

ANNUAL DISTRICT REPORT
FOREST INSECT AND DISEASE SURVEY
BRITISH COLUMBIA, 1970
PART I, VANCOUVER FOREST DISTRICT

by

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INTRODUCTION

This report outlines the status of forest insect and disease conditions in the Vancouver Forest District for 1970, and attempts to forecast pest population trends.

Reports of forest pest outbreaks to the Forest Insect and Disease Survey by public or private cooperators aid in the interpretation of the general pest situation and improve our ability to gauge population trends.

Regular field work in the District in 1970 began on May 19 and ended on August 21. Special surveys were as follows: March 23-26, green-striped forest looper pupal survey in Quatsino area; May 25 - June 5, spruce budworm population assessment in the Fraser Canyon and Squamish - Pemberton areas; June 29 - July 3, assessment of green-striped forest looper populations in the Port Alice - Quatsino area; June 23-26 and July 6-10, assessment of black-headed budworm infestation, Jordan River to Port Alberni; July 13-17 aerial survey of the west coast of Vancouver Island and adjacent mainland; August 10-14, spruce budworm egg survey in Pemberton area; October 5-16, black-headed budworm egg survey, Jordan River to Port Alberni, Vancouver to Squamish, Indian Arm and Indian River; October 19-22, hemlock looper egg survey, Coquitlam and Alouette Lakes. Twenty-eight hours of flying time were used in mapping spruce budworm and black-headed budworm defoliation, and for sampling inaccessible areas.

Collection localities and drainage divisions are shown on Map 1.

Numbers of larval defoliators found in field collections decreased slightly in 1970 on Vancouver Island and remained static on the mainland section of the District: 74% and 88% of beating collections, respectively, contained larvae. Details on individual insect and disease problems appear in subsequent sections.

Spruce budworm caused light to heavy defoliation of 12,500 acres of Douglas-fir and some amabilis fir trees in the Pemberton - Lillooet River area.

Black-headed budworm caused light to medium defoliation of western hemlock and amabilis fir on South Vancouver Island between Jordan River and Port Alberni, and on the Mainland in the Squamish and Indian Arm areas.

Western hemlock looper caused heavy defoliation of western hemlock and amabilis fir at Coquitlam Lake.

The green-striped forest looper infestation on North Vancouver Island declined after causing severe defoliation of western hemlock in 1969.

