ANNUAL DISTRICT REPORTS
FOREST INSECT AND DISEASE SURVEY
BRITISH COLUMBIA, 1968
PART I, FOREWORD AND INDEX

by

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FOREST RESEARCH LABORATORY

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PART I

DEPARTMENT OF FISHERIES AND FORESTRY

APRIL, 1969

ANNUAL DISTRICT REPORTS

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1968

R. L. Fiddick[1/]

FOREWORD

Only two changes were made in ranger assignments in 1968. S. J. Allen was assigned to South Vancouver Island to replace N. E. Alexander, who resigned in 1967, as senior ranger on Vancouver Island. E. V. Morris transferred from Vernon to Victoria in 1967 and was assigned to West Prince Rupert as senior ranger in the Prince Rupert Survey District. Other district assignments are recorded in the introductory remarks of the Senior Ranger for each Survey District.

It was, generally speaking, a year of low but rising insect populations and few new disease problems, with significant tree damage in only a few instances. Bark beetle populations showed a general increase. The spruce beetle reached outbreak levels and caused serious damage in the southeast portion of the Nelson District and increased activity also occurred in the Prince George District. Douglas-fir beetle increased generally in the Cariboo but only scattered tree mortality was seen from the air. Trees which were damaged by frost in the spring of 1966 in the Williams Lake area had made excellent recovery and very few in the established plots and strips had been attacked.

There were no serious defoliator outbreaks in the Province although the western tent caterpillar caused heavy defoliation of various deciduous trees on the Gulf Islands and on the mainland from Horseshoe Bay to Squamish. The forest tent caterpillar infestation in Wells Gray Park increased to some 16,000 acres. Such outbreaks are considered more of a nuisance than serious since defoliated deciduous trees generally put out new foliage as soon as the insect feeding is finished and increment loss is not a concern.

Black-headed budworm populations declined near Hope but increased from Harrison Lake west to Squamish. Egg counts made in the fall were light at all areas examined throughout the lower mainland.

1/ Ranger Supervisor.

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ANNUAL DISTRICT REPORTS
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BRITISH COLUMBIA, 1968
PART II, VANCOUVER SURVEY DISTRICT
VANCOUVER ISLAND SECTION

by

S. J. Allen and M. R. Bedford

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FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1968

VANCOUVER SURVEY DISTRICT

VANCOUVER ISLAND SECTION

S. J. Allen[1/]

No personnel changes were made in the Vancouver Island Section of the Vancouver Forest District in 1968. S. J. Allen surveyed South Vancouver Island and M. R. Bedford surveyed North Vancouver Island. Specific surveys were made for bark beetles, European pine shoot moth, Sitka spruce weevil, spruce gall aphid, root rots in immature stands, Rhizina root rot, and diseases in plantations of exotic species.

Green-striped forest looper populations increased along the west coast of Vancouver Island, particularly towards the north end. Pine butterfly and silver-spotted tiger moth numbers decreased while black-headed budworm remained at a low level. No hemlock needle miner were found in the Holberg and Mahatta River areas. Although ground checks were made, balsam woolly aphid was not found outside the previously known infestation boundaries.

Much of the tree mortality, growth loss, and quality reduction attributed to diseases is caused by mistletoes and, stem and root rot fungi. These usually intensify at a slow rate which makes annual summaries of their status repetitious; for this reason the following report may not mention 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., frost and drought damage which immediately affect tree appearance and may cause dieback and mortality. Other aspects of the Disease Survey which deal with mortality, growth loss and factors influencing the occurrence of the more important diseases are summarized elsewhere.

1/ Forest Research Technician, Forest Insect and Disease Survey Senior Ranger, Victoria.

Table 1. Host tree abbreviations

Abbrev.	Common name	Abbrev.	Common name
Al	alder-general	L	larch-general
rAl	red alder	M	maple-general
Ar	arbutus	bM	broad leaf maple
bCo	black cottonwood	gO	Garry oak
yC	yellow cedar	P	pine-general
wC	western red cedar	lP	lodgepole pine
Ch	cherry-general	wwP	western white pine
D	Douglas-fir	Po	poplar-general
F	fir-general	Po (h)	hybrid poplar
alF	alpine fir	S	spruce-general
aF	amabilis fir	nS	Norway spruce
gF	grand fir	sS	Sitka spruce
mH	mountain hemlock	W	willow-general
wH	western hemlock		

FOREST INSECT AND DISEASE SURVEY

SOUTH VANCOUVER ISLAND

1968

S. J. Allen

INTRODUCTION

Regular field work began on June 10 and ended September 20. Surveys were conducted for defoliators, bark beetles, pine shoot moth, spruce weevil, pine shoot weevil, root rots of immature stands, problems of exotic species and Rhizina root rot.

Insect and disease collections are shown by host in Table 1; collection localities and drainage divisions are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Details on individual insect and disease problems follow.

Numbers of green-striped forest looper larvae found in collections increased in Drainage Divisions 003 and 005. Black-headed budworm and western hemlock looper populations remained at endemic levels. Drought damage was found in the vicinity of Nanaimo Lakes, Alberni, Nitinat River and Lake Cowichan.

Table 1. Collections by hosts, South Vancouver Island, 1968.

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cypress spp.	1	2	Alder, red	8	0
Douglas-fir	123	46	Apple sp.	1	0
Fir, alpine	2	3	Arbutus	0	7
Fir, amabilis	25	4	Ash spp.	0	3
Fir, grand	17	1	Catalpa sp.	0	1
Hemlock, mountain	3	0	Cherry sp.	2	0
Hemlock, western	124	7	Chestnut sp.	0	2
Larch spp.	0	2	Eucalyptus spp.	0	3
Pine spp.	2	28	Maple spp.	1	1
Pine, lodgepole	20	0	Beech	0	1
Redwood	0	1	Oak sp.	1	1
Spruce spp.	0	7	Oak, Garry	7	4
Spruce, Sitka	38	1	Poplar sp.	1	2
			Black locust	0	1
			Willow sp.	0	1
Totals	355	102	Totals	21	27
			Misc. hosts	14	1
			No host	29	2
			GRAND TOTALS	419	132

Table 2. Currently important insect and disease[1] problems by drainage divisions, South Vancouver Island, 1968

Insect and disease problems	Principal hosts[2]	Importance by drainage divisions[3]				
		001	002	003	004	005
Defoliators						
Green-striped forest looper	wH, aF, D, wC	2	2	3	2	3
Black-headed budworm	wH, aF	3	2	2	0	2
Western tent caterpillar	rAl, W	1	1	0	4	0
Sucking Insects						
Balsam woolly aphid	gF, aF	3	3	0	0	0
Terminal Borers						
Spruce weevil	sS	0	0	3	0	3
Physiological Diseases						
Drought damage	wH, D	0	3	0	3	0

1/ Includes only weather - induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.
Scattered high populations and/or significant damage in restricted areas - 4.
Rising populations and/or moderate numbers and/or potential problems - 3.
Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

Green-striped forest looper, Melanolophia imitata

Populations continued to increase in Drainage Divisions 003 and 005 but dropped slightly elsewhere (Table 3). The largest numbers of larvae found in 3-tree beating samples were 78 at Lens Creek, 72 on Grice Bay Road and 62 at Tofino Inlet. Defoliation was negligible in all areas. By late August larval numbers were less than half that originally found at Lens Creek, indicating heavy larval mortality. The five pupae found in 12 one-square-foot duff samples at Lens Creek indicates a light population in 1969. Map 2 shows distribution and intensity.

Table 3. Summary of green-striped forest looper collections by drainage divisions, South Vancouver Island

Drainage divisions	Numbers of samples taken during larval period			% samples containing larvae			Average number of larvae per positive samples		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
001	25	18	16	28	17	25	1.6	1.7	1.8
002	138	86	102	46	79	40	4.2	6.8	3.1
003	34	25	33	34	36	67	1.4	9.8	8.6
004	24	7	21	54	43	19	3.4	2.3	1.8
005	64	23	64	31	83	75	2.6	12.7	19.3
Totals	285	159	236	40	64	50	3.4	7.9	10.7

Black-headed budworm, Acleris variana

Populations increased slightly in all drainage divisions except 002 (Table 4). Larvae were found on western hemlock, Douglas-fir, and amabilis fir. The highest numbers of larvae were found at Jordan River, 18; Chemainus River, 15; Hemmingsen Creek, 14; and Iron Mine Bay, 12. Defoliation was unnoticeable. A few pupae were found on Renfrew Road near Blakeney Creek early in September. The population will probably increase in D.D. 003 and 005 in 1969.

Table 4. Summary of black-headed budworm collections by drainage divisions, South Vancouver Island

Drainage divisions	Numbers of samples taken during larval period			% samples containing larvae			Average number of larvae per positive samples		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
001	5	16	10	0	0	33	0.0	-	8.0
002	80	87	109	9	36	26	1.4	3.2	2.7
003	29	25	38	7	20	10	3.5	3.2	4.4
004	26	7	21	8	0	2	2.3	-	1.0
005	56	23	64	0	4	14	0.0	1.0	2.0
Totals	196	158	242	6	23	21	1.9	3.1	3.1

Pine butterfly, Neophasia menapia

Pine butterfly populations dropped in 1968. Adult flights were observed at McMillan Park and McKay Creek on Cowichan Lake during early September. No adults were observed in study areas at Nanaimo Lakes and Chemainus River valley. An egg sample at McKay Creek indicated a light population in 1969; four clusters of 7 to 9 eggs each were found in a four-tree sample.

Douglas-fir tussock moth, Orgyia pseudotsugae

Larvae were found again at Gorge Vale Golf Course, near Victoria. The population had dispersed from the single tree attacked in 1967 to light attacks on several Douglas-firs in the vicinity. By August very few living larvae and pupae could be found and defoliation was not noticeable.

Small numbers were also found on two Douglas-fir shade trees in nearby Saanich.

Western tent caterpillar, Malacosoma pluviale

Infestations occurred on red alder, willow, hawthorn and numerous domestic broadleaf trees and shrubs on southeast Galiano and Mayne Islands. By mid June about 25% of the alders were up to 90% defoliated and many larvae were ready to pupate. Some domestic hardwoods on Mayne Island were 95 to 100% defoliated.

Smaller populations caused little defoliation on Pender, Saturna and Saltspring islands and the Saanich Peninsula.

Since parasitism was light the population will probably continue in 1969.

Balsam woolly aphid, Adelges piceae

No new outbreaks were detected.[1/] Examinations were made at Lake Cowichan, Galiano Island, McLure Lake and Port Renfrew. Introduced predators were released near Victoria but an assessment cannot be made until at least one winter has passed.

Sitka spruce weevil, Pissodes sitchensis

Sitka spruce reproduction was attacked at Kennedy Lake, Nitinat River and Lens Creek - San Juan River areas where 15 to 25% of the terminals were infested. No attacks were found on spruce at Franklin River, Sarita River, or the Ucluelet area.

Other Noteworthy Insects

Spruce aphid, Neomyzaphis abietina

Sitka spruce at Orveas Bay and Jordan River lost 1967 and 1968 needles. The loss of 1968 needles was probably due to late feeding in June. Defoliation ranged from 10 to 50%, and in some cases up to 80% and was caused by a persistent attack over several years. Eggs were plentiful in November at both locations, and if these survive the possibility of further defoliation in 1969 exists.

Harris, J. W. E. 1968. Detection surveys for balsam woolly aphid, Adelges piceae (Ratz.), in British Columbia. Forest Research Laboratory, Victoria. Inform. Rep. BC-X-20. 8p.

Spruce tip moth, Zeiraphera pacifica

Up to 90% of the new buds on the lower and mid-crown branches of Sitka spruce growing along the shoreline at Long Beach and Port Renfrew were heavily damaged. Tops were lightly defoliated. Defoliation at Port Renfrew was lighter than in 1967 but previous defoliation had killed 5% of the tips. Adventitious buds had formed new foliage around the dead tips and these were lightly defoliated in 1968. Tip moth activity will probably be lighter at Long Beach and Port Renfrew in 1969.

Table 5. Other insects of current minor significance

Insect	Hosts[1/]	Locality	Remarks
Adelges cooleyi Cooley spruce gall aphid	sS	Franklin R., Nitinat R., Lake Cowichan, Port Renfrew, Kennedy L., Parksville.	Sucking insect. Average 0.2 galls per square foot in 551 sq. feet of foliage examined.
Barbara colfaxiana Douglas-fir cone moth	D	Nanaimo R., Cowichan L., Nitinat.	Cone insect. Light attack, less than 10% of cones infested.
Contarinia oregonensis A cone midge	D, wH, sS	Nanaimo Lakes, Muir Cr., Lake Cowichan, Nitinat, China Cr., Museum Cr., Gordon R., Port Renfrew	Cone insect. Light attack, less than 10% of cones infested.
Contarinia washingtonensis A cone midge	D, wH, sS	Nanaimo Lakes, Lake Cowichan, Gordon R., Museum Cr., Nitinat, Port Renfrew.	Cone insect. Light attack.
Dendroctonus ponderosae Mountain pine beetle	wP	Rhinehart Lake	Bark beetle. Light attack.
Dendroctonus pseudotsugae Douglas-fir beetle	D, wP, mH	Gulf Is., Renfrew Rd., Sooke, Great Central, Nanaimo R., Chemainus R., Lake Cowichan, Nitinat, Cameron Cr.	Bark beetle. Light populations found.
Dioryctria abietivorella A cone borer	D	Cedar, Sooke, China Cr.	Cone insect. Light population.
Ectropis crepuscularia Saddleback looper	wH, wC, D, aF	Throughout district, mostly D.D. 005.	Defoliator. 29 positive samples, average 3.0 larvae per sample.
Epirrita autumnata Green velvet looper	wH, D, wC, aF	Throughout district.	Defoliator. 24 positive samples, average 4.0 larvae per sample.

Table 5. (Continued)

Insect	Hosts[1]	Locality	Remarks
Megastigmus spermatrophus A cone insect	D	Muir Cr., Nanaimo Lakes, Sooke, China Cr.	Cone insect. Light population.
Neodiprion spp. Sawflies	D, wH, aF, gF, alF	Throughout district, Haslam Cr., Englishman R.	23% of 185 samples positive, average 16.3 larvae each.
Phloeosinus punctatus Western cedar bark beetle	yC	Nanaimo R.	Bark beetle. Trap tree sample.
Pissodes terminalis Lodgepole terminal weevil	lP	Sooke, Malahat, Tofino, Chemainus, Parksville, Alberni, Cameron Cr.	Pine weevil survey, negative.
Pseudohylesinus grandis A bark beetle on conifers	aF, wH	Gordon R., Weeks L.	Light population.
Rhyacionia buoliana European pine shoot moth	lP	Sooke, Malahat, Tofino, Chemainus, Parksville, Alberni.	Negative in natural stands.
Halisidota argentata Silver spotted tiger moth	D	Saanich Peninsula, Malahat, Parksville, Alberni.	Populations decreased generally.

[1] Host tree abbreviations appear in the Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Physiological Diseases

Drought

Dieback and topkill resulting from the 1967 drought were common on western hemlock and Douglas-fir in the Nanaimo River, Cameron Creek, Saanich Peninsula and Sooke River areas. Intermediate grand firs beneath dominant Douglas-fir were killed at Parksville and Port Alberni. A heavy attack by the bark beetle Scolytus ventralis followed and killed many weakened grand firs. Arbutus was affected by leaf blights in the Gulf Islands, Saanich Peninsula and Sooke River areas. Some top kill of old growth Douglas-fir was found at Nitinat River and on the south side of Mount Whymper.

A pathogen, Sclerophoma pithyophila, was commonly associated with top kill and branch dieback of Douglas-fir in the drought affected areas. This fungus commonly inhabits weakened and recently killed branches of Douglas-fir. It is doubtful if drought damage will extend into 1969.

Indian paint fungus, Echinodontium tinctorium

Indian paint fungus, which causes a serious heart rot, was found in the vicinity of Weeks Lake on amabilis fir. Although prevalent in interior British Columbia, it is uncommon in this area.

Specific Surveys

Root rots of immature stands

Of 30 root rot samples collected in 10 to 30 year old reproduction Douglas-fir, Poria weirii was found in 15, Armillaria mellea in 7 and Fomes annosus in one. Infection centres consisted of 1 to 20 dead and dying trees in areas 20 to 130 feet in diameter.

Rhizina root rot, Rhizina undulata

A disease associated with root rot of seedlings planted in burned areas, Rhizina, was found in two of 20 burned areas examined. Light incidences of the fungus were found near Tofino and Taylor River associated with a few dead and dying seedlings. "Hot" burns had occurred in both areas.

Exotic Species

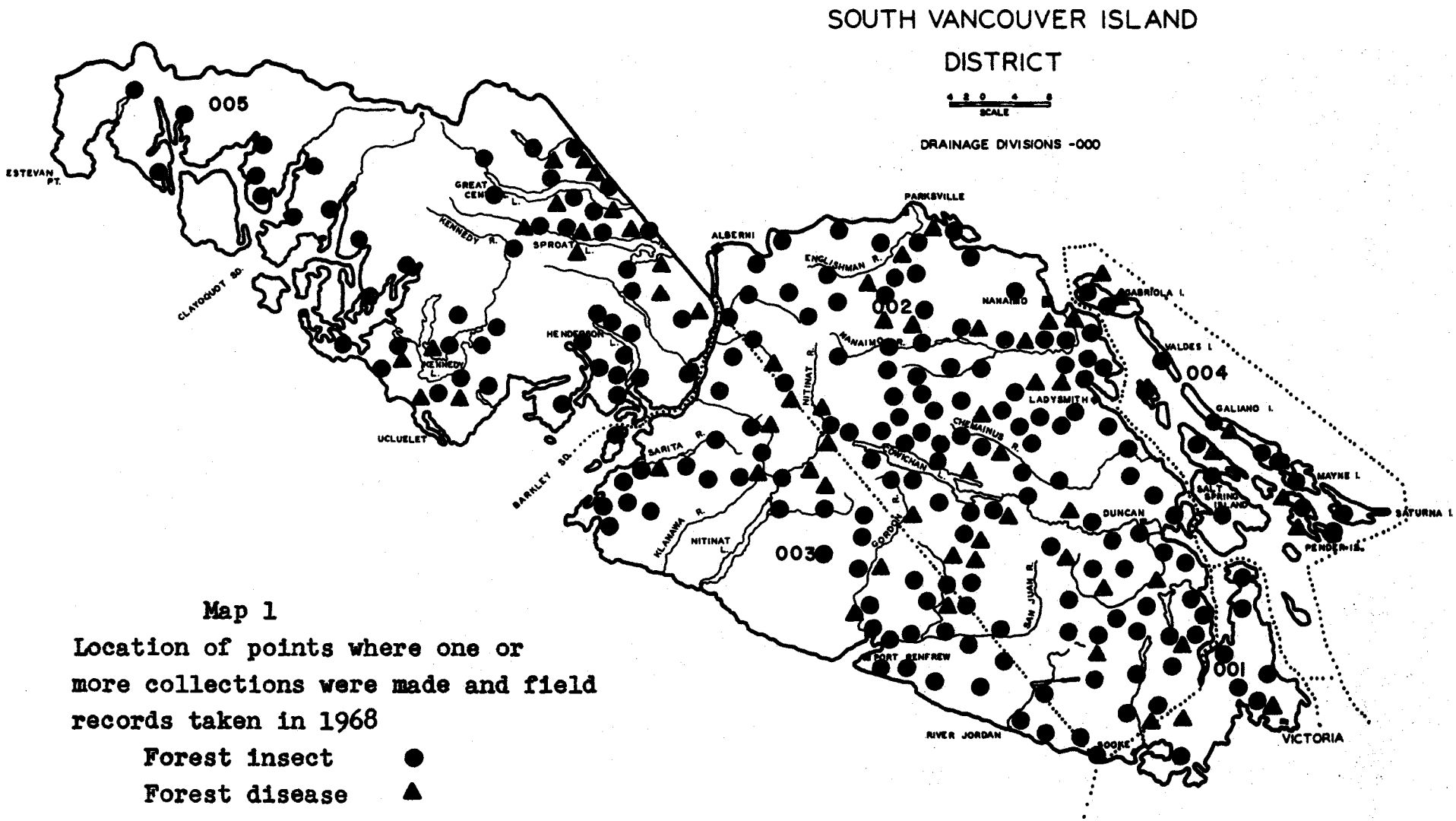
Plantations of 31 exotic species were examined. Monterey, Bishop, cluster and Austrian pines in eight plantations were infected by red band needle disease, Scirrhia pini. From 50 to 100% of the first three species were infected but less than 10% of the Austrian pine were diseased. When planted alone, Bishop or cluster pines were not as heavily infected and Austrian pine was unattacked. The snow damage to cluster pine questions its use as a forest tree in these areas. The majority of Monterey pines planted at Sarita River, Wilson Creek and Kennedy Lake had died due to continuous infections of red band needle blight.

Other Noteworthy Diseases

Table 7. Other diseases of current minor significance

Organism	Hosts[1/]	Locality	Remarks
Chrysomyxa ledicola	Ledum sp.	Tofino	Rust disease, the alternate host is Sitka spruce.
Coccomyces quadratus	Ar.	Galiano Island	Leaf spot infection, associated with drought symptoms on host.
Lophodermium uncinatum	aF	Great Central Lake	Needle cast on true firs, light occurrence.
Phaeocryptopus nudus	aF	Great Central Lake	Needle cast, very light incidence.
Pucciniastrum vaccinii	wH	Pachena Lake, Klanawa River	Needle cast, very light incidence.
Rhabdocline pseudotsugae	D	Montague Harbour, Northwest Bay	Needle cast, light attack on a few trees.
Valsa sp.	Ar. & Po(h)	Gulf Islands, Nitinat River	Associated with canker on branches weakened by 1967 drought. New host record.

1/ Host tree abbreviations appear in the Introduction.

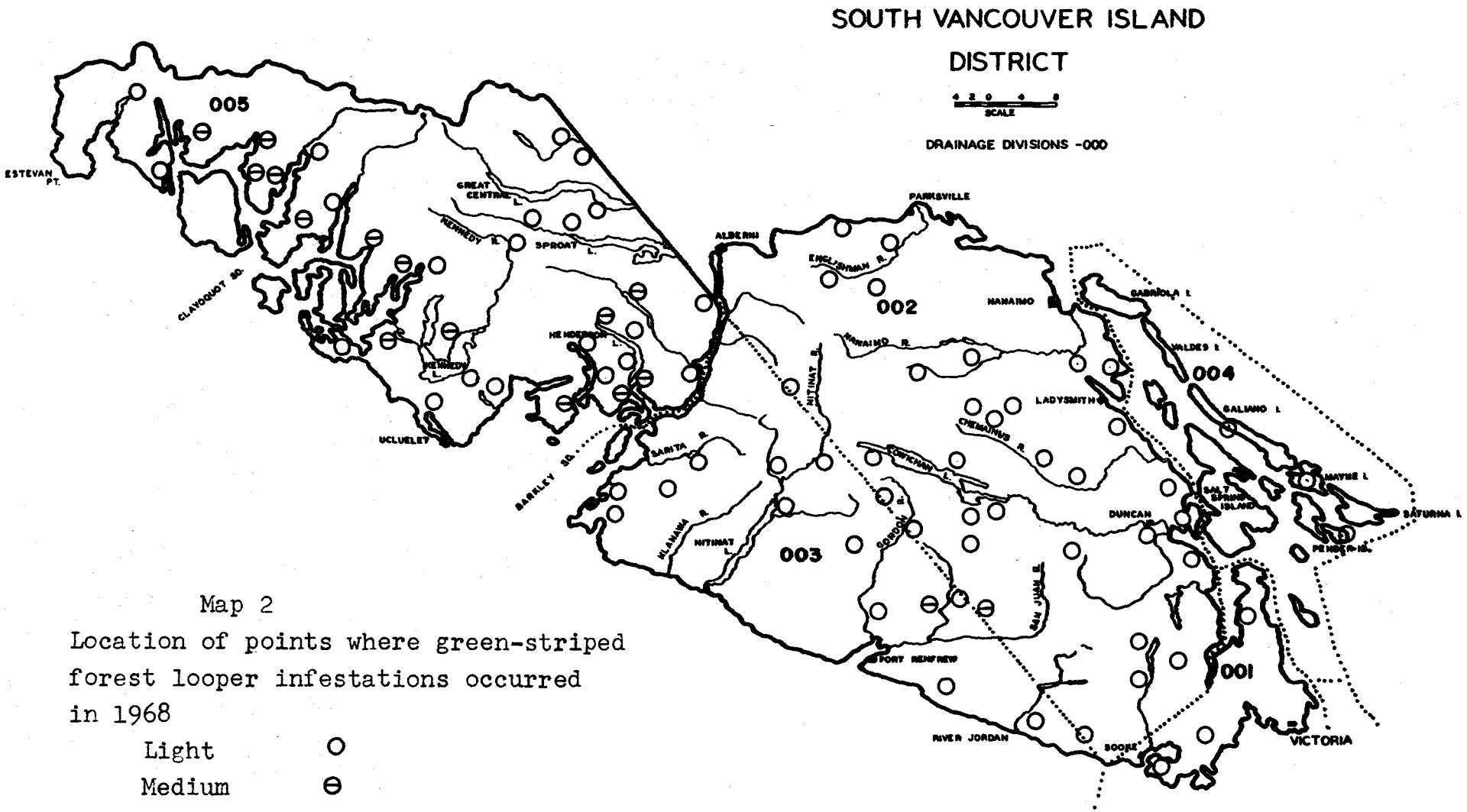


Map 1

Location of points where one or more collections were made and field records taken in 1968

Forest insect ●

Forest disease ▲



Map 2

Location of points where green-striped forest looper infestations occurred in 1968

Light O

Medium ⊖

FOREST INSECT AND DISEASE SURVEY

NORTH VANCOUVER ISLAND

1968

M. R. Bedford[1/]

INTRODUCTION

Regular field work began on May 1 and ended on September 24. Special surveys were: west coast aerial survey from July 22 to July 24, spruce weevil and spruce gall aphid on Sitka spruce, bark beetles and wood borers in logging slash, windfalls and recently felled trees; Rhizina root rot on recently burned areas; occurrence of root rots of immature stands; Indian paint fungus; and problems of exotic tree species.

Insect and disease collections are shown, by host, in Table 1; collection localities are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Drainage divisions are shown on Map 1. Details on individual insect and disease problems follow.

Numbers of larval defoliators found in field collections was about the same as in 1967: 88% of beating collections contained larvae.

The green-striped forest looper, found in large numbers on the west coast and in the Victoria - Alice Lake areas, was the object of a pupal survey conducted in late September. Drought damage to Douglas-fir and western hemlock reproduction resulting in top kill was evident in the Ash River Valley and Great Central area near Alberni.

[1/] Forest Research Technician, Forest Insect and Disease Survey Ranger, Victoria, B. C.

Table 1. Collections by hosts, North Vancouver Island, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	16	0	Alder species	1	0
Cedar, yellow	1	0	Alder, red	3	2
Douglas-fir	111	82	Arbutus	1	0
Fir, amabilis	26	11	Aspen, trembling	0	2
Fir, grand	7	0	Cottonwood, black	0	1
Hemlock, mountain	1	0	Oak, English	0	1
Hemlock, western	152	28	Oak, Garry	1	0
Larch, European	0	3	Oak, scarlet	0	1
Pine species	1	6	Poplar, Lombardy	1	1
Pine, Austrian	0	6	Poplar sp.		1
Pine, cluster	1	5	Willow	1	3
Pine, lodgepole	11	7			
Pine, Monterey	0	6			
Pine, Scots	3	6			
Pine, western white	3	0			
Spruce, Norway	0	1			
Spruce, Sitka	47	3			
Totals	380	165	Totals	8	12
			Misc. hosts	17	1
			No hosts	7	13
			GRAND TOTALS	412	191

Table 2. Currently important insect and disease[1] problems by drainage divisions, North Vancouver Island, 1968

Insect and disease problems	Principal hosts[2]	Importance by drainage divisions[3]					
		021	022	023	024	025	026
Defoliators							
Green-striped forest looper	D, aF, wC, wH	3	3	4	3	4	3
Physiological Diseases							
Drought	D, wH, wC	4	3	3	3	0	4

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.
Scattered high populations and/or significant damage in restricted areas - 4.
Rising population and/or moderate numbers and/or potential problem - 3.
Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

Green-striped forest looper, Melanolophia imitata

Larval populations increased in the Nootka and Kyuquot Sound areas in DD 023 and in the Victoria Lake and Alice Lake areas near Jeune Landing in DD 025 but were relatively unchanged from 1967 elsewhere (Table 3) (Map 2).

Table 3. Summary of green-striped forest looper collections by drainage divisions, North Vancouver Island

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
021	107	117	74	12	71	53	3.1	7.1	4.6
022	60	50	35	15	70	54	2.9	5.5	2.9
023	58	32	34	46	84	76	3.5	16.0	22.8
024	41	35	25	17	37	72	3.4	4.8	4.7
025	58	72	51	36	40	76	2.6	6.2	13.4
026	5	9	8	100	33	62	3.9	2.7	3.0
Totals	329	315	227	25	60	64	3.3	7.7	9.9

Noticeable defoliation of western hemlock was seen near Victoria Lake where the highest larval population occurred. Counts of pupae overwintering in the duff and defoliation estimates on 10 trees were made at six locations (Table 4). An average of 3.5 pupae per square foot of duff with a high of 8 per square foot occurred at the north end of Victoria Lake. In addition, two duff samples from a small island in the lake, where understory and overstory trees were heavily defoliated, yielded 30 pupae. Of 193 pupae being reared in the insectary, 82% died of bacterial infection. If this infection is general, the 1969 population will be reduced markedly and little defoliation will occur.

Table 4. Green-striped forest looper pupae in Victoria-Alice Lake area, North Vancouver Island

Location	% defoliation	Average no. of pupae
North end Victoria Lake (1)	10	8.0
North end Victoria Lake (2)	0	2.8
South end Victoria Lake	5	2.2
Pump house Victoria Lake	20	2.2
S. E. Main (ml 4.5)	0	2.6
S. E. Main (ml 8.5)	0	3.4
Totals	6	3.5

Other Noteworthy Insects

A hemlock needle miner, Epinotia tsugana

Seven damage appraisal strips in the Holberg - Mahatta River infestation were re-examined for defoliation in late May before new growth flushed (Table 5).

Light mortality of overmature western hemlock in the infestation areas was attributed to hemlock needle miner feeding but most trees heavily defoliated in 1966 appeared to be recovering. No larval counts were made as the infestation appears to have subsided.

Table 5. % defoliation of western hemlock caused by hemlock needle miner, Drainage Division 025, North Vancouver Island

Crown class	1966 % defoliation by crown level			1967 % defoliation by crown level			1968 % defoliation by crown level		
	Upper	Mid	Lower	Upper	Mid	Lower	Upper	Mid	Lower
D	62	57	46	52	47	34	40	31	15
CD	58	53	45	43	42	32	34	30	16
I	46	43	33	33	32	21	23	18	9
S	41	39	37	24	26	23	11	8	10
	Overall average			Overall average			Overall average		
	51%			39%			25%		

Spruce gall aphid, Adelges cooleyi

A survey for gall damage in young Sitka spruce stands was carried out at 16 locations. Five out of 15 current attacks were rated as heavy since the trees had an average of one or more galls per square foot of foliage. The locations of heavy attack are listed below:

Location	DD	Galls/sq. ft. of foliage
4 miles past Stamp Falls (Alberni)	021	2.2
B.C.F.S. Experimental Forest (Campbell River)	021	1.0
Emergency Air Strip (Sayward)	022	1.0
Duncan Road (Nimpkish Valley)	024	1.8
South end of Bonanza Lake (Bonanza Valley)	024	1.4

Norway spruce examined in the Tsolum area had no galls.

Sitka spruce weevil, Pissodes sitchensis

Up to 100 young Sitka spruce were examined for current spruce weevil attack at each of 21 locations. Current weevil damage occurred at 13 areas, of which five had more than 20% of the leaders attacked. Locations where highest number of attacks occurred are shown below:

Location	DD	% current attack
Campbell Lake (Gold River Road)	022	30
Emergency Air Strip (Sayward)	022	34
Duncan Road (Nimpkish Valley)	024	50
South end of Nimpkish Lake (Nimpkish Valley)	024	50
Coal Harbour (Coal Harbour)	025	20

Table 6. Other insects of current minor significance

Insect	Hosts[1/]	Locality	Remarks
Acleris variana Black-headed budworm	D, aF, gF, wH	All drainage divisions	Defoliator. 12% of 227 collections averaged 1.6 larvae.
Choristoneura fumiferana Spruce budworm	D	021, 022, 026	Defoliator. 4% of 80 collections averaged 1.7 larvae.
Dendroctonus pseudotsugae Douglas-fir beetle	D	Throughout District	Light populations in trap trees, and logs left on road sides.
		Ash River	Attacking drought weakened trees.
Ectropis crepuscularia Saddleback looper	D, wC, wH	022, 023, 024, 025	Defoliator. 17 positive collections averaged 3.1 larvae per sample. A medium population (30 larvae per sample) was found in the Victoria Lake area.

Table 6. (continued)

Insect	Hosts[1/]	Locality	Remarks
Epirrita autumnata Green velvet looper	D, aF, wH	021, 022, 024, 025	Defoliator. 15 collections averaged 4.4 larvae, with a high of 20 larvae in Mt. Washington area, D.D. 021.
Gallerucella carbo Pacific willow leaf beetle	W	021 (Menzies Bay)	Defoliator. Willows in the Menzies Bay area were heavily skeletonized.
Lambdina fiscellaria lugubrosa Western hemlock looper	D, wH	021, 022, 025	Defoliator. 3% of 215 collections averaged 2.6 larvae.
Malacosoma pluviale Western tent caterpillar	rAl, W	021	Common on deciduous growth in Courtenay area.
Neodiprion spp. Sawflies	Conifers	All drainages	Defoliator. 57 positive collections averaged 8.0 larvae.
Nyctobia limitaria Green balsam looper	wC, D wH, sS	021, 023 024, 025	Defoliator. 24 positive collections averaged 1.8 larvae each compared with 3.2 larvae in 1967.
Orgyia antiqua badia Rusty tussock moth	wC, D wH	023, 025	Defoliator. 9 positive collections averaged 1.4 larvae compared with 4.3 larvae in 1967.
Pseudohylesinus sp. A bark borer	wH, aF	Throughout District	Light populations in trap trees and windfalls.
Trypodendron spp. Ambrosia beetles	D, wH, aF	Throughout District	Light populations in trap trees, windfalls, right of way falling, and overwintered slash.

1/ Host tree abbreviations appear in the Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Physiological Diseases

Drought damage

The effects of the 1967 drought were evident this spring, especially in the Alberni valley. The most severe damage occurred in the Great Central Lake - Ash River area where Douglas-fir and western hemlock reproduction, trees 10 to 40 feet high, suffered two to three feet of top kill in 1967, and a further two foot dieback in the spring of 1968.

On Hornby and Denman Islands a few isolated patches of western red cedar mortality were attributed to the 1967 drought.

Wind and snow damage

A considerable area of western hemlock and Douglas-fir reproduction had three to four feet of their tops broken off on the west side of Menzies mountain at the 2000' level. Wind and snow are believed to be the cause of the damage.

Specific Surveys

Exotic Tree Species

Fifteen plantations were examined. Fifty per cent of the Monterey pine, Pinus radiata in Xp. 74 in Ash River area was infected by sweet fern blister rust, Cronartium comptoniae. Some trees had an unidentified foliage discolouration possibly caused by the red band disease, Scirrhia pini. The plantation is in extremely poor condition and is not likely to survive.

Five Austrian pine, P. nigra, in this area had a leader dieback associated with Sclerophoma pithyophila. Armillaria root rot was found attacking Austrian pine and cluster pine. Austrian pine and cluster pine plantations at Arrowsmith Arboretum were attacked by red band disease with 23% and 17% of the foliage affected.

Four European larch in the Sayward Provincial Forest near Spirit Lake, infected with Armillaria root rot, had blown down.

Root rots of immature and mature stands

Conifers were examined to determine the extent and intensity of root rot in mature and immature stands. Poria weirii, Fomes annosus and Armillaria mellea were prevalent in many stands of Douglas-fir and western hemlock reproduction with from one to twelve trees, dead or dying.

P. weirii was collected at 31 locations from Douglas-fir and western hemlock.

F. annosus was collected in seven areas from western hemlock and amabilis fir and A. mellea was found in 36 locations from the same hosts, plus lodgepole pine, cluster pine, Austrian pine and European larch.

Four centres of Poria subacida were found; the extent of infection ranged from one to six trees with western hemlock and Scots pine being the affected hosts.

Rhizina root rot

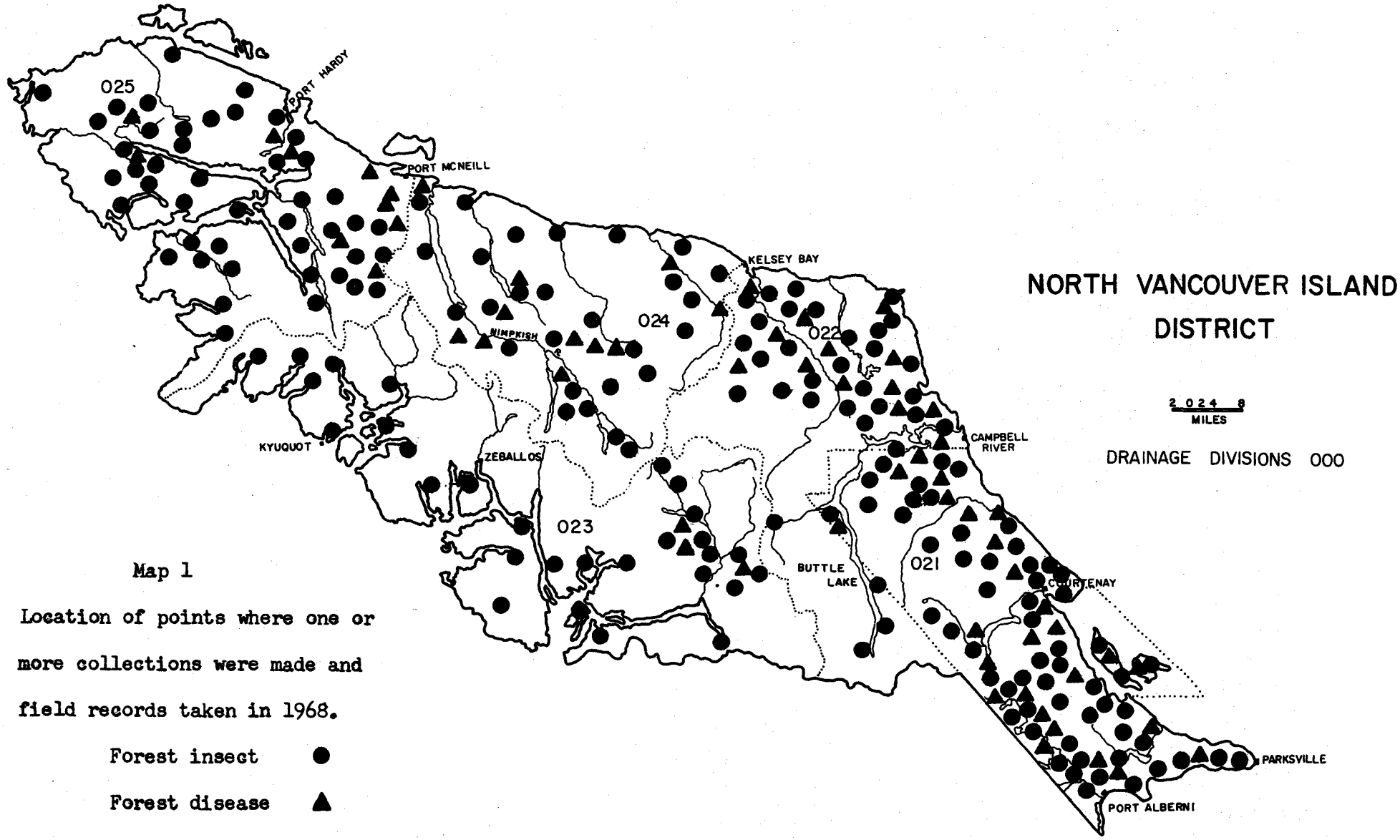
A survey was carried out on areas burned between 1965 and 1967. In 38 sites examined 40% had Rhizina fruiting bodies. In most instances the fruiting bodies were sparse and in isolated patches. Few dead seedlings could be attributed to the fungus. However a potential hazard exists where the fungus is abundant and seedlings have been recently planted, especially the first year after a hot clean slash burn.

Other Noteworthy Diseases

Table 7. Other diseases of current minor significance

Organism	Hosts[1]	Locality	Remarks
Hendersonia pinicola	lP	Coombs-Bowser	Causing needle disease. Found in association with Lophodermella concolor.
Lophodermella concolor	lP	Coombs-Bowser	Needle disease, up to 90% defoliation.
Polyporus volvatus	D	Memekay River	Causes sapwood rot. Found in association with bark beetles and in burnt trees.
Uredinopsis sp.	aF	Branch 22, Alice Lake Logging	Rust causing moderate infection of 1968 needles.

1/ Host tree abbreviations appear in introduction.



NORTH VANCOUVER ISLAND DISTRICT

2 0 2 4 6
MILES

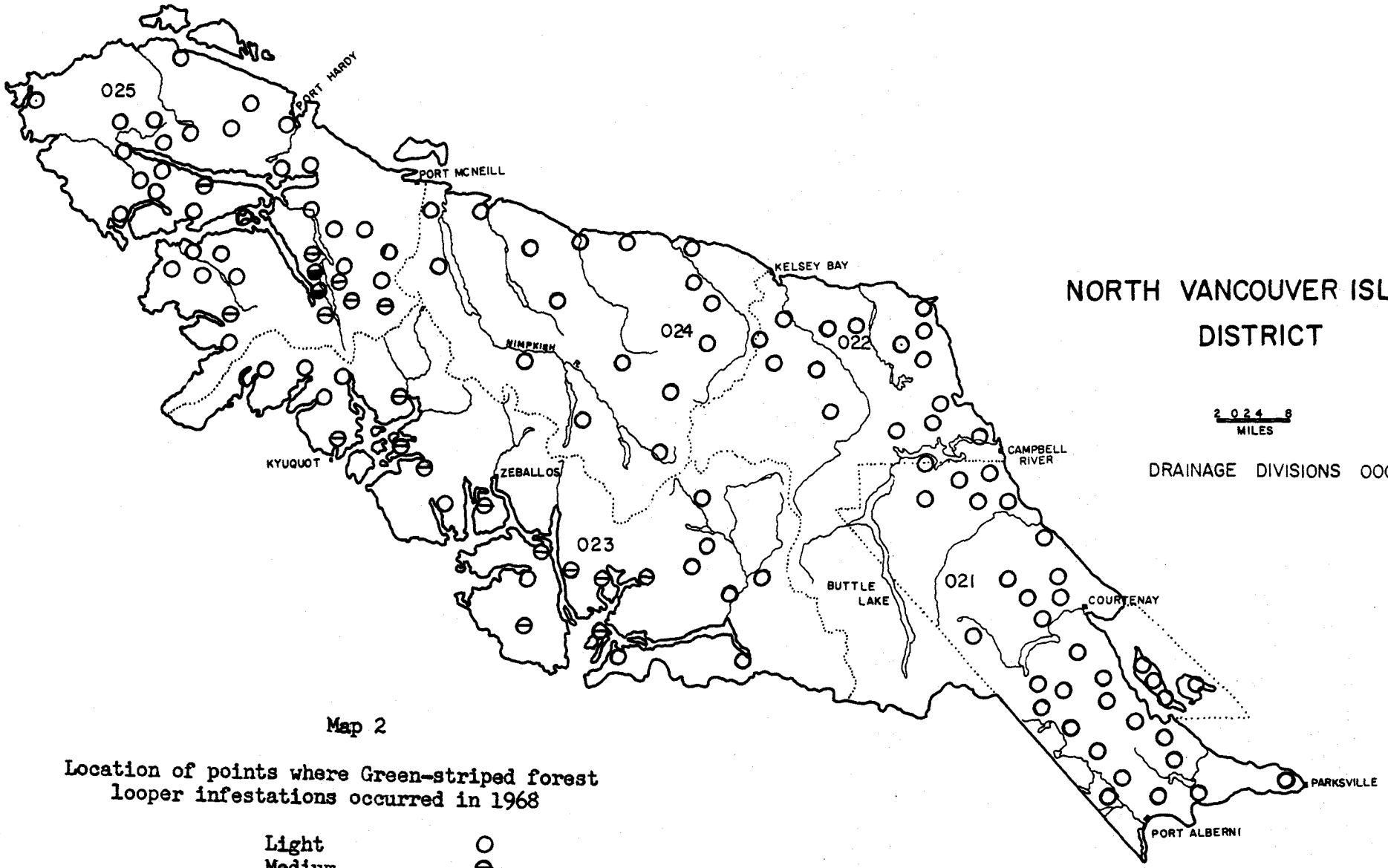
DRAINAGE DIVISIONS 000

Map 1

Location of points where one or more collections were made and field records taken in 1968.

Forest insect ●

Forest disease ▲



NORTH VANCOUVER ISLAND DISTRICT

2 0 2 4 6
MILES

DRAINAGE DIVISIONS 000

Map 2

Location of points where Green-striped forest looper infestations occurred in 1968

Light	○
Medium	⊖
Heavy	◒
Very heavy	●

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1968

VANCOUVER SURVEY DISTRICT

MAINLAND SECTION

C. B. Cottrell[1/]

Ranger personnel assigned to the Mainland Section were C. B. Cottrell, South Vancouver, and A. K. Jardine, North Vancouver.

Black-headed budworm caused moderate defoliation of western hemlock and amabilis fir in the Hope Slide area but less than in 1967. Egg counts made in the fall indicated a further decline in populations in 1969 in the Hope B. C. Forest Service Ranger District. Light defoliation occurred from Stave Lake to North Vancouver as far north as Squamish. Egg counts indicated light defoliation may be expected in most areas in 1969 with possibly moderate defoliation north of Mission and in the Mamquam River Valley.

Green-striped forest looper populations increased in the northwestern portion of the North Vancouver District and in the southeastern part of the South Vancouver District but decreased sharply in the Howe Sound area where a large population existed in 1967.

The silver-spotted tiger moth defoliated Douglas-fir and western hemlock along the coastline from Vancouver to Lund. Top-killing of Douglas-fir may occur in the Howe Sound and Powell River areas.

Western tent caterpillars severely defoliated deciduous trees and shrubs from the mouth of the Fraser River along the coast to Powell River.

Balsam woolly aphids continued to attack balsam trees within the known area of infestation but no spread was detected.

Scattered pockets of timber in both districts died as a result of drought conditions in the summer of 1967. Most of the mortality was restricted to immature trees.

Much of the tree mortality, growth loss, and quality reduction attributed to diseases is caused by mistletoes and stem and root rot fungi.

1/ Forest Research Technician, Forest Insect and Disease Survey Senior Ranger, Victoria, B. C.

These usually intensify at a slow rate which makes annual summaries of their status repetitious; for this reason the following report may not mention 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., frost and drought damage which immediately effect tree appearance and often cause dieback and mortality. Other aspects of the Disease Survey which deal with mortality, growth loss, and factors influencing the occurrence of the more important diseases, are summarized elsewhere.

Host tree abbreviations used in the following reports are shown in Table 1.

Table 1. Host tree abbreviations

Abbrev.	Common name	Abbrev.	Common name
wC	western red cedar	Al	alder-general
		rAl	red alder
D	Douglas-fir		
		tA	trembling aspen
aF	amabilis fir		
alF	alpine fir	wB	white birch
gF	grand fir		
		Ch	cherry-general
mH	mountain hemlock		
wH	western hemlock	bCo	black cottonwood
lP	lodgepole pine	Hw	hawthorn-general
pP	ponderosa pine		
wwP	western white pine	Po	poplar-general
		lPo	Lombardy poplar
eS	Engelmann spruce		
sS	Sitka spruce	W	Willow-general
wY	western yew		

FOREST INSECT AND DISEASE SURVEY

SOUTH VANCOUVER

1968

C. B. Cottrell

INTRODUCTION

Regular field work began on May 17 and ended on August 23. Specific surveys for Rhizina root rot on seedlings and root rots of immature and mature trees were done from late August to late September. Black-headed budworm egg sampling was done from September 23 to October 4. An aerial survey for black-headed budworm and balsam woolly aphid mortality was made in September.

The incidence of defoliating insects decreased slightly this year but remained at a high level; 90% of beating collections contained larvae.

Insect and disease collections are shown by hosts in Table 1; collection localities and drainage divisions are illustrated on Map 1. Table 2 lists the principal problems in each Forest Insect and Disease Survey Drainage Division.

