May 27 and again from a helicopter on June 24. Post application larval sampling showed most of the larvae were dead or dying.

There were no 1983 Douglas-fir tussock moth egg masses found during surveys in September at Chilliwack, Victoria and Cassidy. High incidence of mortality in the cocoon stage was the probable cause of the lack of eggs (Table 2). Dissection of 73 cocoons from two locations on Vancouver Island showed that 75% were parasitized by dipterous insects, 15% were infected with a nuclear polyhedrosis virus and only 10% were healthy. Based on the egg sampling and cocoon studies defoliation by tussock moth should be minimal in the Region in 1984.

TABLE 2. Results of dissections of tussock moth cocoons from two locations on Vancouver Island, Vancouver Forest Region, 1983.

Location	No. cocoons dissected	Percent Cocoons		
		Healthy	Parasitized	Killed by virus
Cassidy	43	5	77	18
Victoria	30	17	73	10
AVERAGE %		10	75	15

Rusty tussock moth, Orgyia antiqua badia

High numbers of rusty tussock moth larvae (more than 50 per standard sample) occurred on Douglas-fir at a golf course near Chilliwack. However, the population was greatly reduced by the aerial application of Orthene against the Douglas-fir tussock moth at the same location.

Previously, this insect has been recorded as having caused only minor damage to several Douglas-fir trees at the Gorge Vale golf course in Victoria in 1977. Defoliation is not expected in the Region in 1984.

CONE AND SEED PESTS

Douglas-fir cone crops were generally light to moderate on Vancouver Island in 1983. Insect pests including cone midges (Contarinia spp.), a cone moth (Barbara colfaxiana), a seed chalcid (Megastigmus spermatrophus), and a cone worm (Dioryctria abietivorella), individually or collectively infested an average of 50% (range 5% to 100%) of Douglas-fir cones examined at each of five sites (Table 3). Random samples from Quinsam Seed Orchard in Campbell River produced no insect pests, which may be attributed to pest control programs.

TABLE 3. Incidence of Douglas-fir cone and seed pests, Vancouver Island, Vancouver Forest Region, 1983.

Location	Host	% Cones Infested by Pest					% Cones Infested*
		<u>Contarinia oregonensis</u>	<u>Barbara colfaxiana</u>	<u>Megastigmus spermatrophus</u>	<u>Contarinia washingtonensis</u>	<u>Dioryctria abietivorella</u>	
Nanaimo Lks. Rd.	D-fir	20	10	50	5	5	65
Schoen Lk.	D-fir	45	100	-	10	15	100
Maple Mtn. Park	D-fir	20	-	5	-	-	25
Sproat Lk.	D-fir	5	10	-	-	-	10
Woss Lk.	D-fir	5	40	5	-	5	50
Average %		19	32	12	3	5	50

*one or more pest species may infest the same cone

Silver-spotted tiger moth, Halisidota argentata

Partially defoliated single and groups of branches of Douglas-fir and occasionally of lodgepole pine were common along the east coast of Vancouver Island. Light defoliation occurred on single trees from Victoria to north of Campbell River, including the Saanich Peninsula, Sooke, Cameron Lake and Lake Cowichan areas and on the Lower Mainland from Vancouver to Squamish.

Standard three-tree beatings contained an average of 1.3 larvae in 12% of Douglas-fir samples.

Rearing studies showed that more than 50% of the larvae in two colonies from Victoria were parasitized by a fly, Uramya halisidotae. However, those from another colony, reared through adult and egg stages, produced more than 300 first-instar larvae. These results indicate that silver-spotted tiger moth should be common in 1984.

Tree mortality by this defoliator has not been recorded in B.C. and although generally of little economic importance, its colonies on Christmas trees in Mill Bay and nursery seedlings in Duncan were of local concern. The most recent infestation of Halisidota argentata on Vancouver Island was from 1953 to 1956.

Douglas-fir beetle, Dendroctonus pseudotsugae

There was a fourfold increase in the number of Douglas-fir trees killed; from 75 in 1982 to 295 in 1983. At 10 locations, mainly in the Fraser Canyon and Pemberton areas (Table 4), beetle-killed trees occurred in scattered groups of 5 to 55 trees.