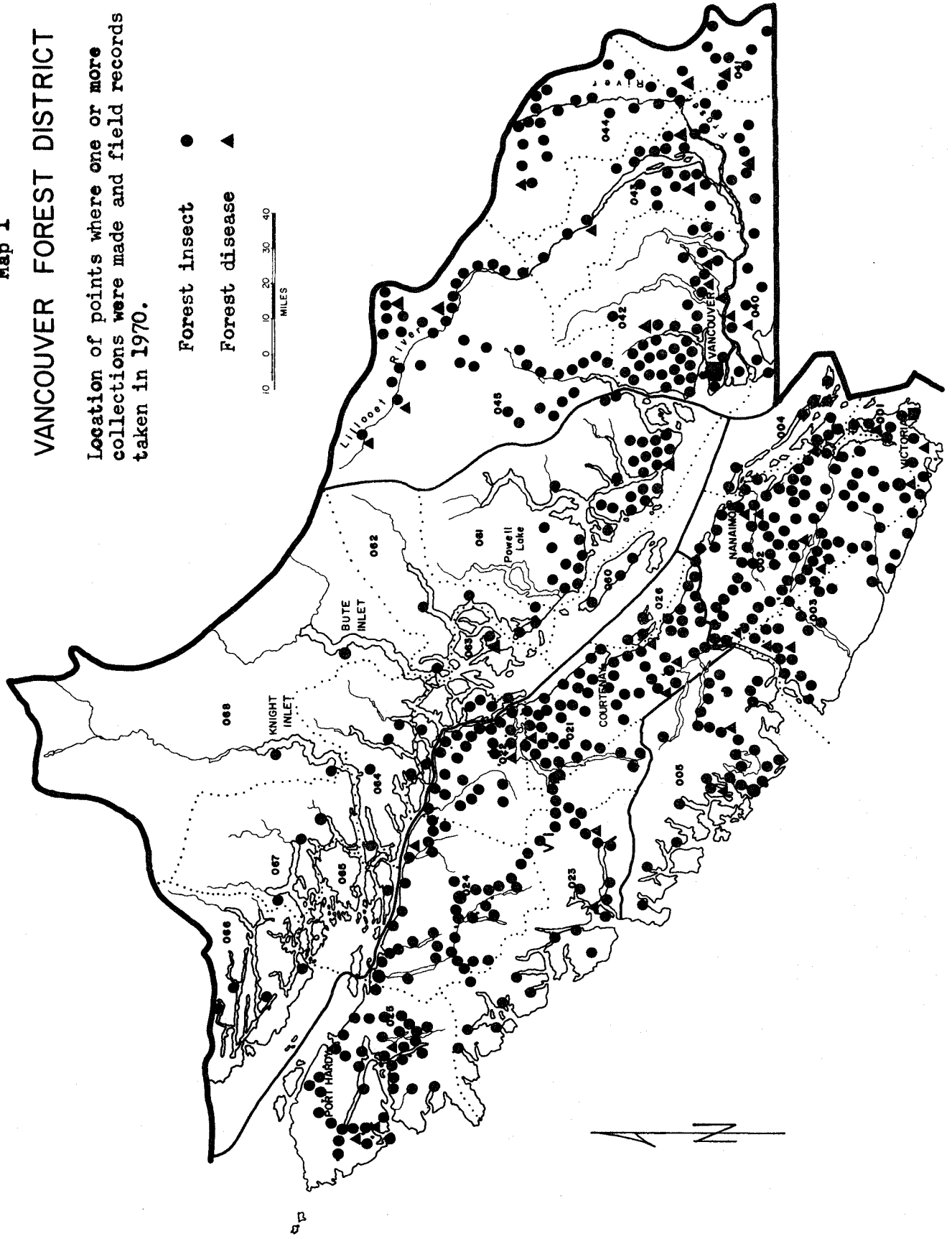
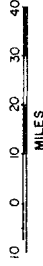
Map 1

VANCOUVER FOREST DISTRICT

Location of points where one or more collections were made and field records taken in 1970.

Forest insect ●

Forest disease ▲



FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

Spruce budworm, Choristoneura occidentalis

Infestations increased in size and intensity in the upper Lillooet River valley from Pemberton to Salal Creek and along Soo River, Rutherford Creek and Haylmore Creek valleys in near pure stands of Douglas-fir. Light to heavy defoliation occurred on some 12,500 acres in patches of from 200 to 1,300 acres (Map 2).

The outbreak was mapped by aerial and ground surveys and areas of significant defoliation were sampled. At each sample point defoliation estimates were made for 10 trees and egg masses were counted on two full length branches from the mid-crown of each of two trees. Fifty new shoots were examined on each sample branch and were classified as: nil, partial or complete defoliation, or killed by budworm feeding. Categories of defoliation were classified as follows: light - less than 30%; medium - 30-60%; heavy - more than 60%.

There was moderate to heavy defoliation of all age classes of Douglas-fir over about 12,000 acres, and light defoliation over 500 acres (Table 1, Map 2). Bud mortality was heavy throughout the infestation and adventitious budding was prevalent. Most of the current shoots, although completely stripped, were still living.