Table 1. Collections by hosts, South Vancouver, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	41	1	Alder, red	12	17
Cedar, yellow	0	1	Alder, Sitka	2	0
Douglas-fir	76	25	Arbutus	1	0
Fir species	2	1	Birch species	0	2
Fir, alpine	2	6	Birch, western white	2	0
Fir, amabilis	34	11			
Hemlock, mountain	3	3	Cherry, bitter	2	2
Hemlock, western	122	17	Maple, broadleaf	3	0
Pine species	1	3	Maple, Douglas	2	0
Pine, lodgepole	17	1	Maple, vine	4	0
Pine, ponderosa	6	0	Poplar species	0	4
Pine, Scots	2	1	Miscellaneous	6	6
Pine, shore	5	1			
Pine, western white	6	3			
Spruce species	0	1			
Spruce, Engelmann	2	0			
Spruce, Sitka	15	3			
Yew, western	2	0			
Miscellaneous	0	8			
Totals	336	86	Totals	34	31
			No host	1	3
			GRAND TOTALS	371	120

Table 2. Currently important insect and disease[1] problems by drainage division, South Vancouver, 1968

Insect and disease problems	Principal hosts[2]	Importance by drainage division[3]					
		040	041	042	043	044	045
Bark Beetles							
Douglas-fir beetle	D	1	1	1	2	3	1
Defoliators							
Black-headed budworm	wH, mH, aF, alF, D, sS, eS	2	5	5	3	1	4
Green-striped forest looper	wC, wH, aF, D, sS	2	2	3	2	0	2
Western hemlock looper	wH, wC, D, aF, sS	1	0	3	3	1	1
Spruce budworm	D, aF, wH	3	3	1	1	2	2
Sucking Insects							
Balsam woolly aphid	aF, alF, gF	2	0	5	3	0	2
Physiological Diseases							
Drought damage	D, lP, pP, wwP	4	2	3	3	4	4
Frost damage	wH, D, aF, wC	1	1	4	4	0	1

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5. Scattered high populations and/or significant damage in restricted areas - 4.
Rising populations and/or moderate numbers and/or potential problems - 3.
Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Douglas-fir Beetle, *Dendroctonus pseudotsugae*

The foliage of 1968-attacked Douglas-fir did not turn color in 1968, presumably due to the cold, wet summer weather. The extent of the 1968 attack will not be known, therefore, until the spring or early summer of 1969. Only light attacks occurred in log decks and felled trees indicating that a small population existed.

Counts of red-topped Douglas-fir comprised mostly 1967-attacked trees in the following areas: Fraser Canyon from Yale to Boston Bar, 240; on the east side of Harrison Lake at Big Silver Creek, 40, Cogburn Creek, 12, and in the Pemberton District, 20 at the north end of Lillooet Lake.

Defoliators

Black-headed budworm, *Acleris variana*

Populations remained at a high level in hemlock stands throughout the District, increasing significantly in the western portion from Mission to Vancouver north of the Fraser River (Table 3). Defoliation was not severe; presumably the cool wet summer weather was not conducive to larval feeding.

The heaviest defoliation occurred east of Hope at Wray Creek where 100 acres of immature western hemlock lost 35% of their foliage. Elsewhere in the Hope Slide area defoliation varied from a trace to 15% in approximately 3,000 acres. Defoliation was lighter in the Coquihalla Valley with up to 10% defoliation of western hemlock and amabilis fir in the valley bottom near Romeo.

There was increased defoliation north of Mission in the Salsbury (Cypress) Lake - Lost Creek area where needle loss varied from 10 to 25%. Defoliation averaged 10% in the mountain areas north of Vancouver and in the Furry Creek and Mamquam River valleys.

Mass larval and pupal collections were made for parasite and disease studies. Larval parasitism was 28%, pupal parasitism 55% and a virus disease caused 7% mortality in the Hope area. Parasitism and disease was negligible in the remainder of the District.

Table 3. Summary of black-headed budworm collections by drainage division, South Vancouver

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
040	18	19	14	39	47	64	6.0	18.1	16.7
041	24	29	30	75	86	83	26.3	63.4	95.4
042	95	76	75	31	63	64	7.3	11.7	25.5
043	38	29	19	37	45	47	25.6	17.6	10.2
044	44	28	10	41	68	0	23.9	6.6	- -
045	60	31	21	12	39	19	8.7	11.3	3.8
Totals	279	212	169	33	59	56	16.0	22.2	40.7

Table 4. Summary of black-headed budworm egg counts and defoliation estimates, South Vancouver

Locality	Area	Av. no. eggs per 10" tip		% defoliation			
				1968		1969[1]	
		1967	1968	Current foliage	Total foliage	Current foliage	Total foliage
Coquihalla Valley	Coquihalla	3.9	0.5	10	T	5	T
	Romeo	5.3	0.2	30	10	T	T
	Iago	6.0	0.2	T[2]	T	T	T
	Boston Bar Cr.	1.1	0.2	10	T	T	T
Boston Bar	Scuzzy Cr. (2100')	1.8	0.5	0	0	5	T
	Scuzzy Cr. (3000')	1.6	0.5	0	0	5	T
	Stoyoma Cr.	4.5	0.9	5	T	10	T
Hope Slide	Wray Cr.	-	0.2	75	35	T	T
	Mile 10	2.6	0.1	10	T	T	T
	Mt. Coulter	5.9	0.5	5	T	5	T
	Mile 13	3.2	0.2	35	15	T	T
Ruby Cr.	Ruby Cr.	1.4	0.1	15	5	T	T
Mission	Salsbury L.	-	4.8	60	25	50	15
	Lost Cr.	-	1.2	20	5	15	5
North Vancouver	Seymour Cr.	1.3	2.1	30	10	25	10
	Grouse Mtn. (1800')	-	0.4	5	T	T	T
	Grouse Mtn. (3000')	6.1	0.1	5	T	T	T
	Cypress Cr.	4.8	1.1	35	10	15	5
Squamish	Furry Cr.	6.2	1.5	45	15	15	5
	Mamquam R.	-	2.5	20	5	25	10
	Raffuse Cr.	-	2.6	50	15	30	10

Based on the number of eggs collected in the fall of 1968 (Table 4), light to moderate defoliation is expected in the Salsbury Lake area north of Dewdney and in the Mamquam River Drainage. Light defoliation is expected in the mountains north of Vancouver. Infestations in the Hope Slide area, and in the Coquihalla Valley are expected to collapse due to high insect parasitism.

Map 2 shows the location of points where black-headed budworm infestations occurred in 1968.

[1] Estimated defoliation in 1969 that will be caused by larvae hatching from 1968 eggs.

[2] T = Trace

Green-striped forest looper, Melanolophia imitata

Moderate numbers of larvae were found on western hemlock and western red cedar in the Fraser Valley and east of Hope. Only a few larvae were taken from Douglas-fir, amabilis fir and Sitka spruce. Populations declined in the Fraser Canyon, Harrison Lake Drainage and Squamish area where a larval fungus disease, Entomopthora sp., appeared in 1967. There was no noticeable defoliation to any host. A summary of collections by drainage division is shown in Table 5.

Table 5. Summary of green-striped forest looper collections by drainage division, South Vancouver

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
040	17	28	16	77	54	68	8.8	2.7	3.6
041	26	38	35	69	47	57	4.1	3.2	3.5
042	94	103	90	77	82	58	24.5	8.4	9.3
043	41	36	22	66	69	68	13.2	5.1	2.7
044	42	30	18	55	43	0	4.0	4.5	-
045	81	36	25	26	53	24	5.0	9.0	3.2
Totals	301	271	206	55	64	50	14.0	6.7	6.3

Western hemlock looper, Lambdina fiscellaria lugubrosa

Populations on western hemlock and western red cedar remained below infestation proportions although there was an increase in the average number of larvae per positive sample. Collections containing 10 or more larvae were restricted to the north side of the Fraser River from Coquitlam Lake to Harrison Lake. The largest collections taken in hemlock-cedar stands were: Harrison Bay, 45; Lost Creek, 37 and Salsbury Lake, 24. The largest number on Douglas-fir was 10 and on amabilis fir seven.

A comparison of collections containing hemlock loopers from 1966 to 1968 is as follows:

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1966	1967	1968	1966	1967	1968	1966	1967	1968
301	261	200	17	24	21	4.9	4.8	8.0

Spruce budworm, Choristoneura fumiferana

There was a significant increase in larval populations on Douglas-fir, although no appreciable tree damage is expected. In the Fraser Valley and Canyon areas, 63% of collections contained an average of 6.1 larvae compared with 39% with 3 larvae in 1967. Collections of 27, 25 and 16 larvae were taken in isolated Douglas-fir stands at Abbotsford, Hope and Clearbrook respectively. From Pemberton to D'Arcy, 71% of collections contained an average of 3.6 larvae compared with 33% with 2.5 larvae in 1967.

Sucking Insects

Balsam woolly aphid, Adelges piceae

This aphid continued to attack amabilis and alpine fir within the known area of infestation; there were no extensions of the infestation beyond the 1967 boundaries. During an aerial survey in September, counts were made of red-topped balsam presumably killed by the woolly aphid. The number of dying balsam recorded were: Indian River, 750 trees; Seymour and Capilano valleys, 285 trees, north of Stave Lake, 180, and 110 along Tretheway Creek.

Other Noteworthy Insects

A conifer sawfly, Neodiprion spp.

Populations increased on all hosts. Light to moderate defoliation of western hemlock occurred in two square miles in the Hope Slide area where collections often contained more than 300 larvae. Moderate defoliation occurred on 10 acres of western hemlock and amabilis fir near Furry Creek. In the Fraser Canyon there were up to 83 larvae in Douglas-fir collections and up to 76 in lodgepole pine. Defoliation was insignificant.

Saddleback looper, Ectropis crepuscularia

Increased numbers of larvae were collected from western hemlock north of Vancouver but populations remained at a low level. Larvae were frequently found in the Capilano and Seymour River valleys; the largest collection, taken from Grouse Mountain, contained 11 larvae.

Silver-spotted tiger moth, Halisidota argentata

Larvae caused up to 20% defoliation on scattered mature Douglas-fir and western hemlock along the shoreline from Horseshoe Bay to Britannia Beach. Up to 25 feet of the upper crowns of Douglas-fir and up to 10 feet of the upper crowns of hemlock were stripped. Shore pines were lightly attacked.

Moderate damage occurred from West Vancouver to Point Grey and light damage from Vancouver to White Rock.

Western tent caterpillar, Malacosoma pluviale

An extremely large population was present from Horseshoe Bay to Britannia. Most immature red alder and willow were completely defoliated early in the season before their leaves had fully developed. Consequently many larvae died from starvation. During the summer, however, the alders "leafed-out" again and recovered.

Defoliation of alders, poplars, cherries, birches and willows was severe in the vicinity of Beach Grove, moderate from White Rock to Cloverdale and light from Pemberton to D'Arcy.

Table 6. Other insects of current minor significance

Insect	Hosts[1/]	Locality	Remarks
Altica spp. Leaf beetles	rAl	Chilliwack B.C.F.S. Ranger District	Leaf skeletonizer. Common, moderate damage.
Dendroctonus ponderosae Mountain pine beetle	pP	D'Arcy	Bark beetle. Decrease, 25 trees killed.
Epirrita autumnata Green velvet looper	wH, mH, aF	Fraser Valley	Defoliator. Slight increase, largest collection contained 10 larvae at Cypress Creek.
Galerucella sp. A leaf beetle	rAl	Harrison B.C.F.S. Ranger District	Leaf skeletonizer. Severe damage on thousands of acres of immature trees.
Hyphantria cunea Fall webworm	rAl, wB, Po, Ch, Hw.	Fraser Valley	Defoliator. Increase widespread.
Malacosoma disstria Forest tent caterpillar	bCO, W, rAl	Fraser Mills, Port Mann	Defoliator. Moderate to severe defoliation on approx. 200 acres.

Table 6. (Continued)

Insect	Hosts[1]	Locality	Remarks
? Nematus sp. A sawfly	rAl	Fraser Valley	Defoliator. Common, moderate damage to immature trees.
Neomyzaphis abietina Spruce aphid	sS	Central and Upper Fraser Valley	Sucking insect. Decrease from 1967 but many trees in shelter-belts dying from repeated attacks.
Nepytia phantasmaria Phantom hemlock looper	wH, wC, D	Fraser Valley, Fraser Canyon	Defoliator. No increase from 1967, population at low level.
Rhyacionia buoliana European pine shoot moth	Scots and Mugho pines, lP	Vancouver	Terminal borer. High population in residential areas. No attacks found on pines in the forest.
Stilpnotia salicis Satin moth	white poplar	Langley	Defoliator. Small isolated infestations, Up to 60% defoliation on some trees.
Vespamima sequoiae Sequoia pitch moth	pP, lP	Fraser Valley, Fraser Canyon	Bark and wood borer. Numerous attacks in small stands. No tree mortality.
Zeiraphera sp. A tip moth	wH, D	Hope B.C.F.S. Ranger District	Defoliator. Increase, frequently from 3 to 10 larvae per collection.

[1] Host tree abbreviations appear in the Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Stem Diseases

Dwarf mistletoe, *Arceuthobium campylopodium* f. *tsugensis*

Although no specific surveys were done for this disease, infections were commonly found throughout the range of western hemlock. Many second-growth hemlock in the Chehalis and Capilano valleys and old-growth hemlock in Spuzzum Creek Valley were badly deformed as a result of numerous infections. These trees have, no doubt, suffered increment loss.

Physiological Diseases

Drought damage

Many trees injured by drought in 1967 died in 1968 or remained in a weakened state. Up to 10% of immature and pole-sized Douglas-fir and lodgepole pine were killed on dry sites in the vicinity of Daisy Lake (north of Squamish).

In the Pemberton area an estimated 25 square miles of hemlock and cedar and 1,000 acres of Douglas-fir and lodgepole pine appeared to be in poor condition. Most immature western white pine was killed although this is a minor tree species.

Top-killing occurred on up to 20% of scattered overmature Douglas-fir, western red cedar and white birch throughout the Fraser Valley, noteably in the vicinity of Cloverdale, Langley and Abbotsford.

Frost injury

Frost after an unusually warm period in February was apparently responsible for partial defoliation of 100 acres of pole-sized western hemlock, western red cedar, amabilis fir, Douglas-fir and western yew in the Capilano River Valley. Several year's foliage was lost on exposed portions of the trees but the 1968 buds were not damaged and little tree mortality is expected.

Frost injury also occurred on an estimated 250 acres of 100 to 120 year old Douglas-fir on the east side of Harrison Lake at Cogburn Creek. Small numbers of western hemlock and amabilis fir were also affected. By fall the 1968 foliage growth had covered much of the needle loss. Bark beetle populations are low in the area and little tree mortality is expected.

Specific Surveys

Exotic tree species

There are 38 plantations of a variety of introduced trees in the District, at least 15 are examined each year to determine the occurrence and effect of native diseases and insects. No serious problems were found. Early spring frosts killed the buds on exposed portions of several species of larch in the vicinity of Haney. A variety of exotic poplars throughout the Fraser Valley were lightly defoliated by leaf beetles but not as severely as native alders.

Rhizina root rot in plantations

This is a disease which may kill coniferous seedlings planted in one- or two-year-old burned areas. One hundred seedlings in each of 20 areas were examined and the disease was found from Seymour Creek Valley to Spuzzum Creek in the Fraser Canyon. The highest incidence of infection was found in wet hemlock-cedar sites and where the burns were particularly severe. The highest seedling mortality occurred in the vicinity of Salsbury Lake where up to 19% of planted Douglas-fir and Sitka spruce were killed.

Root rots of immature stands

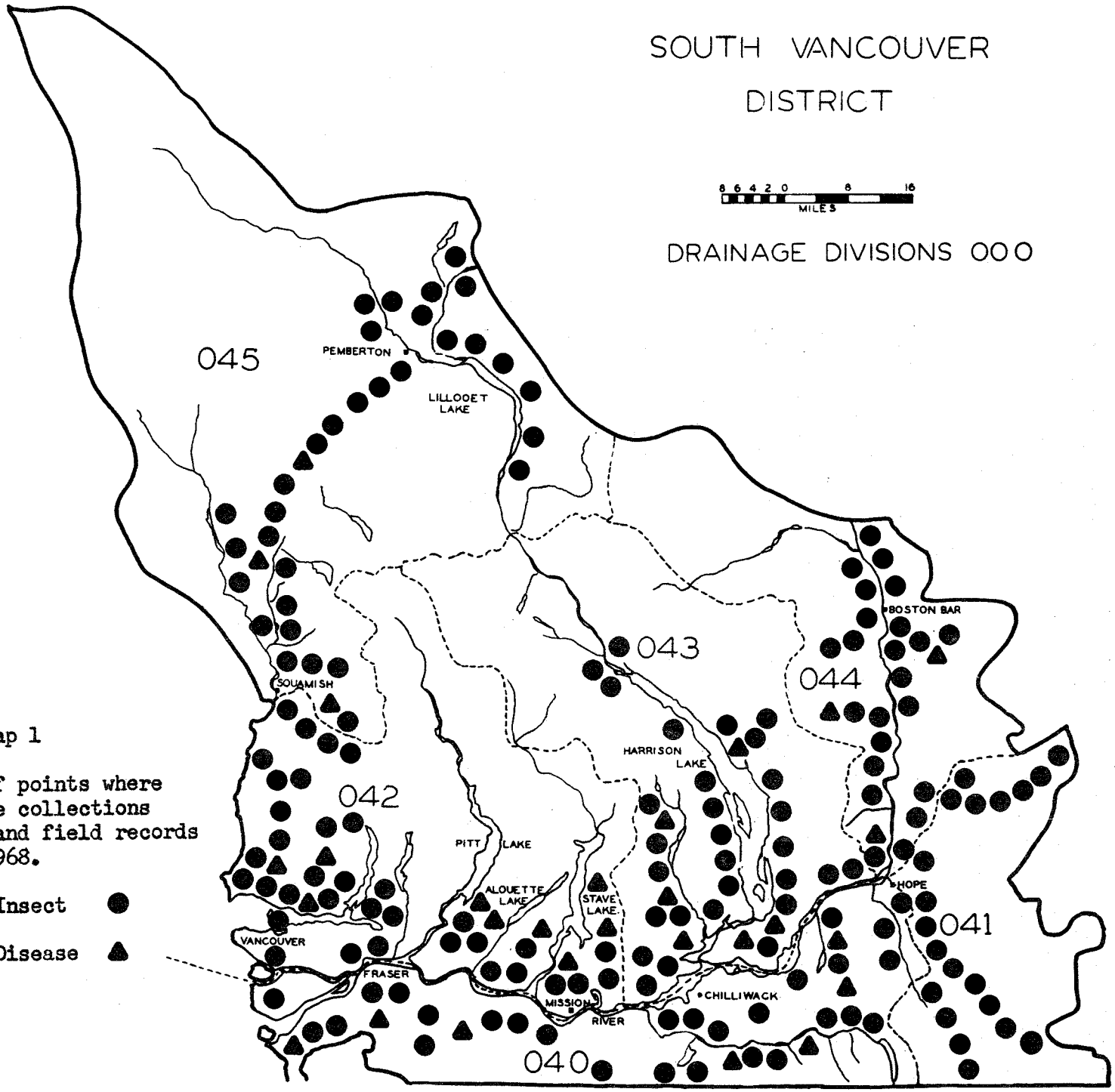
A survey for Poria weirii, Fomes annosus and Armillaria mellea was made in the District. Very few root rot centers were found. Poria and Armillaria were found on Douglas-fir in dry areas such as the Fraser Canyon. F. annosus was collected from amabilis fir north of Mission.

Other Noteworthy Diseases

Table 7. Other diseases of current minor significance

Organism	Hosts[1/]	Locality	Remarks
Discocainia treleasei	wH	Stave Lake, Rolley Lake	A branch canker. Common on pole-sized trees.
Dothichiza populea	lPo	South-western B. C.	An important canker disease of immature trees in U.S.A. Trees were examined near the International border but no cankers were found in B. C.
Epipolaeum tsugae	wH	Dewdney	A sooty mold. Light infections, common.
Ganoderma oregonense	aF	Dewdney	A root rot. New host record.
Phytophthora lateralis	Port Orford cedar	Fraser Valley	A root rot. Continues to kill young trees in residential areas.

1/ Host tree abbreviations appear in the Introduction

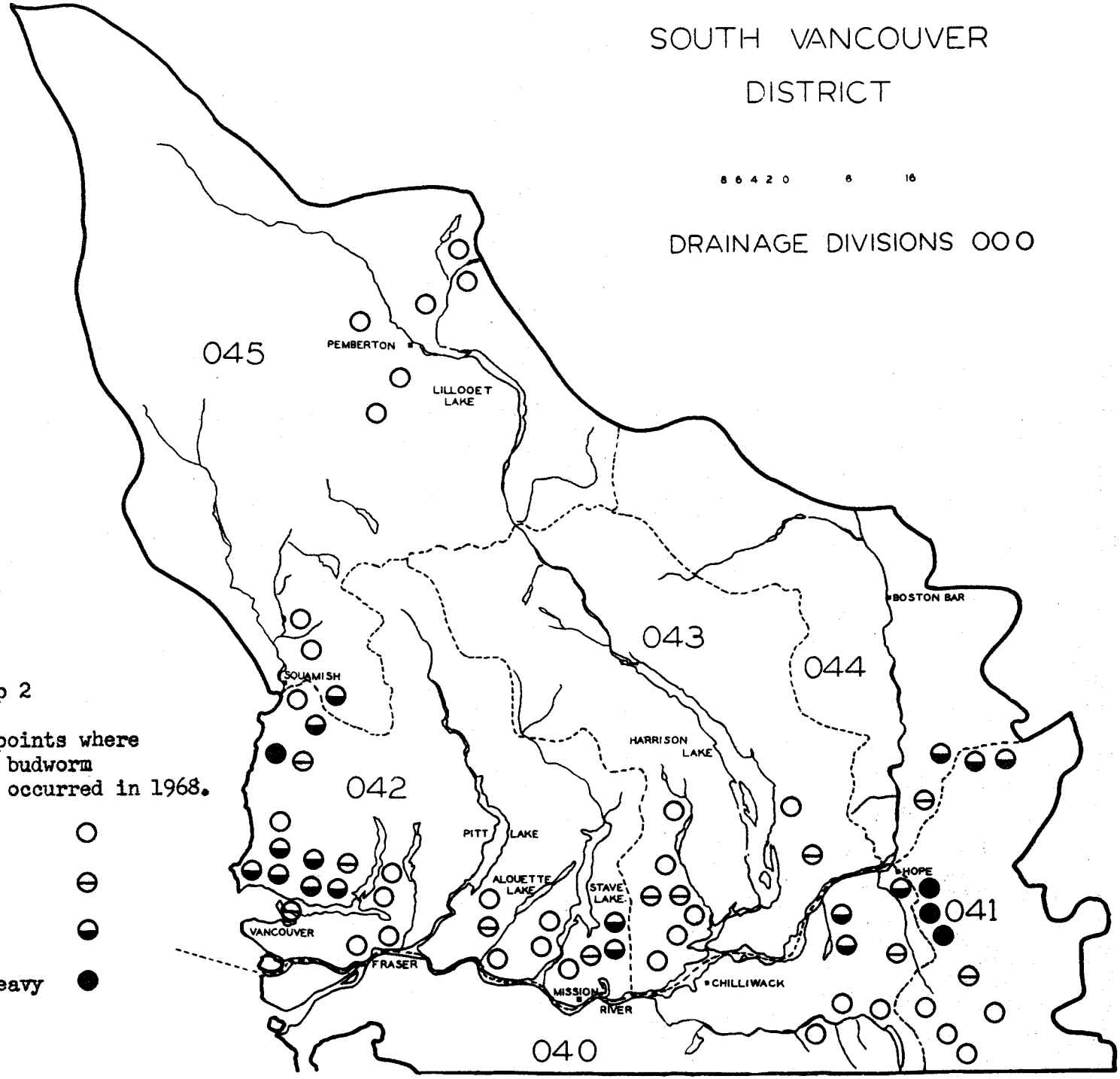


Map 1

Location of points where one or more collections were made and field records taken in 1968.

Forest Insect ●

Forest Disease ▲



Map 2

Location of points where black-headed budworm infestations occurred in 1968.

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

FOREST INSECT AND DISEASE SURVEY

NORTH VANCOUVER

1968

A. K. Jardine[1/]

INTRODUCTION

Regular field work began on May 13 and ended August 15. Special assistance was given by rangers R. G. Brown, P. Koot and summer assistant R. King.

The number of defoliators in field collections substantially decreased; 71% of the beating samples contained larvae, compared with 91% in 1967. Green-striped forest looper populations increased slightly in Drainage Division 066, and declined in the southern portion of the District. Populations of the silver-spotted tiger moth increased to infestation proportions in the Powell River area. The western tent caterpillar increased to infestation levels in the Langdale-Gibsons area. No new outbreaks or range extensions of balsam woolly aphid were found. Young Douglas-fir and hemlock suffered foliage loss, dieback and some mortality as a result of the 1967 drought.

Insect and disease collections are shown by host in Table 1; location of collections and drainage division boundaries are shown in Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Details of individual insect and disease problems follow.

1/ Forest Research Technician, Forest Insect and Disease Survey Ranger, Victoria, B. C.

Table 1. Collections by hosts, North Vancouver, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	54	4	Alder, red	2	0
Douglas-fir	86	36	Aspen, trembling	2	2
Fir, amabilis	2	1	Cherry, wild	2	1
Fir, grand	6	0	Poplar	0	1
Hemlock, western	112	46	Willow	4	2
Pine, lodgepole	8	14			
Pine, ponderosa	0	1			
Pine, red	0	1			
Pine, western white	7	2			
Spruce, Sitka	20	4			
Yew, western	0	2			
Totals	295	111	Totals	10	6
			Misc. hosts	0	5
			No hosts	0	4
			GRAND TOTALS	305	126

Table 2. Currently important insect and disease[1/] problems by drainage divisions, North Vancouver, 1968

Insect and disease problems	Principal hosts[2/]	Importance by drainage divisions[3/]								
		060	061	062	063	064	065	066	067	068
Defoliators										
Green-striped forest looper	wH, D, wC aF, sS	2	2	2	2	2	2	3	3	3
Black-headed budworm	wH, D, aF	1	3	1	1	1	1	1	1	1
Western hemlock looper	wH, D, wC	1	3	1	1	1	1	1	1	1
Silver-spotted tiger moth	D, wH, wC	4	4	1	1	1	1	1	1	1
Western tent caterpillar	Al, W, Po	3	4	1	1	1	1	1	1	1
Sucking Insects										
Balsam woolly aphid	aF, gF	0	5	1	1	1	1	1	1	1
Foliage Diseases										
Davisomycella needle cast	lP	4	4	3	2	2	2	2	2	2
Rhabdocline needle cast	D	2	4	2	1	1	1	1	1	1
Physiological Diseases										
Drought damage	D, wH	4	4	3	3	2	2	2	2	2

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.
Scattered high populations and/or significant damage in restricted areas - 4.
Rising populations and/or moderate numbers and/or potential problems - 3.
Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

Green-striped forest looper, **Melanolophia** imitata

The infestation on Douglas-fir, western hemlock and western red cedar subsided in most areas. Only 46% of the beating collections contained larvae compared to 84% in 1967 (Table 3). The largest sample, 46 larvae, came from hemlock in Nugent Sound where the population increased but there was no visible defoliation. A fungus disease, Entomophthora, associated with the larvae in 1967, may have reduced the population. Endemic populations are expected in 1969 except in Drainage Division 066 where slightly higher numbers may occur.

Table 3. Summary of green-striped forest looper collections by drainage divisions, North Vancouver

Drainage division	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
060	24	17	8	23	82	25	3.4	11.0	1.0
061	267	171	131	66	82	44	10.1	12.4	3.1
062	29	24	20	67	100	35	11.1	13.5	1.8
063	36	44	20	78	90	35	13.0	11.6	3.1
064	19	19	9	84	94	55	12.0	4.4	2.6
065	4	10	4	75	100	50	32.1	5.3	1.5
066	11	15	13	72	67	84	3.5	4.6	15.2
067	6	8	3	66	25	100	4.6	1.0	3.6
068	10	6	9	50	66	11	5.3	4.0	6.0
Totals	406	314	217	65	84	46	10.8	11.0	4.5

Black-headed budworm, Acleris variana

Populations remained generally low, but a gradual increase occurred during 1967-1968 on Douglas-fir and western hemlock in Drainage Divisions 061 and 062. Samples containing larvae increased from 4% in 1966 to 12% in 1968. The most larvae (29) came from a hemlock sample in the Wilson Creek area. No noticeable feeding was observed at any location. Populations could be slightly higher in the southern portion of the District in 1969, but no damage is anticipated. Following is a summary of black-headed budworm collections:

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1966	1967	1968	1966	1967	1968	1966	1967	1968
343	276	203	4	8	12	1.8	1.7	3.0

Western hemlock looper, Lambdina fiscellaria lugubrosa

The population remained relatively low. The largest numbers of larvae were found at Jervis, Sechelt, Salmon and Narrows inlets. No large increase is expected in the populations in 1969. Following is a summary of collections:

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1966	1967	1968	1966	1967	1968	1966	1967	1968
423	259	214	9	22	23	2.1	2.5	2.4

Silver-spotted tiger moth, Halisidota argentata

Up to 30 webs per tree occurred on Douglas-fir, western hemlock and western red cedar from Powell River to Lund. The tops of many trees were completely defoliated. A smaller population with up to 12 webs per tree on the same hosts occurred at Gilles Bay on Texada Island. The population may increase in 1969.

Western tent caterpillar, Malacosoma pluviale

Medium to heavy defoliation of alder, willow and other deciduous ground cover occurred in the Langdale - Gibsons area. Webs were common, mainly on fruit trees, throughout the Powell River area including Cranberry and Wildwood. There was a light infestation on the same hosts in the Gilles Bay area of Texada Island.

Sucking Insects

Balsam woolly aphid, Adelges piceae

This pest was not detected beyond the previously known infestation boundaries.[1/] Further appraisal by crews attached to the survey section continued on permanent study plots within the outbreak areas. Additional imported predators were released. A previously established predator, Laricobius erichsonii, was not detected this year.[2/]

Other Noteworthy Insects

Ambrosia Beetles, Trypodendron lineatum and Gnathotricus sulcatus

Heavy attacks occurred in recently felled Douglas-fir trees along right of ways near Naton Lake and in log decks at Scuttle Bay near Powell River. Logs were lightly attacked along Okeover Inlet Road, near Duck Lake, Glendale Cove in Knight Inlet, Granite Bay on Quadra Island, Chapman Creek and north of Lund near Wooten Bay.

1/ Harris, J. W. E. 1968. Detection surveys for balsam woolly aphid, Adelges piceae (Ratz.), in British Columbia. Forest Res. Lab., Victoria. Inform. Rep. BC-X-20. 8p.

2/ Harris, J. W. E. 1968. Balsam woolly aphid predator studies, British Columbia, 1959-1967. Forest Res. Lab., Victoria. Inform. Rep. BC-X-23. 18p.

Douglas-fir beetle, Dendroctonus pseudotsugae

Attacks were found in blowdown and recently felled logs along right of ways in the southern portion of the District and some log decks near Powell River.

Saddleback looper, Ectropis crepuscularia

Fewer collections contained larvae this year. In 1967, 118 samples contained an average of 3.7 larvae. The 24 samples this year, contained an average of 1.9 larvae. Endemic populations are expected in 1969.

Root weevils, Pissodes spp.

Attacks were common on young Douglas-fir saplings in the Powell River area and on Texada Island. Trees were girdled at the root collar but attacks seemed confined to trees weakened by drought.

Table 4. Other insects of current minor significance.

Insect	Hosts[1/]	Locality	Remarks
Adelges cooleyi Cooley spruce gall aphid	sS, D	Lund, Toba Int., Homfray Chan., Bute Inlet, Nicol Pass, Quadra Ils., Garden Bay, Racoon Creek	Sucking insect. One or two trees infested at each location. Light to med. attacks except at Racoon Creek where heavy attacks occurred on young Douglas-fir.
Adelges tsugae A hemlock adelgid	wH	Lund, Haslam Lake, Texada Island Powell Lake	Sucking insects. Heavy attacks on lower crowns of trees. Localized.
Altica sp. Alder flea beetle	Al, W	Powell River, Lund	Leaf skeletonizer. Causing light to med. defoliation in small areas.
Coccidae sp. Scale insects	Ch	Appleton Creek	Scale insect. Causing tip and branch kill, localized.

Table 4. (continued)

Insect	Hosts[1]	Locality	Remarks
Epirrita autumnata Green velvet looper	wH, D, aF	Widespread	Defoliator. Low population. Ten samples averaged 2.5 larvae.
Galerucella carbo Willow leaf beetle	W, Al	Powell River	Leaf skeletonizer. Causing heavy defoliation along roadsides.
Ips spp. Engraver beetles	lP	Powell River, Texada Island	Single attacks. Localized.
Neodiprion spp. A sawfly on conifers	wH, sS	Widespread	Defoliator. Low population. Largest sample 200 larvae at Rainy River.
Phenacaspis pinifoliae Pine needle scale	lP	Lund	Scale insect. Young pines along roadside heavily infested. Localized.
Stilpnotia salicis Satin moth	tA	Wildwood	Defoliator. Light to medium defoliation of several trees.
Vespamima sequoiae Sequoia pitch moth	lP	Lund	Bark and wood borer attacks on 50% of young pines examined.

1/ Host tree abbreviations appear in the Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

Douglas-fir needle cast, Rhabdocline sp.

A high percentage of needles were cast on young Douglas-fir along the Okeover Inlet Road, around Lund, near Duck Lake and in a small area near Vananda on Texada Island. Infections were also found on a small number of trees near Klien Lake on the Sechelt Peninsula. Approximately 30% of the foliage was attacked. In each of these areas, the heavy needle drop gave the tree crowns a very thin appearance. A single infected tree was found at Deserted Bay in Jervis Inlet. A similar needle cast, Phaeocryptopus gaeumanni, caused heavy foliage loss over several acres of young Douglas-fir near Halfmoon Bay and was associated with Rhabdocline in the Okeover Inlet area. Rhabdocline infection generally results in thin crowns and growth loss; mortality is rare.

Physiological Diseases

Drought damage

Small areas of d ad or dying hemlock and Douglas-fir were common along the immediate coast. Most mortality and damage was restricted to young trees, 3 to 30 feet tall, on exposed or rocky sites. Some larger trees lost much of their lower crown foliage.

Young Douglas-fir on Texada Island were most severely damaged and needle drop on hemlock was extensive in the southern portion of the District. The drought damage resulted from the dry summer of 1967, it is not expected to be evident in 1969.

Stem and Branch Diseases

Dwarf mistletoe, Arceuthobium campylopodum

Young hemlock stands in the southern part of the District and on Texada Island were heavily infected. This parasite caus· stunting and deformation of branches and stems. Light to heavy infections in young hemlock stands were observed in the northern areas. Several infections per tree occurred in lodgepole pine stands in th Wilson Creek and Sechelt areas.

Specific Surveys

Root rot of immature stands

Root rot infections evident in young stands were mainly caused by Armillaria mellea and Poria weirii. A. mellea was found in 18 locations in Douglas-fir, hemlock-cedar stands and in a red pine plantation (Number 12). P. weirii was found at five locations in western hemlock and Douglas-fir. The number of infected trees in each center varied from 1-25. The heaviest mortality occurred in a young hemlock stand on Quadra Island, where 50 trees were killed by P. weirii in one pocket.

Rhizina root rot

Examinations were made in three recent burns for Rhizina root rot, a disease which kills seedlings. All were negative.

Other Noteworthy Diseases

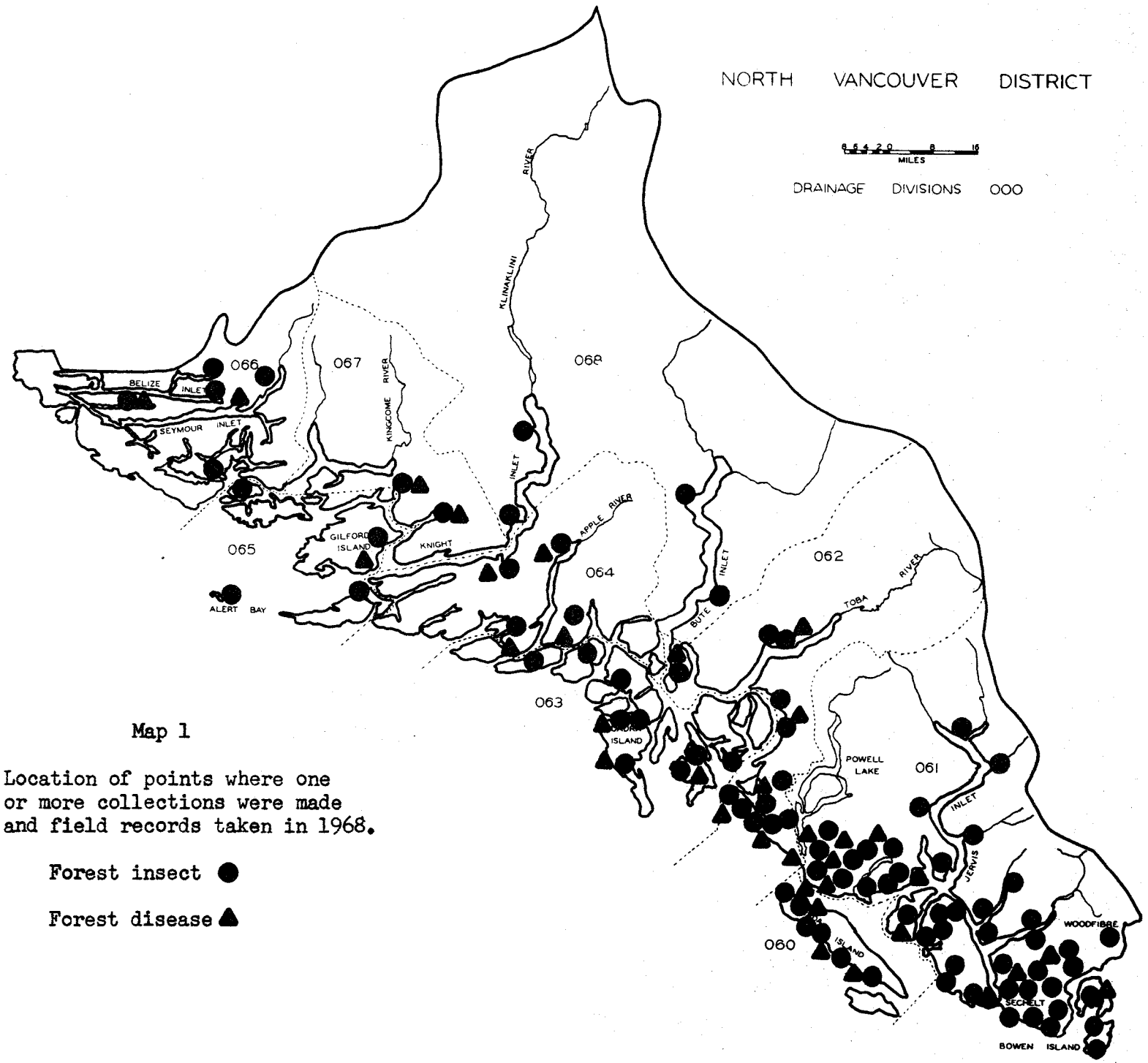
Needle cast of lodgepole pine, Davisomycella ampla

A low percentage of foliage infection was found on most young lodgepole pine in the Lund, Wilson Creek and Porpoise Bay areas. D. montana was also at low levels in the two latter areas. All attacks were confined to 1-year-old needles. Several acres were involved at each location. More infections may occur in 1969 but damage will be confined to increment reductions.

Table 5. Other diseases of current minor significance

Organism	Hosts[1]	Locality	Remarks
Atropellis piniphila	lP	Davie Bay Texada Island	Causes stem cankers and some branch killing. Common.
Bacterium pseudotsugae	D	Bowen Island Nelson Island Cortez Island Lund Powell River	Causing galls on stems and branches of unde story trees, common.
Biatorella resinae	D, wH	Texada Island Glendale Cove	Branch cankers causing dieback. Occasional.
Botryosphaeria tsugae	wH	Powell River Lund	Cankers, girdling stems of young trees, common.
Chrysomyxa weirii	sS	Duck Lake	Rust, causing needle drop, single tree infection.
scyphus pseudotsugae	D	Halfmoon Bay Lund	Cankers, causing dieback, moderate. Localized.
Diaporthe lokyae	D	Texada Island Quadra Island Lang Bay	Canker, causing dieback, top killing. Scattered infections.
Didymacella thujina	wC	Drury Inlet	Needle blight, causing loss of foliage. Widespread.
Discocainia treleasei	wH	Phillips Arm Knight Inlet	Canker. Associated with dwarf mistletoe. Common.
Epicoiaeum tsugae	wH	Ireland Lake Texada Island	Canker, causing dieback, common.
Sclerophoma pityophila	D	Lund Lang Bay	Canker, dieback, common on young fir.
Spaerulina taxicola	wY	Lewis Lake	Needle cast, causing minor defoliation.

[1] Host tree abbreviations appear in the Introduction.



Map 1

Location of points where one or more collections were made and field records taken in 1968.

Forest insect ●

Forest disease ▲

ANNUAL DISTRICT REPORTS

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA, 1968

PART IV, PRINCE RUPERT SURVEY DISTRICT

by

E. V. Morris, R. G. Brown and J. S. Monts

FOREST RESEARCH LABORATORY

VICTORIA, BRITISH COLUMBIA

INFORMATION REPORT BC-X-33

PART IV

DEPARTMENT OF FISHERIES AND FORESTRY

APRIL, 1969

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1968

PRINCE RUPERT SURVEY DISTRICT

E. V. Morris[1/]

The Prince Rupert Forest Insect and Disease Survey District encompasses the Prince Rupert Forest District, except that portion from the Stikine River drainage north to the Yukon-Alaska border, which is included in the Prince George Survey District and is reported in the annual report of the Prince George Survey District.

There was one change in assignment in 1968. In West Prince Rupert E. V. Morris replaced S. J. Allen who was transferred to South Vancouver Island. J. S. Monts remained in East Prince Rupert and G. Brown in South Prince Rupert.

Aircraft were used in the detection survey and for sampling permanent plots on the mainland coast, Queen Charlotte Islands and Tweedsmuir Park lakes. Thirty-two hours flying time were used for these surveys.

Bark beetle populations remained at a low level with a few trees attacked by spruce beetle occurring at Chapman and north Babine Lakes. Mountain pine beetle on lodgepole pine in the Wright Bay and Hagen Arm on Babine Lake remained at a low level. Patches of light to medium balsam mortality caused by a Dryocoetes - Ceratocystis complex occurred in the Sustut River drainage northwest of Bear Lake.

Defoliators remained at a low level except for a localized infestation of black-headed budworm at mile 36 Morice River Forest Development Road. Localized spruce aphid infestations were evident on Sitka spruce in the Prince Rupert area and on the Queen Charlotte Islands.

Weevil damage to Sitka spruce leaders occurred in the Salloomt River Valley.

Much of the tree mortality, growth loss, and quality reduction attributed to diseases is caused by mistletoes and stem and root rot fungi These usually intensify at a slow rate which makes annual summaries of their status repetitious; for this reason the following report may not mention some of the more important diseases. Emphasis is placed on new

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1/ Forest Research Technician, Forest Insect and Disease Survey Senior Ranger, Victoria, B. C.

outbreaks, the status of annually varying foliage diseases and diseases resulting from abnormal weather conditions, i.e., frost and drought damage which immediately effect tree appearance and often cause dieback and mortality. Other aspects of the Disease Survey which deal with mortality, growth loss, and factors influencing the occurrence of the more important diseases, are summarized elsewhere.

Heavy damage to patches of trembling aspen at Houston, Burns Lake and Francois Lake was caused by a shoot and foliage blight, Venturia sp. Flood damage occurred in the Bella Coola Valley with some tree mortality resulting.

Table 1. Host tree abbreviations

Abbrev.	Common name	Abbrev.	Common name
A or Po	aspen or poplar-general	H	hemlock-general
tA	trembling aspen	wH	western hemlock
		mH	mountain hemlock
Al	alder-general		
		L	larch-general
B	birch-general	-L	miscellaneous larch
wB	white birch		
		P	pine-general
C	cedar-general	lP	lodgepole pine
wC	western red cedar	sP	shore pine
yC	yellow cedar	whP	white bark pine
Ch	Cherry-general	pP	ponderosa pine
D	Douglas-fir	-P	miscellaneous pines
F	fir-general	S	spruce-general
alF	alpine fir	wS	white spruce
aF	amabilis fir	sS	Sitka spruce
		-S	miscellaneous spruce

FOREST INSECT AND DISEASE SURVEY

WEST PRINCE RUPERT

1968

E. V. Morris

INTRODUCTION

Regular field work began on May 6 and ended on October 4. Some of the surveys done during this period were for distribution of spruce weevil and spruce gall aphid, distribution of root rots of immature and mature stands, Rhizina root rot in recently burned logged-areas, the examination of lodgepole pine stands for Atropellis cankers and examination of green-striped forest looper mortality plots. A total of 15 hours flying time was used on aerial reconnaissance and for sampling permanent plots on the mainland coast and the Queen Charlotte Islands.

Insect and disease collections are shown, by host, in Table 1; collection localities are shown on Maps 1 and 2. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Drainage divisions are illustrated in Maps 1 and 2. Details on individual insect and disease problems follow.

Numbers of larval defoliators found in field collections remained about the same this year; 93% of beating collections contained larvae.

Bark beetles and defoliator populations remained relatively low except for a build-up of western hemlock looper in a localized area in the eastern portion of the District at Kitsegueela. There were localized infestations of spruce aphid on Sitka spruce at Prince Rupert and Queen Charlotte Islands. Spruce gall aphids were again active in the Nelson River area in Sitka spruce plantations and exotic Douglas-fir and white spruce plantations.

Table 1. Collections by hosts, West Prince Rupert, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	42	2	Alder, mountain	9	0
Douglas-fir	4	4	Alder, red	8	2
Fir, alpine	17	2	Aspen, trembling	2	5
Fir, amabilis	30	7	Birch, western white	4	0
Hemlock, western	123	26	Cottonwood, black	3	1
Larch, western	0	1	Poplar spp.	2	0
Pine, lodgepole	28	40	Willow spp.	6	1
Pine, western white	0	1	Miscellaneous	0	4
Spruce, Sitka	128	8			
Spruce, western white	24	1			
Totals	396	92	Totals	34	13
			Misc. hosts	0	0
			No hosts	0	12
			GRAND TOTALS	430	117

Table 2 Currently important insect and disease[1] problems by drainage divisions, West Prince Rupert, 1968

Insect and disease problems	Principal hosts[2]	Importance by drainage divisions[3]						
		100	101	102	103	104	105	106
Defoliators								
Western hemlock looper	wH, wC, wS, alF	0	0	1	1	1	3	1
Sucking Insects								
Spruce aphid	sS	3	3	2	4	2	1	1
Spruce gall aphids	sS, wS	1	1	1	1	3	1	1
Foliage Diseases								
Foliage rusts	W, tA, bCo	0	0	0	2	3	2	2
Physiological Diseases								
Wind damage	sS, wH, wC	0	4	0	0	0	0	0
Flood damage	sS, wH, wC	0	3	0	0	0	0	0

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.
Scattered high populations and/or significant damage in restricted areas - 4.
Rising populations and/or moderate numbers and/or potential problems - 3.
Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damags - 1.
Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

Western Hemlock Looper, Lambdina fiscellaria lugubrosa

Populations remained low except in the Kitseguecla area of drainage division 105 (Table 3). Localized moderate larval populations were found in pole-sized hemlock-cedar stands with up to 115 larvae being collected from western red cedar and 61 larvae from western hemlock in a three-tree beating sample. No larvae were collected on the Queen Charlotte Islands.

Table 3. Summary of western hemlock looper collections by drainage divisions, West Prince Rupert

Drainage divisions	Number of samples taken during larval period	% samples containing larvae	Average number of larvae per positive sample
100	32	0	0.0
101	40	0	0.0
102	9	33	1.3
103	24	25	1.3
104	21	28	1.6
105	41	53	11.8
106	12	25	1.3

Sucking Insects

Spruce Aphid, Neomyzaphis abietina

Infestations persisted on sapling and pole-sized Sitka spruce in the Prince Rupert area and at several localized areas on the Queen Charlotte Islands. In the Prince Rupert area there was up to 90% defoliation of the old foliage of shade trees in the parks and private residences. Some tree mortality could result if heavy defoliation occurs again in the spring of 1969. On the Queen Charlottes, aphids were active on fringe trees in the Skidegate-Tlell area and at Queen Charlotte City and Sandspit. Most trees affected on the Queen Charlottes were also suffering from the affects of ocean spray damage caused by high winds during winter and early spring.

Spruce Gall Aphids, Adelges cooleyii and Pineus spp.

A special survey for spruce adelgids A. cooleyii and Pineus spp. showed Pineus spp. in most parts of the District and A. cooleyi only where spruce grew near Douglas-fir, its alternate host. Very little damage was caused by these pests except in the Nelson River and Kitimat areas.

At Nelson River, adelgids again caused heavy gall formations on lateral branch tips of Sitka spruce over several hundred acres of plantations. Trees suffering the heaviest damage were one to four feet high. Pineus spp. caused most of the galling. Pineus spp. galls were also found on natural growing Sitka spruce reproduction in the Kitimat District Municipality but the damage was less severe than at Nelson River.