TABLE 4. Location and number of Douglas-fir trees killed by Douglas-fir beetle, as determined from aerial surveys, Vancouver Forest Region, 1983.

Location	Number of dead trees
<u>East side Fraser River</u>	
Saddle Rock	55
Gilt Creek	55
Ainslee Creek	10
east of North Bend	5
<u>West side Fraser River</u>	
south side Nahatlatch Lake and River	20
Kookipi Creek	10
North Bend	5
Spuzzum Creek	60
Gordon Creek	25
Lillooet River (Tenquille Lake Tr.)	50
TOTAL	295

Current beetle attacks in pockets of three to five trees were recorded along the east side of Lillooet Lake south of Joffre Creek, along the Tenquille Lake trail north of Pemberton, and along the Skagit River north of Nepopekum Creek.

On Vancouver Island, fewer than 25 standing trees were killed by the beetle; current attack and tree mortality occurred in the Shawnigan Lake Division, in Rath Trevor and Strathcona Parks and on Saltspring Island in Mount Maxwell Ecological Reserve.

Mortality and current attack could, under favourable climatic conditions, occur throughout the Region in 1984.

Phellinus root rot, Phellinus weirii

During aerial surveys along the Skagit River, small stand openings (.1 ha) typical of Phellinus root rot centers, were identified in Douglas-fir stands for 10 Km from Nepopekum Mountain to the junction with Twenty-six Mile Creek, south of Highway No. 3. Subsequent ground checks of the area at Km 43 of the Silver-Skagit Road, identified the disease in 21% of Douglas-fir along a 380 m cruise line.

Single infected trees were also recorded at Km 22 and Km 36 of the Silver-Skagit Road, at Scuzzy Creek in the Fraser Canyon and in Manning Park. Infection centers up to 0.1 ha were also common in localized areas on Vancouver Island, including the Shawnigan Lake Experimental station and in two centers in Mount Maxwell Park on Saltspring Island.

Root rot surveys of second growth Douglas-fir stands in the Quinsam Block in the Campbell River area, by B.C. Ministry of Forests, indicated that about 8% (14 ha) of 202 ha surveyed in 8 stands were infected by the pathogen.

Swiss needle cast, Phaeocryptopus gaeumanni

This native disease which severely infects all but the current year's foliage of Douglas-fir trees and results in premature needle loss, was widely distributed in the Region in 1983.

In Mainland Douglas-fir forests, an estimated 10 to 30% of the needles were infected on 10% of the trees over 3 ha at Nahatlatch Lake, and 30% of the needles on 96% of the roadside seedlings over 3 ha on Blackwall Peak Road in Manning Park.

On Vancouver Island, surveys at 6 locations showed that the percentage of trees infected ranged from 20% to 100%: Courtenay Seed Orchard (Crown Forest Industries) - 100%; Tsolum River - 100%; Quinsam Seed Orchard - 93%; Koksilah Seed Orchard - 70%; Bamberton - 30%; Lasqueti Island (Boat Cove) - 20%.

Although the pathogen is not considered an important pest in natural stands in British Columbia, continuous severe infections resulting in loss of older needles could be a threat to growth potential in plantations due to loss of photosynthate. Control efforts with a fungicide spray at Dewdney Seed Orchard in 1983 reduced the incidence of infection from 13% in 1982 to less than 3% in 1983.

Black stain root disease, Verticicladiella wagnerii

The disease infected and killed one of 50 Douglas-fir seedlings at a replanted site on Vedder Mountain near Cultus Lake. Surveys for the disease in four Douglas-fir stands in the Skagit River and Lillooet Lake areas were negative.

Armillaria root rot, Armillaria mellea

Tree mortality of occasional sapling-sized Douglas-fir was common at Urquhart Creek in the Fraser Canyon area, along the Silver-Skagit Road southwest of Hope, and on Texada Island. On Vancouver Island, infected trees were also found during root rot surveys in the Campbell River area, but less than 1% of the 202 ha cruised was infected by A. mellea.