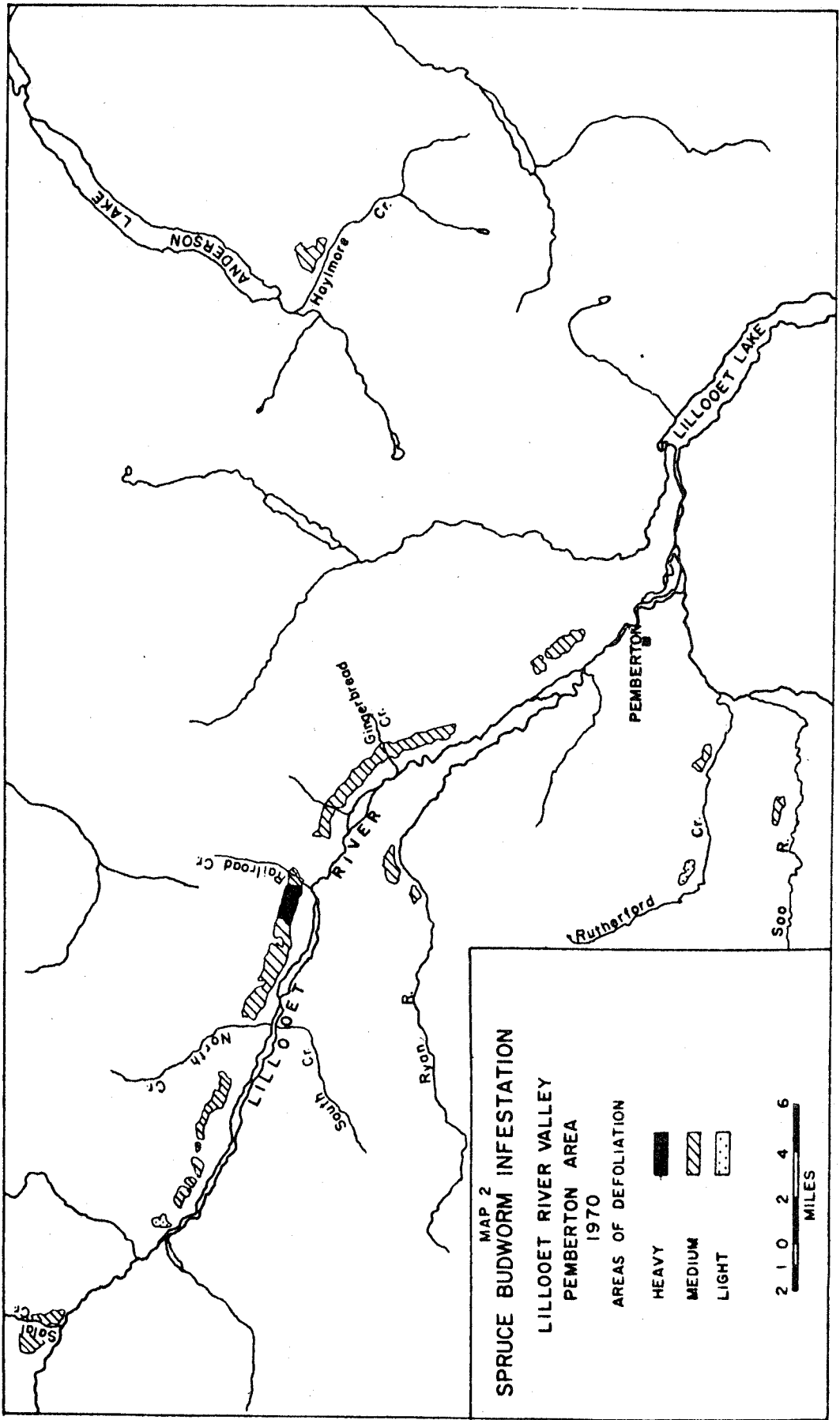


Table 1. Areas of spruce budworm defoliation by age classes
Pemberton - Lillooet River area, 1970

Area	Location	Affected area by age class (acres)				Total
		Category	Immature	Mature	Overmature	
1	Salal Cr. ^{2/}	Mod.	48	990	160	1,198 ^{4,970}
2	Pebble Cr. - North Cr.	Light	-	194	28	222
	Pebble Cr. - North Cr.	Mod.	76	1,247	312	1,635 ^{1,250}
3	Railroad Cr.	Mod.	2,359	295	234	2,888
	Railroad Cr.	Heavy	746	89	-	835 ^{3,723}
4	Gingerbread Cr.	Mod.	1,760	436	777	2,973 ¹⁴⁰
5	NE. of Pemberton	Mod.	156	256	-	412
6	Ryan R.	Mod.	-	-	688	688 ⁶²⁵
7	Rutherford Cr.	Mod.	56	142	-	198
	Rutherford Cr.	Light	-	105	100	205 ¹⁰⁰
8	Soo R.	Mod.	204	-	276	480 ¹⁰⁷
9	Haylmore Cr.	Mod.	484	124	117	725 ²⁰
Totals (acres)			5,889	3,878	2,692	12,459 ^{27,980}