Other Noteworthy Insects

Spruce Beetle, Dendroctonus obesus

No fresh beetle-attacked Sitka or white spruce were found during aerial and ground surveys. A large number of pole-sized Sitka spruce were blown down during the winter and spring of 1968 along the east coast of Graham Island (Q.C.I.) from Skidegate Mission to Tlell. Examination of these trees in July showed no beetle activity. Trap trees felled at several localities to determine the distribution of spruce beetle showed a light to moderate beetle population present.

Western Balsam Bark Beetle, Dryocoetes confusus

Red-topped alpine fir were seen occasionally during aerial surveys along the Bell Irving River Valley north of Meziadin Lake to Oweegee Lake. This has been a chronic damage area for the past several years. A few red-tops were seen in other parts of the District. Moderate populations of beetles occurred in alpine fir trap logs felled at several locations.

Aspen Leaf Miner, Phyllocnistis populiella

Aspen leaf miner populations were moderate to low throughout areas where trembling aspen occurs. Four plots in the Terrace and Cedarvale area were sampled by examining the leaves from one-foot branches cut from each of 10 aspen trees. Table 4 shows the percentage of leaf surfaces mined and the number of adult miners produced per 100 leaf surfaces.

Table 4. Percentage aspen leaf surfaces mined and numbers of leaf miner adults produced per 100 leaf surfaces, West Prince Rupert

Locality	% leaf surfaces with mines			No. adults produced per 100 leaf surfaces		
	1966	1967	1968	1966	1967	1968
Cedarvale	22	40	35	1.2	4.2	8.5
Oliver Creek	33	82	1	1.8	10.2	0.6
Terrace	36	32	30	1.8	0.7	3.3
Beam Stn. Rd.	9	35	3	0.3	0.9	0.2

Spruce Sawflies, Pikonema spp.

Spruce sawfly populations increased throughout the District in 1968. Collections from the preferred host, Sitka spruce, averaged 3.3 larvae per positive sample with 38 per cent of all collections from Sitka spruce containing larvae.

A small infestation of Pikonema alaskensis continued in the Nelson River area in an exotic plantation of white spruce. This is the second year of heavy defoliation at this plantation. A number of trees had up to 90% defoliation with some top kill and tree mortality evident.

Sitka Spruce Weevil, Pissodes sitchensis

In a survey to determine the distribution of Sitka spruce weevil 21 localities were examined. Fifty reproduction and sapling-sized Sitka spruce were examined at each locality for weevil attack. Only three areas were found with infested leaders, 6% at Kiteen River, 10% at Shames and 12% at Amsbury. No spruce weevil was found on the Queen Charlotte Islands.

Balsam Bark Beetle, Pseudohylesinus grandis

Understory sapling and pole-sized amabilis fir in a mature hemlock-cedar stand in the Wedeene River Valley near Kitimat were infested with balsam bark beetles in early May. Beetles were overwintering in the lower bole of host trees over the several acres affected; no beetle galleries were subsequently found and no significant damage resulted.

Ambrosia beetle, Trypodendron lineatum

Sitka spruce and western hemlock log decks were attacked along the Nass River at Ansedagen Creek. The logs, cut in the winter of 1967-68, had up to 25 beetle entrance holes per square foot. Depth of penetration on May 16 was up to one inch.

Table 5. Other insects of current minor significance

Insect	Hosts[1]	Locality	Remarks
Acleris variana Black-headed budworm	wH, sS, alF, aF	Kitimat, Kitwanga	Defoliator. Population at low level. Ten samples averaged 1.6 larvae.
Choristoneura fumiferana Spruce budworm	wH, sS, alF, aF	Kitimat, Kitwanga, Cedarvale	Defoliator. An average of 1.3 larvae in 13 samples.
Chrysomela scripta Leaf beetle	W, bCo	Kalum Valley	Skeletonizer. High populations in old logging and burns where willow and cottonwood have come back.
Ectropis crepuscularia Saddleback looper	wH, wC, aF, sS, wS	Throughout District	Defoliator. Endemic population. Found in 34 collections. Average 1.5 larvae per positive sample.
Galleracella sp. Leaf beetle	W	Nelson River	Skeletonizer. Infestation throughout logged over areas and burns where willow has grown back in.
Lyonetia saliciella A leaf blotch miner	wB, Ch	Cedarvale, Kitwanga	Leaf miner. Common on roadside trees bordering on highway 16.
Malacosoma disstria Forest tent caterpillar	tA, bCo, W	Cedarvale, Skeena Crossing, Amsbury, Pollywog Cr.	Defoliator. Several areas examined for overwintering eggs in October, negative results. Few larvae found feeding on roadside trees west of Terrace, Highway 16.

Table 5 (continued)

Insect	Hosts[1]	Locality	Remarks
Melanolophia imitata Green-striped forest looper	wC, wH, alF, sS	Throughout mainland part of District	Defoliator. Average of 3 larvae found in 18 positive samples. Only one larva found on the Queen Charlotte Islands, at Moresby Camp. Melanolophia mortality plots on the Queen Charlottes examined in 1968; no change from 1967 examination.
Neodiprion spp. Sawflies	wH, lP, wS, sS, alF	Throughout District	Defoliator. Common in beating collections. Localized infestation on lodgepole pine reproduction Mile 5, Kitimat highway.
Nyctobia limitaria Green balsam looper	wC, wH, aF, wC	Throughout District	Defoliator. Common in beating samples.
Zeiraphera sp. Spruce tip moth	sS	Queen Charlotte Islands, Kitimat	Defoliator. Common on shoreline and open growing trees.

[1] Host tree abbreviations appear in the Introduction.

Currently Important Diseases

Hemlock Mortality

Groups of dead and dying western hemlock trees were observed east of Terrace to Cedarvale, Kalum Lake and south of Terrace to Kitimat, during aerial and ground surveys. On the Queen Charlotte Islands large numbers of dead and dying trees were noted in Alliford Bay, Deena Creek, west slopes of Louise Island and adjacent Moresby Island. In stands examined mature and overmature trees were affected in groups of 25 to over 100. Examination of the roots and main bole revealed no causal agent. Armillaria mellea was found on the roots and Echinodontium tinctorium fruiting bodies on the main bole on some of the trees but did not appear to be a primary factor in weakening or killing the trees.

A mortality plot of 50 trees was established in 1966, northeast of Terrace at Kleanza Creek Park to observe the progress of mortality of western hemlock (Table 6). A few spruce and cedar are mixed in the predominantly mature hemlock stand but they appeared relatively healthy.

Table 6. Condition of Western Hemlock at Kleanza Creek, West Prince Rupert

Crown class	No. trees	Dead prior to 1966	Dead			Total dead	% defoliation 1968
			1966	1967	1968		
D	9	1	0	0	0	1	20
CD	20	1	2	2	0	5	32
I	10	3	4	0	0	7	20
S	11	7	1	2	0	10	62
All trees	50	12	7	4	0	23	34

Physiological Diseases

Wind damage

Gale force winds during December 1967 and April 1968 blew down numerous trees, and salt spray from the ocean caused heavy burning of foliage of Sitka spruce, western hemlock and western red cedar in a strip 25 miles long and approximately 100 feet wide from Skidegate Mission to Tlell on the east coast of Graham Island, Queen Charlotte Islands. Spruce aphids were found feeding on the damaged foliage. No bark beetles were found under the bark of the blow down trees.

Flood damage

During aerial surveys of the Queen Charlotte Islands numerous areas of dead and dying timber were observed on Graham Island caused by beavers damming streams and flooding extensive areas. Company foresters for MacMillan and Bloedell Limited are looking into the feasibility of trapping beavers to try to control the population level.

Specific Disease Surveys

Several specific disease surveys were done in conjunction with the regular survey. These surveys are briefly summarized in this report. More detailed reports will be issued for each special survey. The surveys summarized are: root rots of immature and mature stands, Rhizina root rot, Atropellis cankers on lodgepole pine and examination of plantations of exotic tree species.

Root rots of immature and mature stands

Hemlock, cedar, balsam, lodgepole pine and spruce stands were examined at a number of localities in 1968. Root rots occurred in 27 areas examined. Armillaria was found in 11 areas, Poria at five and Annosus root rots and others at 10 localities. Armillaria root rot centers were usually found associated with other agents weakening or killing the trees. Hemlock-cedar was the principal stand type examined. Usually from 1 to 3 trees were infected, but in hemlock stands 25 to 30 trees may have been dead or weakened, but with no root rot fruiting bodies present. More than one root rot occurred at a number of centers.

Rhizina root rot, Rhizina undulata

This disease is associated with root rots of seedlings planted on burned areas. Of 17 burns examined, 8 had Rhizina fruiting bodies; one was planted with hemlock seedlings and one with western larch and lodgepole pine. No infected seedlings were found in the hemlock plantations, but in the larch-lodgepole pine 64% of the larch and 38% of the pine were infected. Burns with the heaviest Rhizina fruiting occurred in September, 1967.

Exotic tree species

There are 39 plantations of a variety of hardwood and softwood exotic trees in the District. Fifteen plantations are examined on an annual basis to determine the occurrence and abundance of native insects and diseases and to record the general condition of the trees.

Douglas-fir plantations have a) moderate to high Adelges cooleyii aphid populations causing damage to the old foliage; b) Melampsora rust was found on the new foliage of most trees; and c) a canker caused by the fungus Sclerophoma sp. in a number of plantations. Over one acre of white spruce trees four to six feet in height were heavily defoliated by spruce sawfly, Pikonema alaskensis. This is the second year that defoliation has occurred at this plot and some tree mortality could result. Snow damage was evident in some of the larch and pine plantations.

Atropellis canker, Atropellis piniphila

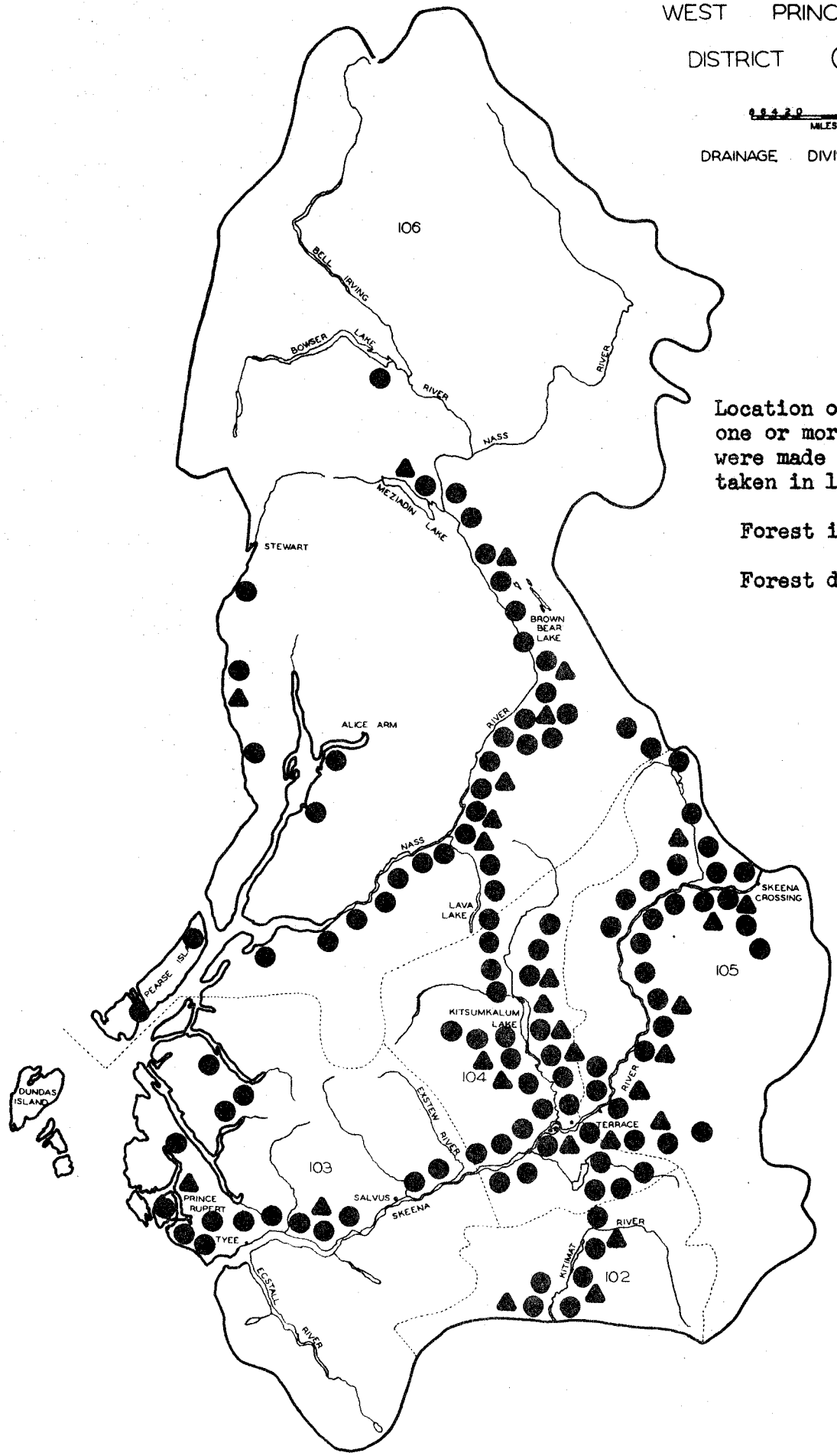
A survey was conducted to determine the distribution and severity of Atropellis canker damage to lodgepole pine. Of 20 pine stands examined, eight had from 6 to 56% of the fifty trees examined infected with A. piniphila. The heaviest infections occurred east of Terrace at Oliver Creek and Kitwanga.

Other Noteworthy Diseases

Table 7. Other diseases of current minor significance

Organism	Hosts[1/]	Locality	Remarks
Chrysomyxa perolata	sS	Beaver River	Cone rust found in one Sitka spruce plantation, infecting the leader growth on trees 2 to 5 feet in height. "This seems to be the first record of this rust occurring on shoots instead of cones." W. G. Ziller
Coleosporium asterum	lP	Kitwanga	Needle rust attacking groups of reproduction pine bordering on highway 16 were heavily infected.
Cronartium comandrae	lP	Rosswood, Kalum Lake	Stem rust, 2 of 7 areas examined were positive.
Cronartium ribicola	wwP	Terrace	Blister rust found on exotic white pine trees planted at Columbia Cellulose, Kalum River nursery.
Lirula macrospora	sS	Queen Charlotte Islands, Portland Canal	A needle cast commonly found on sapling and pole-sized trees.
Melampsora medusae	D, tA	Nelson River area	Needle rust causing heavy infection in exotic Douglas-fir plantations and native trembling aspen.
Phomopsis sp.	sS	Moresby Camp (Q.C.I.)	Causing dieback of five year old planted seedlings. New host record.
Sclerophoma pityophila	lP	Redsand Lake	Dieback of numerous lodgepole pine trees 5 to 10 feet tall.
Venturia populina	tA	Kitwanga	Shoot and leaf blight was common on roadside aspen reproduction. New host record for 1968.

1/ Host tree abbreviations appear in the Introduction.

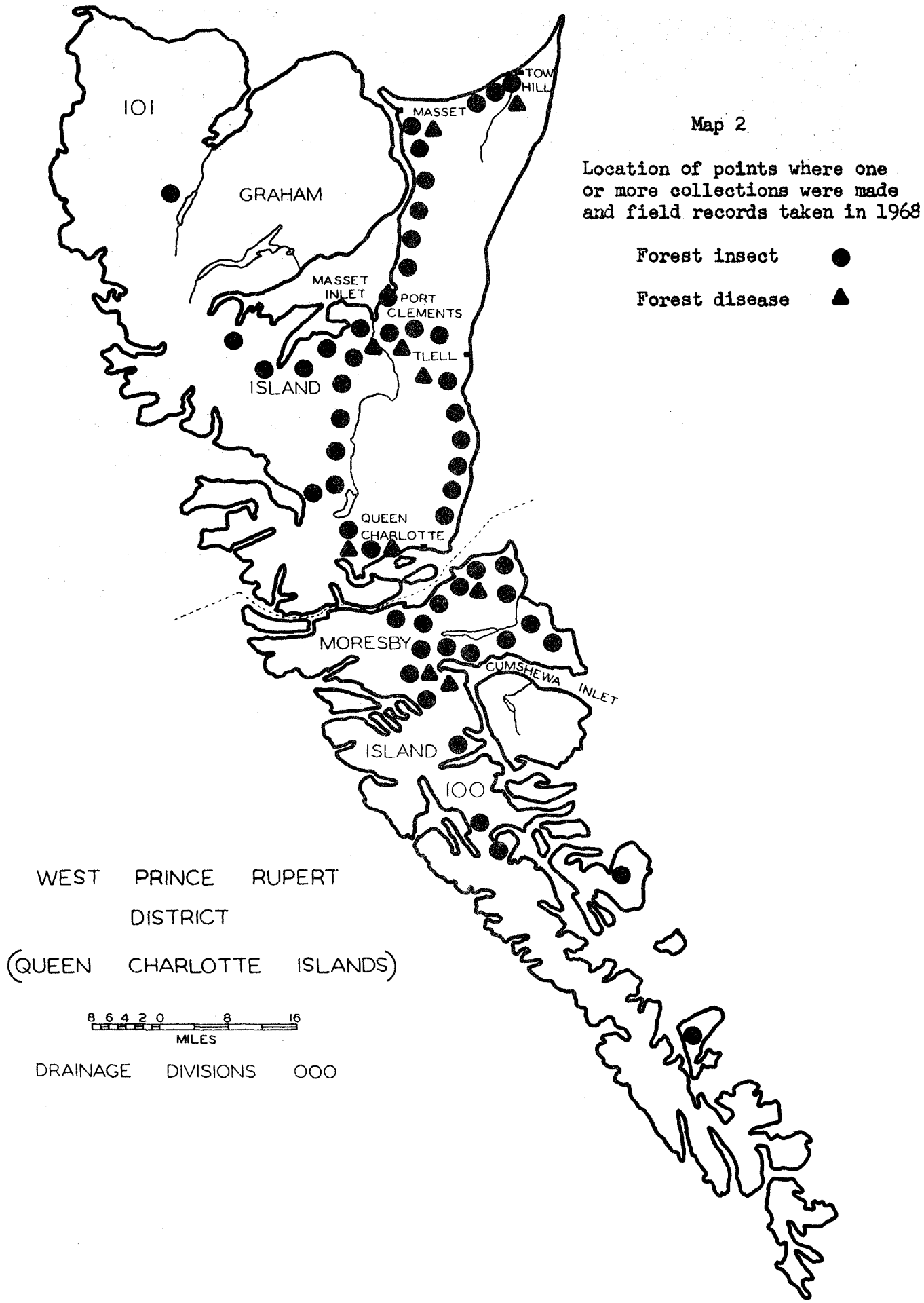


Map 1

Location of points where one or more collections were made and field records taken in 1968.

Forest insect ●

Forest disease ▲



Map 2

Location of points where one or more collections were made and field records taken in 1968

Forest insect ●

Forest disease ▲

FOREST INSECT AND DISEASE SURVEY

SOUTH PRINCE RUPERT

1968

R. G. Brown[1/]

INTRODUCTION

Regular field work began on July 10 and ended on July 24. The main coastal survey was accomplished by float-equipped aircraft. The Bella Coola Valley and adjacent areas were surveyed by motor vehicle.

Insect and disease collections are shown, by host, in Table 1; collection localities are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Drainage divisions are illustrated in Map 1. Details on individual insect and disease problems follow.

Numbers of larval defoliators found in field collections decreased slightly this year; 85% of beating collections contained larvae. There was a slight increase in the western hemlock looper population at lower elevations in the Bella Coola Valley. Green-striped forest looper in drainage division 083 also showed a small increase. Conifer sawflies were more numerous than in 1967, throughout the District.

Several areas in the Bella Coola Valley were flooded in 1968 and some tree mortality could result.

1/ Forest Research Technician, Forest Insect and Disease Survey Ranger, Victoria, B. C.

Table 1. Collections by hosts, South Prince Rupert, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	12	4	Apple, crab	0	1
Cedar, yellow	0	1	Birch, western white	1	0
Douglas-fir	16	7	Cottonwood, black	1	1
Fir, amabilis	3	1	Willow	4	0
Hemlock, western	47	11			
Pine, lodgepole	5	18			
Pine, whitebark	0	1			
Spruce, Sitka	42	5			
Totals	125	48	Totals	6	2
			Misc. hosts	1	5
			GRAND TOTALS	132	55

Table 2. Currently important insect and disease[1] problems by drainage divisions, South Prince Rupert, 1968

Insect and disease problems	Principal hosts[2]	Importance by drainage divisions[3]			
		080	081	082	083
Defoliators					
Green-striped forest looper	wH, wC, sS, D, aF	2	2	2	3
Western hemlock looper	wH, sS, D, wC	0	3	2	0
Conifer sawflies	wH, sS, aF	2	3	1	3
Terminal Borers					
Sitka spruce weevil	sS	0	2	3	0
Physiological Diseases					
Flood damage	wH, sS, D, wC	2	3	4	2

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.
Scattered high populations and/or significant damage in restricted areas - 4.
Rising populations and/or moderate numbers and/or potential problems - 3.
Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

Western hemlock looper, Lambdina fiscellaria lugubrosa

The western hemlock looper population remained low in 1968. There was a small increase at lower elevations in the Bella Coola Valley (Table 3) but larval counts at a sample plot two miles east of Bella Coola decreased from 51 larvae in 1967 to 23 in 1968. Light larval populations were found at Clayton Falls Creek and Deep Bay, Dean Channel. Sixteen collections from western hemlock, Sitka spruce, Douglas-fir, and western red cedar averaged 7.4 larvae each.

Table 3. Summary of western hemlock looper collections by drainage divisions, South Prince Rupert

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
080	20	17	18	0	0	0	0	0	0
081	38	32	24	21	41	46	2.9	6.3	8.6
082	35	24	15	57	63	33	3.6	5.6	4.8
083	36	34	36	0	0	0	0	0	0
Totals	129	107	93	22	26	17	3.4	5.9	7.4

Green-striped forest looper, Melanolophia imitata

The population of green-striped forest looper increased slightly in drainage division 083 and decreased in the remainder of the District (Table 4). Thirty-seven collections on western hemlock western red cedar, Sitka spruce, Douglas-fir and amabilis fir averaged four larvae each.

Table 4. Summary of green-striped forest looper collections by drainage divisions, South Prince Rupert

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
080	20	17	18	0	88	39	0	5.4	4.7
081	39	32	24	15	94	62	7.3	5.7	3.3
082	33	24	15	21	75	53	2.0	7.6	5.8
083	36	34	36	3	12	19	7.0	1.0	2.8
Totals	128	107	93	11	63	40	4.4	5.8	4.0

Conifer sawflies, Neodiprion spp.

Populations of conifer sawflies increased throughout the District, but remained low except at the head of Dean Channel where a moderate population of over 200 larvae per sample was found. The 39 collections on western hemlock, Sitka spruce and amabilis fir averaged 17.0 larvae each whereas 36 collections in 1967 averaged 12.4 larvae.

Terminal Borers

Sitka spruce weevil, Pissodes sitchensis

The incidence of infested Sitka spruce leaders was unchanged. Of 100 trees examined 45% were attacked in the Salloomt River Valley. Four per cent of 100 trees examined at each of two locations near Bella Coola were attacked.

Other Noteworthy Insects

Sucking Insects

Cooley spruce gall aphid, Adelges cooleyi

This aphid which attacks Douglas-fir and Sitka spruce was found in all drainage divisions except 083. Damage to spruce tips was negligible. Gall counts done in the Bella Coola Valley averaged less than one gall per square foot of foliage.

Cambial Borers

Sequoiae pitch moth, Vespamima sequoiae

Pitch masses on lodgepole pine were present throughout the Bella Coola Valley. Of 100 trees examined 24% in the Salloomt River Valley were attacked with an average of 1.8 moths per tree. Damage caused by the pitch moth is not usually serious.

Table 5. Other insects of current minor significance

Insect	Hosts[1/]	Locality	Remarks
Acleris variana Black-headed budworm	wH	Salloomt Valley, MacNair Creek, Banks Island, Belowe Lake	Defoliator. Population increased slightly but remains low. Five collections averaged two larvae each.
Ectropis crepuscularia Saddleback looper	wH, wC, aF	North half of drainage division 083, Bella Coola	Defoliator. Population decreased. Eight collections averaged 1.9 larvae each.
Neophasia menapia Pine butterfly	D	Snootli Creek	Defoliator. One collection contained seven larvae.
Nyctobia limitaria Green balsam looper	wH, aF, sS	Drainage division 083, Wallace Bay	Defoliator. Population increased slightly. One sample at Eagle Bay contained 20 larvae. Thirty-three collections averaged 1.3 larvae each.
Orgyia antiqua badia Rusty tussock moth	wH, sS, wC	Widespread	Defoliator. Population increased slightly. Moderate population at Emsley Cove where two collections contained 48 larvae. Nine collections averaged 6.8 larvae each.
Pikonema spp. Spruce sawflies	sS	Widespread	Defoliator. Population increased slightly. Seventeen collections averaged 1.6 larvae each.

1/ Host tree abbreviations appear in the Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Physiological Diseases

Flood Damage

Flooding occurred in parts of the Bella Coola Valley in the spring of 1968. Heavy mortality may occur near some creeks on the south side of the Valley.

Specific Surveys

Root rot of immature and mature stands

A survey was conducted to determine the distribution of and damage caused by root rots. The only root rot found in immature stands was Armillaria mellea which was found infecting 3 to 23 trees at each of four localities. Douglas-fir and western hemlock were the hosts. The predominant root rot found in mature stands was Polyporus schweinitzii. It was found at two localities and had infected two and three Douglas-fir trees.

Rhizina root rot

Several recently burned areas in the Bella Coola Valley were examined for Rhizina undulata, a fungus associated with root rot of seedlings. No fruiting bodies were found.

Atropellis canker

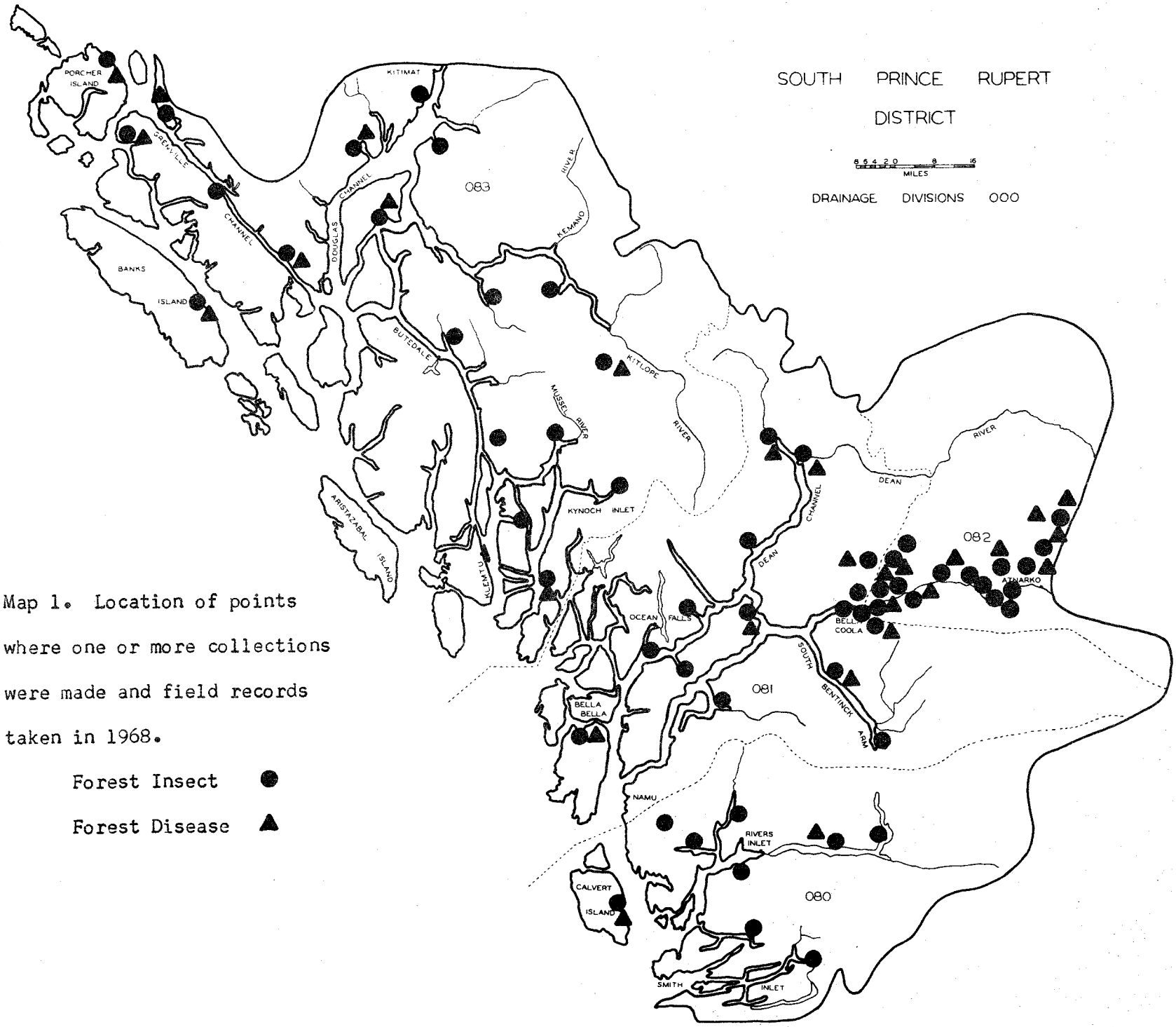
Six strips, with 50 lodgepole pine in each, were examined for stem cankers caused by Atropellis piniphila and Peridermium stalactiforme. Old cankers were numerous but fresh cankers of both diseases were difficult to find. On one strip near Young Creek 12% of the pines were infected with A. piniphila

Other Noteworthy Diseases

Physiological Diseases

Frost Damage

Conifers that suffered frost damage in coastal areas of the District in 1967 appear to have recovered.



Map 1. Location of points where one or more collections were made and field records taken in 1968.

Forest Insect ●

Forest Disease ▲

FOREST INSECT AND DISEASE SURVEY

EAST PRINCE RUPERT

1968

J. S. Monts[1/]

INTRODUCTION

Regular field work began in mid-May and terminated in early October. Specific surveys were conducted for bark beetles, spruce gall aphids, terminal borers, root rots and stem cankers. Spruce beetle trap logs were felled in May and examined monthly for population development studies. Ten hours flying time were used on aerial reconnaissance and sampling permanent plots in the Tweedsmuir Park lakes.

Insect and disease collections are shown by host in Table 1; collection localities are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Drainage divisions are illustrated in Map 1. Details on individual insect and disease problems follow.

Numbers of larval defoliators found in field collections increased slightly this year; 76% of beating collections contained larvae.

Populations of black-headed budworm remained moderately high at a localized infestation in the Morice Forest. Small infestations of green velvet loopers caused up to 25% defoliation of alpine fir regeneration at Tahtsa Reach and McKendrick Creek. A few current-attacked spruce beetle and mountain pine beetle trees were noted at Babine and Chapman lakes. Patches of current balsam mortality were observed along the Sustut River, north of Bear Lake.

1/ Forest Research Technician, Forest Insect and Disease Survey Ranger, Victoria, B. C.

Table 1. Collections by hosts, East Prince Rupert, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	12	1	Aspen, trembling	4	5
Douglas-fir	1	0	Birch species	4	0
Fir, alpine	60	16	Cottonwood, black	1	3
Hemlock, mountain	3	0	Willow species	1	0
Hemlock, western	18	5	Miscellaneous	0	2
Juniper species	1	0			
Pine, lodgepole	74	33			
Pine, whitebark	1	1			
Spruce, white	142	11			
Totals	312	67	Totals	10	10
			Misc. hosts	0	0
			No hosts	0	10
			GRAND TOTALS	322	87

Table 2. Currently important insect and disease[1] problems by drainage divisions, East Prince Rupert, 1968

Insect and disease problems	Principal hosts[2]	Importance by drainage divisions[3]			
		120	121	122	123
Defoliators					
Black-headed budworm	alF, wS	2	4	3	2
Green velvet looper	alF	3	2	3	1
Leaf Miners					
Aspen leaf miner	tA	2	3	2	2
Terminal borers					
Engelmann spruce weevil	wS	1	3	2	2
Foliage diseases					
Poplar leaf and shoot blight	tA	4	2	3	0

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.
Scattered high populations and/or significant damage in restricted areas - 4.
Rising populations and/or moderate numbers and/or potential problems - 3.
Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

Black-headed budworm, Acleris variana

Populations remained generally low (Table 4). The localized infestation at miles 35 to 38 on the Morice West Forest Development Road decreased slightly but caused medium tip defoliation to alpine fir and white spruce. Collections of 55 and 14 larvae were taken from white spruce and alpine fir respectively at Gosnell Creek and a collection of 13 larvae was taken from alpine fir at Collins Lake.

Table 4. Summary of black-headed budworm collections by drainage divisions, East Prince Rupert

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
120	82	8	64	12	25	20	1.7	5.0	2.5
121	47	71	38	32	42	40	9.9	8.1	8.3
122	55	125	51	0	11	14	0	3.3	3.1
123	13	22	9	15	5	33	2.2	1.0	1.6
Totals	197	226	162	14	21	26	3.1	6.3	3.8

Egg counts at Gosnell Creek averaged 0.5 eggs per 18-inch branch sample. The population is expected to decrease in this area in 1969.

Green velvet looper, Epirrita autumnata

Up to 25% defoliation of new growth of understory alpine fir trees occurred for 10 miles in the Tahtsa Reach area, at Sibola Creek and Rhine Creek. There was an average of 17 larvae per collection in this area. At McKendrick Creek defoliation ranged from 10 to 20% of the current foliage of alpine fir from Chapman Burn north to Little Joe Creek; 53 larvae were collected in a sample from alpine fir. Following is a summary of green velvet looper collections.

Number of samples taken during larval period	% samples containing larvae	Average number of larvae per positive sample
269	16	19.1

Leaf miners

Aspen leaf miner, Phyllocnistis populiella

This leaf miner was again prevalent throughout the range of the host tree, Populus tremuloides. Heavy mining occurred in the Bulkley Valley from Moricetown to Houston. The study plots were examined in August and the results of these examinations are shown in tables 5 and 6.

Table 5. Aspen leaf surfaces mined and number of aspen leaf miner adults produced per 100 leaf surfaces, East Prince Rupert

Plot location	% leaf surfaces mined			No. of adults produced per 100 leaf surfaces		
	1966	1967	1968	1966	1967	1968
Priestly Road	29.9	43.3	61.6	6.6	12.3	10.7
Babine Lake	63.3	63.9	49.7	10.5	12.4	8.7
Moricetown	52.8	66.4	45.9	7.8	10.7	10.2
Smithers Station	56.1	72.0	75.1	10.9	18.8	19.1

Table 6. Mortality of aspen leaf miner in 100-cocoon samples, East Prince Rupert

Location	% mortality					
	parasitism			other causes		
	1966	1967	1968	1966	1967	1968
Priestly Road	24	9	17	10	3	51
Babine Lake	15	7	12	8	6	42
Moricetown	39	41	21	17	18	17
Smithers Station	28	21	49	14	4	13

Terminal borers

Engelmann spruce weevil, Pissodes engelmanni

In a distribution survey 100 trees were examined at each of 10 areas. Spruce weevil attacks were found on 12% of open growing regeneration spruce at Morice and Telkwa rivers and 2% at Tchesinkut Creek and Uncha Lake. Some trees were badly deformed from repeated attacks over the past several years.

Other Noteworthy Insects

Cooley spruce gall aphid, Adelges cooleyi

A survey was made for distribution and incidence of this insect. One branch was examined from the mid-crown of 25 trees at each of 20 widely spaced localities and the number of new galls per square foot of foliage recorded. Attacks were common on white spruce regeneration in drainage divisions 120 and 121 but very light in DD 122. The incidence of galls ranged from 0 to 2.1 and averaged 0.9 per square foot over the 20 areas examined.

Two-year-cycle Spruce budworm, Choristoneura fumiferana

No larvae were found and no current defoliation occurred on any of the branch samples examined at five plot locations. Only five larvae were collected from beating samples.

New permanent study plots were established at McKendrick Island and north of Doris Lake to replace the damaged plots at Topley Landing and Chapman Lake. Examinations of trees in the five plots in September indicated normal foliage growth. Following is a summary of spruce budworm collections.

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1966	1967	1968	1966	1967	1968	1966	1967	1968
162	192	138	7	3	4	1.6	0.7	1.2

Spruce beetle, Dendroctonus obesus

Populations remained at a low level. Aerial surveys over Babine Lake, Babine River, Taltapin Lake and Goosely Lake in mid-August indicated light fresh attacks at Chapman Lake and Nilkitkwa Lake. Life cycle and development studies were carried out at Chapman Lake, Morice Forest Development Road and Pinkut Lake. Numbers of beetles and brood development were recorded monthly in 4 one-half square foot bark samples from each of two trees felled in May and one felled in July at these locations (Table 7). Populations are not expected to present a problem in 1969.

Table 7. Spruce beetle development in trap logs, East Prince Rupert, 1968

Location	Date of examination	Eggs present	Average number per square foot	
			Larvae[1]	Parent adults
Morice Forest Development Road	June	Yes	0	1.8
	July	Yes	0	13.3
	August	Yes	80	9.0
	September	No	69	1.3
Pinkut Lake	June	Yes	0	5.3
	July	Yes	0	9.5
	August	No	67	8.0
	September	No	57	4.0
Chapman Lake	June	Yes	0	8.5
	July	Yes	46	5.5
	August	Yes	54	5.0
	September	No	47	7.0

[1] Larval numbers indicate a light to moderate population.

Mountain pine beetle, Dendroctonus ponderosae

Populations remained at a low level. A few scattered currently-attacked lodgepole pine were observed at Hagen Arm and southeast of Wright Bay on Babine Lake. Random lodgepole pine trap logs felled during May at Smithers Landing and Pinkut Lake had been lightly attacked when examined in September. Populations should remain low in 1969.

Balsam mortality caused by the Dryocoetes - Ceratocystis Complex

Current mortality of alpine fir was mapped during aerial surveys. Small patches of light to medium alpine fir mortality occurred in the North Skeena River Valley near the mouth of the Sustut River and along the Sustut River Valley for a distance of 10 miles. Beetle galleries were found in red-topped trees at Swordgrass lake on the Kispiox Forest Development Road but death may have been due to the fungus Ceratocystis.

Western hemlock looper, Lambdina fiscellaria lugubrosa

Larval numbers decreased; the largest collection was from western hemlock at Swordgrass Lake, and contained four larvae. Following is a summary of hemlock looper collections.

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1966	1967	1968	1966	1967	1968	1966	1967	1968
166	249	82	8	5	18	2.7	2.2	1.8

Spruce tip moth, Zeiraphera sp.

Larvae were common in beating collections in drainage divisions 120 and 121. A collection from alpine fir contained 18 larvae at Morice Lake. Up to 10% of the new foliage was defoliated in roadside stands in this area. There was an average of 13 larvae per collection from alpine fir from Nadina Lake to Tahtsa Reach.

Table 8. Other insects of current minor significance

Insect	Hosts[1/]	Locality	Remarks
Ectropis crepuscularia Saddleback looper	wH, C, alF, lP	Kispiox, North Skeena	Defoliator. Common in DD 122 and 123. 13 positive collections contained an average of 2.2 larvae.
Eupithecia sp. A looper	alF, wS, lP, F	Babine Lake, Houston	Defoliator, low population. 15 collections contained 18 larvae.
Feralia sp. A cutworm	wH, alF, wS	North Skeena	Defoliator. Found in small numbers. 9 collections contained 10 larvae.
Neodiprion spp. Sawflies	lP, wS, wH	Kispiox River	Defoliator, widespread distribution. 16 collections averaged 4.1 larvae.
Nyctobia limitaria Green balsam looper	alF, wS, lP	North Skeena	Defoliator. Found in small numbers. 11 collections contained 18 larvae.
Orgia antiqua badia Rusty tuccock moth	alF, wH, wS, lP	Kispiox, North Skeena	Defoliator, common in this area. 14 collections averaged 2.3 larvae.
Pikonema dimmockii Green-headed spruce sawfly	wS, lP	Grassy Plains	Defoliator. Decreased in numbers. 20 collections contained 29 larvae.

1/ Host tree abbreviations appear in the Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Poplar leaf and shoot blight, Venturia populina

Foliage discoloration was common on trembling aspen, throughout the south-eastern portion of drainage division 122 and the northern half of DD 120 where foliage discoloration was severe along the north shores of Ootsa and Francois lakes. Infection in aspen groves at Francois Lake ranged from 60 to 80 per cent and occasionally caused defoliation of exposed saplings. Patches of light to medium damage were observed from Houston to Fraser Lake and along the southern shores of Babine Lake.

Indian paint fungus, Echinodontium tinctorium

This heart rot fungus was found in two decadent western hemlock stands in the north Skeena River Valley, Drainage Division 122. Conks were restricted to suppressed understory trees. High cull factors are attributed to decay caused by this fungus in other areas of the Province.

Stalactiform rust, Peridermium stalactiforme

Branch and stem cankers were common on regeneration and understory lodgepole pine at Houston and Burns Lake. Light infections were widespread throughout the District. Cankers cause deformation of stems and branches and occasionally girdle and kill sapling sized trees.

Specific Surveys

Atropellis canker, Atropellis piniphila

Fifty lodgepole pine trees were examined at each of 17 widespread locations for stem cankers. At 15 locations 4 to 44% of the trees had cankers. Multiple cankers caused light mortality of sapling-sized trees at Wisteria and Verdun Lookout.

Rhizina root rot, Rhizina undulata

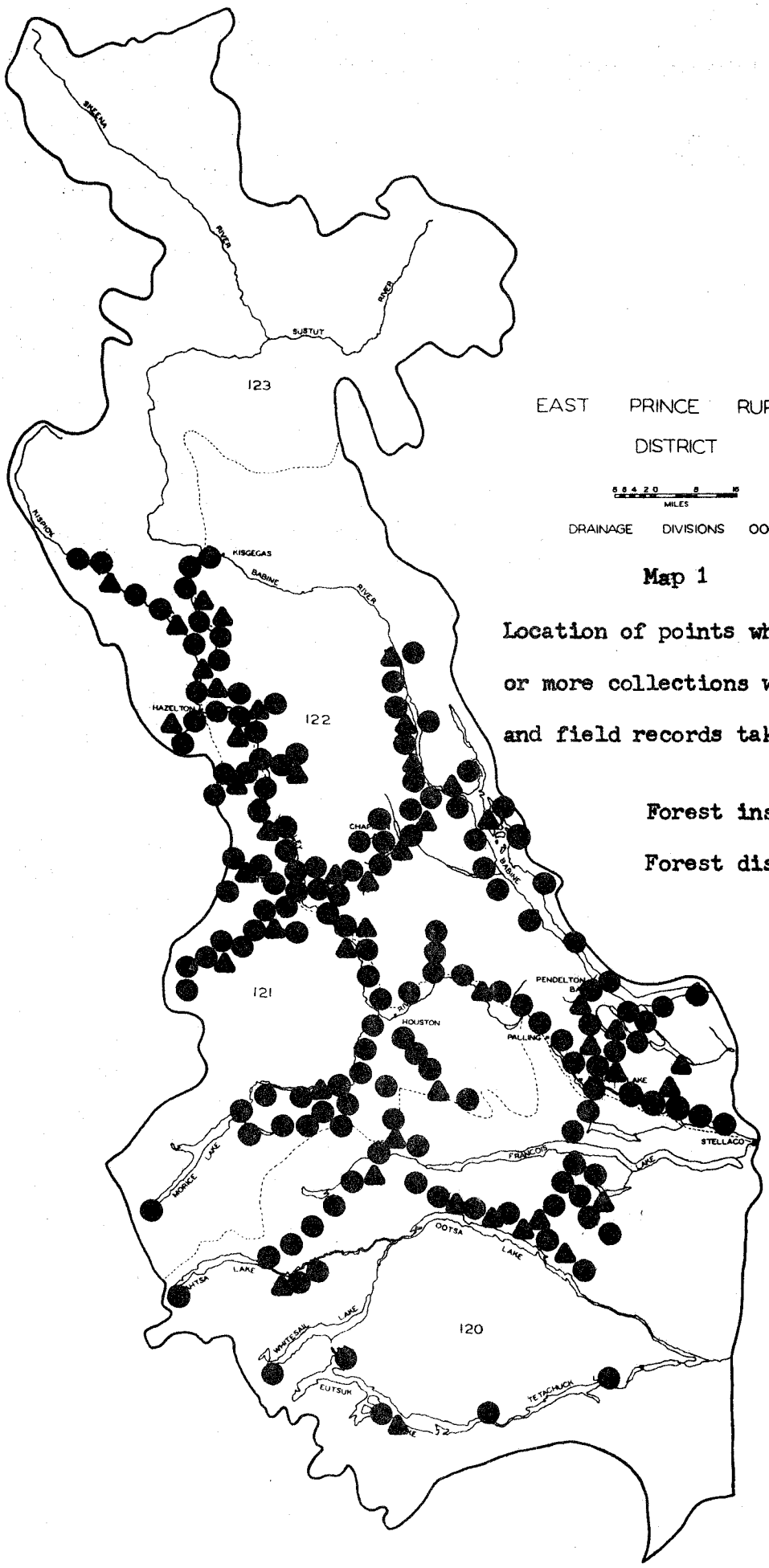
Recently burned areas were examined at 10 locations for Rhizina root rot, a fungus disease that infects and kills seedlings. Fruiting bodies were collected from a 1966 burn at Blunt Creek and a 1967 burn at Kitseguecla Lake. R. undulata had caused 14% mortality to white spruce seedlings at Kitseguecla Lake. The disease was not found in other areas examined.

Root rots of mature and immature stands

Spruce-balsam stands were examined at 10 localities for root rot infection. Armillaria mellea was found in six of the stands examined in the Bulkley and North Skeena River valleys.

Table 9. Other diseases of current minor significance

Organism	Hosts	Locality	Remarks
Coryneum thujinum	C	North Skeena	Parasite of cedar leaf blight.
Coleosporium asterum	lP	Nadina River	Needle rust, affecting regeneration in roadside stands.
Cronartium comandrae	lP	Houston, Burns Lake	A stem rust. Light infections, widespread.
Discina perlata	bCo	Sealy Lake	Associated with root rot. New host record.
Epipolaeum tsugae	wH	Utsen Creek	Common needle cast. Heavy infections on 1967 needles.
Hyalopsora aspidiotus	alF	Tweedsmuir Park	Needle cast. Light infections.
Peridermium harknessii	lP	Smithers, Burns Lake	Gall rust. Light incidence throughout the District.



Map 1

Location of points where one or more collections were made and field records taken in 1968

Forest insect ●

Forest disease ▲

ANNUAL DISTRICT REPORTS
FOREST INSECT AND DISEASE SURVEY
BRITISH COLUMBIA, 1968
PART V, KAMLOOPS SURVEY DISTRICT

by

R. O. Wood, D. F. Doidge and N. J. Geistlinger

FOREST RESEARCH LABORATORY

VICTORIA, BRITISH COLUMBIA

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PART V

DEPARTMENT OF FISHERIES AND FORESTRY

APRIL, 1969

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1968

KAMLOOPS SURVEY DISTRICT

R. O. Wood [1/]

Ranger personnel assigned to the Kamloops Survey District (Kamloops Forest District) were: R. O. Wood, East Kamloops; D. Doidge, Central Kamloops; N. Geistlinger, West Kamloops. D. Beddows of the Prince George Survey District cooperated with the Plant Protection Branch of the Canada Department of Agriculture in a European pine shoot moth survey in the Okanagan Valley and Kamloops areas in April and May. Between April 9 and October 4, studies were made on the flight periods of wood borers in the East and Central Kamloops districts. B. C. Forest Service personnel conducted a survey for balsam woolly aphid on ornamental and native true firs between the United States border and the 51st parallel from mid-May to mid-July.

Bark beetle populations increased in some areas and decreased in others. The Douglas-fir beetle caused extensive mortality in the west and central areas. Mountain pine beetle infestations in ponderosa pine stands decreased on the Douglas Lake plateau and west of Ashcroft but continued near Spences Bridge and Princeton. Extensive infestations continued in lodgepole pine stands in the Williams Lake and Okanagan Valley areas and in western white pine in North Thompson River-Shuswap Lake regions. The Dryocoetes-Ceratocystis complex caused increasing alpine fir mortality in high elevation spruce-balsam stands.

Black-headed budworm defoliation of western hemlock decreased but moderate defoliation of Douglas-fir occurred on the Nicoamen River plateau. There was extensive defoliation of spruce and alpine fir in widely separated areas. The spruce budworm infestation on Douglas-fir near Shalalth persisted but results of egg sampling were negative. The first records of larch casebearer were obtained on Anarchist Mountain and along Vaseux Creek. Larch sawfly defoliation of western larch was noted only at Pearson Creek. The infestation of forest tent caterpillar on trembling aspen in Wells Gray Park increased from 3,600 acres in 1967 to an estimated 16,000 acres in 1968. Populations of western hemlock looper, Douglas-fir tussock moth and other important defoliators were low.