WESTERN HEMLOCK PESTS

Phantom hemlock looper, Nepytia phantasmaria

As predicted, populations of this defoliator at Coquitlam Lake collapsed in 1983. Very few larvae were found and there was no defoliation. The decline was attributed to cool, wet weather in June and to two diseases, Entomophthora sp. and Paecilomyces sp., found in larvae and pupae in 1982. The number of samples which contained phantom hemlock looper from western hemlock elsewhere on the Mainland remained at the 1982 level of 4%, but the average number of larvae per positive sample declined from 2.5 in 1982 to 1.5 in 1983. Populations should remain low in 1984.

Conifer sawfly, Neodiprion spp.

Low populations persisted in the amabilis fir-western hemlock stands in the Keta Lake and Big Tree Creek areas near Kelsey Bay on Vancouver Island where an infestation collapsed in 1982. Over 90% of the blocks defoliated during 1979-81 were salvage logged by the end of 1983. However, low to moderate populations remain in two other areas, with a maximum of 105 larvae per sample at Haihte Lake and 35 at Forbidden Plateau.

An average of 13 larvae per sample was found in 29% of collections from western hemlock, throughout the Region, down from 37 larvae in 21% of collections in 1982.

Based on the number of larvae collected light defoliation may occur in the Haihte Lake area near Kelsey Bay, but is not expected elsewhere on the Island in 1984.

Western hemlock looper, Lambdina f. lugubrosa

Defoliation of western hemlock by western hemlock looper has not been recorded in the Region since 1971 when 250 ha were defoliated in the Coquitlam Lake area. Although the average number of hemlock looper larvae per positive sample on western hemlock on the Mainland decreased in 1983, the percentage of collections containing larvae increased (Table 5). On Vancouver Island 10% of the collections from western hemlock contained an average of only one larva, little changed from 6% containing 2 larvae in 1982. Low populations are expected throughout the Region in 1984.

TABLE 5. Percentage of collections from western hemlock containing western hemlock looper and average number per positive sample, Mainland area, Vancouver Forest Region, 1983.

Year	Percentage of collection containing larvae	Average no. of larvae per positive sample
1981	16	2.0
1982	30	9.0
1983	34	2.5

Green-striped forest looper, Melanolophia imitata

Populations remained at low endemic levels and defoliation of western hemlock stands was not recorded in the Region in 1983. About 35% of the samples contained an average of three larvae, an increase from 11% and three larvae in 1982. Populations were at endemic levels in Douglas-fir and western red cedar stands throughout the Region, with 50% and 43% respectively of the collections positive with an average of 3 larvae per positive sample for each host. Defoliation is not expected to occur in 1984.

Western blackheaded budworm, Acleris gloverana

Populations in western hemlock stands on Vancouver Island did not change significantly in 1983; the percentage of positive collections was 10% with an average of 3 larvae, compared to 6% with an average of 2 in 1982. On the Mainland there was a slight increase, with the percentage of positive collections increased to 44% from 19% in 1982; the average number of larvae per sample was 3, down from 4.8 in 1982.

The 1983 survey did not indicate a significant population buildup and no defoliation is predicted in the Region in 1984. However, outbreaks of blackheaded budworm in the Vancouver Forest Region have occurred at 11- to 14-year intervals since 1940. If future cycles follow the same pattern, the next outbreak could occur in about 1985.

Terminal crook disease, Colletotrichum acutatum

Evidence of the disease was not found in 78 suspect western hemlock seedlings collected from a total of 6 site examinations in the Northwest Bay area in 1983 during summer and fall surveys.

This pathogen, an important nursery pest on P. radiata in New Zealand, and potentially damaging to North America conifers, was discovered for the first time in North America in 1982 on western hemlock seedlings in an Aldergrove nursery. Infected shoots were identified on 38 of the 33 000 western hemlock seedlings examined; 177 000 western red cedar and 690 000 spruce seedlings were healthy.

About 70 000 western hemlock seedlings associated with the infected nursery stock were outplanted at several sites near Northwest Bay on Vancouver Island in 1981. Seedlings at four sites surveyed in 1982 were disease free.