^{2/} Host, amabilis fir

Table 2. Number of spruce budworm egg masses found per 100 square feet of Douglas-fir foliage, Pemberton - Lillooet River area, 1970

Location	Number of egg masses per 100 square feet				Avg
	Tree 1		Tree 2		
	Branch 1	Branch 2	Branch 1	Branch 2	
Gingerbread Cr.	270	133	101	96	150
Railroad Cr.	280	224	868	426	450
Ryan R.	329	351	140	141	240
Soo R.	51	52	104	226	83
Rutherford Cr.	75	93	29	139	84
Haylmore Cr.	34	16	26	18	24
Salal Cr. ^{2/}	109	64	788	528	347

Host, *amabilis* fir

Egg mass counts (Table 2) taken at the seven locations throughout the infestation indicate moderate to severe defoliation in 1971, especially in the areas where an average of more than 100 egg masses per 100 square feet were found.

Green-striped forest looper, Melanolophia imitata

Green-striped forest looper populations in the Port Alice - Quatsino region declined during the 1970 larval period resulting in only light defoliation in limited areas. Populations between Victoria Lake and Port Alice and the south end of Neroutsos Inlet averaged 40 larvae per collection compared to more than 250 in 1969. Larvae were numerous (250 to 1,200 per sample) early in the feeding period on the immature stands around Atkins and Kokwina Coves and Julian and Smith Coves at the northern end of Neroutsos Inlet. However, light defoliation indicated a sharp decline in the larval population early in the summer.

Elsewhere in the District populations ranged from low on the mainland and east coast of Vancouver Island to moderately high in some west coast stands (Table 3). The high 1969 population at Millar Channel collapsed while populations persisted around Brooks Peninsula, where 175 larvae and 133 larvae per collection were found at Ououkinsh Inlet and Malksope Inlet respectively.

In the Port Alice - Quatsino region there was an average of 0.2 healthy pupae per square foot duff sample taken in eight sample areas in October compared to an average of 33 pupae per square foot in the fall of 1969. Out of 50 pupae collected, only 15 were healthy, while the remaining 35 were infected with a fungus, Cordyceps militaris or were parasitized. C. militaris which was found in 22 of 35 dead pupae probably contributed to the decline of the infestation. A light population is predicted for 1971.

Table 3. Summary of green-striped forest looper collections on western hemlock, by drainage division, Vancouver Island

Drainage divisions	No. of samples during larval period			% samples containing larvae			Avg no. of larvae per positive sample		
	1968	1969	1970	1968	1969	1970	1968	1969	1970
001	3	16	0	33	13	-	3	1	-
002	50	85	25	44	21	0	4	2	-
003	19	45	13	84	29	0	10	26	-
004	1	8	0	-	63	-	-	1	-
005	36	22	2	83	82	100	21	37	2
021	27	37	21	52	14	0	5	1	-
022	24	30	9	46	53	22	3	2	1
023	24	22	16	71	82	75	21	78	36
024	19	22	3	74	59	33	5	9	1
025	0	84	43	-	95	58	-	185	133
026	0	0	1	-	-	0	-	-	-

Black-headed budworm, Acleris variana

Populations of black-headed budworm were at medium infestation levels on Vancouver Island in scattered areas between Jordan River and Port Alberni, at Victoria Lake and on the mainland from Howe Sound to Indian Arm. Sampling indicated an increase in the population in drainage divisions 023 and 025 between Tahsis Inlet and Quatsino (Table 4). Approximately 850 acres of mature western hemlock and amabilis fir were lightly defoliated in the Green Mountain area, where there was up to 80% defoliation of the current year's foliage. Similar defoliation was observed at the North Fork Nanaimo River, Cottonwood Creek and Jump Creek Summit. Total defoliation exceeded 20% only at two locations: Cottonwood Creek, 30%; and Jump Creek Summit, 25% (Table 5) (Map 3).