Much of the tree mortality, growth loss and quality reduction attributed to diseases is caused by mistletoes and stem and root rot fungi. These usually intensify at a slow rate which makes annual summaries of

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1/ Forest Research Technician, Forest Insect and Disease Survey Senior Ranger, Vernon.

their status repetitious; for this reason the following report may not mention 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., frost and drought damage which immediately affect tree appearance and often cause dieback and mortality. Other aspects of the Disease Survey which deal with mortality, growth loss, and factors influencing the occurrence of the more important diseases, are summarized elsewhere.

Special surveys were made to determine the distribution and intensity of root rots. Poria weirii and Armillaria mellea were not found in the west but were well distributed elsewhere. Rhizina undulata was found at Quesnel and Shuswap lakes and at Reiter Creek.

Other disease organisms and climatic conditions caused damage in a number of locations. Atropellis stem canker on lodgepole pine was common in many areas. Elytroderma deformans continued to cause needle cast on ponderosa pine. Infection by Lophodermella concolor, a needle cast on lodgepole pine, decreased in the Tunkwa Lake area but was severe from 70 Mile House to 100 Mile House. Larch needle cast was sporadic throughout the range of western larch. Drought damage to Douglas-fir, ponderosa pine and lodgepole pine was evident in scattered areas, mostly in high elevation lodgepole pine stands.

The abbreviations for host trees used in the report are given in Table 1.

Table 1. Host tree abbreviations

Abbreviation	Common name	Abbreviation	Common name
C	cedar - general	S	spruce - general
wC	western red cedar	eS	Engelmann spruce
D	Douglas-fir	Al	alder
F	fir - general	A or Po	aspen or poplar-general
alF	alpine fir	tA	trembling aspen
H	hemlock - general	bCo	black cottonwood
wH	western hemlock	B	birch - general
roJ	Rocky Mtn. juniper	wB	white birch
cJ	common juniper	M	maple - general
L	larch - general	bM	broadleaf maple
aL	alpine larch	mM	Manitoba maple
wL	western larch	W	willow
P	pine - general		
lP	lodgepole pine		
pP	ponderosa pine		
wwP	western white pine		
wbP	white bark pine		

FOREST INSECT AND DISEASE SURVEY

EAST KAMLOOPS

1968

R. O. Wood

INTRODUCTION

Regular field work began April 4 and ended November 7. Special surveys were made for European pine shoot moth in the Okanagan Valley and Kamloops areas, balsam woolly aphid on ornamental and native true firs between the United States border and the 51st parallel, spruce gall aphid and Engelmann spruce weevil, root rot of immature stands, Atropellis stem canker, and Rhizina root rot of planted seedlings. Approximately 11 hours were used in aerial surveys.

Insect and disease collections are shown by host in Table 1; collection localities are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Drainage divisions are illustrated on Map 1. Details on individual insect and disease problems follow.

Numbers of larval defoliators found in field collections remained about the same this year: 83% of beating collections contained larvae.

Tree mortality caused by the Douglas-fir beetle remained low but mountain pine beetle infestations continued in ponderosa and lodgepole pine stands. Engraver beetles caused ponderosa pine mortality in three small areas. Black-headed budworm populations decreased in western hemlock stands but moderate to severe tip defoliation occurred on Engelmann spruce and alpine fir at high elevations. Defoliation of western larch by larch sawfly decreased sharply. The first collections of larch casebearer were made on Anarchist Mountain and damage was noted along Vaseux Creek. An infestation of pine needle-sheath miner occurred on ponderosa pine near Oliver. Fall webworm populations remained moderate to high in a number of areas in the Okanagan Lake watershed.

A lodgepole pine stem canker and two species of root rot were found at widely separated locations. Rhizina root rot was found on two fire sites. Damage to ponderosa pine from Elytroderma needle cast was moderate to severe. Some drought damage to Douglas-fir, ponderosa and lodgepole pine was noted in the southern part of the District.

Table 1. Collections by hosts, East Kamloops, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	8	0	Alder species	0	1
Douglas-fir	101	36	Aspen, trembling	4	0
Fir, alpine	18	7	Birch species	3	0
Hemlock, western	31	4	Chokecherry	1	0
Juniper species	4	1	Cottonwood, black	1	0
Larch, western	31	4	Willow species	3	0
Pine species	3	0			
Pine, lodgepole	30	47			
Pine, ponderosa	46	3			
Pine, western white	5	2			
Spruce, Engelmann	67	7			
Yew, western	0	1			
Totals	344	112	Totals	12	1
			Misc. hosts	2	11
			No hosts	161	9
			GRAND TOTALS	519	133

Table 2. Currently important insect and disease 1/ problems by drainage divisions, East Kamloops, 1968

Insect and disease problems	Principal hosts 2/	Importance by drainage divisions 3/						
		180	181	182	183	184	185	186
Bark Beetles								
Mountain pine beetle	pP, lP, wwP	4	4	2	2	2	2	4
Douglas-fir beetle	D	3	3	1	1	1	1	3
Dryocoetes-Ceratocystis complex	alF	4	4	3	1	3	1	1
Engraver beetles	pP	0	4	0	0	0	0	0
Defoliators								
Black-headed budworm	eS, alF	3	1	1	1	3	1	3
Larch casebearer	wl	0	3	0	0	0	0	0
Foliage Diseases								
Pine needle cast, Elytroderma deformans	pP	4	4	0	2	3	0	0

1 Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High populations and/or widespread outbreak in progress - 5.

Scattered high populations and/or significant damage in restricted areas - 4.

Rising populations and/or moderate numbers and/or potential problem - 3.

Static or falling populations and/or moderate numbers and/or no problem at present - 2.

Endemic population and/or no significant damage - 1.

Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Mountain pine beetle, Dendroctonus ponderosae

The number of beetle-killed ponderosa pines decreased slightly but the combined losses for all pine species increased by some 72,000 cubic feet. The greatest increase in mortality occurred in western white pine stands near Humamilt Lake and in lodgepole pine at Joe Rich Creek. At the latter location there was an increase of 2,000 red tops from 1967.

Table 3 shows 1968 counts of beetle-killed pines and gives a comparison of the total estimated volume losses for the years 1966-1967. Map 2 shows numbers and general location of beetle-killed trees recorded in 1968.

Table 3. Pines killed by mountain pine beetles, East Kamloops, 1966 and 1967, as determined in 1968

Pine species	Location	No. trees killed	Est. volume (cu. ft.)
Lodgepole	Shinish Cr.	30	600
	McNulty Cr.	100	2,000
	Terrace Cr.	500	10,000
	Lambly Cr.	200	4,000
	Daves Cr.	30	600
	Mission Cr.	500	10,000
	Joe Rich Cr.	3,500	70,000
	Pearson Cr.	100	2,000
	Cherry Cr.	20	400
	Ferry Cr.	25	500
	Coldstream Cr.	100	2,000
	Cedar Hill Rd.	100	2,000
		5,205	104,100
Ponderosa	Princeton to Aspen Grove	1,590	63,600
	Inkaneep Cr.	300	9,000
	Baldy Cr.	125	3,750
	Skaha Cr.	100	3,000
	Darke Cr.	70	2,100
	Cardinal Cr.	25	750
	Oyama Lake northeast to Lavington	65	1,950
	Whiteman Cr. to Equesis Cr.	100	3,000
	Falkland-Chase	90	2,700
	Byers Range	50	2,500
		2,515	92,350

Table 3 (continued)

Pine species	Location	No. trees killed	Est. volume (cu. ft.)
Western white	Trinity Valley	75	3,000
	Curwen Cr.	10	400
	Ireland Cr.	60	2,400
	Crazy Cr.	10	400
	Perry R.	65	2,600
	Kwikoit Cr.	200	8,000
	Pisima L.	75	3,000
	Adams L.	150	6,000
	Little Momich L.	40	1,600
	Momich R.	200	8,000
	Humamilt L.	600	24,000
		1,485	59,400
Totals, all pine species			
1966		3,950	109,000
1967		6,965	183,450
1968		9,205	255,850

Douglas-fir beetle, Dendroctonus pseudotsugae

No large-scale infestations were found but rising populations indicated a potential problem in some areas. Numbers of red-topped trees more than tripled at Adams Lake and small groups of beetle-killed trees were noted near Falkland, Equesis Creek and Bluey Lake. During aerial surveys, 850 red tops were counted as compared with 178 in 1967. Groups of 5 to 100 red tops were general (Table 4).

On June 11, beetles had attacked 10 of 77 fire-damaged trees near Cottonwood Creek; attacks were successful in only two. Attacks were also noted on decked logs in the vicinity.

Table 4. Douglas-fir killed by Douglas-fir beetles, East Kamloops, 1966 to 1967 as determined in 1968

Location	No. trees killed
Adams Lake	170
White Lake	20
Pinaus Lake	25
Naswhito Creek	10
Equesis Creek	130
Falkland	110
Bolean Creek	30
Monte Lake	25
Westwold	25
O'Keefe	25
Blair Creek	15
Swanson Creek	20
Missezula Lake	5
Bluey Lake area	120
South of Brookmere	10
Belgo Creek	25
Mission Creek	10
Monashee Creek	15
Cherry Creek	10
Reiter Creek	25
Hidden Lake	25
Totals	850

Dryocoetes-Ceratocystis complex

Over 4,000 red-topped alpine fir trees were counted compared with 450 in 1967. Dead trees, generally inaccessible, occurred singly and in small groups throughout the stands (Table 5).

Table 5. Alpine fir killed by Dryocoetes-Ceratocystis complex, East Kamloops, 1968

Location	No. trees killed
Cayenne Cr.	400
Canoe Cr.	20
West of Chase Cr.	1,000
Whiteman Cr.	400
Terrace-White Rocks mts.	700
Northeast of Lambly Lake	500
Ferry Cr.	50
East of Ireland Cr.	300
North of Greenbush L.	75
South of Hidden L.	50
Winters Cr.	500
Keremeos	100
Total	4,095

Engraver beetles, Ips spp.

The 500 ponderosa pine killed near Ellison airport, 300 near O'Keefe and 100 near Rutland comprised nearly 7,200 cubic feet of timber. Populations probably built up in logging slash, infested the trees in 1967 and re-attacked them in 1968.

Four infested trees examined at Ellison on June 29 had beetles from the base up to a diameter of less than 3 inches at the top. Most beetles had vacated the upper sections of the trees; those in the lower sections were noticeably less mature. Ips pini was the most numerous species, followed by I. plastographus and one tree was infested with Ips mexicanus.

Of 712 trees examined on a 2-acre strip at Ellison in November, 40% were infested. Dead trees averaged 9 inches dbh and 40 feet in height.

Defoliators

Black-headed budworm, Acleris variana

Defoliation of western hemlock occurred in two small areas; one near Crazy Creek and the other at Ratchford Creek, a tributary of Seymour River. The number of larvae in beating collections decreased on western hemlock but increased slightly on Engelmann spruce and alpine fir as follows:

Host	No. samples taken during larval period		% samples containing larvae		Av. no. larvae per positive sample	
	1967	1968	1967	1968	1967	1968
Western hemlock	30	30	80	30	55.7	5.9
Engelmann spruce	28	35	61	37	11.2	23.9
Alpine fir	13	13	61	61	4.0	19.2

Defoliation was noted on Engelmann spruce and alpine fir along the Tulameen River. Of 100 branch tips examined on each host, 85% of the spruce and 75% of alpine fir were infested. Defoliation ranged from a trace to 100% of the current year's growth. The lack of 1967 foliage on some branches was attributed to 1967 budworm feeding.

In other areas lighter tip defoliation was noted on high elevation Engelmann spruce and alpine fir.

Larch casebearer, Coleophora laricella

The first evidence was found on May 28 when pupae were collected from western larch on Anarchist Mountain. Presumably the insect entered the District from the Okanogan Valley south of the border as pupae were found there on larch.

On November 1, overwintering larvae were counted on four 18-inch branches from mid-crown of each of four trees at locations where pupae were found. Results were as follows:

Location	Av. no. casebearers per 18-inch branch
17 miles east of Osoyoos	0.7
14 miles east of Osoyoos	4.5

One hymenopterous parasite, Bracon sp., was reared from casebearer pupae collected on May 28.

At present, populations are low but studies elsewhere indicate that they will increase and expand into larch stands north of the present boundary.

Other Noteworthy Insects

Larch sawfly, Pristiphora erichsonii

Defoliation of western larch covered about 100 acres near Pearson Creek. Unhatched eggs were found on July 11 at the 4,300 foot level. Colonies of mid-instar larvae were found on understory larch trees along Harris Creek on July 26. Elsewhere, low numbers of larvae occurred on western larch; the maximum number per collection was 124 near Cherryville. Thirty-one per cent of the collections were positive with an average of 27.3 larvae; in 1967, 62% were positive with 21.2 larvae per sample.

Square-foot duff samples taken on October 8 from the base of each of 10 trees yielded fewer overwintering cocoons than in 1967. A comparison of sound (those which contain sawfly larvae, either healthy or parasitized) and unsound cocoons (those which are empty because of sawfly emergence, parasitism or predation) with the number found in 1967 is shown below.

Location	Sound		Unsound	
	1967	1968	1967	1968
Becker Lake	238	50	656	304
Aberdeen Lake	204	127	385	304

There was a 17% decrease in successful emergence of adult sawflies in 1968. No parasitism by Mesoleius tenthredinus was found but parasitism by Tritneptis klugii increased to 6%. Predation increased mortality in the cocoon stage to 72% at Becker Lake and 74% at Aberdeen Lake. An examination of sound cocoons showed that 56% at Becker Lake and 15% at Aberdeen contained living larvae.

Damage from larch sawfly in 1969 is expected to be light.

Cooley spruce gall aphid, Adelges cooleyi

One branch from each of 25 Engelmann spruce trees was examined at 15 widely separated locations. The highest number of 1968 galls per square foot of foliage was 1.1 along Ganzeveld Road near Armstrong. A few new galls were noted along Tulameen River Road, Aberdeen Lake Road and at Trinity Valley field station.

On Douglas-fir, the alternate host of spruce gall aphid, the number of needles infested increased at all except one sample point (Table 6).

Table 6. Percentage of Douglas-fir needles infested by Cooley spruce gall aphid at six plots, East Kamloops, 1967 and 1968

Location	No. needles examined		% infested	
	1967	1968	1967	1968
Coalmont	1,343	1,186	13	25
Keremeos	1,605	1,516	26	7
Kelowna	1,350	1,402	3	15
Falkland	2,299	2,179	0	3
Monte Creek	1,801	1,849	11	6
Lumby	2,025	1,495	2	5

Balsam woolly aphid, Adelges piceae

B. C. Forest Service crews examined true firs from east of the Fraser River to the eastern boundary of the District and in all main towns and cities between the United States border and the 51st parallel. Some 305 planted ornamental fir trees and 1,300 native true firs were examined here and in the Nelson Forest District. No balsam woolly aphid were found.

Fall webworm, Hyphantria cunea

Tents were fewer in some areas but serious defoliation occurred on chokecherry, black cottonwood and other deciduous hosts in the Okanagan Lake and Wood Lake watersheds. Table 7 shows the number of webs counted from a slow-moving vehicle on both sides of the road for four miles at Okanagan Lake and two miles at Woodsdale.

Table 7. Fall webworm counts, East Kamloops, 1968

Locality and host	No. webs per mile				Av. per mile
	0-1	1-2	2-3	3-4	
Okanagan Lake					
Chokecherry	390	380	346	210	332
B. cottonwood	0	0	0	0	0
Miscellaneous	169	281	129	40	155
All species					
1968	559	661	475	250	486
1967	598	577	434	256	466
Woodsdale					
Chokecherry	37	19	-	-	28
B. cottonwood	8	28	-	-	18
Miscellaneous	64	249	-	-	157
All species					
1968	109	296	-	-	203
1967	342	337	-	-	340

Aspen leaf miner, Phyllocnistis populiella

The percentage of leaf surfaces mined decreased as did the number of adults produced per 100 leaf surfaces (Table 8). Lack of cocoons at Aspen Grove prevented analysis of adult emergence and mortality in the cocoon stage.

Table 8. Aspen leaf miner populations, East Kamloops

Location	% leaf surfaces mined		No. adults produced per 100 leaf surfaces	
	1967	1968	1967	1968
Carlin	78	58	13.9	4
Phillips Lake	72	29	5.4	3.4
McCulloch Road	18	11	8.1	3.4
Aspen Grove	5	1	11.3	-

Mortality from parasitism and other causes markedly increased at Carlin and along the McCulloch Road but little change occurred at Phillips Lake (Table 9).

Table 9. Mortality of aspen leaf miner in 100-cocoon samples, East Kamloops

Location	% mortality			
	Parasitism		Other causes	
	1967	1968	1967	1968
Carlin	50	53	15	31
Phillips Lake	56	28	17	42
McCulloch	18	42	1	0
Aspen Grove	38	-	10	-

Engelmann spruce weevil, Pissodes engelmanni

The insect attacks and kills spruce leaders, causing reduced height growth and poor tree form. To determine distribution and measure intensity of the population, 100 Engelmann spruce trees were examined in each of 14 widely separated points. Current attacks were generally fewer than in previous years (Table 10).

Table 10. Engelmann spruce weevil attack, East Kamloops

Location	% trees infested	
	Current attack	Old attack
Mile 18 Tulameen R. Rd.	0	19
Skaist Cr.	0	0
Mile 12 Silver Star Rd.	0	7
Mile 8 Ganzeveld Rd.	0	4
Mile 7 Aberdeen L. Rd.	0	0
Mile 6 Bald Peak Rd.	0	3
Bolean Lake	0	7
Mile 6 McGregor Cr. Rd.	0	6
Tuktakamin Mtn. Rd.	1	2
Lodestone Mtn. Rd.	0	1
Mile 6 Bobbie Burns Rd.	0	0
Trinity Valley Field Station	0	0
Mile 9 Terrace Mtn. Rd.	13	8
Becker Lake	1	1

Unidentified dipterous larvae were commonly found feeding on weevil larvae in the galleries and may account for the lack of current attack where old damage was extensive.

European pine shoot moth, Rhyacionia buoliana

We cooperated with the Canada Department of Agriculture, Plant Protection Division, Penticton, in again surveying for pine shoot moth in the Okanagan Valley and Kamloops area.

Of more than 47,000 pine trees in nurseries and plantations and 915 on home premises examined, no specimens or current year's feeding were found. Damage attributed to pine shoot moth was found on Scots pine in a nursery near Kelowna and in a plantation near Glenmore. The damaged trees had been imported prior to 1967, some of them from Ontario.

New provincial regulations regarding treatment of imported pine seedlings, introduced early in 1968, should prevent further introduction of the insect in the Interior. However, there is still a need for more public education on the importance of pine shoot moth control.

The survey will probably be repeated in 1969.

Pine needle-sheath miner, Zelleria haimbachi

A stand of ponderosa pine near Gallagher Lake north of Oliver suffered severe damage. Many understory trees lost most of the current year's growth in the upper crown and there was moderate to severe defoliation of trees up to 60 feet in height. The larger trees were damaged throughout the whole crown. Defoliation of ponderosa pine was noted for five miles west of Oliver along Fairview Road and as far north as Kaleden Junction.

Table 11. Other insects of current minor significance

Insect	Hosts [1]	Locality	Remarks
Barbara colfaxiana Douglas-fir cone moth	D	Hedley, Ashnola R.	Cone insect. Average of 4% of cones infested in 100-cone samples.
Choristoneura fumiferana Spruce budworm	D, wH, wL	Throughout District	Defoliator. Unusually low population in 1968.
Dioryctria abietivorella Fir coneworm	D	Hedley, Ashnola R.	Cone insect. Less than 2% of cones infested in 100-cone samples.

Table 11 (continued)

Insect	Hosts	Locality	Remarks
Lambdina fiscellaria lugubrosa Western hemlock looper	wH, D, eS, alF, wL, lP	Throughout District	Defoliator. Most common on wH; maximum of 8 larvae per sample.
Malacosoma pluviale Western tent caterpillar	W, bCo, saskatoon	Vernon, Sicamous	Defoliator. Occasional tents observed.
Melanolophia imitata Green-striped forest looper	wH, D, wL, eS, alF, pP	Throughout District	Defoliator. Main hosts wH and D; 40% of collections from these hosts were positive with an average of 3.6 larvae.
Nepytia freemani A looper on Douglas-fir	D	Throughout District	Defoliator. 13% of collections were positive with an average of 2.2 larvae.
Nymphalis antiopa Mourning cloak butterfly	W, elm	Vernon	Defoliator. Larvae common on W.
Orgyia pseudotsugata Douglas-fir tussock moth	D	Throughout District	Defoliator. No larvae collected, no damage noted.
Phenacaspis pinifoliae Pine needle scale	pP, lP, D	Winfield, McCulloch Rd., Penticton, Salmon L.	Sucking insect. Most severe along the McCullough Road.
Puto cupressi Mealy bug	lP, alF, eS	Asp Creek	Sucking insect. Infestation covers about 8 acres.
Zeiraphera improbana Larch budmoth	wL	Silver Star Rd., Camp McKinney Rd.	Defoliator. Up to 26 larvae per sample along Camp McKinney Rd.

1/ Host tree abbreviations appear in the Survey District Introduction.

FOREST DISEASES

Currently Important Diseases

Foliage Diseases

Pine needle cast, Elytroderma deformans

Damage continued on ponderosa pine throughout much of its range. A slight increase in percentage of foliage infected was recorded in two permanent plots. A comparison of 1966 to 1968 data follows:

Location	No. living trees			Estimated % foliage infected		
	1966	1967	1968	1966	1967	1968
Carr's Landing	60	57	57	24	29	34
Glenemma	54	54	53	24	22	30

Some trees at both plots had thin crowns and one tree at Glenemma was dead. It is not known if either was due to the effects of needle cast.

Stem and Branch Diseases

Western larch dwarf mistletoe, Arceuthobium campylopodum f. laricis

Trees of all sizes along Long Joe Creek Road on Anarchist Mountain were heavily infected; 14 of 20 trees examined were infected and many others had typical mistletoe brooms. Dwarf mistletoe was found on larch along Bald Peak Road near Lavington.

Lodgepole pine dwarf mistletoe, Arceuthobium americanum

Two plots of 20 trees each were examined along Range Road and Apex Mountain Road. At the former location, 20% of the examined trees were infected and 8% at the latter.

Douglas-fir dwarf mistletoe, Arceuthobium douglasii

Infection occurred in 6 of 20 trees examined along the Apex Mountain Road north of its junction with Highway 3. Dwarf mistletoe on Douglas-fir is common southwest of the above location along the Ashnola River.

Specific Surveys

Root rot of immature and mature stands

Trees showing root rot symptoms occurred in numerous and scattered locations and served as a nucleus for examination of 25 suspected centers. Two species of fungi commonly caused mortality; the laminate rot, Poria weirii and the shoestring rot, Armillaria mellea.

Poria root rot was found only on Douglas-fir and was common along Scotch Creek Road and other areas near Shuswap Lake, along Big White Mountain Road, Apex Mountain Road and at Heckman Creek.

Armillaria root rot infected Douglas-fir, Engelmann spruce and western hemlock at Scotch Creek, Paxton Valley, Salmon Arm, Crazy Creek, Cherryville, Postill and Beaver Lake roads and Allison Pass.

Infection centers varied from 50 to 200 feet in diameter; numbers of infected trees in the 25-tree plots ranged from 3 to 18. In a few instances, dead or dying trees infected with root rot were damaged by bark beetles.

Rhizina root rot

Nine recently burned areas were examined for this fungus which causes a root rot of seedlings. Rhizina undulata was collected at Reiter Creek near Sugar Lake and near Ross Creek but no infected seedlings were found.

Atropellis canker

Fifty lodgepole pine were examined at each of 23 locations; 14 plots contained from 2 to 30 infected trees. The highest numbers of infected trees were found in mature and semi-mature stands.

Exotic plantations

Plantations of European and hybrid larch on Terrace Mountain and Scots pine at Tamarack Lake in T.F.L. 9 were examined in the fall.

Of the 4,000 larch seedlings planted in 1960, only 36 living trees were found. Many of the surviving trees were suffering die-back; some had died back to ground line but a single shoot growing from the root remained alive. Damage from animal feeding and trampling was present.

Only 20 of 4,000 Scots pine seedlings planted from 1958 to 1960 remained alive. No insects or diseases were observed. Surviving trees appeared healthy and were two to seven feet tall.

Other Noteworthy Diseases

Drought damage

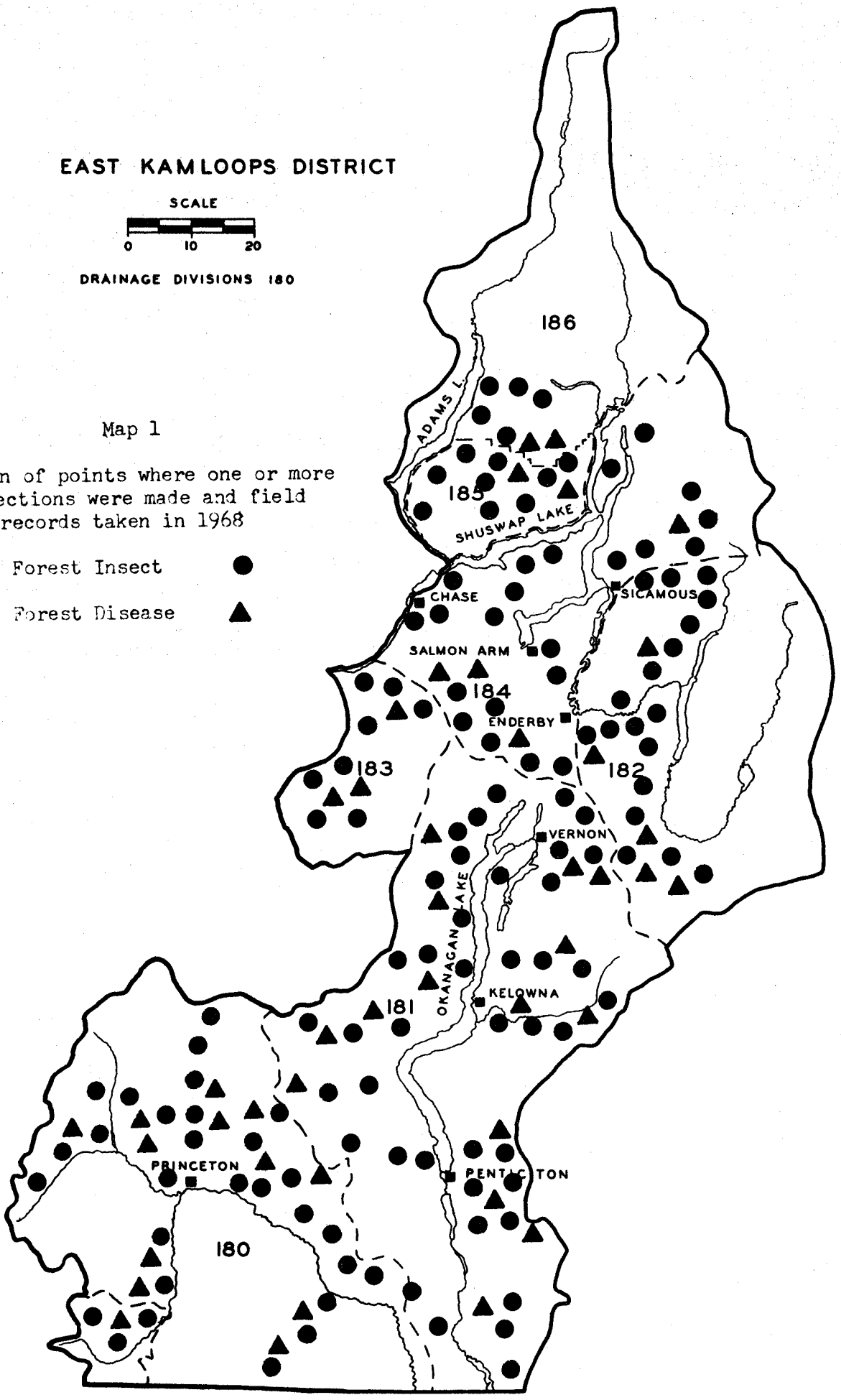
Partially and totally reddened sapling-sized Douglas-fir and ponderosa pine trees were observed along Ellis Creek between 3,000 and 4,000 feet elevation. Douglas-fir trees on rocky, exposed slopes between Hedley and Princeton were similarly damaged.

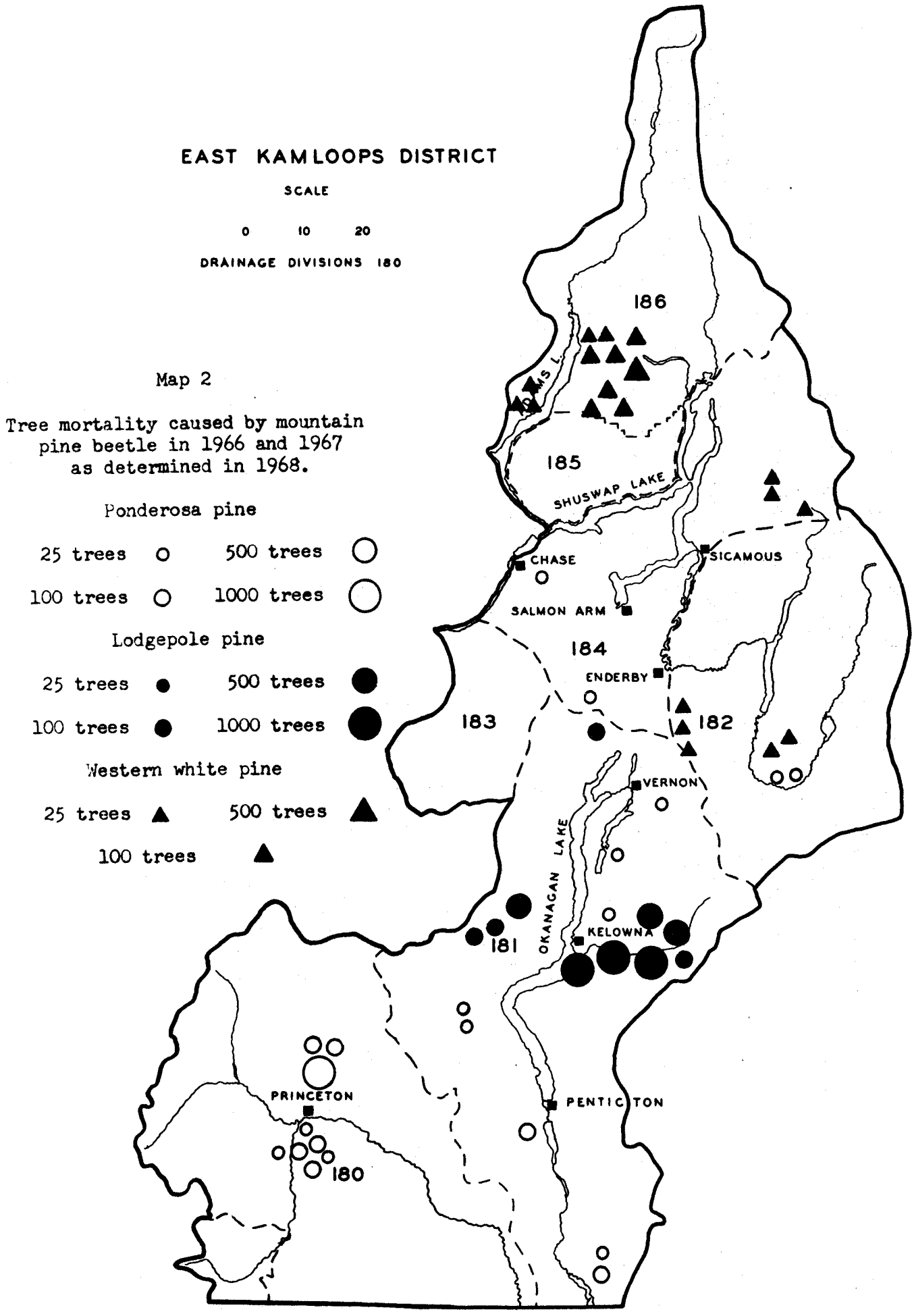
An estimated 1,000 lodgepole pine trees with reddened foliage were noted on steep slopes and exposed ridges during aerial surveys, distributed as follows: Ashnola River - 100; Winters Creek - 500; Agate Mountain - 300; Vaseux Creek - 100.

Table 12. Other diseases of current minor significance.

Organism	Hosts 1/	Locality	Remarks
Aleurodiscus amorphus	alF	Sicamous	A stem canker which is a facultative parasite. Infection noted on two trees.
Chrysomyxa weirii	eS	Apex Mtn., Peachland Cr.	Spruce needle rust. Light infection on a few trees.
Hypodermella laricis	wL	Lumby, Vernon	Larch needle cast. Small areas of infection noted.
Melampsorella caryophyllacearum	alF	Nickel Plate Rd.	A rust fungus. Infection on one tree.
Peridermium holwayi	alF	Skaist Cr.	A rust fungus. Infection on one tree.
Peridermium stalactiforme	lP	Throughout south and southeast section of District	A stem rust. From 1 to 13 trees infected in 50-tree plots.
Rhabdocline pseudotsugae	D	Manning Park, Ellis Cr.	Needle cast. Heaviest infection in Manning Park where 15 out of 50 trees were infected.

1/ Host tree abbreviations appear in the Survey District Introduction.


EAST KAMLOOPS DISTRICT
SCALE
0
10
20
DRAINAGE DIVISIONS 180
Map 1
Location of points where one or more collections were made and field records taken in 1968
Forest Insect
Forest Disease
186
185
184
183
182
181
180
ADAMS L.
SHUSWAP LAKE
CHASE
SICAMOUS
SALMON ARM
ENDERBY
VERNON
OKANAGAN LAKE
KELOWNA
PRINCETON
PENTICTON


EAST KAMLOOPS DISTRICT
SCALE
0 10 20
DRAINAGE DIVISIONS 180
Map 2
Tree mortality caused by mountain pine beetle in 1966 and 1967 as determined in 1968.
Ponderosa pine
25 trees
500 trees
100 trees
1000 trees
Lodgepole pine
25 trees
500 trees
100 trees
1000 trees
Western white pine
25 trees
500 trees
100 trees
186
185
184
183
182
181
180
ADAMS L.
SHUSWAP LAKE
CHASE
SALMON ARM
SICAMOUS
ENDERBY
VERNON
OKANAGAN LAKE
KELOWNA
PRINCETON
PENTICTON

FOREST INSECT AND DISEASE SURVEY

CENTRAL KAMLOOPS

1968

D. F. Doidge 1/

INTRODUCTION

Regular field work began May 7 and ended November 2. Special surveys included spruce gall aphid, Engelmann spruce weevil, root rot of immature and mature stands, Rhizina root rot of planted seedlings and Atropellis canker of lodgepole pine.

Insect and disease collections are shown, by host, in Table 1; collection localities are shown on Map 1. The principal problems in each drainage division are shown in Table 2 and illustrated in Map 1. Details on individual insect and disease problems follow.

Numbers of defoliators found in the field decreased slightly this year; 83% of beating collections contained larvae.

Mountain pine beetle and forest tent caterpillar were the only insects present in epidemic proportions. The mountain pine beetle infestation at Chapperon Lake declined sharply but increased mortality of ponderosa pine occurred in the Merritt-Spences Bridge-Cache Creek area. Forest tent caterpillars defoliated 16,000 acres of trembling aspen south of Wells Gray Park. A bark beetle-disease complex on alpine fir caused scattered widespread mortality at high elevations. A sawfly caused light defoliation of western hemlock. Black-headed budworm remained at a low level near Blue River.

1/ Forest Research Technician, Forest Insect and Disease Survey Ranger, Vernon.

Table 1. Collections by hosts, Central Kamloops, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	6	0	Alder species	2	0
Douglas-fir	176	21	Aspen, trembling	22	1
Fir, alpine	20	4	Birch species	21	0
Hemlock, western	12	3	Willow	4	0
Juniper, Rocky Mtn.	23	0			
Pine, lodgepole	64	26			
Pine, ponderosa	48	2			
Pine, western white	1	0			
Spruce, Engelmann	74	6			
Totals	424	62	Totals	49	1
			Misc. hosts	1	3
			No hosts	55	7
			GRAND TOTALS	529	73

Table 2. Currently important insect and disease [1] problems by drainage divisions, Central Kamloops, 1968

Insect and disease problems	Principal hosts [2]	Importance by drainage divisions [3]					
		160	161	162	163	164	165
Bark Beetles							
Mountain pine beetle	pP, wwP, lP	5	5	1	4	1	5
Douglas-fir beetle	D	1	1	1	4	1	2
Western balsam bark beetle	alF	1	1	2	5	4	2
Defoliators							
Forest tent caterpillar	tA	1	0	1	1	5	0
Foliage Diseases							
Pine needle cast, *Elytroderma deformans*	pP	3	2	3	2	0	0

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5. Scattered high populations and/or significant damage in restricted areas - 4.

Rising populations and/or moderate numbers and/or potential problems - 3.

Static or falling population and/or moderate numbers and/or no problem at present - 2.

Endemic population and/or no significant damage - 1

Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Mountain pine beetle, Dendroctonus ponderosae

Pine mortality generally decreased by about 60% (Table 3). There was approximately a 66% decline in ponderosa pine mortality in the central and southern areas. However, western white pine mortality increased by 43% in the Adams Lake and Blue River areas. An estimated 5,000 red-topped ponderosa pine, 1,200 western white pine and 45 lodgepole pine were observed during aerial surveys. An average volume of 30 cubic feet per tree was used to calculate the volume of timber killed. Map 2 shows the distribution of beetle-killed ponderosa and western white pine.

Table 3. Pine killed by mountain pine beetle as estimated from aerial surveys, Central Kamloops

Pine species	Location	Est. no. trees killed		Est. gross vol. (cu.ft.)	
		1967	1968	1967	1968
Ponderosa	Chapperon L.	11,200	3,000	336,000	90,000
	Clapperton	790	515	23,700	15,450
	Spences Bridge	320	470	9,600	14,100
	Pritchard	830	425	24,900	12,750
	Cache Creek	550	250	16,500	7,500
	Stinking L.	-	100	-	3,000
	Tranquille Cr.	90	80	2,700	2,400
	Deadman R.	315	45	9,450	1,350
	Promontory Mtn.	109	25	3,270	750
	Arrowstone Cr.	-	20	-	600
	Cache Cr. Hills	50	20	1,500	600
	Barnes Cr.	405	20	12,150	600
	Salem Cr.	-	15	-	450
	Cultus L.	-	10	-	300
	Prospect Cr.	-	10	-	300
	Moulton Cr.	-	5	-	150
	Nilsson	-	5	-	150
	Brookmere	-	5	-	150
	Dot	-	5	-	150
	Spius Cr.	95	5	2,850	150
	Jacko L.	25	-	750	-
	Niskonlith L.	25	-	750	-
	Jamieson Cr.	20	-	600	-
	Copper Cr.	20	-	600	-
	Robin L.	10	-	300	-
	Doherty Cr.	10	-	300	-

Table 3 continued

Pine species	Location	Est. no. trees killed 1967	1968	Est. gross vol. (cu. ft.) 1967	1968
Ponderosa	Shumay L.	65	-	1,950	-
	Paul Cr.	5	-	150	-
Total		14,934	5,020	448,020	150,900
Western white	Mud L.	330	1,000	9,900	30,000
	Brennen Cr.	100	100	3,000	3,000
	Deadfall Cr.	50	75	1,500	2,250
	Vavenby	-	30		900
	Reg Christie Cr.	-	10		300
	Otter Cr.	10	10	-	300
	E. Barriere R.	65	-	1,950	-
	Murtle R.	60	-	1,800	-
	Clearwater	30	-	900	-
Total		635	1,225	19,050	36,750
Lodgepole	Range Cr.		20	-	600
	Bonaparte L.	-	15	-	450
	Whitewood Cr.	50	-	1,500	-
	Nicola	12		360	-
Total		62	45	1,860	1,050
GRAND TOTALS		15,631	6,290	468,930	188,700

Douglas-fir beetle, Dendroctonus pseudotsugae

For the second year in a row there was a marked increase in the number of red-topped Douglas-fir counted. The counts were 800 in 1966, 1,358 in 1967, and 2,131 in 1968; a 62% increase over two years. The location, number and volume of beetle-killed trees in 1968 is compared with 1967 in Table 4.

Table 4. Douglas-fir killed by Douglas-fir beetle as estimated from aerial surveys, Central Kamloops

Location	Est. no. trees killed 1967	Est. no. trees killed 1968	Vol. per tree (cu. ft.)	Est. gross vol. 1967	Est. gross vol. 1968
Cultus L.	150	575	90	13,500	51,750
Tranquille Cr.	276	260	100	27,600	26,000
Deadman R.	560	340	90	50,400	30,600
Skwaam Bay	-	110	100	-	11,000
Forest L.	-	100	100	-	10,000
Paul L.	-	75	90	-	6,750
Cultus Lake	-	75	90	-	6,750
Tobacco Cr.	-	60	90	-	5,400
Mowich L.	-	60	90	-	5,400
Brennen Cr.	-	60	100	-	6,000
Campbell Cr.	-	55	80	-	4,400
Samatosam L.	-	50	100	-	5,000
Spius Cr.	45	50	85	3,825	4,250
John Cr.	-	45	100	-	4,500
Jamieson Cr.	-	40	100	-	4,000
Duffy Cr.	-	40	90	-	3,600
Wasly Cr.	-	35	100	-	3,500
E. Barriere Cr.	-	30	100	-	3,000
Burr Cr.	-	30	85	-	2,550
Spahomin Cr.	-	30	85	-	2,550
Gordon Cr.	-	25	85	-	2,125
Jackson L.	-	20	85	-	1,700
Brookmere	-	20	85	-	1,700
Adams L.	55	15	100	5,500	1,500
Cache Cr. Hills	40	20	90	3,600	1,800
Misc. locations not active 1968	232	-	85	19,720	-
TOTALS	1,358	2,220		124,145	208,575

Western balsam bark beetle, Dryocoetes confusus

In 1967 only 70 recently-killed trees were counted on aerial surveys compared with 4,000 in 1968. Generally the heaviest attacks occurred in high elevation alpine fir along the North Thompson River from Kamloops to Blue River. Counts at specific locations were: Louis Creek (1,000 trees), Wentworth Creek (700), Johnson Lake (500), Efdee Lake (320), Martin Meadows Lake (200), Moira Lake (200), Whitewood Creek (165), Pendleton Lake (135), Mud Lake (100), Bob Creek (100).

Defoliators

Forest tent caterpillar, Malacosoma disstria

Defoliation of trembling aspen continued and extended over an estimated 16,000 acres along the Wells Gray Park Road compared with 3,600 acres in 1967 and 150 acres in 1966. Total defoliation occurred on an estimated 60% of the trees. Egg sampling was done in late October on three randomly selected co-dominant trees at four locations (Table 5). As 10 egg masses per 6-inch dbh tree indicate there will be heavy defoliation it is expected that heavy defoliation will continue in 1969.

Table 5. Forest tent caterpillar egg counts on trembling aspen, Wells Gray Park Road, Central Kamloops

Location	Tree no.	No. of egg masses
Mi. 17.4 Wells Gray Park Road	1	2
	2	4
	3	1
Mi. 1.8 Ken McKay Road - Wells Gray Park Road	1	11
	2	58
	3	63
Mi. 19.5 Wells Gray Park Road	1	69
	2	88
	3	93
Mi. 20.5 Wells Gray Park Road	1	81
	2	98
	3	73

Other Noteworthy Insects

Black-headed budworm, Acleris variana

Populations on Engelmann spruce, alpine fir and western hemlock were light. The largest collection, 61 larvae, came from Engelmann spruce at Coquihalla in the extreme southern area.

Up to 100% defoliation of current year's growth occurred on Douglas-fir on the Nicoamen River plateau about three miles along the road in a strip approximately 0.4 mile wide. In October egg counts were made on Douglas-fir at two locations about a mile apart along the Nicoamen River Road. Plot 1 had an average of 3.8 eggs per 10-inch branch sample

and plot 2 an average of 5.1 eggs. Defoliation will probably be light in 1969.

Spruce gall aphid, Adelges cooleyi

This insect has two hosts, Engelmann spruce and Douglas-fir. In Douglas-fir, needles are killed or discolored making heavily infested trees unsuitable for sale as Christmas trees. Galls produced on Engelmann spruce make trees extremely unsightly and retard growth. Damage to Douglas-fir at the Cherry Creek, Heffley Creek and Barriere permanent sampling plots increased from 4.7% of the needles infested in 1967 to 21%. Engelmann spruce was examined for aphid at 15 locations. Galls were counted on one branch from the mid-crown of each of 25 trees at each location. The heaviest attack was 4.5 new galls per square foot of foliage. Generally the population was light in 1968.

Two-year-cycle spruce budworm, Choristoneura fumiferana

Populations were almost non-existent. Only five larvae were collected during the field season. There was no defoliation in permanent sample plots at Jamieson Creek and McGillivray and Grizzly lakes. As this was a flight year egg sampling was carried out, but with negative results. The population should remain low in 1969.

Douglas-fir needle midges, Contarinia spp.

Populations were generally light to moderate. The percentage of needles mined increased at the three permanent sample plots as determined by sampling five current year's terminals from each of five trees at each plot. Following is a comparison of needles infested. Populations should remain about the same in 1969.

Location	No. needles examined		% needles infested	
	1967	1968	1967	1968
Cherry Creek	2,326	796	0.5	4.5
Heffley Creek	2,574	912	1.5	11.1
Barriere	2,984	1,560	3.4	13.3

Fall webworm, Hyphantria cunea

Web counts made along both sides of the road for 3 miles west of Savona and 7 miles along the Nicola River east of Spences Bridge, showed the average number of webs per mile decreased near Savona for the first time in three years. The 1968 count was 104 webs per mile compared with 300 in 1967; near Spences Bridge the number of webs per mile increased from 91 in 1967 to 92 in 1968 (Table 5).

Table 5. Roadside web counts of fall webworm, Central Kamloops, 1968

Hosts	No. of webs per mile							Av. per mile
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	
Savona								
Black cottonwood	50	17	43	-	-	-	-	37
Chokecherry	43	0	0	-	-	-	-	14
Miscellaneous	89	55	16	-	-	-	-	53
Totals 1968	182	72	59	-	-	-	-	104
1967	314	320	266	-	-	-	-	300
Nicola River								
Black cottonwood	48	24	40	19	55	37	30	36
Chokecherry	6	0	0	0	0	0	0	1
Miscellaneous	42	48	76	56	117	45	3	55
Totals 1968	96	72	116	75	172	82	33	92
1967	133	118	144	81	102	56	6	91

Aspen leaf miner, Phyllocnistis populiella

Infestations remained light. The population has fluctuated since 1966 (Table 6). Parasitism was heavier at three of the five plots (Table 7).

Table 6. Aspen leaf miner populations, Central Kamloops

Location	% leaf surfaces with mines			No. adults produced per 100 leaf surfaces		
	1966	1967	1968	1966	1967	1968
Paul Creek	28	32	6.5	8.2	5.0	0.9
Semlin Ranch	5	3	0.0	1.3	0.1	0.0
Campbell Range	21	12	1.3	9.9	1.0	0.2
Coldwater River	3	0	1.8	1.1	0.0	0.1
Tunkwa	-	4	7.5	-	0.9	2.1

Table 7. Mortality of aspen leaf miners in 100-cocoon samples, Central Kamloops

Location	% mortality					
	Parasitism			Other causes		
	1966	1967	1968 1/	1966	1967	1968
Paul Creek	27	50	47 2/	1	16	20
Samlin Ranch	27	17	- 2/	2	34	-
Campbell Range	22	50	60	0	13	0
Coldwater River	46	0	88	5	-	0
Tunkwa	-	25	44	-	18	6

1/ Insufficient cocoons for 100-cocoon samples.
2/ No mined surfaces.

Engelmann spruce weevil, Pissodes engelmanni

One hundred Engelmann spruce were examined at each of 15 scattered plots for this terminal weevil. Damage to open growing spruce was light; the heaviest current attack was four damaged leaders at Clearwater. Understory spruce was nearly free of attack especially where the overstory was lodgepole pine. Damage appeared restricted to spruce growing in meadows, creek bottoms, and along logging roads. Engelmann spruce weevil may become a problem when planting of spruce seedlings on logged or burned areas becomes more widespread.

Table 8. Other insects of current minor significance

Insect	Hosts 1/	Locality	Remarks
Choristoneura fumiferana One-year-cycle spruce budworm	eS, wH, D, alF, lP	N. Thompson	Defoliator. Population low. 18% collections positive with 1.2 larvae per positive collection.
Cryptorhynchus lapathi Poplar-and-willow borer	W	Merritt, Coquihalla, Wells Gray Park	Borer. Very heavy attack along Coldwater R. in Merritt; trees up to 6 in. diameter at base severely damaged. Small willows 1-2 ins. along Wells Gray Park R Rd. and at Coquihalla killed.