Although the surveys of planted and natural stock indicate that the disease is not well suited to climatic or site conditions of the area, further examinations will be conducted in 1984.

AMABILIS FIR PESTS

Seedling weevil, Steremnius carinatus

Mortality of one- and two-year old seedlings in the Holberg area on northern Vancouver Island was recorded by industry for the second year during survival studies of 30 1982 plantations.

Incidence of seedling mortality averaged 5.3% at 30 plantations and ranged from a high of 33% for western hemlock at a Macjack River plantation to a low of 0% for amabilis fir, Sitka spruce, western hemlock and western red cedar at 12 locations and from 1% to 24% for all hosts at 17 locations. Average incidence of mortality was highest on amabilis fir (12%) followed by western hemlock (10%), western red cedar (3%) and Sitka spruce (2%) (Table 6). This represented an increase from the 1.4% mortality recorded during 1982 assessments of 1981 plantations.

Table 6. Percent mortality of seedlings by a seedling weevil in Holberg area*, Vancouver Island, Vancouver Forest Region, 1983.

Location & Plantation #	% Mortality by species			
	aF	wH	sS	wC
Hathaway Cr. #448	18	-	0	-
Hathaway Cr. #445	-	-	0	-
Hathaway Cr. #447	21	28	8	-
Hathaway Cr.	-	-	0	0
Hathaway Cr.	-	2	-	0
Hathaway Cr.	-	3	-	2
Pegattem Cr.	-	0	-	16
Pegattem Cr.	0	-	0	-
San Josef R.	-	12	13	-
Moore Lk.	-	17	-	9
Leesson Lk.	-	-	0	-
Topknot Lk.	-	9	-	6
Topknot Lk.	-	-	0	-
Topknot Lk.	-	25	-	8
Topknot Lk.	-	-	1	-
Topknot Lk.	8	5	-	-
Macjack R.	-	0	-	0
Macjack R.	10	33	-	-
Macjack R.	-	-	0	0
Ronning Cr.	-	0	-	0
Ronning Cr.	-	6	0	-
Ronning Cr.	-	9	-	0
San Josef R.	-	-	0	-
San Josef R.	-	25	-	-
Goodspeed R. #442	13	-	0	0
Nahwitti Lk. #441	-	0	-	0
Nahwitti Lk.	-	0	-	0
Goodspeed R.	-	2	-	0
Hathaway	-	-	0	-
Hathaway+	-	-	-	-
Average % mortality by species	12	10	2	3

*Based on survival assessment information provided by WFP, Holberg.
+1% Douglas-fir

Surveys by FIDS at four plantations in mid-August showed a high incidence of basal stem girdling but limited mortality; four dead amabilis fir seedlings were recorded in one 1983 plantation and two dead western hemlock seedlings in three 1982 plantations.

Early spring reports by industry of severe mortality were not confirmed, probably due to deterioration of seedlings during extended time intervals between spring and late summer surveys. Damage, such as partial stem girdling, averaged 20% in all plantations, and ranged from 33% in the 1983 plantation in the Macjack River area to 13% at Hathaway Creek (Table 7). Amabilis fir was the most severely affected with 29% damaged in four plantations compared to 18% for western hemlock and 5% for Sitka spruce.

Table 7. Incidence of partial girdling and seedling mortality caused by seedling weevil in 1982/1983 plantations in Holberg area, Vancouver Island, Vancouver Forest Region, 1983.

Plantation/Location	% Damaged by Species				% attack by location*	Number seedlings killed
	aF	wH	sS	wC		
P1 480 (1983) Macjack R.	35	31	0	-	33	4 aF
P1 447 (1982) Hathaway Cr.	17	16	11	-	15	2 wH
P1 448 (1982) Hathaway Cr.	50	15	0	-	13	
P1 442 (1982) Goodspeed R.	28	-	8	0	17	
Ave. % attacked by species*	29	18	5	0	20	

*based on actual counts

Survival of stock partially girdled by the weevil was good. However, damaged seedlings could be predisposed to invasion by pathogens. There is currently no method available to project survival of damaged stock or 1984 infestation levels. Several previous infestations at approximately 10 year intervals between 1960 and 1980 were reported on the Queen Charlotte Islands, all of which appeared to collapse naturally after only one or two years of severe attack.