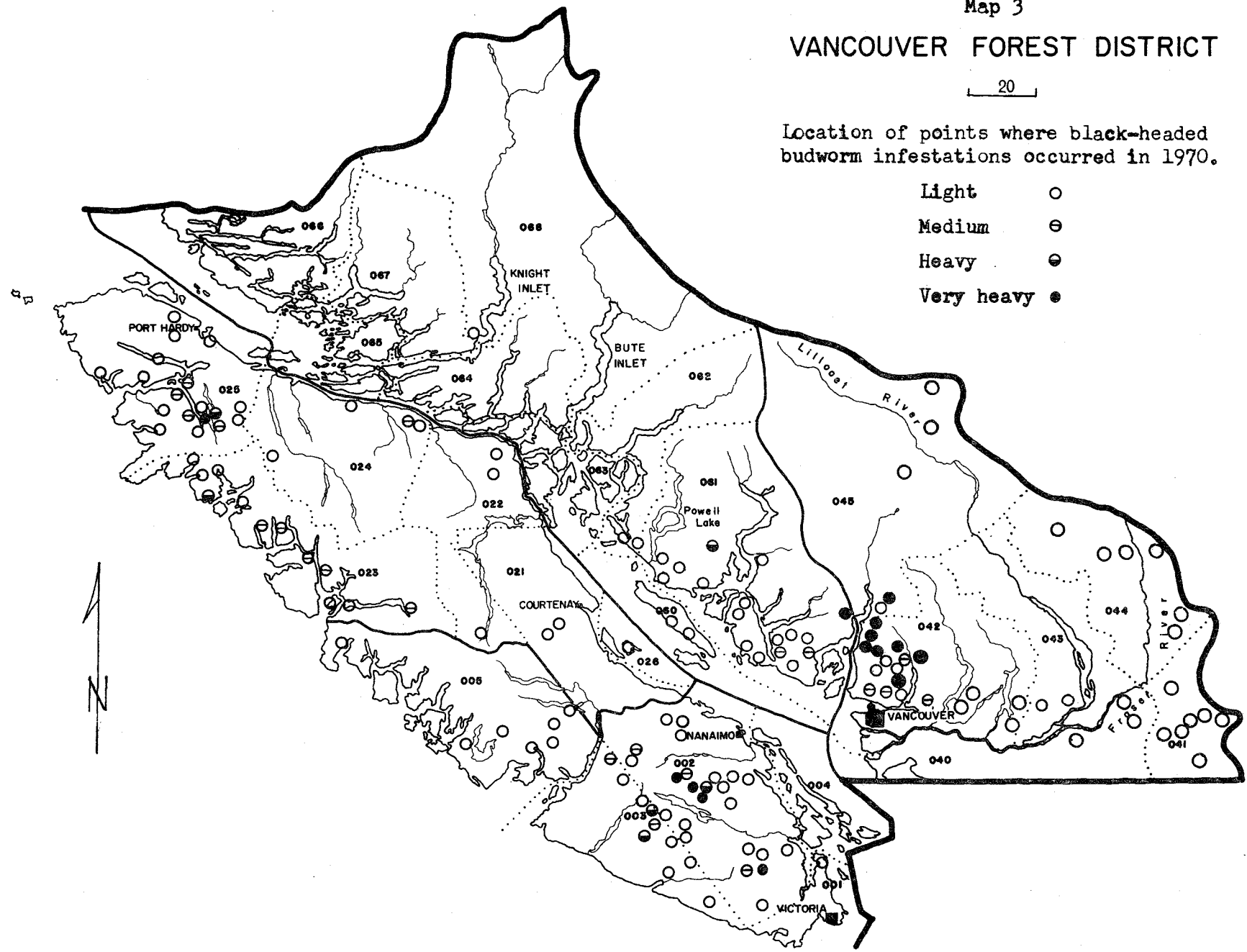
Map 3

VANCOUVER FOREST DISTRICT

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Location of points where black-headed budworm infestations occurred in 1970.

- Light ○
- Medium ⊖
- Heavy ⊙
- Very heavy ●



Infestations on the mainland generally declined from 1969 but remained severe in the Indian River valley around Hixon Creek and Grand Creek, where, at higher elevations, there was up to 100% defoliation of the current year's growth, and feeding on the older foliage of western hemlock. Populations were of lighter density from Coquitlam Lake to Harrison Lake where there was negligible defoliation in 1970.

At Stawamus River, Furry Creek, Henrietta Creek (Woodfibre) and Andrews Creek (Capilano River) defoliation was lighter with up to 50% of the foliage on the current year's growth destroyed. Some feeding terminated before larval development was complete, due to a high incidence of disease or parasitism in late instar larvae.