Table 8 continued

Insect	Hosts	Locality	Remarks
Lambdina f. lugubrosa Western hemlock looper	wH, D, eS, alF	N. Thompson River Valley	Defoliator. Average number of larvae per positive collection increased from 1.5 in 1967 to 3.7 in 1968.
Melanolophia imitata Green-striped forest looper	eS, D	General	Defoliator. Low population; 37% of collections positive with an average of 2.4 larvae per collection
Neodiprion sp. A hemlock sawfly	wH	Blue River (Mud Lake)	Defoliator. Maximum 600 larvae per sample. Light defoliation.
Orgyia pseudotsugata Douglas-fir tussock moth	D	Heffley Cr.	Negative in 1968.
Pissodes terminalis A terminal weevil	lP	Tunkwa L.	Terminal borers. Infested 40% of 500 trees examined in a stand of lodgepole 5 to 30 ft. high growing in old burns.
Stilpnotia salicis Satin moth	tA	N. Kamloops City, Campbell Range	Defoliator. Low population. No notable defoliation in District.
Zelleria haimbachi Pine needle sheath-miner	lP, pP	Clearwater, Westsyde	Sheath miner. Maximum 12 larvae collected in Wells Gray Park area. No noticeable damage.

1/ Host tree abbreviations appear in Survey District introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

Needle cast of ponderosa pine, Elytroderma deformans

Infection continued widespread throughout the range of ponderosa pine, but seemed lighter than in 1967. Crown infection varied from 5% to 50% at Promontory Mountain, Le Jeune Lake Road, Westsyde, Ashcroft-Spences Bridge, south side of Kamloops Lake from Kamloops to Savona, and around the south end of Nicola Lake.

On Le Jeune Lake Road the permanent plots had 22% of the trees with more than 50% infection compared with 25% in 1967 and on Promontory Mountain 25% of the trees had more than 50% infection, or about the same as in 1967. The level of infection is expected to be about the same in 1969.

Specific Surveys

Root rot of immature and mature stands

A survey for distribution and intensity of root rots showed most root rots in Central Kamloops were caused by Poria weirii or Armillaria mellea. Twelve centers of Poria root root and seven of Armillaria were recorded in Douglas-fir from Kane Valley near Aspen Grove north to Clearwater. At McGillivray Lake, three centers of Poria and one of Armillaria had from 4 to 25 infected trees in each center. The width of the centers varied from 20 to 300 feet. Poria had infected 2 to 18 more trees per center than Armillaria.

Rhizina root rot

Recently burned areas were examined for Rhizina undulata a disease that can kill seedlings but results were negative.

Atropellis canker

Lodgepole pine were examined for cankers caused by Atropellis piniphila in ten areas already known to have the disease. On the Dominic Lake and Le Jeune Lake roads, 46% and 44% of the 50-tree samples had stem cankers. Along the Mamette Lake Road two areas had 16 and 18% infection. Eight areas sampled were negative.

Dwarf mistletoe, Arceuthobium americanum

Infection of lodgepole pine continued high throughout the District. Damage is generally in the form of growth loss. Of 50 mature trees examined at Mile 19, Mamette Lake Road, 100% were infected.

Indian paint fungus, Echinodontium tinctorium

This trunk rot is common in western hemlock stands, especially at Clearwater and Blue River and results in extensive cull. Three collections of conks from suppressed trees 2-4 inches dbh were made to determine the age at which E. tinctorium infects the tree. The tree ages were 125 years at Clearwater and 110 and 120 years at Blue River.

Other Noteworthy Diseases

A needle cast, Lophodermella concolor

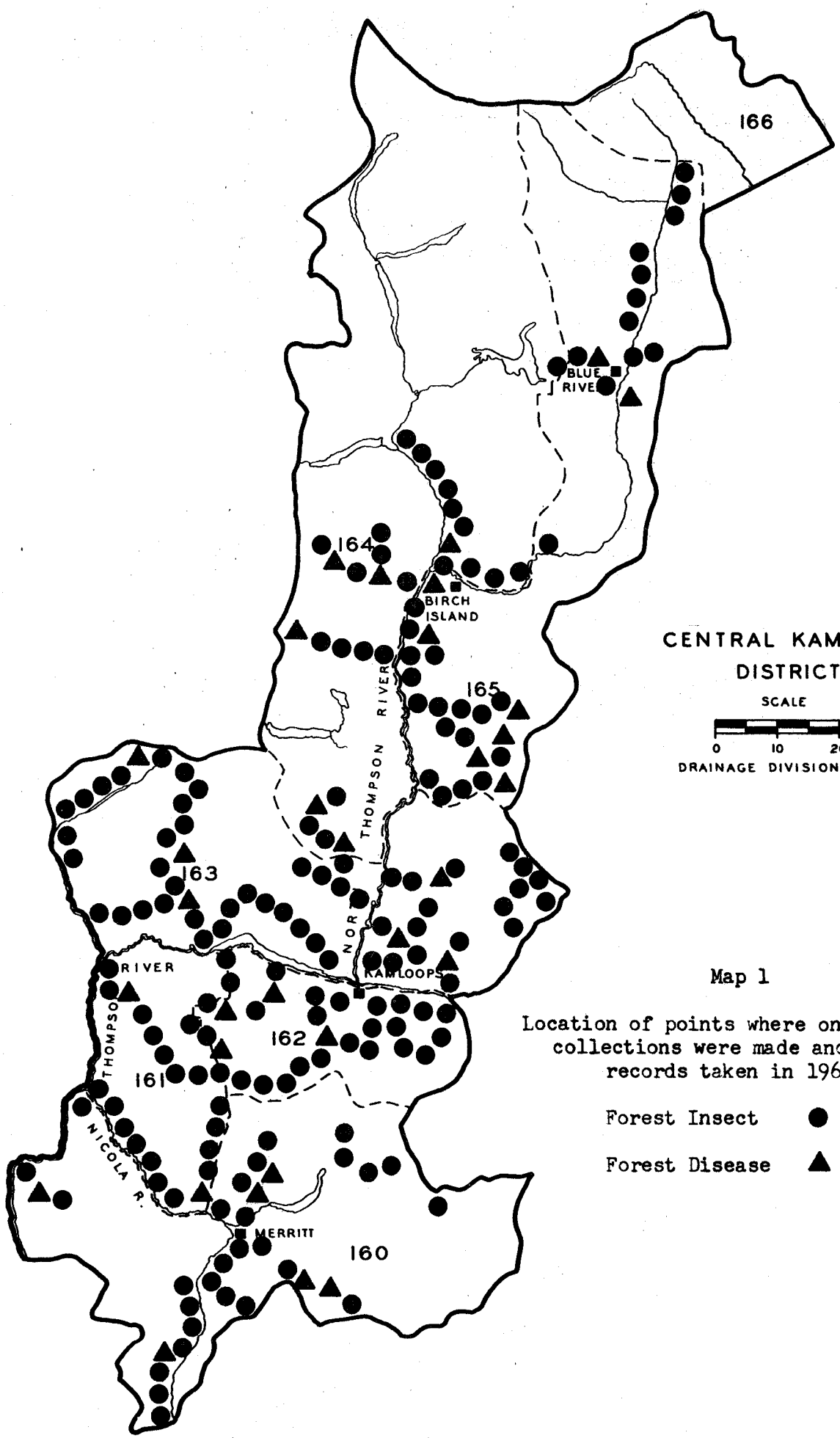
Lodgepole pine along the Mamette Lake-Highland Valley roads that had 100% of the previous year's needles infected in 1967 had completely recovered. Only scattered branches were infected. A hyperparasite Hendersonia pinicola, present on needles infected by L. concolor, often contributes to the collapse of outbreaks.

Table 9. Other diseases of current minor significance

Organism	Hosts 1/	Locality	Remarks
Chrysomyxa weirii	eS	Knouff L.	In epidemic stage causes severe defoliation. Light in 1968.
Gymnosporangium nelsoni, G. nidusavis	Saskatoon	Deadman R.	Severe infection in localized area; 20 bushes checked, 100% infection.
Lirula abietis-concoloris	alF	Jamieson Cr.	Reduces increment. Light infection.
Lirula macrospora	eS	Clearwater, Vinsula	Defoliates lower crown. Very light infection.
Melampsora epitea	alF	Coquihalla	Collected on alpine fir. Alternate host is willow. Four trees infected of 20-tree sample.
Puccinia coronata	Shepherdia canadensis	Jamieson Cr., Tranquille Cr., Tunkwa L.	Common throughout.
Pucciniastrum epilobii	alF	Jamieson Cr., McGillivray L.	Heavy infection in localized areas, 8-15 trees infected in 20-tree sample.

Organism	Hosts	Locality	Remarks
Stereum chailletii	D	Merritt	Root rot. 14 dead trees in 25-tree plot.
Rhabdocline sp.	D	Deadman R.	Very light. One tree infected of 20-tree sample.

1/ Host tree abbreviations appear in Survey District introduction.

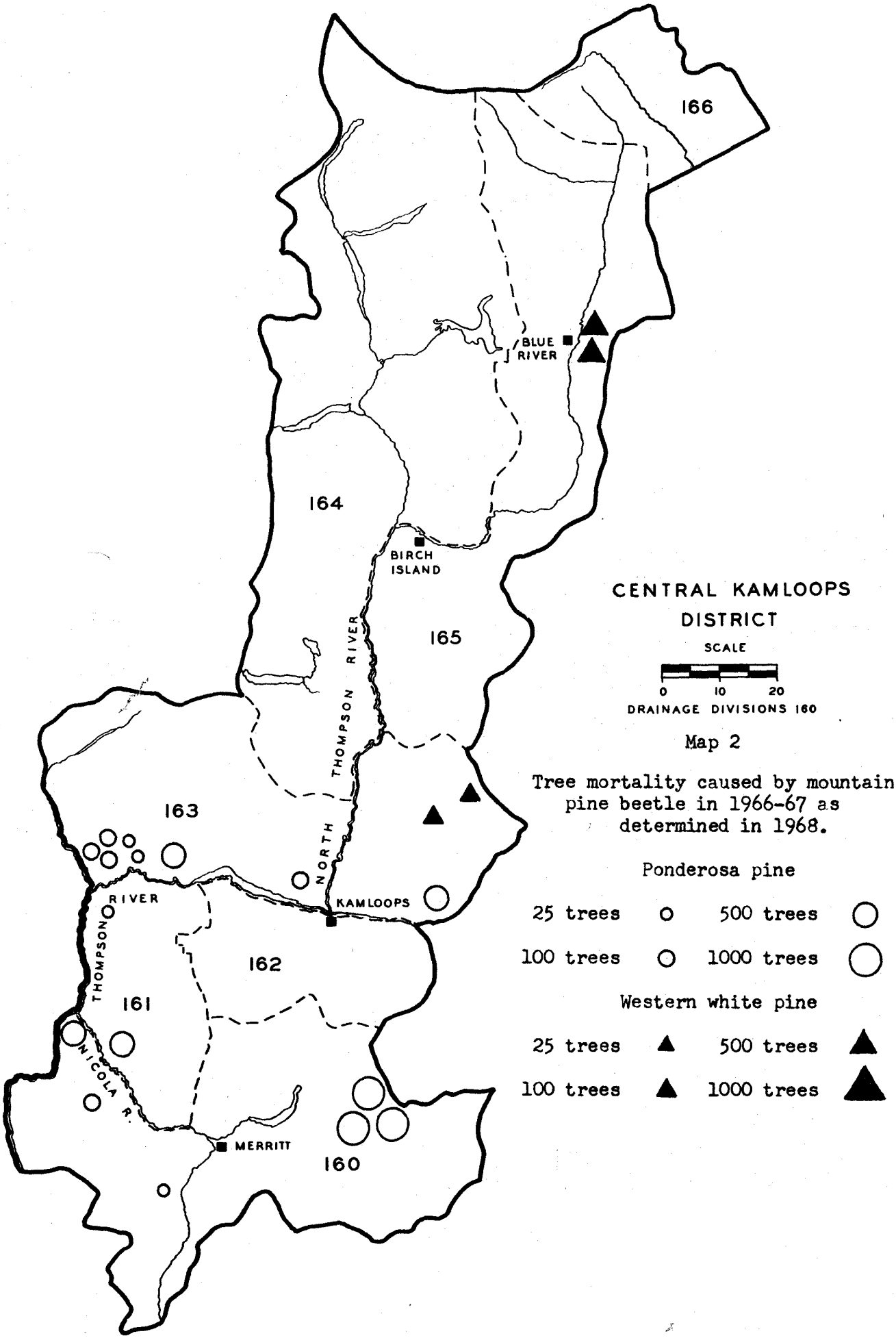


Map 1

Location of points where one or more collections were made and field records taken in 1968

Forest Insect ●

Forest Disease ▲



Map 2

Tree mortality caused by mountain pine beetle in 1966-67 as determined in 1968.

Ponderosa pine

25 trees ○ 500 trees ◯

100 trees ○ 1000 trees ◯

Western white pine

25 trees ▲ 500 trees ▲

100 trees ▲ 1000 trees ▲

FOREST INSECT AND DISEASE SURVEY

WEST KAMLOOPS

1968

N. J. Geistlinger [1]

INTRODUCTION

Regular field work began on May 27 and ended on October 25. Special surveys were for frost damage on Douglas-fir at Williams Lake, spruce gall aphids, Engelmann spruce weevil, wood borers and bark beetles, root rots of immature and mature stands, Rhizina root rot and lodgepole pine stem canker. Aerial surveys of approximately 10 hours were conducted early in August.

Insect and disease collections are shown, by host, in Table 1; collection localities are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Drainage divisions are illustrated on Map 1. Details on individual insect and disease problems follow.

Numbers of larval defoliators found in field collections remained about the same as in 1967; 71% of beating collections contained larvae.

Attacks by Douglas-fir beetles increased in the Williams Lake-Lac La Hache area, possibly as a result of frost damage predisposition. There was a marked increase in the number of red-topped lodgepole pine killed by mountain pine beetle in the Williams Lake area.

Spruce budworm caused moderate to heavy defoliation of Douglas-fir on Mission Mountain between Seton and Carpenter lakes. Populations of black-headed budworm near Quesnel and Mitchell lakes declined sharply.

A needle cast disease severely infected lodgepole pine between 70 Mile House and 100 Mile House. Infections of ponderosa pine needle cast were not as severe as in 1967. A stem canker of lodgepole pine was commonly found in the wetter northeastern portion of the District. Drought damage to lodgepole pine was common in the central Cariboo.

1/ Forest Research Technician, Forest Insect and Disease Survey Ranger, Vernon.

Table 1. Collections by hosts, West Kamloops, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	3	0	Alder	1	0
Douglas-fir	139	8	Aspen, trembling	14	4
Fir, alpine	11	3	Birch	1	0
Hemlock, western	3	0	Maple, Douglas	1	0
Juniper, common	1	0			
Juniper, Rocky Mtn.	14	0			
Pine, lodgepole	105	76			
Pine, ponderosa	24	0			
Pine, whitebark	0	1			
Spruce, Engelmann	124	9			
Totals	424	97	Totals	17	4
			Miscellaneous hosts	1	4
			GRAND TOTALS	442	105

Table 2. Currently important insegt and disease [1] problems by drainage divisions, West Kamloops, 1968

Insect and disease problems	Principal hosts [2]	Importance by drainage divisions [3]						
		140	141	142	143	144	145	146
Bark Beetles								
Douglas-fir beetle	D	1	1	0	3	4	1	3
Mountain pine beetle	lP, pP	4	1	1	2	5	1	4
Defoliators								
Black-headed budworm	wH, alF, eS	3	1	1	1	1	2	2
One-year-cycle spruce budworm	D	5	1	1	1	1	1	1
Foliage Diseases								
Pine needle cast	pP	0	0	0	0	4	0	0
A needle cast disease	lP	0	0	0	1	4	0	0

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.

Scattered high populations and/or significant damage in restricted areas - 4.

Rising populations and/or moderate numbers and/or potential problems - 3.

Static or falling population and/or moderate numbers and/or no problem at present - 2.

Endemic population and/or no significant damage - 1.

Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Douglas-fir beetle, Dendroctonus pseudotsugae

A significant increase in the number of red-topped Douglas-fir was observed during aerial surveys (Table 3). Largest concentrations of dead trees were in the Williams Lake-Lac La Hache area where frost in April 1966 may have predisposed trees to attack. Increases were also noted in the central Cariboo, Chilcotin and Clinton areas. Map 2 shows locations and numbers of red-topped Douglas-fir observed during aerial surveys in 1968.

An increase in Douglas-fir mortality may occur in 1969, if overwintering conditions are favourable to the beetle.

Table 3. Douglas-fir killed by Douglas-fir beetle as determined from aerial surveys, West Kamloops

Period	Year of survey	No. of trees killed	Est. total volume (cu. ft.)
1961 - 1962	1963	37,000	2,878,900
1962 - 1963	1964	29,500	2,227,900
1963 - 1964	1965	26,300	1,957,800
1964 - 1965	1966	5,300	393,400
1965 - 1967	1967	2,900	212,600
1966 - 1967	1968	11,000	796,400

Mountain pine beetle, Dendroctonus ponderosae

The number of lodgepole pine killed by mountain pine beetle increased, while red-topped ponderosa pine observed during aerial surveys decreased (Table 4). The estimated numbers and general locations of red-topped pines are shown on Map 3.

Large infestations occurred in lodgepole pine stands near Bull Mountain and the Williams Lake Airport, both near Williams Lake, along Cayoosh Creek southwest of Lillooet and along the Cariboo River. Infestations in ponderosa pine stands near Clinton and Hat Creek abated considerably. Small patches of red-topped ponderosa pines were noted near Gunn Lake and west of the Fraser River near Gang Ranch.

Table 4. Pine killed by mountain pine beetle as determined from aerial surveys, West Kamloops

Period	No. of trees killed	Est. total volume (cu. ft.)
Ponderosa pine		
1965 - 1966	3,120	128,040
1966 - 1967	720	28,800
Lodgepole pine		
1965 - 1966	21,530	473,620
1966 - 1967	42,200	928,400

Infestations in lodgepole pine stands near Williams Lake and along Cayoosh Creek will probably continue in 1969. Infestations in ponderosa pine may be negligible in the near future as populations have been waning the past two years.

Defoliators

Black-headed budworm, Acleris variana

Infestations in the Quesnel Lake - Mitchell Lake area declined to negligible proportions. Moderate defoliation of western hemlock occurred in two small patches near Bouldery Creek along the east arm of Quesnel Lake.

Larvae were common throughout the District except in the Bosk Lake area where defoliation occurred in 1967. An average of 3.7 larvae per positive sample was taken from Engelmann spruce, 1.8 from Douglas-fir and 13.6 from alpine fir. There was light defoliation near Duffey Lake where 63 larvae were collected in a sample from western hemlock.

This insect is not expected to cause appreciable defoliation in 1969, but a light to moderate population may persist near Duffey Lake.

One-year-cycle spruce budworm, Choristoneura fumiferana

The occurrence of larvae in Douglas-fir samples taken between June 1 and July 15, 1966 to 1968, was as follows:

No. of samples taken during larval period			% samples containing larvae			Av. no. of larvae per positive sample		
1966	1967	1968	1966	1967	1968	1966	1967	1968
78	71	63	17	11	30	1.5	2.0	2.5

Douglas-fir on Mission Mountain west of Lillooet at 3,500 to 3,900 feet elevation, again suffered moderate to severe defoliation of current year's foliage. Some trees sustained 80% to 90% defoliation of current growth while average defoliation was agout 60%. Defoliation was most severe near the mountain top, and on the north side. No disease or parasitism was evident in larvae collected about mid-June and reared at the Vernon laboratory. However, as few eggs were found, populations next year should be low.

Other Noteworthy Insects

Cooley spruce gall aphid, Adelges cooleyi

Infestation was generally light on Engelmann spruce and the alternate host, Douglas-fir. Examinations of one branch from each of 25 Engelmann spruce trees were made at 29 locations to determine intensity of current infestations. The number of current galls per square root of foliage ranged from 0 to 1.8. The greatest number occurred in the Chilcotin area south of Lee's Corner near Hanceville.

Fall webworm, Hyphantria cunea

Severe infestations again occurred on bitter cherry, chokecherry and wild rose at Seton Lake beach on black cottonwood along the Murray Creek road near Spences Bridge.

Webworm tents were counted early in September on two roadside sample strips near Lillooet. On a five mile strip along the Texas Creek road, seven tents were observed on chokecherry, six on alder, one on black cottonwood and one on domestic apple. On a five mile strip along the highway south of Lillooet, 22 were counted on chokecherry, five on black cottonwood and three on domestic apple. Although this was an increase from 1967, only a nuisance problem has resulted.

Aspen leaf miner, Phyllocnistis populiella

Populations remained low except for moderate to heavy infestations between Horsefly and Quesnel Lake along the Horsefly River. Sampling was done at the four plots in the District in mid-September. Samples consisted of one 12-inch branch from each of 10 trees at each location. Slight population increases occurred at all plots except near Soda Creek (Table 5). Percentage mortality in the cocoon stage is shown in Table 6.

Table 5. Aspen leaf miner populations, West Kamloops

Location	% leaf surfaces mined			No. adults produced per 100 leaf surfaces		
	1966	1967	1968	1966	1967	1968
Oregon Jack Creek	9.3	2.1	1.9	0.6	-	0.3
Clinton	2.5	0	0.9	0.6	-	0.2
Soda Creek	1.2	0	0.7	- 1/	-	-
Williams Lake	0	0	0.2	0	0	0.2

1/ Cocoon counts not done because of paucity of cocoons.

Table 6. Mortality of aspen leaf miners in 100-cocoon samples, West Kamloops

Location	% mortality					
	Parasitism			Other causes		
	1966	1967	1968	1966	1967	1968
Oregon Jack Creek	40	-	38	24	-	17
Clinton	22	-	25	16	-	34
Soda Creek	- 1/	-	-	-	-	-
Williams Lake	-	-	32	-	-	28

1/ Insufficient cocoons for 100-cocoon sample

Engelmann spruce weevil, Pissodes engelmanni

Examinations were made of 100 immature Engelmann spruce trees at each of 28 locations. Current attacks were found on from 0 to 9% of the trees at six locations, with the highest in the Chilcotin area near Tatla Lake. Old attacks were uncommon in the surveyed areas. The Engelmann spruce weevil does

not appear to pose a serious threat to natural spruce stands in the District.

Pine needle-sheath miner, Zelleria haimbachi

Populations on ponderosa pine remained almost static. Twenty-five tips on each of four trees were examined at five locations. Infestation ranged from 9% at Venables Valley to 32% at Lillooet (Table 7).

Table 7. Pine needle-sheath miner damage to ponderosa pine, West Kamloops

Locality	% tips infested				
	1964	1965	1966	1967	1968
Lillooet	16	6	12	34	32
Lytton	9	3	2	16	10
Spences Bridge	0	0	26	8	5
Venables Valley	0	0	1	6	9
Lower Hat Creek	0	0	10	13	11

Table 8. Other insects of current minor significance

Insect	Hosts[1/]	Locality	Remarks
Contarinia spp. Douglas-fir needle midges	D	Widespread	Needle miners. Light populations, no damage.
Dryocoetes confusus Western balsam bark beetle	alF	Northeastern portion of District	Bark beetle. Light populations.
Lambdina fiscellaria lugubrosa Western hemlock looper	D, wH, wC, eS	Widespread	Defoliator. Light populations, no damage. Maximum of eight larvae per sample.
Nepytia freemani A looper on Douglas-fir	D	Southern portion of District	Defoliator. Light populations, no damage.
Orgyia pseudotsugata Douglas-fir tussock moth	D	Carquile	Defoliator. No larvae collected. No damage.
Pissodes sp. Root weevil	lP	Big Bar Rd.	Root collar weevil. Light populations in drought-damaged trees.

1/ Host tree abbreviations appear in the Survey District Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

Needle cast on ponderosa pine, *Elytroderma deformans*

Infection although less severe than in 1967, was found throughout the range of the host in the southern section. Major areas of infection were near Cache Creek, Clinton, along Hat Creek and in Venables Valley, where an average of about 15% of the 1967 foliage was infected.

Permanent plots near Lower Hat Creek and Clinton were examined on July 12 to record progress of the disease (Table 9). An additional six trees in the Clinton plot had died, possibly as a result of the 1967 drought.

Table 9. Needle cast damage on ponderosa pine trees at two sample plots, West Kamloops

Est. % of foliage infected	No. of trees							
	Lower Hat Creek				Clinton			
	1965	1966	1967	1968	1965	1966	1967	1968
0	11	7	6	5	3	4	7	1
10	3	5	9	14	3	7	6	10
20	3	4	4	2	5	4	5	4
30	2	4	1	2	4	2	0	2
40	1	3	3	2	2	2	5	1
50	3	2	1	0	1	4	3	3
60	1	0	1	0	4	0	0	2
70	0	0	0	0	4	0	0	2
80	1	2	0	1	2	3	4	1
90	2	0	2	0	5	6	5	3
100	1	1	1	2	3	3	1	1
No. of dead trees	2	2	2	2	4	5	5	11

A needle cast on lodgepole pine, *Lophodermella concolor*

Severe infection occurred between 70 Mile House and 100 Mile House. All trees were affected to some degree; many had 100% of the year-old needles discolored. The disease, common in the area since 1966 was most severe in 1968. Other infected stands were west of the Fraser River near Riske Creek and near Chimney Lake south of Williams Lake.

Specific Surveys

Lodgepole pine dwarf mistletoe, Arceuthobium americanum

Collections were made at 14 locations for distribution records. Most severe infection was found in the Chilcotin area. A new locality record was Mile 9.1 Likely Road.

Rhizina root rot

Seven recently burned areas were examined for Rhizina undulata; three had been replanted with Douglas-fir or Engelmann spruce in 1967 and 1968. Twenty-five consecutive seedlings in four consecutive rows were examined. Two dead Engelmann spruce seedlings were found with fruiting bodies of the fungus nearby in a slash burn near Mitchell Bay on Quesnel Lake. Fruiting bodies were also found in two other areas near Quesnel Lake which were logged and burned in 1966 and 1967. These stands before logging and burning comprised western hemlock, western red cedar and Douglas-fir.

No fruiting bodies were found in recent burns in the drier Chilcotin area.

Atropellis canker

Infection in 21 lodgepole pine stands was evaluated. Nine examinations were made within one mile of locations where cankers were found in 1967 and the remainder were made in new areas. In the 50-tree samples from 0 to 20% of the stems were infected. The disease was most common in the northeastern portion of the District.

Exotic tree species

A Scots pine, Pinus sylvestris plantation (XP 183) along the Knife Creek Road had most trees with multiple leaders as a result of browsing. Ten of 50 trees examined had western gall rust, Peridermium harknessii.

Other Noteworthy Diseases

Douglas-fir frost damage

Below zero temperatures in April 1966 damaged Douglas-fir trees in the Williams Lake area, but by July 1968 no mortality could be directly attributed to frost damage. Most trees had made satisfactory recovery although some had thin foliage or suffered top-kill, possibly due to secondary disease or insect attack.

Douglas-fir beetle populations increased within the frost-damaged stands. In 1968 a total of approximately 11,000 red-topped Douglas-fir

were mapped during aerial surveys while in 1967 the total was about 2,000. In study plots established to study effects of the frost, only overmature trees were found to have succumbed to beetle infestation.

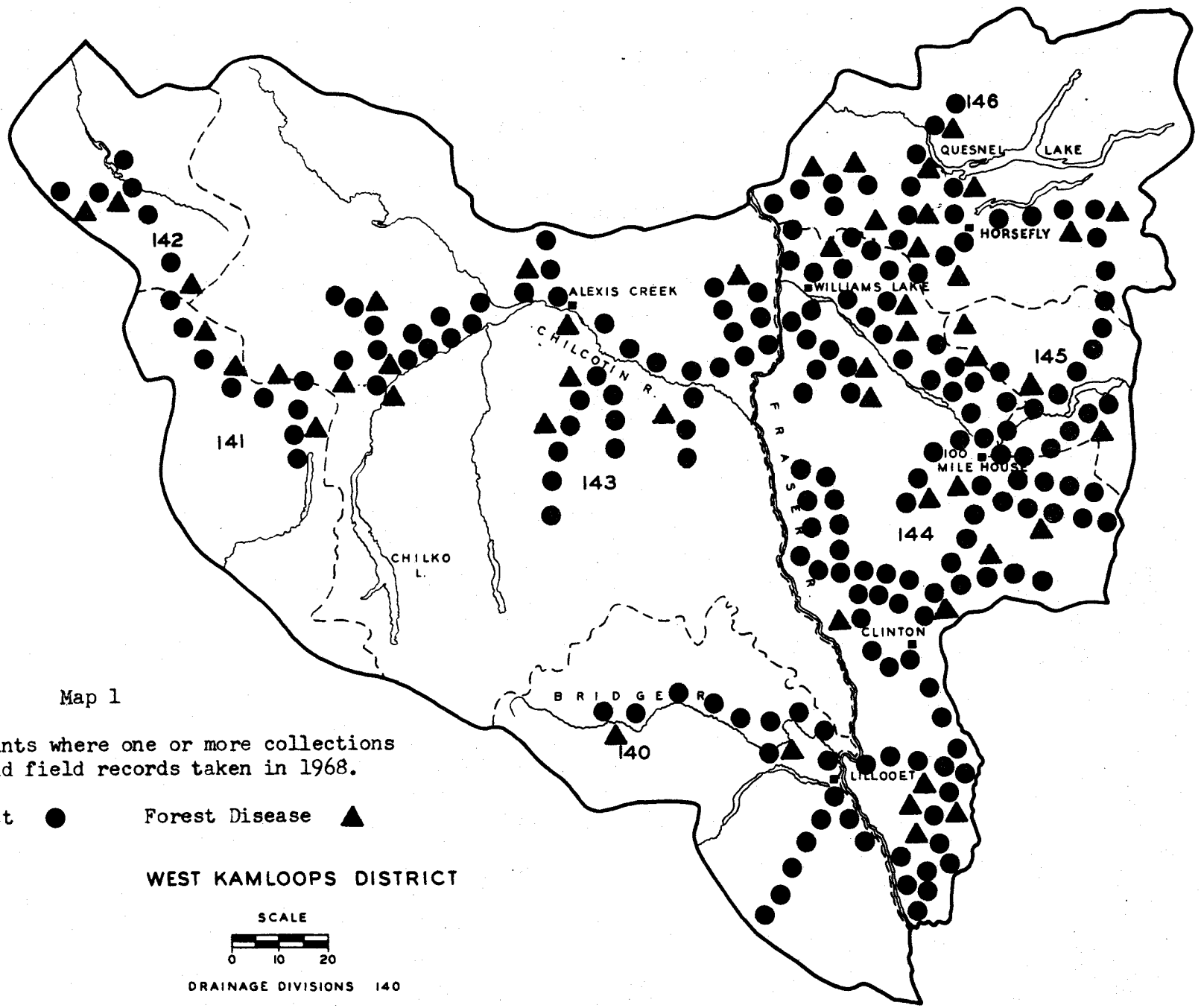
Drought damage

Mortality of coniferous trees caused by the 1967 drought was common in ponderosa and lodgepole pine stands in the southern areas. Ponderosa pine mortality was heaviest along the Cariboo highway near Clinton. Lodgepole pine in Fountain Valley and along the Big Bar and Green Lake roads were also killed. Mortality in the Big Bar and Green Lake areas was confined primarily to immature fringe trees along the roadside. Fringe ponderosa pines along the Hat Creek road also succumbed to drought. Many of the dead lodgepole pine trees harboured populations of secondary bark beetles, wood-borers and root collar weevils.

Table 10. Other diseases of current minor significance

Organism	Hosts [1]	Locality	Remarks
Botryosphaeria piceae	eS	Horsefly F.D.R.	Causes cankers on branches. Common on understory. All branches on all trees examined were infected.
Cronartium comandrae	lP	Northeastern section	Causes stem cankers. Collected for distribution records.
Tryblidiopsis pinastri	eS	Horsefly F.D.R., Mission Mtn.	Causes branch cankers. On understory trees.
Valsa sp.	D	South Hawks Cr.	Causes dieback of main stem.
Venturia populina	tA	Black Cr.	Foliage disease. Causes withering of leaves. Light infection.

[1] Host tree abbreviations appear in the Introduction.



Map 1

Location of points where one or more collections were made and field records taken in 1968.

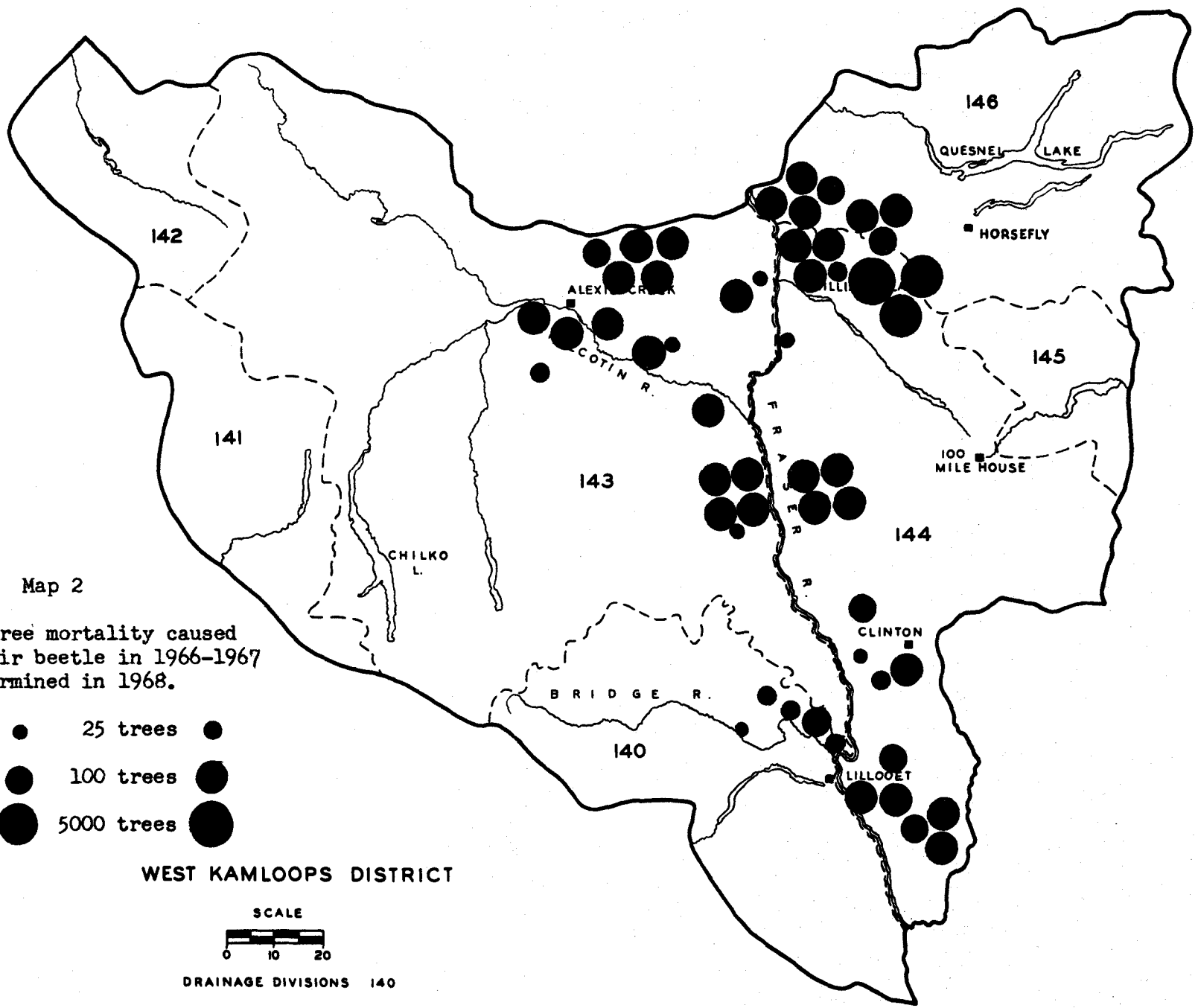
Forest Insect ● Forest Disease ▲

WEST KAMLOOPS DISTRICT

SCALE

0 10 20

DRAINAGE DIVISIONS 140



Map 2

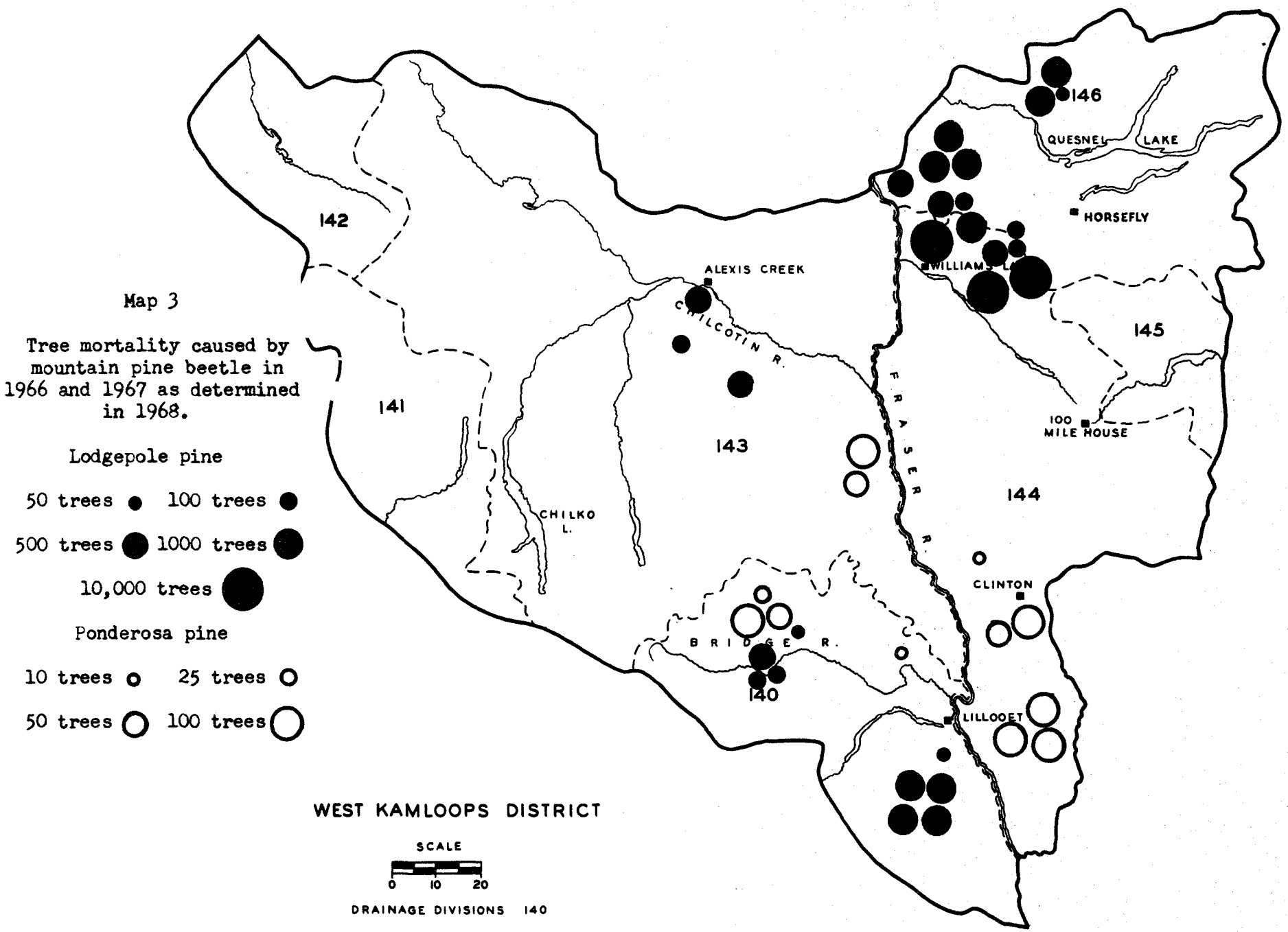
Douglas-fir tree mortality caused by Douglas-fir beetle in 1966-1967 as determined in 1968.

10 trees ● 25 trees ●

50 trees ● 100 trees ●

1000 trees ● 5000 trees ●

WEST KAMLOOPS DISTRICT


Map 3
Tree mortality caused by mountain pine beetle in 1966 and 1967 as determined in 1968.
Lodgepole pine
50 trees
100 trees
500 trees
1000 trees
10,000 trees
Ponderosa pine
10 trees
25 trees
50 trees
100 trees
142
141
143
140
144
145
146
ALEXIS CREEK
CHILCOTIN R.
CHILKO L.
QUESNEL LAKE
HORSEFLY
WILLIAMS L.
FRASER R.
100 MILE HOUSE
CLINTON
BRIDGE R.
LILLOOET
WEST KAMLOOPS DISTRICT
SCALE
0 10 20
DRAINAGE DIVISIONS 140

ANNUAL DISTRICT REPORTS

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA, 1968

PART VI, NELSON SURVEY DISTRICT

by

R. J. Andrews, H. Vanderwal and N. G. Bauman

FOREST RESEARCH LABORATORY

VICTORIA, BRITISH COLUMBIA

INFORMATION REPORT BC-X-33

PART VI

DEPARTMENT OF FISHERIES AND FORESTRY

APRIL, 1969

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1968

NELSON SURVEY DISTRICT

R. J. Andrews [1/]

The Nelson Forest Insect and Disease Survey District comprises the Nelson Forest District. Ranger personnel assigned to the District in 1968 were: N. Bauman, East Nelson; H. Vanderwal, Central Nelson and R. J. Andrews, West Nelson.

There were widespread severe infestations of spruce beetle in mature and overmature spruce stands in the East Kootenay area.

Numbers of pine trees infested by mountain pine beetle increased in the central and western areas and were variable in East Nelson.

There was a slight increase in the number of Douglas-fir killed by Douglas-fir beetle in East Nelson while in West Nelson there was a significant decrease.

Larch sawfly infestations collapsed in 1968 with only light defoliation at scattered localities in West Nelson.

Black-headed budworm caused moderate defoliation of western hemlock at five widely scattered localities in the West Nelson District.

Much of the tree mortality, growth loss and quality reduction attributed to diseases is caused by misteltoes and stem and root rot fungi. These usually intensify at a slow rate which makes annual summaries of their status repetitious; for this reason the following report may not mention 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., frost and drought damage which immediately affect tree appearance and often cause dieback and mortality. Other aspects of the Disease Survey which deal with mortality, growth loss, and factors influencing the occurrence of the more important diseases, are summarized elsewhere.

Drought damage, caused by high temperatures and low precipitation in the summer of 1967 occurred at numerous locations in East and West Nelson districts.

1/ Forest Research Technician, Forest Insect and Disease Survey Senior Ranger, Vernon.

Severe reddening of lodgepole pine and, to a lesser extent, Douglas-fir and ponderosa pine on 600 acres near Kimberley, was attributed to sulphur dioxide fumes.

The following is a list of standard abbreviations for tree species mentioned in this report.

Host Tree Abbreviations

Abbreviation	Common name	Abbreviation	Common name
wC	cedar, western red	Al	alder species
D	Douglas-fir	tA	aspen, trembling
alF	fir, alpine	B	birch species
gF	fir, grand	wCh	chokecherry, western
wH	hemlock, western	bCo	cottonwood, black
lP	pine, lodgepole	W	willow species
pP	pine, ponderosa		
wwP	pine, western white		
eS	spruce, Engelmann		

Special Reports

Spruce Beetle, Dendroctonus obesus

A severe outbreak of spruce beetle, Dendroctonus obesus (Mann.), was reported in Engelmann spruce (Picea engelmanni Parry) in the Flathead Region of the Nelson Forest District in September 1967. General surveys during the winter of 1967-68 revealed heavy timber kill in the Harvey Pass, Cabin and Howell Creek areas and large beetle flights were forecast for 1968. Surveys to determine distribution of infestations in East Nelson were conducted in September 1968.

The major areas of spruce beetle killed timber were located in the Elk, Bull, Wildhorse, Flathead and Wigwam drainages (Map 1). In excess of 15,000 acres were involved in the infestation, encompassing a total gross volume of 74 million cubic feet, of which an estimated gross volume of 41 million cubic feet was attacked by the beetle.

Observations on brood development indicate only a small proportion of beetles reached the teneral adult stage in 1968 and most of the broods will overwinter as larvae. On that basis beetles in condition for flight and fresh attack in 1969 will include parent adults in re-

latively small numbers, a small residual from the 1967 brood and the very small proportion of 1968 brood which developed to adults.

A preliminary report has been sent to the British Columbia Forest Service office in Nelson and will be followed by a final report.

Larch casebearer, Coleophora laricella

INTRODUCTION: The larch casebearer, introduced from Europe, initially attacked tamarack (Larix laricina) in the eastern United States. In 1957, an infestation covering 170 square miles was discovered in western larch (Larix occidentalis) in Idaho. By 1963 it had dispersed over 7,500 square miles in the Idaho Panhandle, northern Washington and northwestern Montana. The insect was first collected in British Columbia in 1966 on western larch at Christina Lake, Salmo, Creston and Yahk. In 1967, surveys determined that the western distribution of casebearer remained near Christina Lake while the eastern range extended to Roosville along the Kootenay River. The northerly range extended to within five miles of the north end of Kootenay Lake and five miles north of Cranbrook.

METHODS: Visual examination of larches was continued in 1968 to determine the distribution and rate of spread of the casebearer in the Nelson Survey District.

Five permanent sampling points established in 1966 near Salmo, Creston and Yahk were sampled in April and October, 1968. The method used was to record the average number of casebearers from four 18-inch branch samples from the mid-crown of each of four trees at each sample point. Population levels were classified as follows: 1-10 casebearers per branch (light), 11-30 per branch (medium), and 30+ per branch (heavy).

In early June, mass collections of late instar larvae and pupae were sent to the Vernon laboratory from the permanent sampling plots at Creston and Salmo to be reared for determining parasitism.

During the first two weeks of August samples of infested larch foliage containing unhatched eggs were collected and sent to the Vernon laboratory to test a sampling method. A solution of 1.5% NaOH was used and foliage containing unhatched eggs was immersed at 12, 24, 36 and 48 hour intervals to determine if this method could be used to sample the egg stage.

RESULTS; In 1968 western larch samples containing larch casebearer had a wider distribution than in 1967 (Map 2). Surveys determined that the casebearer had entered the Kamloops Forest District along the International Boundary at Anarchist Mountain (East Kamloops report). Collections from Rock Creek to the Nelson Forest District boundary at the height of land contained small numbers of casebearers. The northerly

range extended to eight miles north of Kootenay Lake and eight miles north of Cranbrook. Populations within this range had expanded, particularly along the Kootenay River from Roosville to Wardner. Defoliation in June was severe in the Creston area from the International Boundary to Wynndel and east to Kitchener. Groups of larch trees near Salmo, Fruitvale and Yahk showed heavy browning.

Collections of late instar larvae sent to the laboratory from Creston and Salmo disclosed more parasitism than in previous years. Two mass collections of late instar larvae and pupae sent in from near Creston showed 4 and 12% parasitism while a similar collection from Salmo showed 5%. In all, seven species of parasites were reared from these locations. No Agathis pumila, a European parasite released in neighbouring Idaho forests, were found.

Autumn populations at the Salmo and Creston plots increased while those at North Creston, Porthill and Yahk showed a decrease (Table 1).