PINE PESTS

Mountain pine beetle, Dendroctonus ponderosae

There was a significant increase in the number of lodgepole pine and western white pine trees killed by mountain pine beetle as recorded in 1983 (Table 8). The number of recently killed pine, estimated from aerial surveys more than doubled to 6875 trees from the 3000 trees in 1982, and the area of infestation quadrupled to 2 065 ha from 500 ha.

Table 8. Area of infestation and number of pine trees killed by mountain pine beetle. Vancouver Forest Region, 1983.

Location	Pine Species	Area (ha)	No. of recently killed trees
<u>Pemberton</u>			
Specht Cr.	lodgepole	300	1 250
Gates L.	"	300	450
Eight Mile Cr.	"	100	275
Spruce-Haylmore crs.	"	350	800
W. end Anderson L.	"	100	400
West of Devine	"	100	200
Blackwater R.	western white	40	200
Phelix Cr.	lodgepole	80	300
Birkenhead L.	"	20	150
Mt. Currie	"	5	5
<u>Fraser Canyon</u>			
Ainslee Cr.	lodgepole	200	500
Mowhokam Cr.	"	10	20
W. of Boston Bar	"	60	125
<u>Bute Inlet</u>			
Homathko R.	lodgepole	400	2 200
TOTALS		2 065	6 875

The three year old infestation at Eastgate in Manning Provincial Park was resurveyed and only 29 currently attacked trees were found, all within 30 m of 10 pheromone-baited trees; seven newly infested trees were recorded in two pockets about 5 km west of Eastgate. All infested trees were marked for removal. There was no evidence of current beetle attack in either Muledeer or Hampton campgrounds west of Eastgate.

The number of attacks per 225 cm² bark sample on currently attacked trees ranged from 1 to 12 and averaged 5. Attacks were in the initial stage on about half the trees and the remainder contained small to medium sized larvae.

The beetle control program in the Park has apparently been successful in controlling the population, having reduced the number of attacked trees from 3500 in 1981, to 252 in 1982 to only 29 in 1983. However, recently-killed lodgepole pine, including 18 groups of 5-10 trees and one of 200-500, were recorded in the adjoining Kamloops Region within 20 km of the eastern boundary of the Park. This indicates the possibility of re-infestation and emphasizes the need for continued monitoring of beetle populations in the Park in 1984, particularly in the extensive lodgepole pine stands west of Eastgate which are of a size and age where they are most susceptible to mountain pine beetle attack.

European pine shoot moth, Rhyacionia buoliana

The shoot moth which attacks the terminals and laterals of ornamental pines and affects height growth and tree form significantly damaged several dozen ornamental pines in several locations on Vancouver Island. About 5% of the shoots were infested on each of about 20 Mugho pine in the University of Victoria area where populations have persisted for over 10 years. Four larvae were collected and an average of 39 adults (range 30-50) were attracted to each of 4 pheromone-baited traps located in the stadium area, indicating a low but persistent population. In a Christmas tree plantation near Mill Bay, 80% of the Scots pine were infested with an average of 2 infested tips per tree. A spot infestation of 10-20 Mugho pines in Nanaimo had up to 50% of branch tips infested, and single infested ornamental pines were scattered throughout the Comox area.

SPRUCE PESTS

Spruce weevil, Pissodes strobi

At five of seven spruce plantations surveyed on Vancouver Island, to determine the status of spruce weevil an average of 17% (range 4-34%) of the trees were currently attacked, and an average of 41% (range 0-66%) were attacked prior to 1983 (Table 9).

TABLE 9. Incidence of spruce weevil attack in spruce plantations, Vancouver Island, Vancouver Forest Region, 1983.