Counts of overwintering eggs were made on six 18-inch branch samples taken from each of 3 trees at 12 locations on Vancouver Island. There was a maximum of 190 eggs per 18-inch branch at Marshall Creek, 56.5; Cottonwood Creek, 53.9; Clapp Creek, 44.4 and Jump Creek summit, 36.9 (Table 6). The high numbers of eggs indicate that there will be a higher larval population and increased defoliation in 1971.

On the mainland a much lower egg population was found from Grand Creek to Ruby Creek (Table 5). This indicates a light population for the mainland areas in 1971.

Table 4. Summary of black-headed budworm collections on western hemlock, by drainage divisions, Vancouver Forest District

Drainage divisions	No. of samples during larval period			% samples containing larvae			Avg no. of larvae per positive sample		
	1968	1969	1970	1968	1969	1970	1968	1969	1970
001	3	2	0	67	50	-	11	1	-
002	53	48	24	36	67	83	3	32	32
003	22	34	8	36	62	100	5	10	25
004	1	0	0	0	-	-	-	-	-
005	36	17	17	28	24	29	2	2	1
021	20	42	14	11	7	14	2	2	1
022	20	30	17	20	20	6	1	2	1
023	24	22	16	21	32	56	2	6	12
024	18	22	9	6	9	33	1	10	4
025	0	84	44	-	43	59	-	3	31
026	0	0	0	-	-	-	-	-	-
<u>4/</u>									
040	8	12	4	88	75	100	20	10	7
041	14	6	12	100	83	58	172	33	3
042	44	45	30	80	62	73	31	46	78
043	10	16	17	70	63	18	10	12	2
044	0	1	3	-	0	100	-	-	3
045	7	5	19	29	100	42	6	30	96
060	2	3	0	0	0	-	-	-	-
061	42	2	27	33	0	67	4	-	9
062	5	1	4	20	0	0	1	-	-
063	6	3	4	17	0	0	1	-	-
064	7	6	5	0	0	0	-	-	-
065	1	1	1	0	0	0	-	-	-
066	8	4	2	0	0	50	-	-	2
067	3	2	3	0	0	0	-	-	-
068	5	5	2	0	0	0	-	-	-

4/ Mainland - from Drainage Division 040 to 068 inclusive.

Table 5. Summary of black-headed budworm egg counts and defoliation estimates for hemlock, Vancouver Forest District, 1970

Location	% current defoliation	% total defoliation	Avg no. eggs per 18" branch
Loss Cr.	30	5	29.8
Clapp Cr.	35	15 ^{5/}	44.4
Weeks L.	5	t ^{5/}	3.8
McLure L.	10	5	18.9
Waterloo Mtn.	t	t	9.6
Cottonwood Cr.	80	30	53.9
Jump Creek summit	75	25	36.9
Marshall Cr.	40	5	56.5
Vaughn Cr.	65	10	29.2
Bell Cr.	70	10	34.5
Nanaimo R. N. fork Br. P 1	35	15	20.7
Museum Cr.	5	t	20.4
Victoria L. (pipeline)	0	0	12.7
Grand Cr.	25	10	6.0
Grouse Mtn.	t	t	4.0
Indian R. (Meslilloet Cr.)	45	10	3.0
Furry Cr.	45	10	3.0
Woodfibre	50	20	3.0
Cypress Cr.	t	t	2.0
Norton L.	40	10	3.0
Stawamus Cr.	25	5	2.4
Raffuse Cr.	5	t	3.0
Ruby Cr.	t	t	1.2

^{5/} t = Trace

Western hemlock looper, Lambdina fiscellaria lugubrosa

Hemlock looper larvae caused moderate to severe defoliation of 200 acres of western hemlock and amabilis fir on the east side of Coquitlam Lake, opposite Coquitlam Island. Of 50 trees examined in the area, 23 were completely defoliated. Some of the amabilis fir had been partially or completely killed by balsam woolly aphid, Adelges piceae prior to the looper outbreak in 1969.

A fungus disease, Beauveria sp. was prevalent on dead pupae, and on adults found on the ground or bark during late October at Coquitlam Lake.