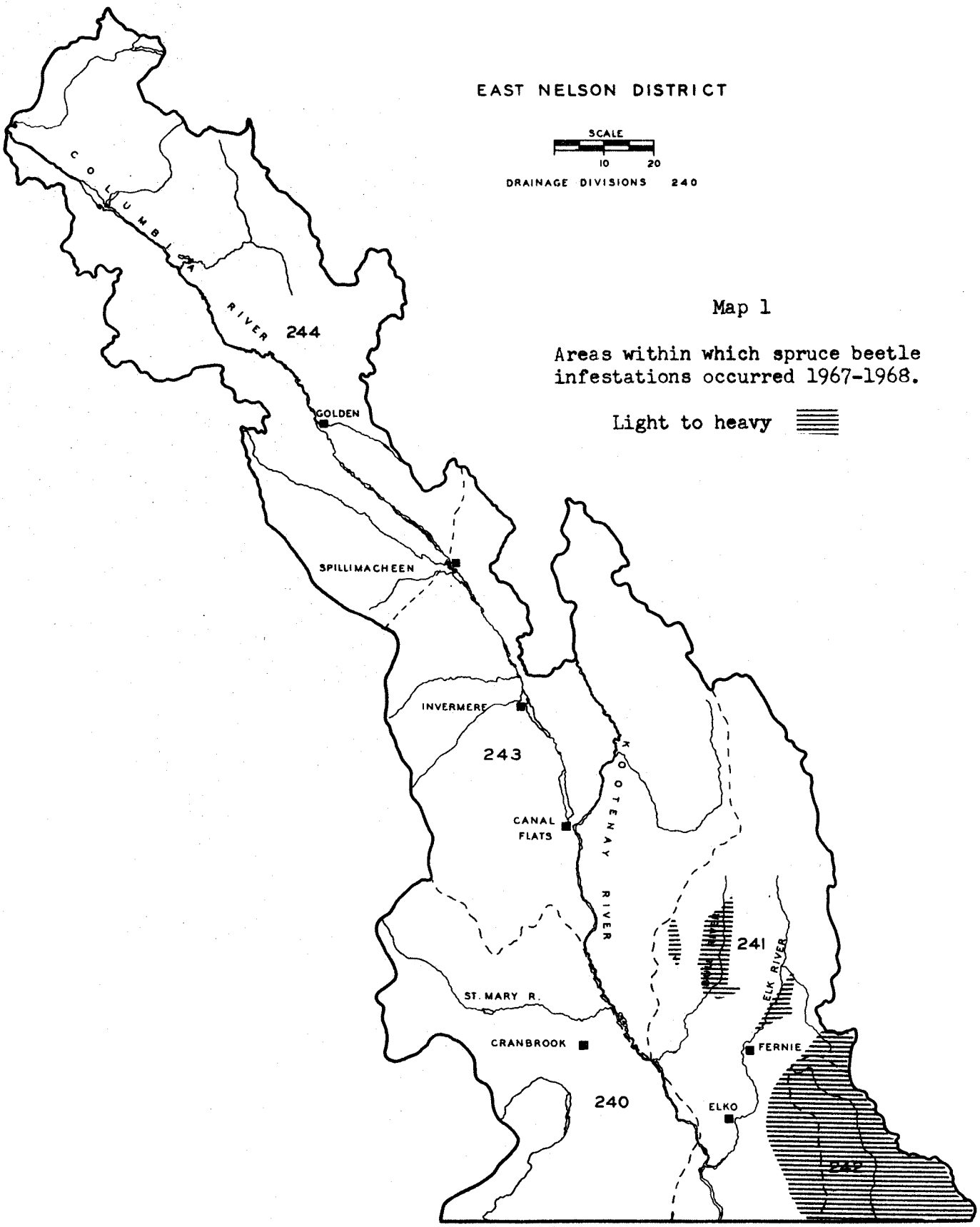
Table 1. Larch casebearer populations at five plots
Nelson District

Locality	Av. no. casebearers per 18-inch branch			
	1967		1968	
	April	October	May	October
Salmo	33	55	42	128
N. Creston	164	75	28	36
W. Creston	85	81	46	93
Porthill	80	207	102	165
Yahk	8	23	8	13

The results of the egg washing trials were inconclusive and more trials will be conducted in 1969.

DISCUSSION: Increases in population as well as wider distribution may be expected in 1969. Expanded areas of severe browning near Creston, Salmo, Yahk and Fruitvale may be expected.

Parasitism has increased but is still negligible. Casebearers parasitized by Agathis pumila will be collected in Idaho in April 1969 and released at two locations near Creston.



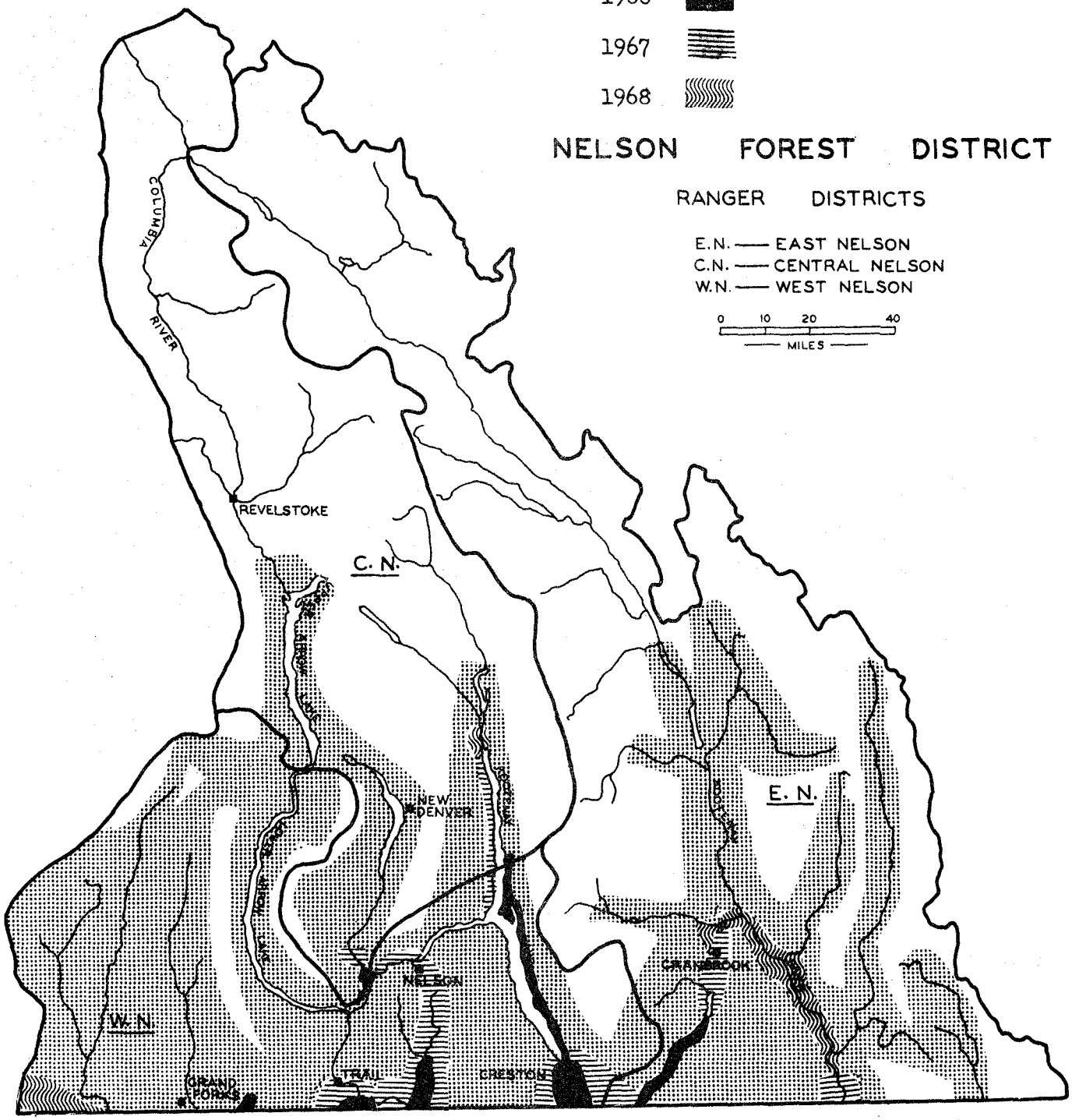
Map 1

Areas within which spruce beetle infestations occurred 1967-1968.

Light to heavy

Map 2

Distribution of western larch and locations where larch casebearer was collected in 1966-1968.



FOREST INSECT AND DISEASE SURVEY

WEST NELSON

1968

R. J. Andrews

INTRODUCTION

Field work began on May 6 and ended on November 8. Special surveys were: larch casebearer, May 9-23, October 9-10; larch sawfly, October 10-11; black-headed budworm, October 8-10. In addition, six weeks were spent in East Nelson on spruce beetle investigations.

Defoliators were less numerous; 82% of the random samples contained larvae, compared with 95% in 1967 and 87% in 1966.

Totals of 291 insect and 68 forest disease collections were made in the District. Table 1 shows the collections by host. Collection points and drainage divisions are shown on Map 1. The principal problems in each Forest Insect and Disease Survey Drainage Division are shown in Table 2.

Table 1. Collections by Hosts, West Nelson, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	2	0	Aspen, trembling	0	1
Douglas-fir	57	26	Cherry, choke	1	0
Fir, alpine	27	3	Cottonwood, black	2	0
Fir, grand	10	1	Willow	3	0
Hemlock, western	48	2			
Larch, western	56	5			
Pine, lodgepole	22	24			
Pine, ponderosa	13	2			
Pine, western white	3	0			
Spruce, Engelmann	47	4			
Totals	285	67	Totals	6	1
			GRAND TOTALS	291	68

Table 2. Currently important insect and disease problems [1/] by drainage divisions, West Nelson, 1968

Insect and disease problems	Principal hosts [2/]	Importance by drainage division [3/] 200	201	202	203
Bark Beetles					
Douglas-fir beetle	D	4	4	0	0
Mountain pine beetle	lP, pP	4	4	4	0
Defoliators					
Larch casebearer	wL	0	0	3	4
Physiological Diseases					
Drought damage	D, lP	4	4	4	4

1/ Includes only weather-induced and foliage diseases subject to notable annual fluctuations.

2/ Refer to host code in main district introduction.

3/ High population and/or widespread outbreak in progress - 5.

Scattered high populations and/or significant damage in restricted areas - 4.

Rising population and/or moderate numbers and/or potential problem - 3.

Static or falling population and/or moderate numbers and/or no problem at present - 2.

Endemic population and/or no significant damage - 1.

Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Douglas-fir beetle, *Dendroctonus pseudotsugae*

Counts of attacked trees in 1967 indicated an increasing population; however, attacked trees counted in 1968 were confined to a relatively small area near Beaverdell as follows: Little Goat Creek, 15; Beaverdell Creek, 180; Cranberry Ridge, 70; Wallace Lake, 50.

Mountain pine beetle, *Dendroctonus ponderosae*

There was increased attack on lodgepole and western white pine. Almost 1,100 white pine were killed in wet belt areas. They were concentrated as follows: 530 near Erie Creek, 120 trees between Salmo and Hall Creek, 100 near Priest Creek and 140 in the Whatshan Lake area. There were 650 beetle-killed lodgepole pines north of Beaverdell, compared with 285 in 1967.

A total of 445 ponderosa pine were killed. Beetle-infested mature and overmature ponderosa pine in the Lois-Beaverdell Creek area decreased from 150 in 1967 to 30 in 1968. There were small infestations of 1 to 25 trees near the Kettle River from Beaverdell to Christina Lake.

Defoliators

Larch casebearer, *Coleophora laricella*

See special report following Survey District introduction.

Other Noteworthy Insects

Spruce beetle, *Dendroctonus obesus*

Stumps, butts and logs in the Boundary Creek area, where a moderate attack occurred from 1954-58, were checked with negative results along a road right-of-way. Near Erie Creek in the Salmo district, right-of way logs had an average of five beetles per square foot in four square-foot bark samples. No green infested trees were seen.

Engraver beetles, *Ips* sp.

There were 150 pole-sized ponderosa pine killed in each of two areas near Midway and 100 near Granby River.

Near Midway, infested standing pine surrounded a clearing where pines had been bulldozed into piles. Some of the discolored trees were attacked only on the upper stem.

Black-headed budworm, Acleris variana

Larvae were commonly collected from western hemlock, Engelmann spruce, alpine fir and Douglas-fir (Table 3).

Table 3. Summary by hosts of black-headed budworm collections during larval period June 1 - August 15

Host	No. samples taken during larval period			% samples containing larvae			Av. no. larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
Western hemlock	39	47	43	95	96	67	54	96	59
Engelmann spruce	10	17	16	80	82	31	3	29	15
Alpine fir	13	23	26	23	70	50	2	62	9
Douglas-fir	58	59	52	22	19	3	1	1	1

Light to moderate defoliation occurred on overmature western hemlock stands at five locations. During June larvae were common and samples containing 75 to 200 larvae per three-tree beating were collected at Giveout, Hall, Leadville, Gray and Inonoaklin creeks.

The 894 larvae reared to determine parasitism (Table 4) substantiated field observations that parasitism in the larval stage was greater than in 1967.

Table 4. Results of mass rearing of black-headed budworm, West Nelson, 1968

Location	No. of larvae collected	Percentage 1/			
		Pupation	Parasitism		Adult emergence
			Larvae	Pupae	
Hall Cr.	160	14	36	5	10
Gray Cr.	204	42	24	16	26
Leadville Cr.	169	10	62	3	7
Inonoaklin Cr.	168	22	62	1	12
Giveout Cr.	193	41	9	0	24

1/ Percentage of original numbers collected. Larvae and pupae that died from unknown causes not tabulated.

In the 100 tree plot established in 1966 at Crawford Creek, annual records show maximum defoliation in 1966 was 92%; in 1967, 33% and in 1968 no defoliation was recorded. No top-kill was evident in 1966; 12 trees suffered top-kill of 2 to 6 feet in 1967 and there was no change in 1968.

Egg samples were made on two 10-inch branch samples taken from each of three crown levels of each of three dominant western hemlock at four locations. The guide for predicting the next year's defoliation based on the average number of eggs per 10-inch branch is as follows: light, one to seven eggs; moderate, 8 to 15 and heavy, 16 or more eggs. The average number of eggs per 10-inch branch were as follows: Gray Creek, 0.9; Giveout Creek, 0.02; Leadville Creek, 0.0; and Hall Creek, 2.0. Defoliation of 10 trees ranged from a trace at Hall and Leadville creeks to 25% of the current year's foliage at Giveout Creek. Little or no defoliation is expected in 1969.

Larch sawfly, Pristiphora erichsonii

Damage to western larch was light. Defoliation seen from aircraft occurred on an estimated five-acre area near the south end of Christina Lake. Near Gray Creek there were thin crowns of individual trees. Along the Granby River and near Phoenix, portions of branches were lightly defoliated.

No defoliation was noticeable and no mortality recorded in the 100-tree plot south of Salmo.

The number of cocoons in one-square-foot samples of duff and soil taken from beneath each of 10 marked trees at each of five localities, indicated the number of sound (unopened and apparently undamaged) and unsound (empty) cocoons at each locality (Table 5).

Table 5. Cumulative number of larch sawfly cocoons in 10 one-square-foot duff samples at each of five localities, West Nelson

Locality	Number of cocoons					
	Sound			Unsound		
	1966	1967	1968	1966	1967	1968
Gray Creek	473	185	54	534	407	499
Salmo	510	230	129	575	917	334
Eholt	-	203	23	-	336	73
Beaverdell	-	352	14	-	148	60
N. Salmo	-	191	26	0	269	103

Parasitism and other mortality factors were determined by dissection (Table 6).

Table 6. Classification of sound cocoons at each of five plots, West Nelson, 1968

Locality	No. of cocoons				
	Total no.	With living larvae	Parasitized by *Tritneptis*	Moldy	Dead, unknown causes
Gray Cr.	54	11	2	32	9
Salmo	129	0	6	109	14
Eholt	23	1	0	2	20
Beaverdell	14	3	0	5	6
N. Salmo	29	1	3	18	7

Many apparently sound cocoons did not contain healthy larvae. The incidence of mold was high; such cocoons may have been old. It was impossible to differentiate between healthy and moldy cocoons without opening them. Living larvae were not dissected to determine parasitism by *Mesoleius tenthredinus* in 1968.

The larch sawfly epidemic has collapsed and little damage is expected in 1969.

Engelmann Spruce Weevil, *Pissodes engelmanni*

Trees were examined in 16 localities. Weevil populations were light and confined to the Upper Westkettle River area where 1 to 10% of the trees were infested.

Cooley spruce gall aphid, *Adelges cooleyi*

Some 473 square feet of spruce foliage from 400 trees at 16 locations revealed less than one spruce gall per square foot of foliage.

Aspen leaf miner, *Phyllocnistis populiella*

Populations were light. At Grand Forks, Jewel Lake and near Phoenix, insufficient infested leaf surfaces made it impossible to determine adult emergence (Table 7).

Table 7. Aspen leaf miner infestations, West Nelson

Locality	Percentage of leaf surfaces with mines			No. of adults produced per 100 leaf surfaces		
	1966	1967	1968	1966	1967	1968
Greenwood	17	4.4	1.0	1.4	2.4	-
Grand Forks	3	1.1	0.2	0.5	-	-
Phoenix 1/	6	2.3	9.0	1.5	0.3	-
Crawford Cr.	62	87.2	21.0	1.4	26.2	8.6

1/ Sample trees removed. 1968 samples taken on aspen trees within one mile of former plot.

Near Crawford Creek, the population decreased considerably from 1967. Parasitism was 16% while mortality from other causes was 12%.

Fall webworm, Hyphantria cunea

Tents were numerous. Near Genelle and Wynndel tent counts on various hosts were made (Table 8).

Table 8. Roadside web counts of fall webworm near Genelle and Wynndel, West Nelson

Locality	Hosts	Mi. 0-1	1-2	2-3	Av. per mile
Genelle	Chokecherry	0	23	7	10.0
	Cottonwood	1	164	26	63.2
	Elm	3	105	20	42.6
	Birch	0	14	6	6.6
	Elderberry	13	0	0	4.3
	Alder	0	0	5	1.6
Totals, 1968		17	306	64	129
1967		340	73	39	150.6
Wynndel	Chokecherry	141	63	78	94.0
	Cottonwood	20	13	45	26.0
	Alder	0	2	26	9.3
	Saskatoon	0	6	23	9.6
	Elderberry	0	4	11	5.0
Totals, 1968		161	88	183	114
1967		66	61	15	47.3

Table 9. Other insects of current minor significance

Insect	Host 1/	Locality	Remarks
Altica sp.	Al	Widespread	Heavy defoliation along most water courses.
Choristoneura fumiferana Spruce budworm	D, wH, eS, alF	Widespread	Defoliator. Low population.
Cryptorhynchus lapathi Poplar-and-willow borer	W	Goat River	Stem borer. Willow commonly infested.
Galerucella sp. A leaf beetle	W	Lower Arrow	Leaf skeletonizer. Light to moderate defoliation.
Lambdina fiscellaria lugubrosa Western hemlock looper	wH, D, alF	Nelson, Creston	Defoliator. Low population.
Melanolophia imitata Green-striped forest looper	D, wH	Widespread	Defoliator. Of 52 collections of Douglas-fir during larval period, 50% averaged 4.8 larvae. Of 43 collections of wH, 34% averaged 3.3 larvae.
Mindarus abietinus Balsam twig aphid	alF	Giveout Creek	Sucking insect. Moderate to heavy population in small area.
Pleroneura borealis Alpine fir twig sawfly	alF	Keefer Lake Rd.	Tip borer. 24% of tips infested on regeneration roadside trees.

1/ Host tree abbreviations appear in the Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Stem Diseases

Stem canker disease of lodgepole pine, *Peridermium stalactiforme*

Heavy infection occurred along the summit portion of the Monashee Highway and the summit of the Blueberry Cutoff between Christina Lake and Castlegar. Cankers 4 to 20 feet long were found on 2 to 24% of the pines. Occasional dead pines near Nancy Green Lake were girdled by cankers.

Physiological Diseases

Drought Damage

The 1967 drought caused dieback of pole-sized Douglas-fir and killed regeneration in 1 to 5 acre patches near Summit Creek and along Kettle River from Christina Lake to Grand Forks. Near Brilliant, similar damage occurred on western larch and lodgepole pine. Regeneration and pole-sized lodgepole pines were killed intermittently from Beaverdell to Kallis Creek. All areas were near extensive rock outcroppings.

Specific Surveys

Stem canker disease of lodgepole pine, *Atropellis piniphila*

Infection by *Atropellis* was found only in the western sections. Lodgepole pine stands from Big White Mountain turnoff to Westbridge were infected by this disease. In 50-tree samples at eight locations in the Westkettle and Kettle drainages, infection ranged from 2 to 14%.

Root rot of immature stands

Eleven centres of *Armillaria mellea* and 10 centres of *Poria weirii* were found. The number of diseased Douglas-fir trees in each centre ranged from 2 to 11.

There were three areas heavily infected with *Poria* root rot near Lower Arrow Lake within which infection foci had coalesced. Infection had occurred on Douglas-firs from 3 to 14 inches dbh growing in shallow soil on very rocky steep terrain.

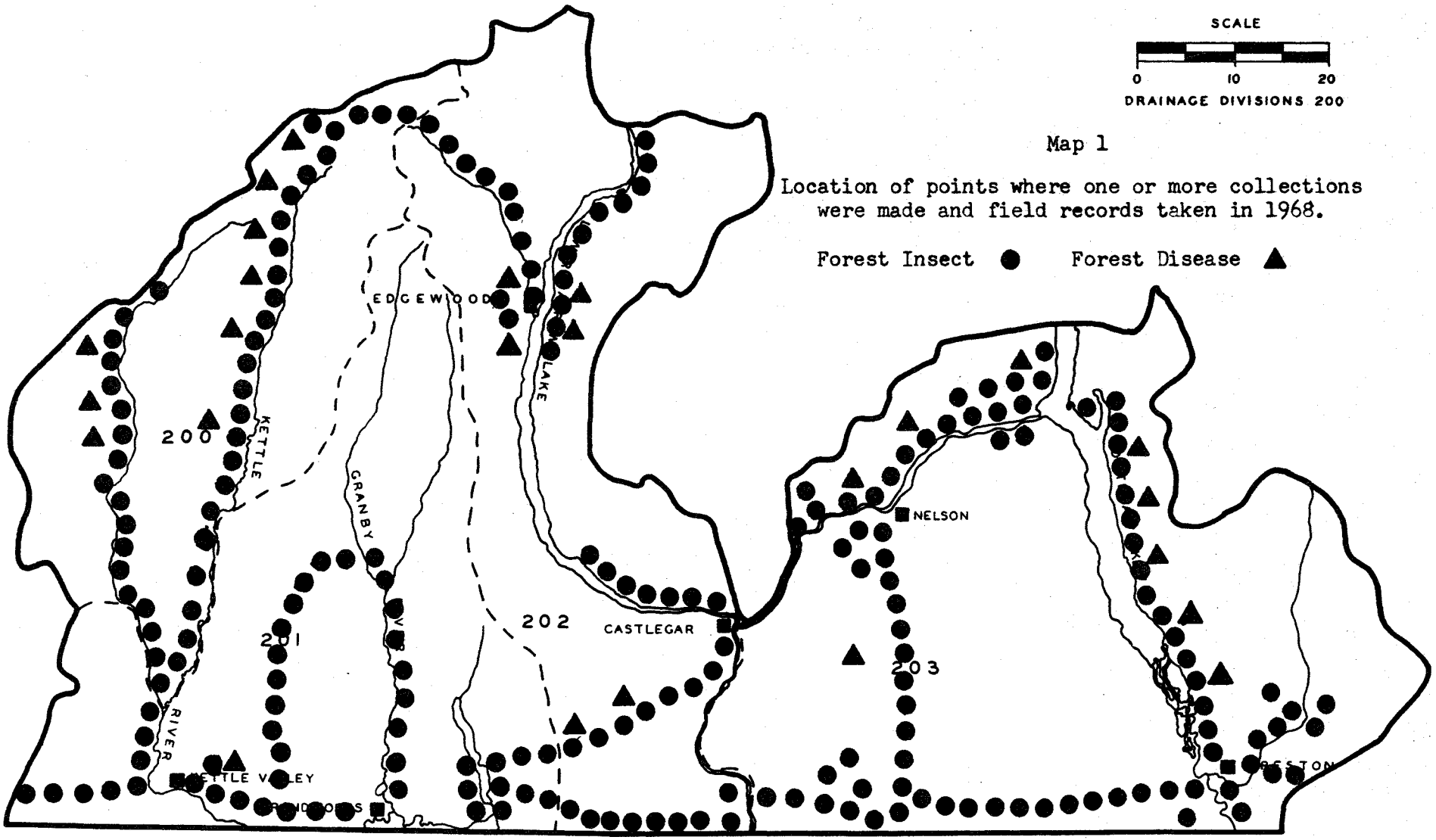
Infection centres of *A. mellea* were found in both wet and dry-belt areas.

Other Noteworthy Diseases

Table 10. Other diseases of current minor significance

Organism	Host 1/	Locality	Remarks
Ascocalyx sp.	alF	Kallis Cr.	Branch dieback. Common in mixed lP, eS and alF stands.
Dermea pseudotsugae	D	Blewett	Causing dieback. Group of 15 regeneration trees dead and dying.
Elytroderma deformans	pP	Anarchist Mountain	Needle cast. Anarchist Mtn. to Rock Cr. 25% of trees showing from 10-50% infection.
Hypodermella laricis	wL	Nicholson Cr., Ingram Cr.	Needle cast 10-50% infection in 10-20 acres.
Melampsora epitea	wL	Rock Cr.	Needle rust. 3 trees 10-25% infected.
Potebniamyces balsamicola	alF	Kettle R.	Causing dieback. Common on branches.

1/ Host tree abbreviations appear in the Introduction.


WEST NELSON DISTRICT
SCALE
0
10
20
DRAINAGE DIVISIONS 200
Map 1
Location of points where one or more collections were made and field records taken in 1968.
Forest Insect
Forest Disease
EDGEWOOD
LAKE
KETTLE
GRANBY
200
201
202
203
CASTLEGAR
NELSON
RIVER
KETTLE VALLEY

FOREST INSECT AND DISEASE SURVEY,

CENTRAL NELSON

1968

H. Vanderwal 1/

INTRODUCTION

Regular field work began May 15 and ended September 6. Special surveys were made for root rots of immature stands, pests of exotic tree species, Rhizina root rot, Atropellis canker, spruce gall aphid and Engelmann spruce weevil. The writer was also involved in spruce beetle and other surveys throughout the Nelson Survey District.

Insect and disease collections made in the District are shown by host in Table 1; collection localities are shown in Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Drainage divisions are illustrated in Map 1. Details on individual insect and disease problems follow this introduction.

Numbers of larval defoliators collected in the field decreased considerably this year: 78% of beating collections contained larvae compared with 95% in 1967 and 89% in 1966.

Black-headed budworm and larch sawfly populations were light as was predicted by egg and cocoon sampling in 1967.

Larch casebearer spread 10 miles northward to Cooper creek. West of Kootenay Lake the distribution was unchanged.

The number of white pine killed by mountain pine beetle was up 1,600 over 1967.

Armillaria mellea and Poria weirii, root rot fungi, were frequently found attacking Douglas-fir within hemlock-cedar stands. Drought conditions during the summer of 1967 resulted in considerable mortality of lodgepole pines growing on rocky sites in the southern half of the Slocan Valley.

1/ Forest Research Technician, Forest Insect and Disease Survey Ranger, Vernon.

Table 1. Collections by hosts, Central Nelson, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	25	4	Alder species	1	0
Douglas-fir	73	21	Aspen, trembling	5	2
Fir, alpine	5	9	Birch species	5	0
Fir, grand	1	0	Cottonwood, black	3	0
Hemlock, western	91	16	Willow species	1	0
Juniper, Rocky Mtn.	1	0			
Larch, western	27	8			
Pine, lodgepole	35	20			
Pine, ponderosa	0	1			
Pine, western white	33	3			
Spruce, Engelmann	43	2			
Totals	334	84	Totals	15	2
			Flight traps	26	0
			Misc. hosts	0	1
			No hosts	0	1
			GRAND TOTALS	375	98

Table 2. Currently important insect and disease 1/ problems by drainage divisions, Central Nelson, 1968

Insect and disease problems	Principal hosts 2/	Importance by drainage divisions 3/					
		220	221	222	223	224	225
Bark Beetles							
Mountain pine beetle	wwP	1	1	3	3	1	1
Physiological Diseases							
Drought damage	lP	3	0	0	0	0	0

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in main Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.

Scattered high populations and/or significant damage in restricted areas - 4.

Rising population and/or moderate numbers and/or potential problem - 3.

Static or falling population and/or moderate numbers and/or no problem at present - 2.

Endemic population and/or no significant damage - 1.

Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Mountain pine beetle, Dendroctonus ponderosae

Counts of red-topped western white pine increased from 2,005 in 1967 to 3,505 (Table 3). Many beetle-infested trees were also infected with white pine blister rust. Volumes are based on measurements of beetle-killed trees at several localities.

Table 3. White pine killed by mountain pine beetle in 1967 as determined by aerial and ground surveys, 1968

Locality	No. of trees killed	Volume (cu. ft.)
Slocan Lake	275	11,550
Wilson Creek - Nakusp	225	9,450
West shore Upper Arrow Lake	725	30,450
East shore Upper Arrow Lake	200	8,400
Incomappleux River	375	15,750
Staubert Lake	400	16,800
Trout Lake	725	30,450
Poplar Creek	25	1,050
Howser Ridge	125	5,250
Meadow Creek	75	3,150
Kaslo	75	3,150
Rogers Pass	70	2,940
Revelstoke	35	1,470
Big Bend Highway	175	7,350
Totals	3,505	147,210

Other Noteworthy Insects

Black-headed budworm, Acleris variana

Larval populations declined (Table 4). Populations high in 1967 in the Slocan Valley and Kootenay Lake area dropped to very low levels. A maximum of 31 larvae per beating collection occurred in isolated pockets of understory hemlock on the west side of Kootenay Lake north of Kaslo. Populations are expected to remain low in 1969.

Table 4. Summary of black-headed budworm collections, Central Nelson

Host	No. samples taken during larval period			% samples containing larvae			Av. no. larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
wH	63	62	79	92	93	34	48.9	61.8	7.0
eS	24	20	28	45	95	43	6.6	8.5	4.0
alF	8	13	5	37	69	0	3.7	13.4	-
D	70	50	65	36	64	10	2.4	3.3	1.6

Host tree abbreviations are given in introduction to Survey District report.

Spruce budworm, Choristoneura fumiferana

Larvae were very scarce. The following summary compares collections this year from Douglas-fir and western hemlock with previous years.

Host 1/	No. samples taken during larval period				% samples containing larvae				Av. no. larvae per positive sample			
	1965	1966	1967	1968	1965	1966	1967	1968	1965	1966	1967	1968
D	55	50	42	78	18	16	16	9	1.6	1.6	2.3	1.0
wH	56	80	66	65	17	11	22	18	1.5	2.2	5.2	1.2

1/ Host tree abbreviations are given in introduction to Survey District report.

Larch sawfly, Pristiphora erichsonii

Populations continued to decline. There was no defoliation or tree mortality in the 100 tree plot at Perry's Siding. Small pockets of western larch near Winlaw produced 125 larvae per sample but little or no defoliation was evident. Aerial surveys disclosed no noticeable defoliation. The following summary indicates the population trend; there will probably be further decline in 1969.

No. samples taken during larval period				% samples containing larvae				Av. no. larvae per positive sample			
1965	1966	1967	1968	1965	1966	1967	1968	1965	1966	1967	1968
25	21	8	24	48	47	44	28	41.8	63.5	58.6	27.4

Larch casebearer, Coleophora laricella

See report in the introduction to this Survey District report.

Western hemlock looper, Lambdina fiscellaria lugubrosa

The number of samples containing larvae declined; the highest number collected in a random sample was five larvae from Engelmann spruce at Ferguson. The trend indicates probable low populations in 1969 (Table 5).

Table 5. Summary of western hemlock looper collections, Central Nelson

Host	No. of samples taken during larval period			% samples containing larvae			Av. no. larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
wH	85	79	78	19	16	10	1.5	1.3	1.4
eS	22	23	28	9	8	11	1.0	2.5	2.6
wC	23	43	20	26	18	5	3.0	1.6	1.0
D	57	62	65	5	3	2	1.9	5.5	1.0

Green-striped forest looper, Melanolophia imitata

The number of samples containing larvae decreased slightly and the number of larvae per positive collection remained low (Table 6). Larvae should be common in 1969, but in low numbers.

Table 6, Summary of green-striped forest looper collections, Central Nelson

Host	No. samples taken during larval period		% samples containing larvae		Av. no. larvae per positive sample	
	1967	1968	1967	1968	1967	1968
wH	74	65	44	38	2.5	3.5
wC	38	20	52	40	2.7	2.7
D	51	78	76	40	3.2	3.3
wwP	22	20	30	5	1.5	1.0

Cooley spruce gall aphid, Adelges cooleyi

Damage to spruce branch terminals by this aphid was light. Galls were counted on one branch from the lower mid-crown of 25 spruce at each of six locations, and the number of galls per square foot was calculated (Table 7). The highest number of galls occurred at Little Slocan Access Road.

Table 7. Cooley spruce gall aphid damage, Central Nelson

Location	Galls per sq. ft.
Little Slocan Access Rd.	2.70
Wilson Creek	1.80
Retallack	1.80
Shannon Creek	0.66
Glacier Station	0.66
Ferguson	0.25

Douglas-fir needle midges, Contarinia spp.

Damage to needles remained relatively light. The percentage of current needles mined by Contarinia sp. was determined at five plots in August (Table 8).

Table 8. Douglas-fir needle midge infestation, Central Nelson

Locality	% current year's needles mined		
	1966	1967	1968
Thrums	58	1	1
Lemon Creek	38	0	9.3
Gwillum Creek	10	0	2.9
Vallican	40	0	0.8
Little Slocan River	40	1	2.5

Aspen leaf miner, Phyllocnistis populiella

Intensity of damage varied widely throughout the range of aspen. Percentage of leaves infested increased at four of five permanent sampling points. Data were determined by examining the foliage on one 12-inch branch from each of 10 trees at each plot (Table 9). Table 10 shows the results of cocoon examinations.

Table 9. Aspen leaf miner populations, Central Nelson

Locality	Percentage of leaf surfaces with mines				No. of adults produced per 100 leaf surfaces			
	1965	1966	1967	1968	1965	1966	1967	1968
Revelstoke	72	53	55	40	43	17	33	35
McKay Creek	64	38	14	31	52	10	3	32
Summit Lake	69	38	33	12	49	18	29	37
New Denver	67	49	50	18	42	16	37	39
Winlaw	69	50	49	33	22	6	14	35

Table 10. Mortality of aspen leaf miner in 100-cocoon samples at five locations, Central Nelson

Locality	% mortality							
	Parasitism				Other causes			
	1965	1966	1967	1968	1965	1966	1967	1968
Revelstoke	20	18	15	23	13	30	15	7
McKay Creek	12	22	26	34	20	12	26	1
Summit Lake	8	16	19	24	17	12	12	1
New Denver	13	12	8	21	11	40	16	2
Winlaw	24	15	23	25	15	30	31	5

Engelmann spruce weevil, Pissodes engelmanni

One hundred pole-size and reproduction spruce were examined. At Passmore 10% of the trees in one plot and 3% in another had currently infested leaders. Plots near Hills, Kaslo and Glacier Station were negative.

Table 11. Other insects of current minor significance

Insect	Hosts 1/	Locality	Remarks
Altica sp. Alder flea beetle	Al, bCo	Widespread	Leaf skeletonizer. Very common on roadside alder bushes. 100% skeletonizing common on bushes in the Slocan Valley.
Conophthorus sp. White pine cone beetle	wwP	Kaslo	Cone beetle. 10% of cones collected from the ground were infected.
Dryocoetes - Ceratocystis complex Western balsam bark beetle	alF	Koch Cr., Goldstream R., Rogers Pass	Bark beetle-fungus complex. Three groups of approximately 65 red-topped trees noted during aerial surveys of subalpine forests at each location.
Galerucella sp. A willow leaf beetle	W, Al	Summit L., Kaslo	Leaf skeletonizer. Light to moderate damage.

Table 11 continued

Insect	Hosts 1/	Locality	Remarks
Lyonetia sp. A leaf blotch miner	B, tA	Rogers Pass, Trout L., Kootenay L.	Leaf miner. Heavy browning of foliage on clumps and bushes.
Megastigmus sp. A cone chalcid	D	Rosebery	Cone chalcids. 4% of 100 cones (from 1,900 feet elevation) were infested.
Monochamus spp. Sawyer beetles	wwP	Nakusp, Meadow Cr.	Wood borers in white pine killed by blister rust. Moderate numbers.
Neodiprion sp. A hemlock sawfly	wH	Widespread	Defolator. Populations low, positive collections decreased to 25% from 43% in 1967. Average number of larvae per collection was the same as 1967.
Neophasia menapia Pine butterfly	lP, wwP	Gwillum Cr., Trout L.	Defoliator. Small numbers of adults seen in flight at Trout Lake; one larva collected on lodgepole pine at Gwillum Creek.
Nepytia freemani A looper	D, wH	Widespread	Defoliator. Scarce.

1/ Host tree abbreviations appear in Survey District introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Stem Diseases

Western larch mistletoe, Arceuthobium campylopodum

This disease generally on overmature trees, was widely distributed throughout the range of western larch. There are many mistletoe-deformed trees along the east side of Slocan Lake to Slocan, and the Slocan River from Slocan to Winlaw. Lighter infections occurred at Mosquito and Cedar creeks.

White pine blister rust, Cronartium ribicola

Cankers occur on white pines of all ages throughout this tree's range. Many regeneration-size trees were infected in the Arrow Park-Mosquito Creek drainage. Other areas where infections were common were Trout Lake, Revelstoke-Mica Creek and Slocan Lake drainages.

Physiological Diseases

Drought damage

Two hundred drought-killed lodgepole pines 2 to 6 inches in diameter were observed at Evans Creek near Slocan Lake. Scattered pines on rocky exposures in South Slocan Valley were also killed.

Specific Surveys

Atropellis canker

Of 10 areas examined, eight were negative. One and two infected stems were found in the 50 trees each examined at Passmore and Kaslo. Scarcity of lodgepole pine stands of merchantable size and a low incidence of the disease make this a minor problem.

Exotic tree species

Fifty young trees were examined at each of four plantations, two of Sitka spruce and two of mixed poplar species. No significant pests were encountered. Competition from brush and natural regeneration has retarded growth in all except the plantation at Marblehead where trees are well established.

Rhizina root rot

Seven new plantations, with the sites burned prior to planting, and four burned, naturally regenerated areas were examined for Rhizina root rot, a disease which kills seedlings. No fruiting bodies were found.

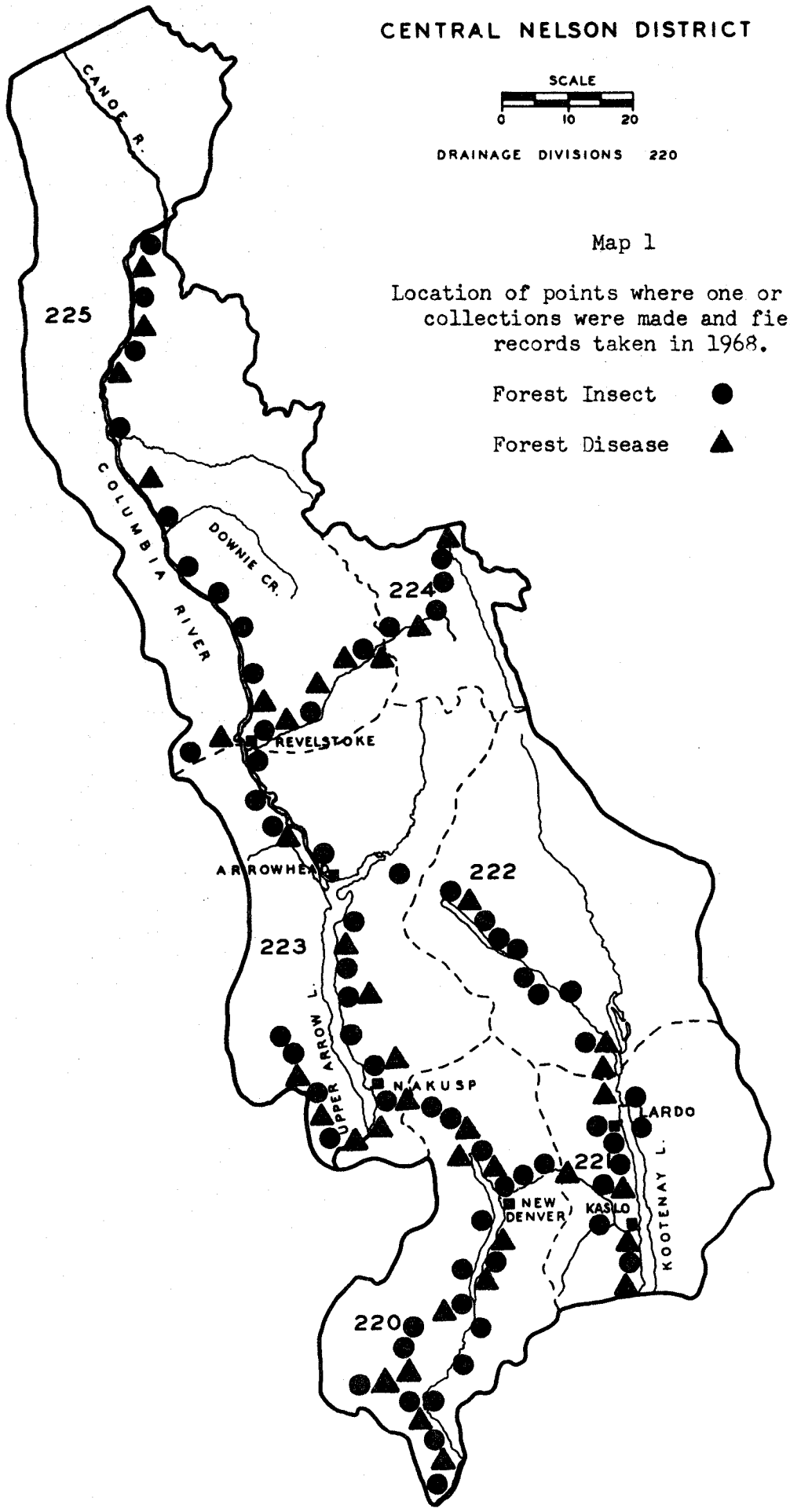
Root rots of immature and mature stands

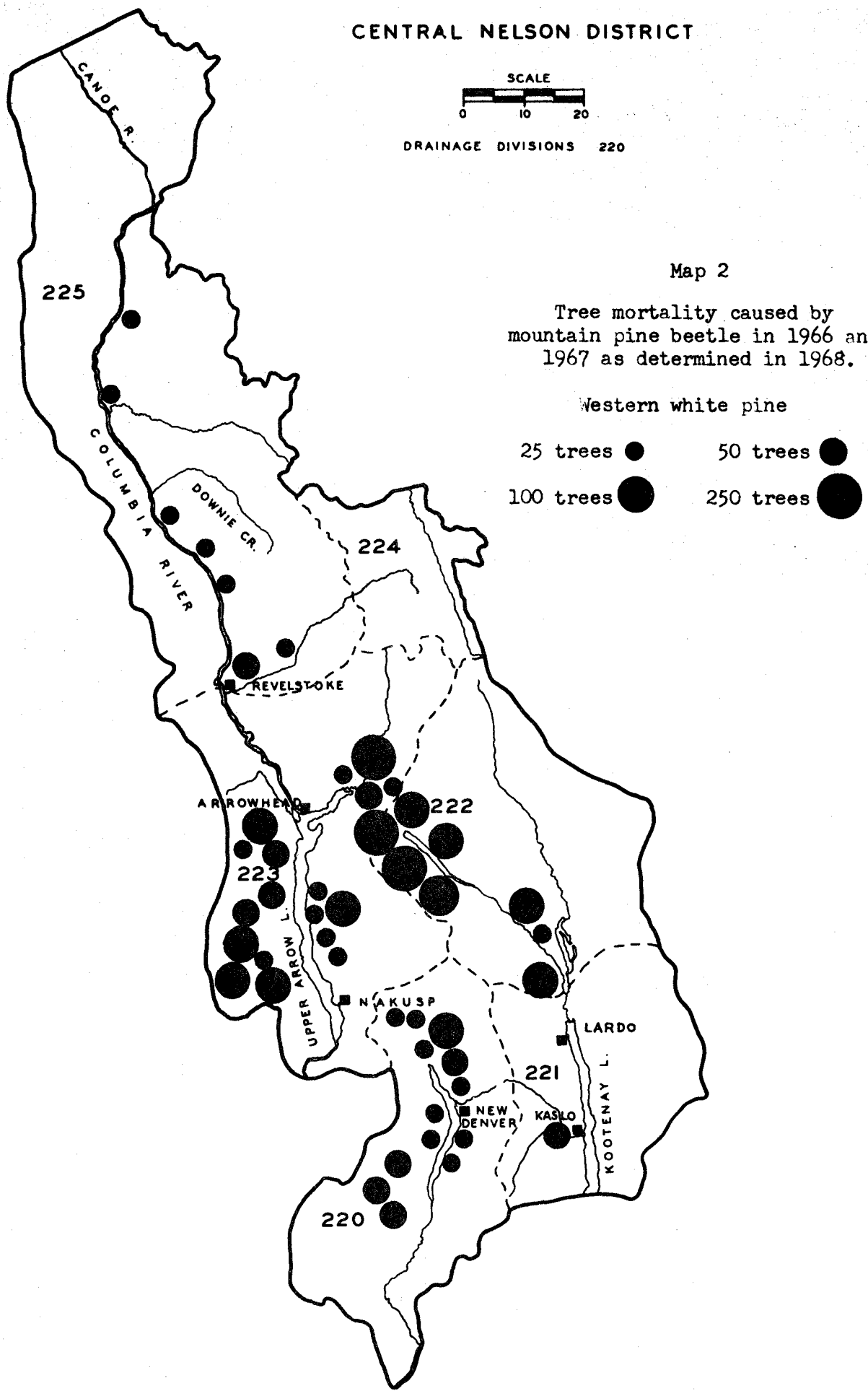
Douglas-fir growing in the hemlock-cedar type, particularly in transition from wet sites to drier pine sites, were frequently attacked by root rot fungi Poria weirii and Armillaria mellea. Ten infection centres of Poria weirii were found; numbers of trees killed varied from 1 to 20 with an average of 10. In an infection centre at Meadow Creek 20 pole-sized trees were killed within a radius of 200 feet. Nine infection centres of Armillaria mellea were located. Tree mortality ranged from 6 to 15 trees per centre with an average of 8.7 trees. Highest tree mortality caused by Armillaria occurred at Rosebery where 15 trees were killed within a radius of 100 feet.

Other Noteworthy Diseases

Table 12. Other diseases of current minor significance

Organism	Hosts	Locality	Remarks
Arceuthobium americanum	lP	Kuskanax Cr.	Dwarf mistletoe. 25 semi-mature trees examined; 40% were infected.
Didymascella thujina	wC	St. Leon, West Demars	Cedar leaf blight. Light infection; occurs sporadically on roadside trees.
Herpotrichia juniperi	alF	Idaho Mtn.	Snow blight. Common on lower branches of young trees.
Hypodermella laricis	wL	Beaver L., Kaslo	Needle cast. Localized infections occur frequently on young trees.
Marssonina populi	tA	Rogers Pass, Thrums	Leaf spot and shoot blight. Patches totalling approximately 100 acres.


CENTRAL NELSON DISTRICT
SCALE
0 10 20
DRAINAGE DIVISIONS 220
Map 1
Location of points where one or more collections were made and field records taken in 1968.
Forest Insect
Forest Disease
CANOE R.
225
COLUMBIA RIVER
DOWNIE CR.
224
REVELSTOKE
ARROWHEAD
223
222
UPPER ARROW L.
NAKUSP
LARDO
221
NEW DENVER
KASLO
KOOTENAY L.
220


CENTRAL NELSON DISTRICT
SCALE
0 10 20
DRAINAGE DIVISIONS 220
Map 2
Tree mortality caused by mountain pine beetle in 1966 and 1967 as determined in 1968.
Western white pine
25 trees
50 trees
100 trees
250 trees
CANOE R.
225
COLUMBIA RIVER
DOWNIE CR.
224
REVELSTOKE
ARROWHEAD
222
223
UPPER ARROW L.
NAKUSP
LARDO
221
NEW DENVER
KASLO
KOOTENAY L.
220

FOREST INSECT AND DISEASE SURVEY

EAST NELSON

1968

N. G. Bauman[1/]

INTRODUCTION

Regular field work began May 13 and ended October 5. Special surveys were: spruce beetle May 6-8, September 16-26; larch casebearer May 9 and aerial surveys July 30-31. In addition, surveys were made for Cooley spruce gall aphid, Engelmann spruce weevil, various root rots, and Atropellis canker. Flight traps were set up to obtain records of the kinds and numbers of various beetles and horntails attracted to freshly felled trees.

Numbers of larval defoliators found in field collections decreased this year; 40% of the beating collections contained larvae as compared with 67% in 1967.

A serious spruce beetle problem exists between the Kootenay River and the Alberta border where most mature spruce stands are threatened.

The larch sawfly infestation totally collapsed but the larch casebearer continued to spread and consolidate itself in the southwestern portion of the District.

The substantial increase in bark and engraver beetles was due partially to numerous drought weakened trees.

Shoestring root rot was widespread in the drier stands of Douglas-fir and ponderosa pine.

Insect and disease collections are shown by host in Table 1; collection localities are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Drainage divisions are illustrated in Map 1. Details on individual insect and disease problems follow.

1/ Forest Research Technician, Forest Insect and Disease Survey Ranger, Vernon.

Table 1. Collections by hosts, East Nelson, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	4	0	Alder, Sitka	0	1
Douglas-fir	71	24	Aspen, trembling	10	1
Fir, alpine	23	1	Birch, white	2	0
Hemlock, western	11	3	Cottonwood, black	1	0
Juniper, Rocky Mtn.	7	1	Willow species	5	1
Larch, European	1	0			
Larch, western	24	22			
Pine, lodgepole	41	41			
Pine, ponderosa	14	5			
Pine, western white	3	0			
Pine, whitebark	0	4			
Spruce, Engelmann	82	4			
Totals	281	85	Totals	18	3
			Flight traps	44	0
			Misc. hosts	3	1
			No host	1	0
			GRAND TOTALS	347	89

Table 2. Currently important insect and disease[1/] problems by drainage division, East Nelson, 1968

Insect and disease problems	Principal hosts[2/]	Importance by drainage divisions[3/]				
		240	241	242	243	244
Bark Beetles						
Spruce beetle	eS	4	5	5	2	0
Mountain pine beetle	lP	0	0	0	4	4
Douglas-fir beetle	D	0	3	0	3	1
Western balsam bark beetle	alF	0	1	3	1	2
Defoliators						
Larch casebearer	wL	3	3	0	0	0
Physiological Diseases						
Drought damage	lP, pP, D	2	3	1	2	0
Fume damage	lP, pP, D	4	0	0	0	0

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.
Scattered high populations and/or significant damage in restricted areas - 4.
Rising populations and/or moderate numbers and/or potential problems - 3.
Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Spruce beetle, Dendroctonus obesus

See the introduction to the Nelson Survey District.