Location	% of Trees Attacked	
	Current (1983)	Old (1982 and previous)
Nimpkish	4	0
Tsolum R.	34	66*
Sprise Lk.	5	21
Staghorn Cr.	9	61
Sayward	33	59+
AVERAGE	17	41

*Norway spruce plantation
+Sayward provenance trials

At a Loss Creek plantation 5% of the trees were previously attacked but current attack was not evident, due possibly to the early examination date. At Robertson River, two Sitka spruce plantations (average 1.9 m high) planted under a deciduous canopy, were not attacked.

In a plantation in the Nimpkish River Valley, attack was not recorded in 1982, but by 1983 trees averaged about 2 m high and apparently had reached a more susceptible size, age and vigor and 4% of the leaders were infested. Increased damage is projected for this area in 1984.

Leader mortality and current attack was common from Campbell River to Kelsey Bay in roadside regeneration. Severe damage at Swah Creek near Vernon Lake was reported by forest industry, and leader clipping control programs continued in several plantations in the Tahsis area where high weevil populations and annual terminal mortality remain a problem.

DECIDUOUS TREE PESTS

Western oak looper, Lambdina f. somniaria

Defoliation of Garry oak ranged from 5 to 20% and averaged 10%, a decrease from 50 to 100% defoliation in 1982 over approximately 16 ha of the Mt. Maxwell Ecological Reserve on Saltspring Island. This was the fourth consecutive year of defoliation.

Early summer surveys produced only 125 larvae in three standard samples from Garry oak which resulted in light defoliation of oak but there was no feeding on Douglas-fir as in previous years. However, 5 000

larvae were collected from only six Garry oak trees in mid-August. The late development of larvae was attributed to cool, wet weather in June and July.

About 1 142 larvae and pupae were collected from lichen and 26 burlap traps in August for parasitism studies. Preliminary results showed that 19% were parasitized by dipterous parasites, 6% by hymenopterous parasites, and 3% were infected by either a nuclear polyhedrosis virus (NPV) or a pathogen, Beauvaria bassinia. Of 3 511 larvae reared from the August mass collections, 27% were parasitized by dipterous insects and 1% by hymenopterous parasites. The larval and pupal mortality apparently had little effect on the looper population, since large numbers of adults were in flight in October and November. This indicated continued high populations in 1984, with the potential for moderate to severe defoliation in the Ecological Reserve.

The bark beetle, Dendroctonus pseudotsugae attacked four mature Douglas-fir trees, partially defoliated by the oak looper for three consecutive years.

Winter moth, Operophtera brumata

Defoliation of deciduous trees on southern Vancouver Island continued in 1983 for the thirteenth consecutive year, with no reduction in extent or intensity in the Greater Victoria, Colwood and Saanich Peninsula areas. Defoliation, mainly of Garry oak but also of broadleaf maple and fruit trees, was generally light to moderate except for localized areas of severe defoliation in Victoria and on the Saanich Peninsula.

The pest was collected in Duncan for the first time when 80 larvae were collected from 3 lightly defoliated fruit trees, a significant spread from the Victoria area. Surveys for the moth in the Delta-Richmond areas on the Mainland were negative.

A parasite release program, initiated in 1979 in the Greater Victoria area, has established the parasites but not at levels high enough to affect the general winter moth population. Final results of rearing programs to determine percentage of 1983 larvae parasitized by Cyzenis albicans and Agrypon flaveolatum will not be available until the spring of 1984. A special trapping and netting program for adult parasites resulted in 80 C. albicans and 36 A. flaveolatum adults at eight locations in 1983 as compared to no C. albicans and 12 A. flaveolatum found at three locations in 1982. This increase indicated that larval parasites could reduce winter moth populations in the near future. However, high numbers of winter moth adults in November indicated high populations and continuing defoliation within Greater Victoria in 1984.

In preliminary analysis 31% of 6986 winter moth cocoons from 31 parasite release sites contained dipterous parasites, primarily C. albicans and parasitism at three sites in Victoria was over 70%: High Rock Park - 77%, West Saanich & Markham - 76%, and a West Saanich Road location - 75%. Hymenopterous parasites were determined to be present but completion of rearing program will be required to establish numbers of A. flaveolatum (Hymenoptera) and to isolate numbers of C. albicans (Diptera). These preliminary results confirm the success of the parasites in becoming established and effective controls and suggest a substantial reduction in defoliation in many of the release site areas in 1984.