Three tree-samples were taken for egg counts at Alouette and Coquitlam Lakes. From each tree one-square foot moss samples were selected at six-foot intervals from the base of the tree as far as the moss extended up the trunk. The respective numbers of eggs in the moss samples were counted. Most eggs were found at the 30 to 48 foot levels.

Significant numbers of eggs were found at Coquitlam Lake and Moyer Creek as shown below.

Location	No. of ft ² moss samples		Avg no. of eggs per ft ² moss sample	
	1969	1970	1969	1970
Coquitlam L.	8	27	53.0	106.0
N. Alouette R.	3	-	0.3	-
Moyer Cr.	-	8	-	50.2

The hemlock looper population is expected to increase in these areas in 1971.

Elsewhere on the lower mainland and in Jervis and Toba Inlet areas the population had declined (D.D. 061, Table 6). At Phillips Arm one collection of 42 larvae was taken on western hemlock.

Table 6. Summary of hemlock looper collections by Drainage Divisions, on western hemlock, Vancouver District (Mainland)

Drainage divisions	No. of samples during larval period			% samples containing larvae			Avg no. of larvae per positive sample		
	1968	1969	1970	1968	1969	1970	1968	1969	1970
040	7	12	15	28	0	0	1	-	-
041	14	5	22	0	0	13	-	-	2
042	43	41	43	40	56	30	8	27	4
043	10	16	35	60	75	6	12	5	4
044	0	0	10	-	-	10	-	-	1
045	7	1	46	28	0	2	1	-	1
060	4	5	3	0	0	33	-	-	1
061	63	39	36	30	33	4	3	15	2
062	6	6	15	0	16	0	-	11	-
063	7	3	5	43	100	20	2	2	1
064	7	6	8	29	50	50	1	6	12
065	1	1	1	0	0	0	-	-	-
066	8	4	4	0	0	50	-	-	2
067	3	2	4	0	50	0	-	1	-
068	3	5	3	67	60	67	2	1	2
Totals	183	146	250	31	40	34	5	14	4

(70) 10%
16

(71)

9%
36

Sucking Insects

Elatobium abietinum

Spruce aphid, ~~*Neomphalis abietina*~~

Spruce aphid caused light to severe defoliation of shoreline Sitka spruce on Vancouver Island between Victoria and Jordan River and from Parksville to Campbell River. There was up to 90% defoliation of 75 spruce trees near the mouth of the Little Qualicum River. Some tree mortality and top-kill is expected in this area. A few trees at Shelter Point near Campbell River were up to 50% defoliated. On the mainland, shelterbelt Sitka spruce and ornamental Colorado spruce suffered light to moderate defoliation from Tsawwassen to Sumas, and from Mission to Harrison.

Balsam woolly aphid, Adelges piceae

Balsam woolly aphid continued to attack and kill amabilis fir in Stawamus and Indian River valleys, and Seymour and Coquitlam River valleys. No extensions of the previously described infestation boundaries were found in 1970 on either Vancouver Island or the lower mainland.

Other Noteworthy Insects

Phantom hemlock looper, Nepytia phantasmaria

Populations of the phantom hemlock looper decreased suddenly in 1970. Only three larvae were found throughout the mainland area compared to 55 larvae per collection at Coquitlam Lake and the Harrison and Hope B. C. Forest Service Ranger Districts in 1969.