Mountain pine beetle, Dendroctonus ponderosae

Mountain pine beetle continued to be a serious problem in lodgepole pine stands. The hot dry summer of 1967 may have predisposed many trees to attack in 1968. There was an overall increase of 1,300 beetle-killed trees this year but the largest infestation near Redgrave decreased by 1,000 (Table 3). There were large increases near Coyote Creek, Elk Creek, Columbia Lake, and Windermere Lake.

Map 2 shows the locations and numbers of trees killed as determined by the 1968 aerial survey. Some red-topped trees of 1967 may have been counted again in 1968 as most beetle-attacked trees take two years to lose their needles.

Table 3. Lodgepole and western white pine[1/] killed by mountain pine beetle, 1966 and 1967, as determined by aerial surveys, 1968.

Location	No. of red-tops	Volume (cu. ft.)
Brisco	125	1,750
Canal Flats	100	1,400
Coyote Creek	2,100	29,400
Dutch Creek	75	1,050
Elk Creek	1,600	22,400
Findlay Creek	75	1,050
Golden	50	700
Horsethief Creek	75	1,050
Kootenay R. - White R.	260	3,640
Palliser River	25	350
Radium Jctn.	200	2,800
Redgrave	2,500	35,000
Roosville	20	280
Steamboat Mtn.	60	840
Toby Creek	245	3,430
Windermere Lake	360	5,040
Bush River	50	700
Total	7,920	110,880

1/ Western white pine at Bush River; lodgepole at all other localities.

Douglas-fir beetle, Dendroctonus pseudotsugae

The number of trees killed decreased 33% from 1967. Increases occurred around Whiteswan Lake and along the Wigwam River (Table 4).

Table 4. Douglas-fir killed by Douglas-fir beetle, 1966 and 1967, as determined by aerial surveys, 1968.

Location	No. of red-tops	Volume (cu. ft.)
Bush River	15	900
Kootenay River	20	1,200
Whiteswan Lake - White River	170	10,200
Wigwam River	175	10,500
Totals	380	22,800

Dryocoetes - Ceratocystis complex

Populations of western balsam bark beetle, Dryocoetes confusus (and associated fungus, Ceratocystis sp.) increased and tree mortality occurred in widely scattered locations in high elevation alpine fir - Engelmann spruce stands. The heaviest infestation (310 red-topped trees) occurred near Couldrey Creek (Table 5).

Table 5. Alpine fir killed by western balsam bark beetle, 1966 and 1967, as determined by aerial surveys, 1968

Location	No. of red-tops	Volume (cu. ft.)
Bush River	25	500
Cabin Creek	20	400
Couldrey Creek	310	6,200
Harvey Pass	20	400
Kinbasket Lake	50	1,000
Sage Creek	50	1,000
Wigwam River	20	400
Wildhorse	15	300
Total	510	10,200

Defoliators

Larch casebearer, Coleophora laricella

See the introduction to the Nelson Survey District.

Other Noteworthy Insects

Cooley spruce gall aphid, Adelges cooleyi

Engelmann spruce were examined at 20 widely scattered locations; Adelges cooleyi were found in 81% of the stands examined. There were between 0 and 12 galls per square foot of foliage with an average of 3.4 galls per square foot. No Pineus sp. galls were found.

Populations on Douglas-fir decreased in most areas except near Canal Flats where the percentage of infested needles increased from 14% in 1967 to 37% (Table 6).

Table 6. Douglas-fir infested by Cooley spruce gall aphid, East Nelson

Location	% of needles infested		
	1966	1967	1968
Brisco	14	35	33
Canal Flats	31	14	37
Edgewater	20	52	7
Invermere	16	28	4

Two-year-cycle spruce budworm, Choristoneura fumiferana

Light to moderate defoliation occurred on 1,000 acres of alpine fir and Engelmann spruce along the North White River, 20 miles east of Canal Flats. On a permanent plot of 20 overstory and 100 understory trees, the former had 10 - 80% current defoliation (average 30%) and the latter 10 - 100% current defoliation (average 60%). Total defoliation was trace to 10% on overstory trees and trace to 50% (average 14%) on understory trees. Very few egg masses were found indicating a low population in 1969.

Scarab beetles, Dichelonyx spp.

Dichelonyx spp. caused defoliation and foliage browning in the drier areas between Cranbrook and Canal Flats where Douglas-fir and ponderosa pine predominate. Dichelonyx backi and D. fulgida primarily attacked Douglas-fir while D. columbiana usually fed on ponderosa pine. These beetles usually were associated with Scythropus spp. which caused much the same kind of damage. The result of this damage is reduced tree growth.

A leaf blotch miner, Lyonetia saliciella

The infestation along the Big Bend Highway increased and spread north to Boat Encampment and south to Nicholson. The main hosts were black cottonwood, alder, willow and birch, although it appeared to attack any deciduous foliage. In heavily attacked areas the trees were a distinct brown color. Reduced increment is probably the only lasting effect caused by this insect.

Aspen leaf miner, Phyllocnistis populiella

Populations decreased except at Findlay Creek where an increase in the number of leaf surfaces mined was observed (Table 7). The plot at Moyie Lake had fewer adults produced per 100 leaf surfaces, the plot at Nicholson stayed the same, but the other three plots each showed substantial increases.

Table 7. Aspen leaf miner populations, East Nelson

Location	leaf surfaces mined			Av. no. of adults produced per 100 leaf surfaces		
	1966	1967	1968	1966	1967	1968
Dutch Creek	62	60	45	6	5	24
Findlay Creek	38	12	29	6	3	15
Moyie Lake	52	52	41	25	27	11
Nicholson	31	52	38	13	22	21
St. Mary's Lake	70	67	57	26	20	26

Parasitism ranged from 9% to 22% in cocoon samples and was considerably lower than in 1967 (Table 8).

Table 8. Aspen leaf miner mortality in 100-cocoon samples at five locations, East Nelson

	Percentage mortality					
	Parasitism			Other causes		
	1966	1967	1968	1966	1967	1968
Dutch Creek	36	40	9	14	14	8
Findlay Creek	22	19	15	13	9	12
Moyie Lake	12	27	22	8	6	20
Nicholson	16	28	17	16	11	13
St. Mary's Lake	26	30	14	11	13	18

Engelmann spruce weevil, Pissodes engelmanni

One hundred Engelmann spruce were examined in each of 20 widely scattered locations for Engelmann spruce weevil attack. Ten per cent of the Engelmann spruce in a plot near Michel Creek had current terminals attacked, 23% had old terminal attack and 69% were unattacked. Two trees each had current and old attacks. Weevils appeared to be widespread in the southern half of the District where up to 11% of the terminal leaders were infested in 50% of the stands examined (Table 9).

Table 9. Engelmann spruce weevil infestation, East Nelson

Location	% of terminal leaders infested
Hawkins Creek	11
Michel Creek	10
Lizard Creek	9
Morrissey	7
Elk River	5
Cold Creek	3
Kootenay River	2
Sage Creek	2
Flathead River	1
White River	1

Larch sawfly, Pristiphora erichsonii

The larch sawfly infestation collapsed completely at the end of 1967. There was no noticeable defoliation and only one beating collection contained larvae in 1968. As a result, cocoon sampling at the five sampling plots was discontinued.

Short-snouted weevils, Scythropus spp.

Moderate defoliation and foliage browning of Douglas-fir and ponderosa pine in the drier areas between Canal Flats and Wardner was caused by two weevils, Scythropus elegans and S. californicus. Damage resulted from the weevils feeding on the surface of the needles which soon dried out and turned brown.

Woodborers

Three flight traps were used to obtain data on the numbers, species, and flight periods of woodborers. On May 16, one trap was set up near Wasa Lake (2,900' elev.) with Douglas-fir and ponderosa pine trees as attractants and one at 3,800' with lodgepole pine and western larch trap trees. A third trap was set up on June 18 at 5,700' in Harvey Pass on an Engelmann spruce felled on May 8. Numerous bark beetles and other scolytids were found in the weekly collections along with many species of woodborers.

Table 10. Other insects of current minor significance

Insect	Host	Location	Remarks
Acleris variana Black-headed budworm	eS alF	Widespread	Defoliator. Decrease, only four positive beating collections made.
Barbara colfaxiana Douglas-fir cone moth	D	Elko, Wardner	Feeds on seeds in cones; heavy near Elko.
Contarinia spp. Douglas-fir needle midge	D	Edgewater, Brisco	Needle miner. Decrease, trace at two locations.
Dendroctonus valens Red turpentine beetle	lP	Kimberley, Wasa Lake, Waldo	Bark beetle. Increasing, common in drought weakened trees.
Ips spp. Engraver beetles	lP eS	Widespread	Bark beetle. Increasing, common in drought weakened trees and in felled or wind-thrown timber.
Malacosoma californicum pluviale Western tent caterpillar	Willow, Misc. shrubs	Big Bend Hwy., Fort Steele, Bull R.	Defoliator. Increasing, very noticeable along roadside bushes.
Nymphalis antiopa Mourning Cloak butterfly	tA	Cranbrook	Defoliator. Moderate defoliation in localized areas.
Phenacaspis pinifoliae Pine needle scale	lP	Widespread	Scale insect. Common along dusty roadsides.
Pikonema alaskensis Yellow-headed spruce sawfly	eS	Fernie	Defoliator. Caused heavy defoliation on two ornamental Engelmann spruce in Fernie.
Semiothisa sexmaculata Green larch looper	wL	Kingsgate, Sparwood	Defoliator. Decreasing, maximum of 15 larvae in a beating collection.
Vespamima sequoiae Sequoia pitch moth	lP	Kimberley, Waldo	Bark and wood borer. Common within 20 mile radius of Kimberley.
Zelleria haimbachi Pine needle-sheath miner	lP pP	Ryan, Moyie, Kimberley, Wardner	Needle-sheath miner. Increasing, damage generally light.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Stem Diseases

Dwarf mistletoe, *Arceuthobium americanum*

Dwarf mistletoe was common in lodgepole and ponderosa pine stands. Heavy infections occurred between Canal Flats and Kimberley and along the Bull River road to Wardner. Collections were made from lodgepole pine near Donald and Kinbasket Lake along the Big Bend Highway.

Dwarf Mistletoe, *Arceuthobium campylopodum* f. *laricis*

Many of the mature larch stands in the St. Mary's River drainage and between Cranbrook and Kingsgate were infected with this mistletoe. Dispersion of mistletoe seeds from the overstory larch is causing the understory trees to be infected.

Indian Paint Fungus, *Echinodontium tinctorium*

This wood destroying fungus is causing much damage in hemlock stands, particularly along the Big Bend Highway. Conks, indicating the presence of advanced decay, were common on otherwise apparently healthy trees.

Physiological Diseases

Drought damage

The hot dry summer of 1967 and dry spring of 1968 killed and weakened many trees in the drier areas. Some of these weakened trees succumbed to secondary insects and diseases. Stands affected were predominantly lodgepole pine or Douglas-fir and ponderosa pine on drier sites from Canal Flats south to the United States border. Although lodgepole pine of all sizes were affected it was uncommon for Douglas-fir or ponderosa pine trees above five feet tall to be discolored.

Between Cranbrook and the United States border groups of 25 to 100 trees growing in shallow soil immediately above exposed rock faces were killed. In the spring, in semi-open forest lands near Elko, a high percentage of ponderosa pine reproduction was browned but many recovered, no doubt helped by the cool wet summer. Mature and semi-mature trees were not noticeably affected.

In August much of the foliage of western red cedar turned bright red due to drought and natural pruning. This was especially noticeable along the Big Bend Highway between Boat Encampment and Sullivan River where a high percentage of the stand was western red cedar. Although this color change is very striking it does not appear to adversely affect the trees.

Fume damage

During the middle of May severe browning of the foliage of lodgepole pine on 2,500 acres of semi-open forest south and west of the old Kimberley airport was probably caused by fumes. The area is approximately 10 air miles north east of the Marysville fertilizer plant where the fumes are thought to originate. Although all browned needles dropped during the summer new foliage which came out soon after the damage occurred gave most trees enough foliage to survive and only 10% to 15% of the trees died. There was little discoloration and no mortality of Douglas-fir and ponderosa pine.

Specific Surveys

Atropellis canker

Fifty trees in each of 24 immature lodgepole pine stands were examined for the presence of stem cankers but only 7 stands were infected. Intensity of infection ranged between 4% and 24% of the stems examined with an average of 6.4%. The area of heaviest infection was northeast of Golden. Cankers usually occurred in young, dense lodgepole pine stands on poor sites on trees in the 2 to 3 inch dbh class. As Atropellis attacks mostly small trees on poor non-commercial sites, damage to the forest is minimal.

Douglas-fir dieback

Of the three plots established in 1958 to determine the annual amount of dieback in Douglas-fir Christmas trees, one was subsequently destroyed. At Premier Lake 22% of the trees had between one and five branches killed in 1968 and in the plot at Invermere 17% of the trees had between one and three branches killed. The fungus, Valsa sp., was associated with dieback of the branches of Douglas-fir. The trees are finally killed but in the years preceeding death the trees are unsightly due to many dead branches and are not suitable as Christmas trees.

Plantations of exotic tree species

Three plantations, two of European larch, Larix decidua and one of Scots pine, Pinus sylvestris were examined for the occurrence and effect of native insects and diseases on the trees. One European larch plantation was not found in 1968. The other plot located near Findlay Creek had only light browsing damage. Signs of feeding, either by Scythropus spp. or Dichelonyx spp., were present on 10 Scots pines near the Yahk River. No diseases were found but three trees succumbed probably after increased competition from the overstory lodgepole pines.

Root rots of immature and mature stands

Shoestring root rot, Armillaria mellea was the only root rot found. Twenty-one infection centers were found between Marysville and Radium Junction on poor dry sites, usually associated with a Douglas-fir - ponderosa pine cover type. Most of these centers were located just north of Fairmont. Infection centers are characterized by the presence of clusters of dead and dying trees. The number of diseased trees in each group varied from 1 to 18 with an average of 10. The diameter of the infection centers ranged from 10 to 200 feet with an average of 130 feet. Trees ranging from regeneration to mature size were killed.

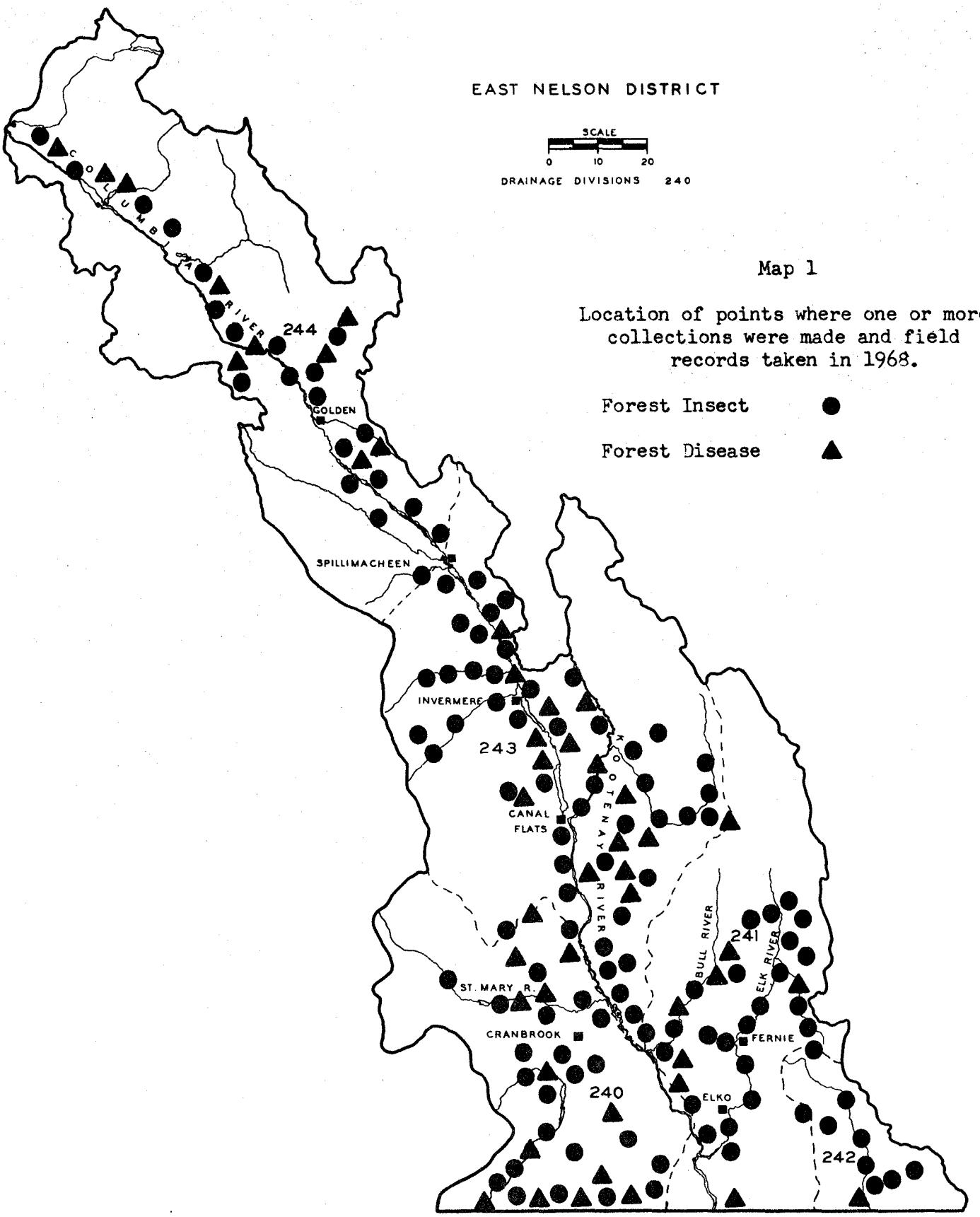
Other Noteworthy Diseases

A Broom rust, Chrysomyxa arctostaphyli

Witches' brooms on Engelmann spruce were common east of Canal Flats in the Whiteswan Lake - White River area. Brooming was generally light and sporadic along the Kootenay River.

Table 11. Other diseases of current minor significance

Organism	Hosts	Locality	Remarks
Elytroderma deformans	lP pP	Ta Ta Creek to Kimberley, St. Mary's R.	Needle cast. Damage generally light this year although individual trees heavily infected.
Gymnosporangium ?nelsoni	roJ	Widespread over range of juniper	Foliage and stem rust. Decrease from last year.
Lophodermella concolor	lP	Kingsgate	Needle cast. Considerable decrease from last year.
Peridermium harknessii	lP	Widespread	Gall rust. Common throughout range of lodgepole pine.
?Venturia tremulae	tA	Wardner	Leaf blight. Localized infection causing black blotches on foliage.

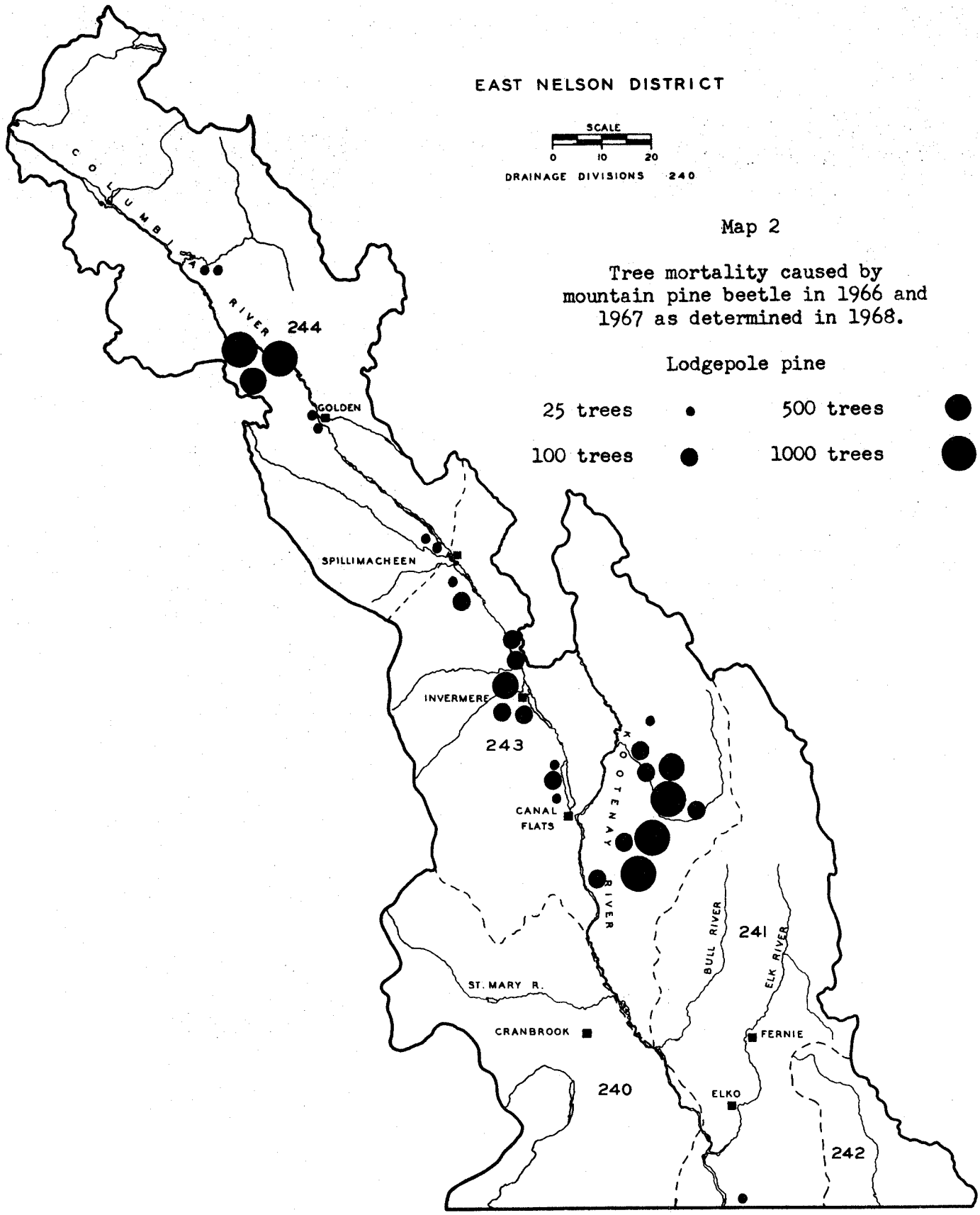


Map 1

Location of points where one or more collections were made and field records taken in 1968.

Forest Insect ●

Forest Disease ▲


EAST NELSON DISTRICT
SCALE
0 10 20
DRAINAGE DIVISIONS 240
Map 2
Tree mortality caused by mountain pine beetle in 1966 and 1967 as determined in 1968.
Lodgepole pine
25 trees
500 trees
100 trees
1000 trees
COLUMBIA RIVER
244
GOLDEN
SPILLIMACHEEN
INVERMERE
243
CANAL FLATS
KOOTENAY RIVER
BULL RIVER
241
ELK RIVER
ST. MARY R.
CRANBROOK
FERNIE
240
ELKO
242

ANNUAL DISTRICT REPORTS

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA, 1968

PART VII, PRINCE GEORGE SURVEY DISTRICT

by

J. Grant, D. Beddows and D. G. Lund

FOREST RESEARCH LABORATORY

VICTORIA, BRITISH COLUMBIA

INFORMATION REPORT BC-X-33

PART VII

DEPARTMENT OF FISHERIES AND FORESTRY

APRIL, 1969

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1968

PRINCE GEORGE SURVEY DISTRICT

J. Grant [1/]

The Prince George Survey District includes the Prince George Forest District and that part of the Prince Rupert Forest District extending north from the Stikine River drainage to the Yukon border.

Ranger personnel assigned to the Prince George District in 1968 were D. G. Lund in North Prince George, D. Beddows in West Prince George, and J. Grant, South Prince George.

Spruce beetle attack on standing trees was the heaviest since 1964. Most infestations were associated with blowdown in the area east of Quesnel and in the Willow River drainage. Cool temperatures prevailing through the summer slowed larval development so that very few broods established in 1968 reached the adult stage by autumn.

Douglas-fir beetle caused increased losses in mature stands in the Blackwater River Valley and the Fraser River Valley.

Mountain pine beetle infestations persisted in lodgepole pine stands south of Quesnel, but continued to decline in the Takla Lake region.

The western balsam bark beetle caused widespread mortality of alpine fir in West Prince George District and in the mountainous parts of the South Prince George District.

White spruce along the edge of stands adjacent to logging slash were killed by engraver beetles in several localities in the Willow, Bowron and Crooked River drainages.

The one-year cycle spruce budworm caused light to moderate defoliation of white spruce in the Prophet, Muskwa, Fort Nelson and Fontas River valleys and along part of the Upper Liard River Valley. The two-year cycle spruce budworm in the southern part of the District was at its lowest population level in 20 years.

1/ Forest Research Technician, Forest Insect and Disease Survey, Senior Ranger, Vernon.

Black-headed budworm caused light defoliation of understory hemlocks near McBride and were numerous in most southern parts of the Prince George District.

Much of the tree mortality, growth loss, and quality reduction attributed to diseases is caused by mistletoes and stem and root fungi. These usually intensify at a slow rate which makes annual summaries of their status repetitious; for this reason the following report may not mention some of the more important diseases. Emphasis is placed on new outbreaks, the status of annually varying foliage diseases and abnormal weather conditions, i.e., frost and drought damage which immediately affect tree appearance and often cause dieback and mortality. Other aspects of the Disease Survey which deal with mortality, growth loss, and factors influencing the occurrence of the more important diseases, are summarized elsewhere.

A leaf and shoot blight of poplar was epidemic in trembling aspen stands in the southern section and caused spectacular defoliation.

Late frost in June killed new growth of conifers in some areas and caused minor losses of Douglas-fir cones in the Blackwater Valley.

Special surveys dealt with the following insects and diseases: spruce gall aphid, Engelmann spruce weevil, Atropellis canker, Rhizina root rot, and root rots of mature and immature stands. Window flight traps were used throughout the field season to obtain data on the flight periods and abundance of bark beetles, wood boring beetles and horntails.

Approximately 32 hours were used on aerial surveys of bark beetle and spruce budworm infestations.

The abbreviations for host trees used in the report are given in Table 1.

Table 1. Host tree abbreviations

Abbrev.	Common name	Abbrev.	Common name
wC	western red cedar	eS	Engelmann spruce
D	Douglas-fir	wS	white spruce
alF	alpine fir	tA	trembling aspen
mH	mountain hemlock	bCo	black cottonwood
wH	western hemlock	W	willow
tL	tamarack		
lP	lodgepole pine		
wbP	whitebark pine		
bS	black spruce		

Special Report

Spruce beetle, Dendroctonus obesus

INTRODUCTION: An outbreak of the spruce beetle in the Prince George District killed an estimated 444 million cubic feet of white spruce in the period 1961-1964 (Cottrell et al 1966) 1/. In 1965 and 1966 few standing trees were attacked although high beetle populations persisted in windthrown timber. In 1967 a few localized infestations were in the Quesnel district, with light and scattered attacks in many other areas. Unusually warm weather in the summer of 1967 accelerated beetle development and may have predisposed spruce on some sites to attack. Infestations of standing trees in 1968 increased greatly over those of the previous three years.

METHODS: Spruce beetle mortality in the winter of 1967-1968 was assessed in May 1968 at four localities: McLeod Lake, Aleza Lake, Pitoney Lake and near Wells. Square-foot samples of bark were removed from trees felled and infested in 1967, and the numbers of living and dead beetles and larvae counted.

Aerial surveys totalling 26 hours flying time were conducted from August 19 to 26, 1968. Location of recently-killed spruce trees were plotted on two mile to the inch forest cover series maps. Severity of attack was classified as light, 1 to 5% of trees killed; medium, 6 to 30% and heavy, 31% or more of the trees killed. Areas where blowdown was known to have occurred in recent years and mature stands adjacent to logged areas were given particular attention.

From September 16 to October 5, ground surveys were carried out at locations ranging from McLeod Lake south to Quesnel and east to Aleza and Bowron lakes. Thirty-six one-chain-wide strips ranging in length from 9 chains (on leave strips) to 110 chains, and totalling 29 miles, were cruised. Most areas selected were those where blowdown, either in otherwise undisturbed stands or adjacent to logging, had occurred, and in stands where aerial surveys had indicated a beetle increase in 1967. Six were permanent strips which were established in 1963 and cruised annually. All spruce stems 8 inches dbh and over were tallied and the following data recorded: status of tree (whether healthy or attacked in 1968, 1967, 1966 or "old grey", which were trees killed prior to 1966); extent of attack (completely girdling tree, partial or pitched out); stages of beetle present in infested trees; diameter of old and new windfall which had been standing on the strip, and whether or not windfall had been infested by

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1/ Cottrell, C. B., J. C. Holms and D. A. Ross, 1966. Status of the spruce beetle Prince George Forest District 1965. Ann. Dist. Rep., For. Ins. and Dis. Surv. 1965. Dep. Forest., For. Res. Lab. Victoria Intern. Rep. B.C. -4, 1966: pp. 187-196.

spruce beetle. In stands where site classes had not already been determined, diameters and tree heights were measured to obtain data for determining volumes.

In those localities where significant losses had occurred in 1966-1967, volume figures of infested trees were obtained by applying the volumes recorded on strips to the areas of corresponding attack severity as mapped from the air. This was not possible for 1968 losses since the infested trees could be recognized only by ground examination.

Brood development studies were carried out at McLeod, Aleza and Pitoney lakes and near Wells. Mature white spruce were felled in May and in September bark samples were examined to determine the stage of development attained by the 1968 broods.

RESULTS AND CONCLUSIONS: Overwintering mortality of spruce beetles at four sample plots was very light except at McLeod Lake and Wells (Table 1). Waterlogging of the inner bark apparently was responsible for death of 41 and 25% respectively at these plots; at both locations, adult survival was higher than that of larvae.

Table 1. Spruce beetle mortality in logs cut in May 1967 and examined in May 1968, Prince George

Locality	No. of sq. ft. samples	Av. no. per sq. ft.				% mortality
		Adults		Larvae		
		Living	Dead	Living	Dead	
McLeod Lake	6	4	2	21	15	41
Aleza Lake	6	8	1	12	0.5	5
Pitoney Lake	6	4	1	11	0.0	4
Wells	6	7	0.3	51	19	26

Aerial surveys revealed few areas of concentrated 1967 beetle attack. Most damage was west of Swift River and near Benson Lake, and in the Cottonwood River drainage in the Quesnel district; scattered infested trees were common in parts of the Willow River drainage, chiefly in the vicinity of tracts of blowdown. Some leave strips and fringes of trees adjacent to logging had sustained losses but in general, incidence of attack was below the light infestation category of 1% of trees killed. An unusually heavy cone crop which gave a brownish-red cast to all mature spruce stands in 1968 considerably reduced the distance at which fading beetle-killed trees could be detected, although it did not hamper close-range observations. Trees attacked in 1968 could not be detected as their foliage was still a normal color.

Ground strips were cruised from September 16 to October 6. On nine strips totalling 500 chains, trees killed by spruce beetles since 1966 comprised less than 1% of the stems over 8 inches dbh; on 18 strips totalling 1,318 chains, from 1 to 5% of the trees had been killed; on eight strips totalling 489 chains the infestation ranged from 6 to 30%; and on one strip of 24 chains, more than 30% of the trees had been infested (Table 2, Map 1).

Table 2. Summary of ground survey data, Prince George District, 1968

Locality	No. acres	No. trees 1/	% of stems						
			Healthy	Attacked 1968	Partial 2/ 1968	Total 1968	Killed 1967	Killed 1966	Old grey
Tacheeda Creek	8	460	91.1	1.1	0.0	1.1	0.0	0.0	7.8
Pas Lumber (Parsnip R.)	8	572	96.7	0.7	0.0	0.7	0.0	0.0	2.6
McLeod Lake	8	495	94.3	0.2	0.0	0.2	0.0	0.0	5.5
Barney Creek	8	422	97.4	1.4	0.0	1.4	0.0	0.0	1.2
Aleza Lake	8	640	87.3	0.2	0.2	0.4	0.2	0.2	12.2
Wansa Lake east	2	149	98.7	0.0	0.0	0.0	0.0	0.0	1.3
Wansa Lake south	8	626	90.1	3.4	0.6	4.0	0.3	0.0	5.6
Pitoney Lake north	7	448	78.6	17.4	0.2	17.6	1.1	0.0	2.7
Pitoney Lake west	8	352	88.3	0.9	0.6	1.5	0.0	0.0	10.2
Pitoney Lake southeast	8	735	92.5	2.9	0.7	3.6	0.0	0.0	3.9
Pitoney Lake seedblocks	1.5	202	96.0	0.5	0.0	0.5	0.5	0.0	3.0
Thursday Creek leave strips	3	260	84.6	4.2	3.5	7.7	0.0	0.0	7.7
Narrowlake Creek	9	665	91.7	4.1	0.8	4.9	0.8	0.0	2.7
Narrowlake seedblocks	1.9	235	68.9	17.9	3.8	21.7	3.8	1.3	4.3
Stony Lake northwest	2.4	170	65.3	25.9	3.5	29.4	1.8	0.0	3.5
Stony Lake southwest	7	475	95.2	0.2	0.4	0.6	0.0	0.0	4.2
Ahbau Lake northwest	10	593	91.2	4.0	0.0	4.0	0.0	0.0	4.7
Rebman Creek	8	537	91.8	0.9	0.6	1.5	0.2	0.6	6.0
Ross Lake	8	698	84.0	2.3	0.3	2.6	0.3	0.1	13.0
Nitaga Creek	5	498	96.6	0.4	0.0	0.4	0.2	0.2	2.6
Mile 16 Naver Rd.	11	823	91.8	2.3	0.6	2.9	0.1	0.0	5.1
Potlikker Creek	4	287	98.6	0.3	0.0	0.3	0.0	0.0	1.0
North Naver Rd.	8	421	95.0	2.4	0.5	2.9	0.2	0.0	1.9
Alice Creek	4	146	89.0	1.4	2.0	3.4	2.0	0.7	4.9
Benson Lake north	8	562	74.2	11.9	6.4	18.3	4.3	0.7	2.5
Benson Lake west	8	376	93.1	4.0	0.8	4.8	0.0	0.0	2.1
Elgert Road	6	495	69.1	13.1	6.9	20.0	2.4	1.4	7.1
Cascade Road	10.3	1,014	96.3	0.1	1.1	1.2	0.3	0.1	2.2

Table 2 continued

Locality	No. acres	No. trees 1/	% of stems						
			Healthy	Attacked 1968	Partial 1968 2/	Total 1968	Killed 1967	Killed 1966	Old grey
Atis Creek	10	534	89.1	4.5	0.4	4.9	1.1	1.6	3.2
Bendickson Rd.	2	124	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Wingdam	6	428	83.9	2.6	1.2	3.8	0.5	0.0	11.9
Tregillus Creek	8	357	94.7	1.1	0.3	1.4	0.6	0.0	3.4
Van Winkle	6	249	97.2	0.0	0.0	0.0	0.4	0.4	2.0
Monkton Creek	4	218	97.2	0.9	0.5	1.4	0.5	0.0	0.9
Big Valley leave strips	4	392	93.9	0.8	0.5	1.3	0.8	0.5	3.6
Indian Lake	5	241	96.3	0.8	0.4	1.2	0.0	1.2	1.2

1/ 8 inches dbh and over

2/ strip attacks and pitched out

The number of trees attacked in 1968 greatly exceeded those killed in the two preceding years; on 27 of the 36 strips, 1966 and 1967 losses together accounted for less than 1% of the stems tallied. Volume of timber killed in these two years was calculated only for those areas where appreciable attack occurred over a sufficient acreage to make aerial mapping feasible (Table 3).

Table 3. Estimated gross volume of spruce 8 inches dbh and over, attacked by spruce beetle in 1966 and 1967 as determined in 1968, Prince George District

Locality	Volume (cu. ft.)
Atis Creek	12,000
Benson Lake - Swift River	418,800
Alice Creek	9,000
Ross Lake	33,000
Total	472,800

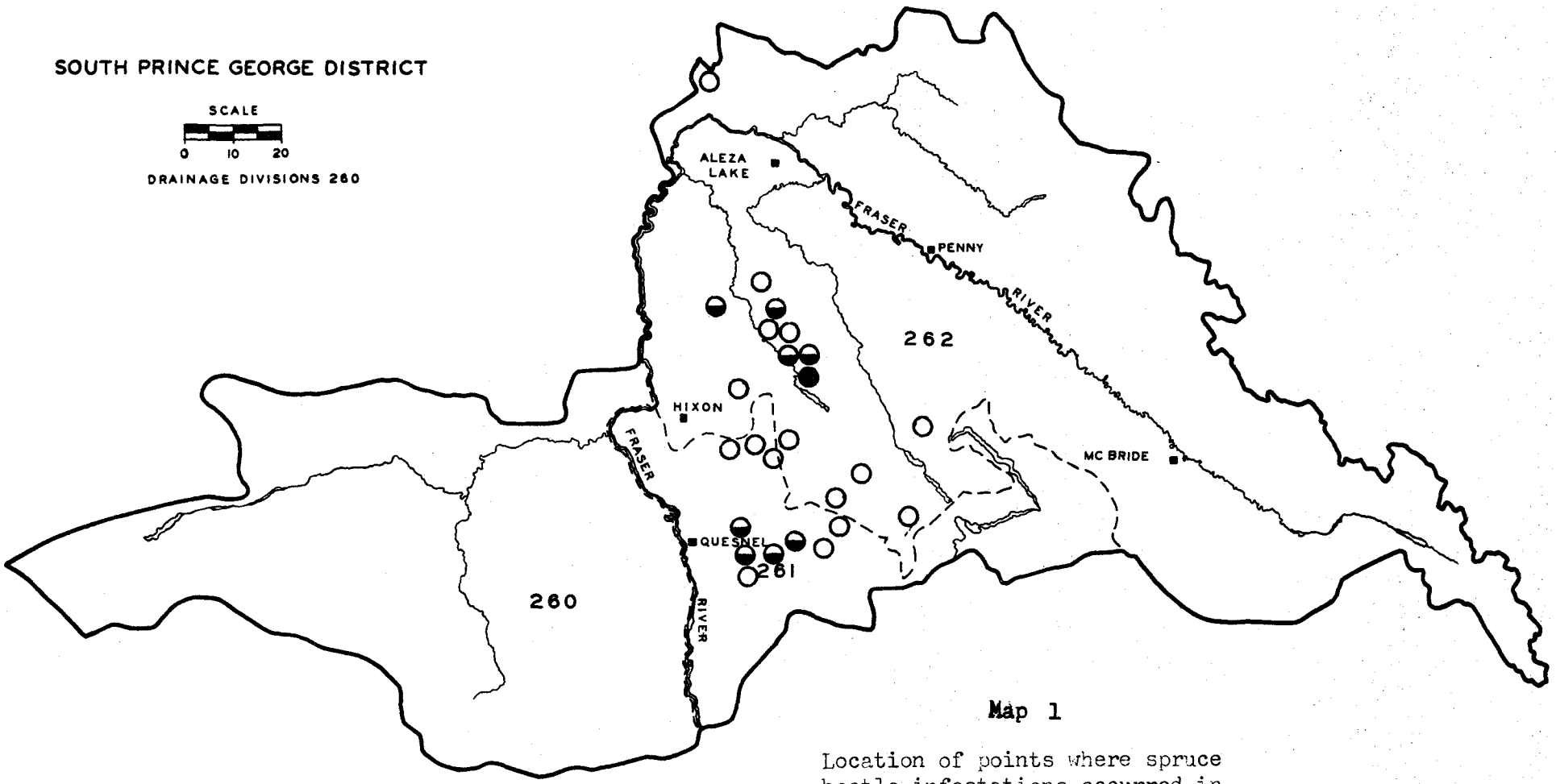
Heaviest 1968 attack was in the Swift and Cottonwood drainages and in the Willow River drainage from Wansa Lake south to Ahbau Lake. Within these areas, infestation levels were extremely variable with the heaviest concentration in stands close to patches of blowdown unassociated with other disturbance, and adjacent to scattered blowdown along edges of logging. Some seed blocks and leave strips, particularly in the Willow River drainage, had suffered moderate losses both from spruce beetle attack, and from infestation of fringe trees adjacent to slash, by an engraver beetle, Ips perturbatus. It will not be possible to determine location and extent of all 1968 infestations until the trees have become sufficiently discoloured to be mapped from the air, in 1969.

In contrast to the unusually warm summer of 1967 which accelerated development of beetle broods, the 1968 season was cool. Log examinations at four brood development study plots showed that almost all broods established in 1968 will require two years to mature; the only teneral adults were found at Aleza Lake where they represented only 2% of the 1968 generation.

The situation in 1969 is difficult to forecast. The attacking population will consist of that part of the 1967 generation which did not mature until 1968, and some 1968 parent adults which attacked only once. Unusually cold temperatures in the winter of 1968-1969 may be expected to greatly reduce beetle populations above the snow line in standing trees, but as these broods consist chiefly of larvae, effect of this mortality will not be felt until 1970. Populations below the snow line in standing trees and in windfall may not be greatly reduced. Blowdown resulting from

high winds in October 1968 may, in some areas, attract a large part of the 1968 flight which would otherwise have attacked standing trees.

SUMMARY: Spruce beetle infestations in 1967 were confined chiefly to a few localities east of Quesnel. In 1968, attacks on standing trees increased sharply, especially in stands adjacent to infested windthrown timber. Ground surveys indicated that the heaviest losses were in the drainages of the Swift, Cottonwood and Willow rivers, but aerial surveys to determine the extent and severity of infestations will not be possible until the trees become discolored in 1969.



Map 1

Location of points where spruce beetle infestations occurred in 1967 - 1968

Light ○

Medium ◒

Heavy ●

FOREST INSECT AND DISEASE SURVEY

SOUTH PRINCE GEORGE

1968

J. Grant

INTRODUCTION

Regular field work began on May 13 and ended on October 10. Special surveys, integrated with other field work, were: spruce beetle overwintering mortality studies, May 13 - 15; spruce gall aphid, Engelmann spruce weevil, Atropellis canker, Rhizina root rot and root rots of mature and immature stands. Aerial surveys occupied the period August 19 to 21 and spruce beetle ground surveys, September 16 to October 6.

Insect and disease collections are shown, by host, in Table 1; collection localities and drainage divisions are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Details on individual insect and disease problems follow.

Numbers of larval defoliators found in field collections increased slightly in 1968; 95% of beating collections from the major coniferous host trees contained larvae, compared with 93% in 1967.

For the first time since 1964, spruce beetles infested substantial numbers of standing trees; from ground surveys, most of the damage seemed to occur in the Willow River drainage and east of Quesnel.

Douglas-fir beetle infestations increased in stands near the confluence of the Blackwater and Fraser rivers, and in the Blackwater Valley.

A leaf and shoot blight was widespread in trembling aspen stands.

Table 1. Collections by hosts, South Prince George, 1968

Coniferous hosts	Forest insects	Forest diseases	Broadleaved hosts	Forest insects	Forest diseases
Cedar, western red	4	0	Alder species	3	1
Douglas-fir	36	4	Aspen, trembling	4	5
Fir, alpine	64	15	Cottonwood, black	0	4
Hemlock, western	17	1	Willow species	1	1
Pine, lodgepole	41	45			
Pine, whitebark	0	3			
Pine, Scots	1	1			
Spruce, black	11	1			
Spruce, Engelmann	4	0			
Spruce, white	115	12			
Tamarack	2	0			
Totals	295	82	Totals	8	11
			Miscellaneous hosts	1	0
			No hosts	32	5
			GRAND TOTALS	336	98

Table 2. Currently important insect and disease [1] problems by drainage divisions, South Prince George, 1968

Insect and disease problems	Principal hosts [2]	Importance by drainage divisions [3] 166	260	261	262
Bark Beetles					
Spruce beetle	wS	1	1	4	4
Mountain pine beetle	lP	2	4	2	1
Douglas-fir beetle	D	1	3	2	2
Western balsam bark beetle	alF	1	1	2	4
An engraver beetle	wS	1	1	3	3
Defoliators					
Black-headed budworm	wH, wS, alF	1	1	2	3
Foliage Diseases					
Leaf and shoot blight	tA, bCo	1	4	2	4
Physiological Diseases					
Weather damage	D, A, wS, alF	0	1	4	3

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.

Scattered high populations and/or significant damage in restricted areas - 4.

Rising populations and or moderate numbers and/or potential problems, - 3.

Static or falling population and/or moderate numbers and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Spruce beetle, Dendroctonus obesus

See spruce beetle report following Introduction to Prince George Survey District.

Mountain pine beetle, Dendroctonus ponderosae

Fewer lodgepole pine red-tops were counted in aerial surveys than in 1967. Except for localized infestations in the Canoe River Valley, damage was in mature stands south of Quesnel. Table 3 shows, by locality, the number of trees and estimated volume killed by mountain pine beetles in 1966 and 1967, as determined by aerial surveys in 1968. Volumes are based on measurements of beetle-killed trees at Cuisson Lake and Narcosli Creek.

Table 3. Mountain pine beetle infestation in 1966 and 1967, as determined by aerial surveys in 1968, South Prince George

Locality	Tree species 1/	No. of trees	Volume (cu. ft.)
Cuisson Lake	lP	300	9,000
Narcosli Creek	lP	200	6,000
Tingley Creek	lP	650	19,500
Moffat Lake	lP	150	4,500
Canoe River	lP	60	1,800
Canoe River	wwP	70	2,100
Totals		1,430	42,900

1/ Host tree abbreviations appear in the Introduction.

Douglas-fir beetle, Dendroctonus pseudotsugae

Aerial surveys revealed a substantial increase in damage in the Blackwater River Valley and near the confluence of the Blackwater and Fraser rivers. Approximately 700 red-tops, most in groups of less than 30 trees, were counted. The largest concentrations were adjacent to recently logged areas and in seed blocks, some of which had suffered 50% mortality.

Dryocoetes confusus - Ceratocystis complex

Alpine fir red-tops, believed due to western balsam bark beetles in association with the fungus Ceratocystis dryocoetidis, were widely scattered in the mountainous eastern portion of the District. The most heavily infested stands were along the Fraser River Valley and tributary valleys between Dome Creek and McBride.

An engraver beetle, Ips perturbatus

Mortality of mature spruce on the fringes of leave strips and seed blocks and along the edges of stands adjacent to logging slash was noted in several localities during the aerial survey. Ips perturbatus was the primary, and often the only attacker of exposed trees although spruce beetle was responsible for mortality of trees in the closed stands nearby. Apparently, Ips attacked the upper part of the stem first, with attacks on the lower bole occurring later. Most dead trees were less than 14 inches dbh, although a few trees 18 inches dbh had been killed.

Heaviest damage was on the edges of logging at Thursday Creek where over 200 trees had been killed. Infested trees were observed at several other localities in the Willow River drainage and at Atan Lake.

As Ips perturbatus has not caused significant losses in this area in the past, possibly an unusual combination of favourable circumstances, the warm summer of 1967 and an abundance of slash of suitable age, was responsible for the buildup in population.

Defoliators

Black-headed budworm, Acleris variana

After increasing sharply in 1967, populations remained fairly static in most areas. Frequency of positive collections from the three major hosts (white spruce, alpine fir and western hemlock) increased slightly but the number of larvae per collection showed no particular trend. (Table 4).

The heaviest damage observed was at the sites of 1967 infestations. At West Twin Creek and Goat River, populations were reduced from the 1967 level but cumulative defoliation of understory hemlocks was medium to heavy. There was no visible defoliation of overstory trees.

Light defoliation of understory white spruce, alpine fir and western hemlock was widespread in the Torpy and McGregor River valleys.

Table 4. Summary of black-headed budworm collections, South Prince George

Host 1/	No. of samples taken during larval period			% samples containing larvae			Av. no. larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
wS	71	74	69	41	61	74	4.0	10.9	8.3
alF	61	55	48	38	65	73	2.5	10.4	6.7
wH	13	28	17	69	75	82	2.8	28.2	29.5
D	24	17	27	4	12	11	1.0	1.0	1.0

1/ Host tree abbreviations appear in the Introduction.

Other Noteworthy Insects

Two-year-cycle spruce budworm, Choristoneura fumiferana

Populations reached their lowest level in at least 20 years. The following is a summary of flight-year collections since 1964:

Host 1/	No. collections taken during larval period			% samples containing larvae			Av. no. larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
wS	66	53	49	42	17	8	20.7	1.8	1.2
alF	51	39	35	45	41	3	26.8	2.9	1.0

1/ Host tree abbreviations appear in the Introduction.

Branches from the mid-crown of 10 alpine fir trees at each of five plots were examined for larvae and defoliation in June. No spruce budworm larvae were found.