Fall webworm, Hyphantria cunea

Light to severe defoliation of a variety of deciduous trees and shrubs was conspicuous on the Lower Mainland and the east coastal area of Vancouver Island.

Severe defoliation of single and small groups of trees was intermittent on the Mainland from Vancouver to Nahatlatch Lake and from Horseshoe Bay to Mt. Currie near Pemberton, but the severest damage was in the Agassiz-Kent area. Similar defoliation intensities occurred on Vancouver Island from the Malahat, north of Victoria, to Campbell River. Infested trees had from 1 to 15 or more webs but averaged only 2 or 3. The damage caused by this defoliator, although unsightly, is considered of little economic importance.

Gypsy moth, Lymantria dispar

Agriculture Canada, Plant Quarantine, trapped nine adults in four traps in the Courtenay area; 26 adults in the Fort Langley area, one adult in the Chilliwack area and one near Deep Cove. Egg mass surveys in the Fort Langley area produced three egg masses but similar surveys at Courtenay were negative. Surveys will continue in 1984.

The Forest Insect and Disease Survey co-operated with Agriculture Canada in an annual survey for male gypsy moth adults in the Vancouver Region. Two traps, each baited with a sex attractant pheromone, were placed in each of 5 Mainland locations; and two traps in each of five provincial parks on Vancouver Island, but all were negative (Table 10).

Table 10. Location and number of adult Gypsy moth in pheromone-baited traps, Vancouver Forest Region, 1983.

Location	No. of Traps	No. of Adults/Trap
<u>Mainland</u>		
Silvertip Park	2*	0
Hicks Lake	2*	0
Weaver Lake	2*	0
Emory Creek	2*	0
Chilliwack Lake	2	0
<u>Vancouver Island</u>		
Little Qualicum Falls Park	2	0
Ivy Green Park	2	0
Petroglyph Park	2	0
Rathrevor Park	2	0
Englishman River Falls Park	2	0
TOTAL	20	0

*Locations where one trap was vandalized or missing.

Dogwood leaf blight, Gloeosporium sp.

The incidence of infection by the blight increased significantly in the Region in 1983. About 65% of the dogwood trees over about 5 ha in Golden Ears Park at Alouette Lake were severely infected by the disease. Infection ranged from 80 to 100% of the foliage, (average 85%), with lighter infections, (10 to 15%), at Chilliwack Golf Course and Canada Agriculture Experimental Farm at Agassiz. Moderate to severe infection was evident in other areas on the Mainland, from Peace Arch Park to Powell River.

Between 30 and 85% of the crowns on 30 to 100% of the trees were infected at five sites between the Saanich Peninsula and Nanaimo on Vancouver Island.

The fungus poses a threat to native dogwood trees, because persistent annual infections could result in branch dieback, as well as predisposing the trees to other pathogens. The increased infection in the Region is attributed to wetter than normal weather conditions in 1982 and 1983. Wet weather in the growing season will likely contribute to increased infection levels in 1984.

Armillaria root rot, Armillaria mellea

The disease infected at least 50% of an estimated 200 mature Garry oak, with thinning crowns and yellowing foliage, in a 15-20 ha stand on the southeast corner of Newcastle Island Provincial Park near Nanaimo.

Although not common on Garry oak, 50-100% of trees in the area may be infected and could present a hazard in park campsite areas where infected trees with unstable root systems are a potential hazard.

The disease also killed numerous immature dogwood trees along the Mike Lake Road in Golden Ears Park at Alouette Lake on the Mainland. Young dogwood trees from the infected site were being replanted in other areas, both within and outside of the Park, and this could spread the disease to new areas.

A poplar canker, Mycosphaerella populorum

This organism was collected from less than 3% of the several hundred hybrid poplars in a plantation along the Fraser River, east of Harrison Mills, and from three plantations on an unnamed island in the Fraser River northwest of Rosedale. The canker was found during a survey for another canker, Fusarium lateritium, which was not found.