Table 7. Other insects of current minor significance

Insect	Host(s)	Locality	Remarks
✓ <u>Adelges cooleyi</u> Cooley spruce gall aphid	Sitka spruce, Douglas-fir	Widespread	Sucking insect. On needles of Douglas-fir, causes galls on alternate host spruce.
✓ <u>Dendroctonus</u> <u>pseudotsugae</u> Douglas-fir beetle	Douglas-fir	Cameron R., Ash R., Bell Cr., Cowichan L., Stulkawits Cr. and Yale	Bark beetle. Moderate populations in felled and bucked and decked Douglas-fir.
✓ <u>Ectropis</u> <u>crepuscularia</u> Saddleback looper	Douglas-fir, western hemlock, western red cedar, amabilis fir	Hope to Squamish and Quatsino region, Fraser Canyon, Howe Sd., Jervis Inlet	Defoliator. Thirty positive samples averaged 20 larvae each.
✓ <u>Hyphantria</u> <u>cunea</u> Fall webworm	Red alder, black cottonwood, willow	Duncan to Nanaimo, Yarrow to Rosedale, Haney to Harrison	Defoliator. Up to 80% defoliation of fringe stands of alder.
✓ <u>Malacosoma</u> <u>pluviale</u> Western tent caterpillar	Red alder, willow, cherry, birch	Howe Sd., Galiano I.	Former epidemic collapsed in spring from action of polyhedral virus. Few egg clusters found on Galiano I.
✓ <u>Neodiprion</u> spp. Conifer sawflies	Western hemlock, Douglas-fir, Sitka spruce, amabilis fir, grand fir, mountain hemlock	Widespread throughout District	Defoliator, 192 positive collections averaged 16 larvae per sample. More than 800 larvae in a collection at Woodfibre.
<u>Pissodes strobi</u> Spruce weevil	Sitka spruce	Widespread	Terminal borer, common, 80% of Sitka spruce leaders attacked in Klanawa River Valley.
✓ <u>Pyrrhalta carbo</u> Pacific willow leaf beetle	Red alder, black cottonwood	Harrison L. and Squamish R.	Defoliation also at Estero Basin near Bute Inlet.

FOREST DISEASE CONDITIONS

The organisms currently causing much of the tree mortality, growth loss, and quality reduction attributed to diseases are mistletoes, and stem and root rot fungi. These organisms, once established in a stand, persist for many years. They usually intensify at a slow rate which makes annual summaries of their status repetitious; for this reason the following report may omit the mention of some of the more important diseases. Emphasis is placed on new outbreaks, the status of the annually varying foliage diseases and abnormal weather conditions, i.e. frosts, drought, snow damage, etc., which immediately affect tree appearance and often cause dieback and mortality. Other aspects of the Disease Survey dealing with mortality, growth loss, and factors influencing the occurrence of the more important diseases are summarized elsewhere.

Currently Important Diseases

Stem Disease

Dwarf mistletoe, Arceuthobium campylopodum f. tsugensis

Western hemlock trees were examined for dwarf mistletoe at seven locations in the District to update distribution data. Light infections and brooming were found at Tranquil Inlet, Bligh Island, and Kennedy Lake on Vancouver Island. Near South East Bay, along the Adam River, 82% of the trees examined were infected. Infection and incidence of mistletoe on western hemlock was light at Teakerne Arm, West Redonda Island and along the Elaho River, north west of Squamish in a predominantly Douglas-fir stand.

Non-infectious Diseases

Fume damage

Many deciduous and coniferous tree species in the immediate area surrounding the Gold River pulp mill, suffered from various degrees of SO₂ burn and defoliation. Scattered pockets of dead and dying Douglas-fir and western hemlock were observed on the north and south sides of the pulp mill. Foliage examination revealed high concentrations of fly-ash deposits.

Exotic Plantations

There are 130 plantations of various introduced hardwood and softwood trees in the Vancouver Forest District. Under a rotating system, one-third of these are examined annually to determine the occurrence and effect of native insects, diseases and other environmental effects on the various tree species.

No serious new problems were found. Snow press, causing deformity and breakage, was prevalent in most plantations examined. A needle cast disease, Lophodermium pinastri, caused from 10 to 40% needle loss on all Monterey pine at Ash River and on 13 jack pine at Sutton Creek. A leaf spot disease, Mycosphaerella populicola was found on black cottonwood in XP20, a plantation of hybrid poplars near Pitt Meadows, and may have been associated with the exotic species.

Table 8. Other diseases of current minor significance

Organism	Host(s)	Locality	Remarks
<u>Rhizina undulata</u>	Douglas-fir	Harrison Cr.	Causes root disease of Douglas-fir seedlings in burned areas. Heavy infection causing almost 100% seedling mortality.
<u>Lophodermella concolor</u>	Lodgepole pine	Cassidy, D'Arcy, Daisy L., Chehalis R.	Needle cast.
<u>Hendersonia pinicola</u>	Lodgepole pine	Cassidy, D'Arcy, Daisy L., Chehalis R.	Needle blight, found in association with <u>Lophodermella concolor</u> .
<u>Echinodontium tinctorium</u>	Western hemlock	Nahatlatch R., South Cr.	Heart rot.