M. populorum, which causes leaf spots, stem cankers, branch dieback and stem deformation or tree mortality could be an economic threat to young commercially grown poplar stands.

Poplar shoot blight, Venturia sp.

Seventy-five percent of the leaves on 95% of the black cottonwood trees in a 50 ha stand along the Fraser River near Agassiz were infected, which resulted in severe premature leaf drop by early August. Although the disease has persisted at high intensities at that location since 1981, tree mortality has not yet been recorded. However, most trees have a generally unhealthy appearance and dieback and tree mortality could occur if infections continue.

PESTS OF YOUNG STANDS

Employment Bridging Assistance Programs (EBAP)

In conjunction with the Forestry Relations and Development Program, the Forest Insect and Disease Survey surveyed seven EBAP projects in the Vancouver Forest Region to determine the status of pests at the project field locations (Table 11). No major pest problems were noted at the sites or projected as a result of work done. However, several pest problems were identified including: 55% moisture stress and sunscald damage or mortality to Douglas-fir seedlings in a scarifying project at one site and 4% fork or crook on Douglas-fir trees at one site.

TABLE 11. Pests noted and projected in EBAP forestry programs, Vancouver Forest Region, 1983.

Location	Project No.	Activity	Host	Pest	Remarks
<u>Vancouver Island</u>					
Sooke (Macdonald Lk.)	V06 033	Pruning	D-fir	4% fork or crook	mild sunscald and increased brush problems possible
Nanaimo (Mt. Benson)	V07 004A	wwP blister rust pruning	aF	balsam woolly aphid - 30%, <u>Pucciniastrum</u> sp. - 40% light	research project only, pests not associated with activity
			WH	<u>Arceuthobium</u> <u>tsugense</u> - 90%	
			D-fir	<u>Adelges cooleyi</u> - common	
			wwP	<u>Cronartium</u> <u>ribicola</u> - in control strips and outside block	
Campbell R. (Beavertail Lk.)	V08 006	Roadside slash disposal	D-fir	<u>Melanolophia</u> <u>imitata</u>	No problems projected
Amor Lk.	V08 020	pruning, hand scarifying, "sock" program	D-fir	moisture stress and sunscald 55%	severe mortality in scarifying project, no other problems
Pt. McNeill (Woss Lk.)	V09 002	spacing	D-fir	spruce gall aphid - common	no problems projected
<u>Vancouver Mainland</u>					
Stave Lk.	V02 013	residual cleaning	western hemlock	none	
Vedder Mtn.	V01017	brushing	D-fir	blackstain root disease in general area	continued seedling mortality possible

Not Sufficiently Restocked (NSR) Sites

In anticipation of federally-funded programs to address the 650 000 ha backlog reforestation, nine sites in the Region were assessed to identify current and potential forest pest problems. The most common problems and pests were dense brush competition and rocky substratum, root rots, leader dieback and deer browsing (Table 12).

TABLE 12. Pest problems in Not-Sufficiently-Restocked Sites in Vancouver Forest Region, 1983.

NSR site Location	Tree Species	Pest(s) Percent	Conditions
Texada Island	D-fir white pine	<u>Armillaria</u> root disease white pine blister rust, deer browsing	area burned, very rocky substratum
Lyon Lake	D-fir amabilis fir	leader and lateral dieback	dense undergrowth competes with natural reseeding
Mile 9 Scuzzy Cr.	D-fir	none	steep slope, rocky substratum, brush competition
Mile 10, Scuzzy Cr.	D-fir	<u>Phellinus</u> root rot	very rocky sub- stratum
Mile 11, Scuzzy Cr.	D-fir	none	rocky substratum
Sproat Lk.	D-fir	none	dry, rocky south aspect
Loveland Bay area	D-fir	none	rocky substrate, severe browsing
Nahwitti R. (Port Hardy)	wH Ss	potential spruce weevil, seedling weevil	severe brush
Kains Lk. (Port Hardy)	wH Ss	potential spruce weevil, seedling weevil	severe brush

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