Cooley spruce gall aphid, Adelges cooleyi

A survey for gall aphid damage to white spruce at 20 locations showed galls to be unusually scarce. One branch was removed from each of 20 trees, the foliage measured, and the number of galls recorded.

At five localities no new galls were found, and the highest population, at Red Pass, was only 0.69 galls per square foot of foliage.

The most striking decline was in the Wells-Bowron Lake area; old galls, mostly formed in 1967, were present in concentrations of up to 10 per square foot, but no 1968 galls were found at the three plots sampled.

Galls formed by another aphid, Pineus sp., were found at one location near Quesnel.

Western hemlock looper, Lambdina fiscellaria lugubrosa

Populations increased, possibly as a result of favourable weather during the oviposition period in the autumn of 1967. Very little variation existed between the numbers collected from the four major hosts (Table 5).

Table 5. Summary of western hemlock looper collections, South Prince George

Host 1/	No. samples taken during larval period			% samples containing larvae			Av. no. larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
wS	75	63	70	5	22	29	1.2	1.3	2.3
alF	59	58	53	8	14	28	1.8	1.4	3.7
wH	13	28	17	23	7	27	1.0	1.5	2.5
D	23	25	27	0	28	26	-	1.1	1.9

1/ Host tree abbreviations appear in the Introduction.

A leaf blotch miner, Lyonetia sp.

White birches along the Fraser River from Tete Jaune to Red Pass, and in the Canoe River Valley southeast of Valemount, were heavily infested. Most birches along the Fraser had at least 80% of the leaves damaged; bitter cherry, mountain ash and Sitka alder were also infested.

Aspen leaf miner, Phyllocnistis populiella

Trembling aspen stands in the McBride and Valemount districts were the only ones noticeably discoloured by the aspen leaf miner.

Four plots in the Prince George area were sampled by cutting one-foot branches from each of 10 trees, and examining the leaves for mines and cocoons. Table 6 shows the percentage of leaf surfaces mined and the number of adult leaf miners produced per 100 leaf surfaces. Populations were too low for samples to yield accurate data on causes of mortality in the cocoon stage.

Table 6. Aspen leaf miner infestation, South Prince George

Locality	% leaf surfaces with mines			No. adults produced per 100 leaf surfaces		
	1966	1967	1968	1966	1967	1968
Cale Creek	0.7	3.4	5.0	0.0	0.6	3.4
Stoner	0.3	0.8	1.0	0.0	0.1	0.3
Woodpecker	1.6	10.6	6.1	0.5	1.2	1.2
Hixon	1.2	4.5	3.2	0.1	1.0	1.1

Lodgepole terminal weevil, Pissodes terminalis

Attacks on leaders of young lodgepole pines are rarely numerous enough in the District to cause noteworthy damage. A young stand of 60 acres near Moffat Lake, heavily infested in 1967, had 51% of a 100-tree sample with dead leaders in June, 1968.

One branch terminal of a Scots pine in a plantation at Aleza Lake had been killed.

Table 7. Other insects of current minor significance

Insect	Hosts [1]	Locality	Remarks
Nymphalis antiopa Mourning cloak butterfly	W, tA	Prince George, Quesnel	Defoliator. Colonies common in 1968.
Oligonychus ununguis Spruce spider mite	alF, wS, D	Hixon, Quesnel	Mite. Light damage to exposed seedlings.
Orgyia antiqua badia Rusty tussock moth	wS, alF, wH	Torpy R., McGregor R.	Defoliator. Locally abundant: maximum of 37 larvae per collection.
Taniva albolineana Spruce needle miner	wS	Albreda	Needle miner. Scarce; locality record.
Urocerus gigas flaviventris and U. albicornis Wood wasps	wC	McBride	Wood borers. Ovipositing in decked logs.

[1] Host tree abbreviations appear in the Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

Leaf and shoot blight of poplars, Venturia populina

Infections in trembling aspen stands, first noted in 1967, intensified and became more widespread. Foliage became noticeably discolored early in June and many of the dead leaves were shed throughout the summer.

The most spectacular damage was in the extreme western part of the District where many square miles of aspen forest were almost leafless by mid-August. Damage was heavy but more sporadic in aspen stands in the Hixon, Prince George and McBride districts; the only extensive tracts of aspen forest not noticeably affedted were south of Hixon and in the Quesnel area.

Infections on black cottonwood, although affecting only a small percentage of the trees in most localities, were apparently more virulent than on aspen. Besides killing up to 80% of the leaves on individuals or small groups of trees, many shoots and branch ends, particularly in the lower crown, were killed.

Physiological Diseases

Lodgepole pines and trembling aspens on western and southwestern slopes of a mountain east of Kersley were affected during the winter of 1967 - 1968. Damage was local, extending in a belt about two miles long, but within vertical limits of only 400 feet. The pines were conspicuously reddened until early summer when the dead needles were either shed or hidden by new growth; the aspens did not leaf out until several weeks after trees above and below the "red belt" were covered with foliage.

Late frosts in June killed new growth of Douglas-fir, alpine fir and white spruce regeneration on a few low sites near Hixon and Prince George. Damage to new alpine fir foliage was severe on susceptible sites in the Wells-Barkerville area. Some open-grown Douglas-fir in the Blackwater River Valley had half of the young cones on their lower branches killed by frost some time in June.

Specific Surveys

Atropellis canker of lodgepole pine

Atropellis piniphila causes stem cankers which result in deformities and, occasionally, death of the tree. For the second consecutive year, 50 trees in a straight line were examined at each of 20 localities.

Cankers were found in most lodgepole pine stands, but incidence was extremely variable. The heaviest infection was on a high moderately exposed site on Milburn Mountain west of Quesnel, where 47 and 16 trees on two plots respectively, had cankers. Possibly some kind of climatic injury may have predisposed these pines to Atropellis canker infection.

Most frequently young, overstocked stands were infected. In two instances old inactive cankers on mature trees were partly healed over.

Root rots of mature and immature stands

A survey of conifer stands for the root rot fungi Poria weirii, Fomes annosus and Armillaria mellea revealed no well-defined centres of infection in the District although a few lodgepole pines near Willow River were infected with Armillaria. It seems that root rots are either not as prevalent as in southern British Columbia, or that the damage is more insidious.

Rhizina root rot

A survey was made of five recent burns for Rhizina undulata, a fungus which kills conifer seedlings. No evidence of the fungus was found.

Plantations of exotic tree species.

At Aleza Lake, most of the 50 Scots pines (XP 40) examined were healthy. Some were suffering from increasing competition from native trees; one was gnawed, but not girdled, in four places by a porcupine; one had two branches killed by pitch nodule makers, Petrova sp.; and one had a branch terminal killed by the weevil, Pissodes terminalis. No snow damage, which broke many branches in the winter of 1966-1967, was evident.

In the mixed coniferous plantation (XP117) at Prince George Experimental Farm, the only noteworthy abnormality was light defoliation of eight Siberian larches by the larch sawfly, Pristiphora erichsonii.

Other Noteworthy Diseases

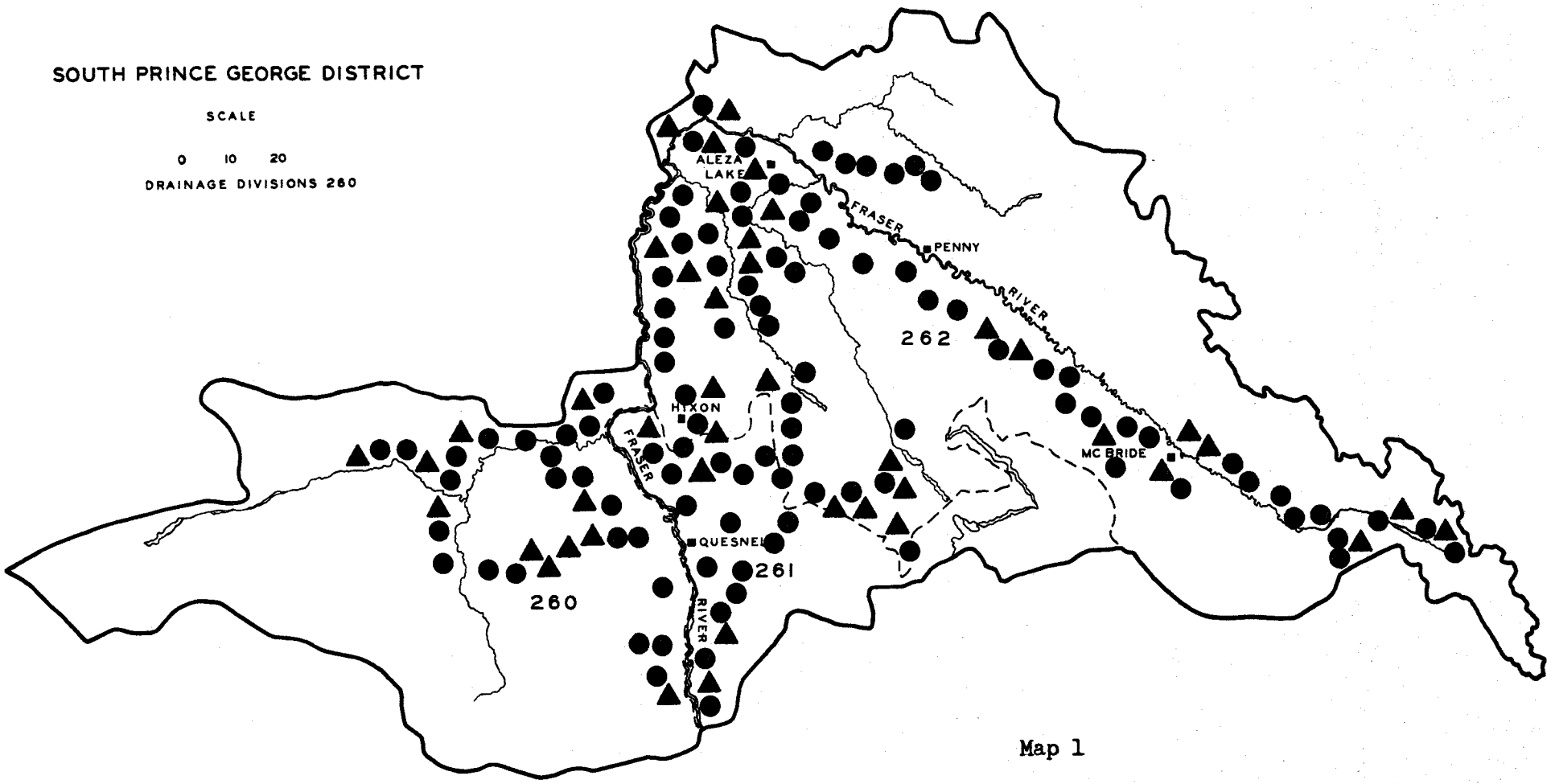
A needle cast, Lophodermium concolor

This fungus was widespread in lodgepole pine stands, but no severe infections of any extent were noted. Localized damage occurred at Bowron Lake, Marguerite, Valemount, Albreda and Hixon.

Table 8. Diseases of current minor significance

Organism	Host 1/	Locality	Remarks
Chrysomyxa ledicola	eS	Red Pass	Needle rust. Up to 80% of current foliage of understory infected.
Delphinella balsameae	alF	Crescent Spur	Shoot blight. Heavy local infection.
Elytroderma deformans	lP	Alexandria	Needle cast. Light infection. Seldom collected.
Isthmiella abietis	alF	McBride	Needle cast. Light infection.
Isthmiella quadrispora	alF	Strathnaver	Needle cast. Sporadic heavy infection.
Lachnellula flavovirens	lP	McBride	On dead terminals.
Lirula abietis-concoloris	alF	McBride	Needle cast. Heavy infection on individual trees.
Lirula macrospora	wS	Widespread	Needle cast. Collected at 8 localities but infections rarely heavy.
Lophodermium nitens	wbP	McBride	Needle cast. Locally common.
Lophodermium pinastri	lP	Newlands	Needle cast. Occasional trees with 70% of old needles killed.

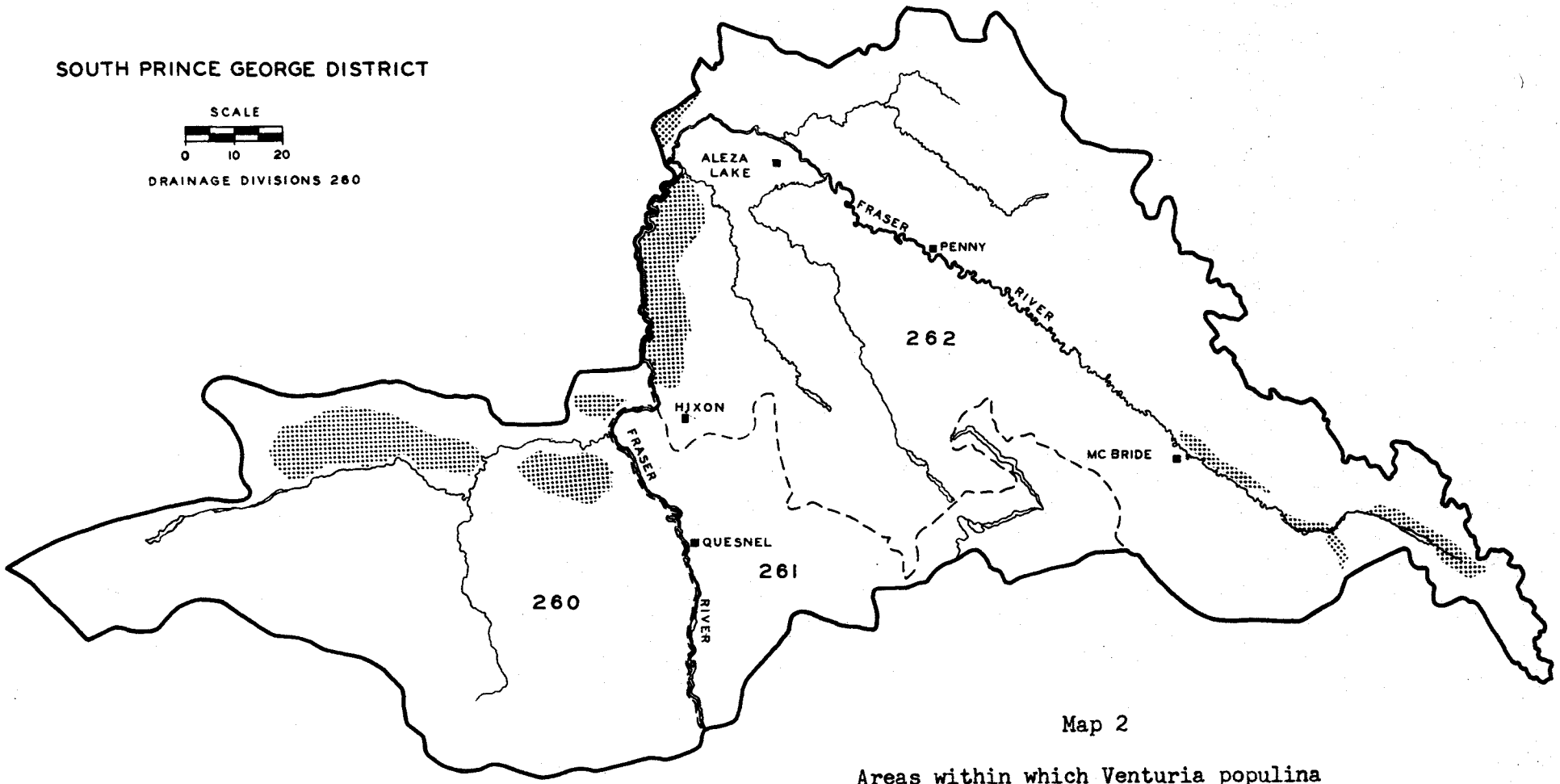
1/ Host tree abbreviations appear in the Introduction



Map 1

Location of points where one or more collections were made and field records taken in 1968.

Forest Insect ● Forest Disease ▲



Map 2

Areas within which Venturia populina infections occurred on trembling aspen in 1968.

Medium to heavy

FOREST INSECT AND DISEASE SURVEY

WEST PRINCE GEORGE

1968

D. Beddows 1/

INTRODUCTION

Regular field work began May 29 and ended October 11. Special surveys were carried out for spruce weevil, spruce gall aphid, bark beetles and woodborers, root rots, Atropellis canker and Rhizina root rot. Spruce beetle mortality studies were carried out in May and September and an aerial survey in August used 26 hours of flying time mapping beetle-killed trees in West and South Prince George. Ground surveys for spruce beetle were carried out from September 16 to October 6.

Insect and disease collections are shown, by host, in Table 1; collection localities are shown on Map 1. The principal problems in each Forest Insect and Disease Survey drainage division are shown in Table 2. Drainage divisions are illustrated on Map 1. Details on individual insect and disease problems follow.

Numbers of larval defoliators found in field collections decreased slightly this year; 74% of beating collections contained larvae.

Spruce beetle populations increased and a few standing trees were attacked. The mountain pine beetle infestation at Bivouac Creek on Takla Lake continued to decline. Light to heavy mortality of alpine fir was caused by a western balsam bark beetle-*Ceratocystis* fungus complex in many areas. A leaf blight on aspen, *Venturia populina*, became more widespread and severe in the southern portion of the District.

1/ Forest Research Technician, Forest Insect and Disease Survey Ranger, Vernon.

Table 1. Collections by hosts, West Prince George, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Douglas-fir	22	0	Aspen, trembling	5	3
Fir, alpine	59	5	Cottonwood, black	0	1
Pine, lodgepole	73	30	Willow	3	0
Spruce, black	13	1			
Spruce, white	144	5			
Larch, eastern	3	0			
Totals	314	41	Totals	8	4
			No hosts	28	11
			GRAND TOTALS	350	56

Table 2. Currently important insect and disease 1/ problems by drainage divisions, West Prince George, 1968

Insect and disease problems	Principal hosts 2/	Importance by drainage division 3/					
		280	281	282	283	284	285
Bark Beetles							
Spruce beetle	wS	1	1	3	3	0	0
Dryocoetes -Ceratocystis complex	alF	1	0	3	3	0	0
Foliage Diseases							
A leaf blight on aspen	tA	5	5	5	5	0	0
Physiological Diseases							
Weather damage	lP, wS, tA	4	1	1	4	1	0

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.

Scattered high populations and/or significant damage in restricted areas - 4.

Rising populations and/or moderate numbers and/or potential problems - 3.

Static or falling population and/or moderate numbers and/or no problem at present - 2.

Endemic population and/or no significant damage - 1.

Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Spruce beetle, Dendroctonus obesus

See introduction to the Prince George Survey District.

Dryocoetes-Ceratocystis complex

An aerial survey in August indicated widespread light to heavy mortality of alpine fir in inaccessible areas between 3,000 and 5,000 feet elevation.

Severe infestations were observed at Burden Lake, Scovill Creek, and at Pam Lake, southwest of Stuart Lake. There were light infestations at Weston and Tsedeka Creeks, Curve, Morfee, McLeod, Takla and Trembleur lakes.

No predictions can be made on this beetle's status in 1969.

Other Noteworthy Insects

Spruce gall aphids, Adelges cooleyi and Pineus sp.

A single branch from each of 25 white spruce trees at 18 separate locations was examined for attack. New galls were found in 50% of the areas examined (Table 3).

Sixteen of the plots contained A. cooleyi galls (old and/or new), one contained Pineus sp. galls (old and new) and one was negative.

Table 3. Adelges cooleyi and Pineus sp. galls on white spruce, West Prince George

Location	Foliage area (sq. ft.)	Av. no. galls per sq. ft.	
		New	Old
Mile 9 Uslika Lake Road	35.2	0.22	1.78 1/
Mile 17 Kenney Dam Road	34.1	0.02	3.48
Endako	88.2	1.13	1.65
Uslika Lake	42.2	0.0	0.0
Gaffney Creek	29.8	0.0	0.1
Mile 9 Uslika Lake Road	35.2	0.0	0.1
Weneez	49.6	0.0	2.8
Kenney Dam	43.0	0.0	3.2
Mile 14 Kenney Dam Road	62.5	0.0	2.2
Mile 30 Kenney Dam Road	48.6	0.0	1.1
Mile 6 Merton Lake Road	32.1	0.0	1.6
Mile 42 Hart Hwy.	45.9	0.0	1.5
13.6 Miles West of Vanderhoof	60.1	0.4	3.1
Miworth	35.6	0.1	0.8
Mile 46 Hwy. 16 - Hulatt	38.4	0.1	4.6
Mile 6 Tatuk Lake Road	24.9	0.1	2.4
Mile 66 Hart Hwy.	37.1	1.2	4.6
Mile 23 Hart Hwy.	43.7	0.2	2.2

1/ Pineus sp. galls

Two-year-cycle spruce budworm, Choristoneura fumiferana

Populations were virtually non-existent at all four permanent sample plots examined in June for larvae and infested tips. One 18-inch branch sample was taken from the mid-crown of each of 10 trees at each plot. No larvae were found (Table 4).

Table 4. Spruce budworm larval populations and damage in 1964, 1966 and 1968, West Prince George

Locality	No. of larvae per sq. ft.			% tips killed		
	1964	1966	1968	1964	1966	1968
Davie Lake	0.18	0	0	1	0	0
Tudyah Lake	0.56	0	0	1	0	0
Pine Pass	2.85	0.04	0	0	0	0
Big Creek	1.31	0.15	0	2	0	0

There was relatively little change in frequency or abundance of

larvae in random collections:

Host	No. collections during larval period			% containing larvae			Av. no. larvae per positive sample		
	1964	1966	1968	1964	1966	1968	1964	1966	1968
White spruce	40	68	55	32	1.5	1.8	2.4	6	1
Alpine fir	10	19	31	70	21	9.6	16	1.5	2

Mountain pine beetle, Dendroctonus ponderosae

The amount of mountain pine beetle damage recorded on aerial surveys decreased in comparison with the 1967 survey. The only infested area was at Bivouac Creek on Takla Lake where the number of lodgepole pine trees killed had dropped from 600 trees in 1967 to 100 trees in 1968.

An engraver beetle, Ips sp.

Populations were at a high level in windfall and log decks. Approximately 50 semi-mature lodgepole pine trees (average dbh 5 inches) were killed along a newly cleared pipe line right-of-way at Mile 8, Salmon River Access Road.

Aspen leaf miner, Phyllocnistis populiella

The population, based on samples taken at five plots, increased in 1968 at four locations and decreased at one. One 12-inch branch sample was taken from each of the 10 tagged sample trees at each plot and the leaves examined (Table 5 and 6).

Table 5. Aspen leaf miner populations, West Prince George

Locality	% leaf surfaces with mines			No. adults produced per 100 leaf surfaces		
	1966	1967	1968	1966	1967	1968
Hart Hwy. Mile 79	0.4	6.7	5.2	0.0	0.8	2.3
Hart Hwy. Mile 103	0.4	4.4	7.0	0.3	0.1	0.9
Shelley	4	17.4	30.2	0.1	13.2	1.6
Vanderhoof	0	0.9	1.2	0.0	0.1	0.4
Endako	13	3.3	27.1	5.0	0.6	0.6

Parasitism in the cocoon stage was lighter than in 1967 but mortality from other causes was significant (Table 6).

Table 6. Mortality of aspen leaf miner in cocoons at five plots, West Prince George

Locality	Percentage mortality					
	Parasitism			Other causes		
	1966	1967	1968	1966	1967	1968
Hart Hwy. Mile 79	25	19	4	0	60	19
Hart Hwy. Mile 103	0	43	10	0	43	33
Shelley	20	12	8	20	3	32
Vanderhoof	0	20	8	0	48	15
Endako	6	22	5	12	43	11

Because of a foliage disease, Venturia populina, on aspen (see disease section below), the characteristic whitening of mined leaves was masked and visual evaluation of leaf miner damage was difficult. The foliage disease may be detrimental to aspen leaf miner populations in 1969.

Yellow-headed spruce sawfly, Pikonema alaskensis

The population increased slightly but remained at a low level as shown in the following summary.

No. collections during larval period			% collections containing larvae			Av. no. larvae per positive collection		
1966	1967	1968	1966	1967	1968	1966	1967	1968
53	68	45	13	24	44	1.4	1.5	2.8

Green-headed spruce sawfly, Pikonema dimmockii

The percentage of beating collections containing this insect and the average number of larvae per positive collection increased from 1967 as shown in the following summary. It is not expected to increase noticeably in 1969.

No. collections during larval period			% collections containing larvae			Av. no. larvae per positive collection		
1966	1967	1968	1966	1967	1968	1966	1967	1968
60	87	72	35	30	32	1.4	1.5	2.0

Engelmann spruce weevil, Pissodes engelmanni

At each of 20 plots, 100 spruce trees were examined and the number of infested leaders recorded (Table 7). Attacks were light, ranging from 0 to 5% of the leaders infested. Most attacks were observed in open areas such as road right-of-ways, meadows, and lake shores.

Table 7. White spruce leaders infested by Engelmann spruce weevils in 100-tree plots, West Prince George, 1968

No.	Location	% leaders infested
1	Mi. 35 Kenney Dam Rd.	1
2	Mi. 51 Kenney Dam Rd.	1
3	Mi. 56 Kenney Dam Rd.	1
4	Mi. 30 Kenney Dam Rd.	1
5	Endako	1
6	Mi. 34 Hart Hwy.	4
7	Mi. 44 Hwy. 16 - Hulatt	1
8	Mi. 52 Hwy. 16 - Sinkut Falls	5
9	Mi. 37 Hwy. 16 - Cluculz Lk.	2
10	Isle Pierre	1
11	Jct. Hwy. 16 and Mud R. Rd.	3
12	Mile 3.5 Upper Mud R. Rd.	2
13	Mile 2.5 Tacheeda Lake Rd.	1
14	Mi. 81 Hart Hwy.	2
15	Graveyard Lk.	2
16	3 miles east of Punchaw	1
17	Mi. 4.6 West Lk. Rd.	1
18	Mi. 34 Blackwater Rd.	1
19	Chilako R. on Blackwater Rd.	0
20	Mi. 17.5 Tacheeda Lk. Rd.	0

Lodgepole pine terminal weevil, Pissodes terminalis

Damage was noticeable throughout the District. The most striking was in lodgepole pine regeneration along Kenney Dam Road where there was an average of 12 reddened terminals per mile.

Table 8. Other insects of current minor significance

Insect	Hosts[1]	Locality	Remarks
Acleris variana Black-headed budworm	wS, alF, D, bS	Widespread	Defoliator. An average of 5.5 larvae per collection from 56 positive collections.
Caripeta divisata Grey spruce looper	wS, alF, bS	Widespread	Defoliator. Light populations. Only 11 larvae in 3 positive collections.
Dioryctria reniculella Spruce cone worm	wS	Widespread	Defoliator and cone feeder. An average of 1.8 larvae per positive collection. Found more frequently in beating collections than in 1967.
Neodiprion spp. Sawflies	wS, lP, alF, D	Isle Pierre, Chief Lake, Blackwater Rd., Pine Pass	Defoliators. An average of 2.9 larvae per collection in 29 positive collections.

[1] Host tree abbreviations appear in the Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

A leaf blight on aspen, Venturia populina

Since 1966, this disease has increased in severity. Identified in 1968 as Venturia populina, the fungus kills portions of the leaf and new shoots leaving them brown and withered. Heavily infected trees may lose as much as 90% of their foliage.

From sporadic infections around Vanderhoof and McLeod Lake in 1966, the disease has spread to large areas encompassing 1,700,000 acres of aspen. Map 2 shows the areas affected as determined by aerial and ground surveys.

Physiological Diseases

Weather Damage

"Red belt" winter injury was extensive in the Kenney Dam, Pine Pass and Parsnip River areas.

Near Kenney Dam, lodgepole pine on the slopes of Mount Greer and Mount Hobson were severely reddened. In Pine Pass, white spruce, lodgepole pine, and some aspen were damaged on the south slopes at Mile 115, Hart Hwy. Damage to aspen was extensive along the Parsnip River in the Rocky Mountain Trench to Williston Lake. Although mortality is unusual, "red belt" reduces the vigor of the tree making it more susceptable to insect or disease attack.

Specific Surveys

Atropellis canker survey

Fifty lodgepole pine were examined at each of 20 areas for cankers caused by the fungus Atropellis piniphila. Cankers were found in eight of of the 20 plots examined, with six infected stems the most counted in any one plot.

Rhizina root rot survey

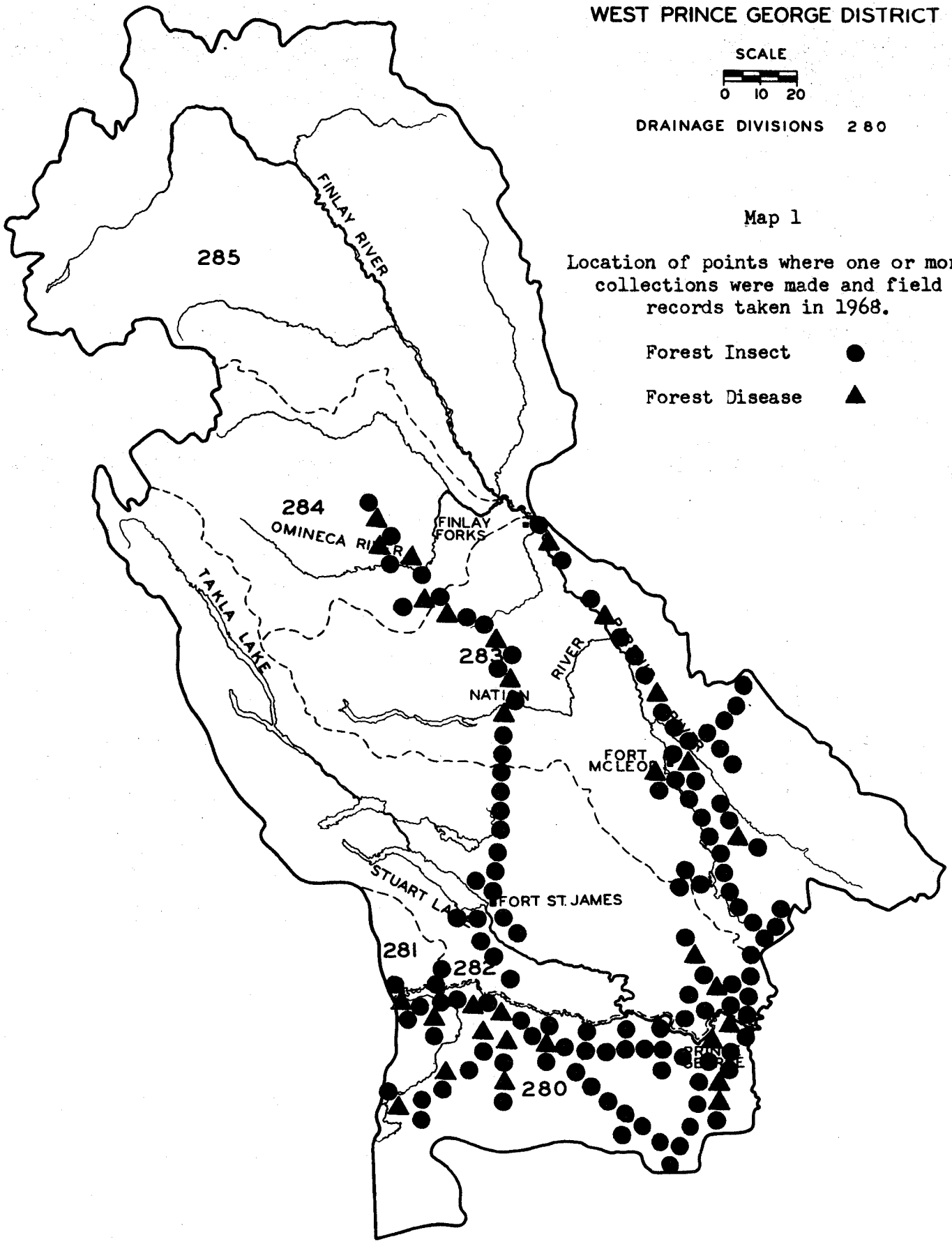
Three unplanted burns at McLeod Lake, Baldy Hughes Radar Station and near Uslika Lake were examined in July and September for fruiting bodies of Rhizina undulata, a fungus disease which kills conifer seedlings. None were found.

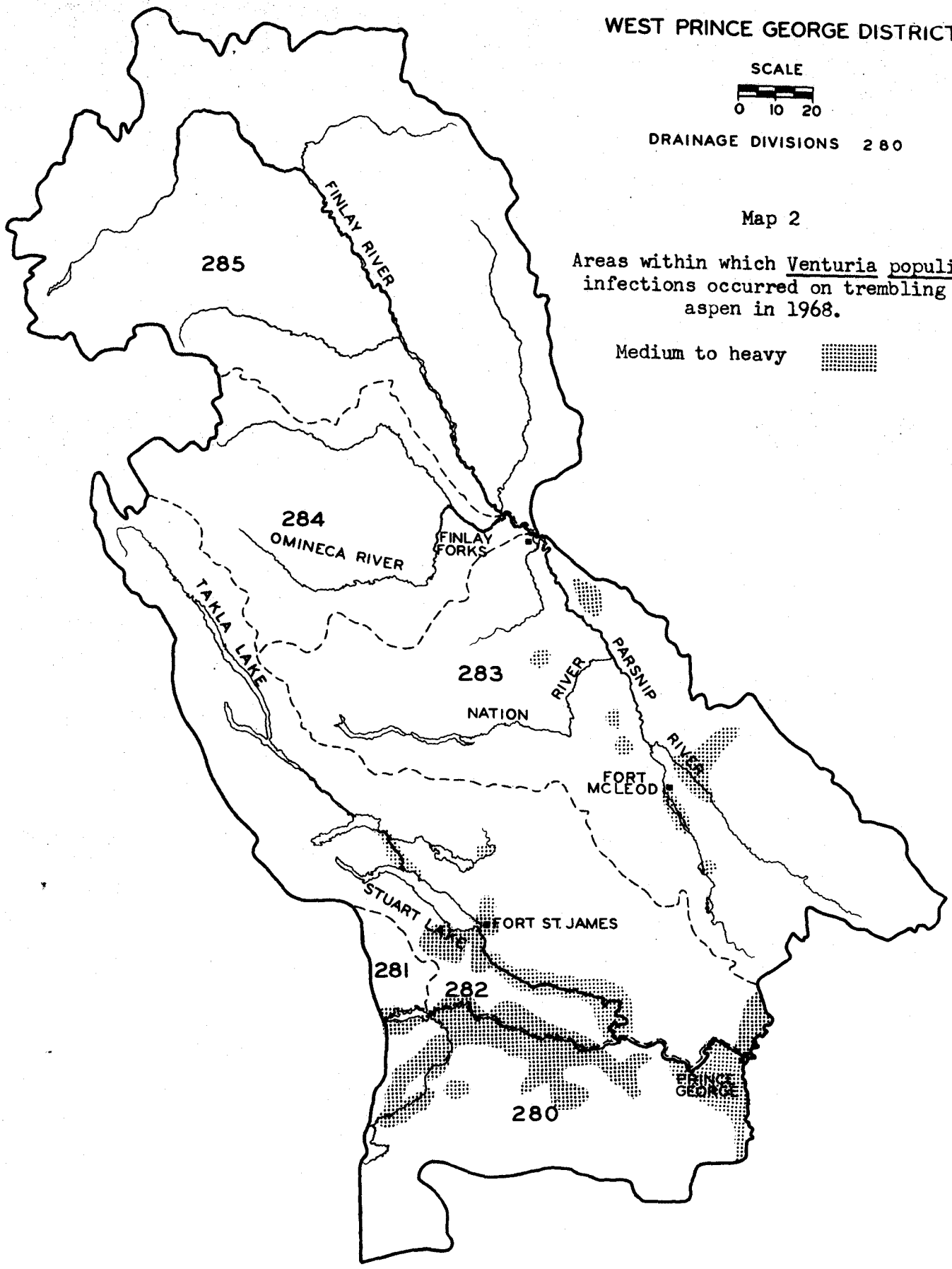
Other Noteworthy Diseases

Table 9. Other diseases of current minor significance

Organism	Hosts[1/]	Locality	Remarks
Armillaria mellea	wS, lP, alF	Bear Lake, Kerry Lake	Total of 50 trees examined, 5 trees infected and dying from this root rot.
Chrysomyxa arctostaphyli	bS, wS	Widespread	Most severe in black spruce stands. A rust fungus causing brooming in crowns.

1/ Host tree abbreviations appear in the Introduction.


WEST PRINCE GEORGE DISTRICT
SCALE
0 10 20
DRAINAGE DIVISIONS 280
Map 1
Location of points where one or more collections were made and field records taken in 1968.
Forest Insect
Forest Disease
285
FINLAY RIVER
284
OMINECA RIVER
FINLAY FORKS
TAKLA LAKE
283
NATION
RIVER
FORT MCLEOD
STUART LAKE
FORT ST. JAMES
281
282
280


WEST PRINCE GEORGE DISTRICT
SCALE
0 10 20
DRAINAGE DIVISIONS 280
Map 2
Areas within which Venturia populina infections occurred on trembling aspen in 1968.
Medium to heavy
285
FINLAY RIVER
284
OMINECA RIVER
FINLAY FORKS
TAKLA LAKE
283
NATION
PARSNIP RIVER
FORT MCLEOD
STUART LAKE
FORT ST. JAMES
281
282
PRINCE GEORGE
280

FOREST INSECT AND DISEASE SURVEY

NORTH PRINCE GEORGE

1968

D. G. Lund [1/]

INTRODUCTION

Regular field work commenced on June 3 and terminated on September 13. Aerial (5 hours and 10 minutes flying time) and ground surveys of spruce budworm damage were carried out in the Liard and Fort Nelson River drainages from July 29 to August 2. Special surveys were made for spruce gall aphids, spruce terminal weevil on white and black spruce, Atropellis canker on lodgepole pine, Rhizina root rot of coniferous seedlings, and root rots of conifers.

Insect and disease collections are listed, by host, in Table 1; collection localities are shown on maps 1 and 2. The principal problems in each Forest Insect and Disease Survey drainage division appear in Table 2. Drainage divisions are illustrated in maps 1 and 2. Details on individual insect and disease problems follow this introduction.

Numbers of larval defoliators found in field collections decreased; 42% of the beating collections contained larvae in 1968 compared with 54% in 1967.

Spruce budworm was the only major problem. Larch sawfly continued to decline with very light defoliation in isolated areas. Aspen leaf miner persisted along the B.C. - Yukon border. A pine stem blister rust, Peridermium stalactiforme, severely infected pine stands in the Atlin region.

1/ Forest Research Technician, Forest Insect and Disease Survey Ranger, Vernon.

Table 1. Collections by hosts, North Prince George, 1968

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Fir, alpine	23	7	Aspen, trembling	20	3
Hemlock, mountain	2	0	Birch	3	5
Juniper, common	1	0	Poplar	16	3
Larch, eastern	27	0	Willow	21	4
Pine, jack	2	0	Miscellaneous	6	0
Pine, lodgepole	52	41			
Spruce, black	33	3			
Spruce, white	190	19			
Totals	330	70	Totals	54	15
			Misc. hosts	4	7
			No hosts	2	2
			GRAND TOTALS	392	94

Table 2. Currently important insect and disease 1/ problems by drainage divisions, North Prince George, 1968

Insect and disease problems	Principal 2/	Importance by drainage divisions 3/							
		300	301	302	303	304	305	306	307
Defoliators									
One-year-cycle spruce budworm	wS, alF, bS, tL	0	1	4	3	1	0	0	0
Leaf-miners									
Aspen leaf miner	tA	1	1	1	0	4	1	0	1
Foliage Diseases									
Ink Spot on Aspen	tA	1	3	3	0	1	1	0	1

1/ Includes only weather-induced and foliage diseases which fluctuate annually.

2/ See host code in Survey District introduction.

3/ High population and/or widespread outbreak in progress - 5.

Scattered high populations and/or significant damage in restricted areas - 4.
Rising population and/or moderate numbers and/or potential problem - 3.
Static or falling population and/or moderate numbers and/or no problem at present.- 2.

Endemic population and/or no significant damage - 1.

Not sampled and/or no host and/or not found - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

One-year-cycle spruce budworm, Choristoneura fumiferana

Larval populations were variable. Heaviest defoliation occurred south and southeast of Fort Nelson in valleys of the upper Fort Nelson River drainage system and along the Liard River from Mile 540 Alaska Highway to Liard Hot Springs. White spruce was the preferred host but alpine fir and eastern larch were defoliated where larval populations were heaviest. A comparison of beating samples from white spruce shows population trends from 1966 to 1968 (Table 3).

Table 3. Summary of spruce budworm collections by drainage divisions, North Prince George

Drainage divisions	No. of samples taken during larval period			% samples containing larvae			Av. no. of larvae per positive sample		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
301	2	5	5	0	0	0	-	-	-
302	19	41	31	47	84	86	13	60	75
304	16	2	2	0	50	50	-	1	1
Totals	37	48	38	27	57	61	13	54	69

Aerial surveys on July 30 and August 3, after larval feeding had been completed, showed light to severe defoliation of current year's growth in spruce stands along the Fontas, Sikanni Chief, lower Muskwa, Prophet and the upper sections of the Liard and Fort Nelson rivers (Map 3). No damage was visible along the lower Liard and Fort Nelson rivers and the upper Muskwa River where damage was last noted in 1965.

Estimates of current year's defoliation were made on 10 overstory plot trees at 12 permanent sampling points along the Alaska Highway from Mile 247 to 538. Damage was heavier this year at Mile 247 Alaska Highway (Parker Creek) and along the Liard River than in 1967 (Table 4).

Table 4. Defoliation of white spruce by one-year-cycle spruce budworm, North Prince George

Location	% defoliation of current year's growth		
	1966	1967	1968
Mile 247 Al. Hwy.	74	85	95
270	4	tr [1]	tr
5 Sikanni Rd.	- [2]	59	tr
321 Al. Hwy.	22	10	0
335	22	5	0
342	13	10	0
494	12	tr	0
506	4	18	51
514	tr	5	6
Smith River Falls	-	34	74
Mile 528 Al. Hwy.	3	12	22
538	25	85	90

1/ trace

2/ not sampled

Accumulated defoliation was estimated for each year's growth on 10 twigs from two branches from the upper crown of one overstory tree at each of the 12 sampling points (Table 5). Foliage loss appeared to be reaching critical levels at miles 247, 506, 514, 528 and 538 Alaska Highway and at Smith River Falls.

Table 5. Total defoliation of white spruce by spruce budworm, North Prince George

Location	Estimated % total defoliation of the upper crown				Four year average
	1965	1966	1967	1968	
Mile 247 Al. Hwy.	34	46	82	62	56
270	16	16	24	12	17
5 Sikanni Rd.	- [1]	-	51	49	50
321 Al. Hwy.	24	30	39	32	31
335	30	26	39	29	31
342	26	47	34	24	33
494	25	46	33	34	35
506	55	50	37	52	49
514	57	63	20	66	52
Smith R. Falls	-	-	71	54	63 [2]
Mile 528 Al. Hwy.	43	20	44	48	39
538	49	53	78	73	63

1/ not sampled 2/ two year average

Egg sampling was carried out at the 12 permanent sampling points along the Alaska Highway. Two complete branches were taken from the south side of the upper crown of one overstory tree on the periphery of each plot (Table 6).

Table 6. Spruce budworm defoliation and population estimates, North Prince George

Location	% defoliation of current year's growth			No. of adults emerged per 100 sq. ft.			No. of egg masses per 100 sq. ft.		
	1966	1967	1968	1966	1967	1968	1966	1967	1968
Mile 247 Al. Hwy.	74	95	100	480	303	0	1,426	2,396	19
270	4	tr 1/	tr	0	25	0	40	99	0
5 Sikanni Rd.	80	80	10	425	425	19	1,058	1,058	19
321 Al. Hwy.	22	tr	0	25	0	0	25	0	0
335	22	5	0	10	132	0	10	131	0
342	13	tr	0	15	59	0	46	98	0
494	12	tr	0	0	20	0	0	0	67
506	4	tr	85	0	0	133	0	141	663
514	tr	tr	0	0	0	68	43	28	170
Smith R. Falls	0	50	85	-	-	800	-	116	942
Mile 528 Al. Hwy.	tr	tr	50	0	44	150	26	304	800
538	25	90	95	29	81	31	246	677	310

1/ trace

Numbers of egg masses indicate a sharp drop in the 1969 larval populations in the Fort Nelson River Drainage and at Mile 538 Alaska Highway. Considerable increases in larval populations are expected from Mile 494 to 528 Alaska Highway. Medium to heavy defoliation may be expected at these localities in 1969.

Leaf Miners

Aspen leaf miner, Phyllocnistis populiella

Infestations remained heavy in stands along the B. C. - Yukon border and extended southward along the main rivers and their tributaries: along the Liard to Mile 540 Alaska Highway, along the Dease River to Pinetree Lake and extending down to Atlin Lake. All other areas were lightly infested. In July and August, the trees in two permanent plots at Hyland River and Mile 45 Cassiar Road were heavily infested; two plots at Smith River and Prochniac Creek were lightly infested and had insufficient cocoons to yield adequate data (Table 7).

Table 7. Aspen leaf miner populations, North Prince George

Location	% leaf surfaces with mines			No. of adults per 100 leaf surfaces		
	1966	1967	1968	1966	1967	1968
Prochniac Cr.	0.0	3.6	0.7	0.0	0.0	0.0
Smith River	0.0	4.4	30.0	0.0	0.0	0.0
Hyland River	31.0	90.0	77.0	26.3	57.6	12.1
Mile 45 Cassiar Rd.	- 1/	56.4	57.0	-	31.4	30.9

1/ not sampled

Parasitism increased at the Hyland River plot and at Mile 45 Cassiar Road. In the 100 cocoon sample at Hyland River, 48% were parasitized, 22% dead, 2% otherwise destroyed and 28% emerged successfully. At Mile 45 Cassiar Road, 20% were parasitized, 13% dead, 1% otherwise destroyed and 66% emerged successfully. A decrease in population may be expected at Hyland River due to the high percentage of cocoons parasitized.

Other Noteworthy Insects

Spruce gall aphids, Adelges sp. and Pineus sp.

A special survey, where the number of galls per square foot were determined from one branch selected from the mid-crown of each of twenty-five trees in 20 stands of white and black spruce showed populations to be light to nil. The maximum number of new galls per square foot of foliage was 1.14 Pineus sp. galls on black spruce at Mile 530.5 Alaska Highway and 0.17 Adelges sp. galls on white spruce at Mile 292.7 Alaska Highway.

Spruce beetle, Dendroctoonus obesus

There was little or no activity in accessible white spruce stands. Three standing mature white spruce at Mile 539.5 Alaska Highway, which had been weakened by spruce budworm feeding, were lightly attacked. During aerial surveys old damage was seen in two stands of white spruce along the Liard River near the mouth of the Smith River where approximately 50% of the trees were dead.

Yellow-headed spruce sawfly, Pikonema alaskensis

Larvae caused up to 50% defoliation of ornamental native spruce within towns and cities in the Peace River Region. Populations remained

low in other areas.

Larch sawfly, Pristiphora erichsonii

Larval populations declined sharply in eastern larch stands as shown in the following summary:

No. of samples taken during larval period			% samples containing larvae			Av. no. of larvae per positive sample		
1966	1967	1968	1966	1967	1968	1966	1967	1968
29	25	24	69	56	47	14	50	12

Very light defoliation occurred in some stands in the Fort Nelson River drainage and light to no defoliation in the Peace River region and Monkman Pass area.

Table 8. Other insects of current minor significance

Insect	Host 1/	Locality	Remarks
Acleris variana Black-headed budworm	wS, alF, bS	widespread	Defoliator. Decreased population.
Dioryctria reniculella Spruce foliage worm	wS, bS, alF	Liard R.	Defoliator. Decreased population.
Disonycha alternata A leaf beetle	W	Raspberry Cr., Muskwa R.	Defoliator. Moderate damage along the river and creek.
Operophtera bruceata Spruce spanworm	tA, W, B, Al	Peace R. region	Defoliator. Increased population. 37% of samples averaged 2.9 larvae.
Pikonema spp. Spruce sawflies	wS	widespread	Defoliators. Decreased population.
Pissodes engelmanni Engelmann spruce weevil	wS, bS	southern part of District	Terminal borer. A special survey was conducted to determine the distribution. It was not found.

1/ See host code in Survey Introduction.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Stem Diseases

Stalactiform rust, Peridermium stalactiforme

Infections occurred in lodgepole pine stands at miles 197.8, 216.8 and 230 Hart Highway and in the Atlin area. Eighteen per cent of 150 trees examined along the Hart Highway and 90% of 200 trees surveyed at two localities at Atlin were infected. Many infected immature trees had been girdled by rodents and were dead. Mature trees were deformed by previous infection.

Attacked trees may suffer stem deformation and growth loss or death if cankers girdle the stem.

Foliage Diseases

Ink spot on aspen, Ciborinia whetzelii

Infections caused browning of leaves on about 60 acres at Mile 128 Alaska Highway; by the first week in August, leaves had begun to drop. At Mile 420, about 100 acres of trees were infected but browning was less evident than in 1967. Dieback of the current year's shoots and defoliation probably reduce growth increment. Mortality is rare.

Specific Surveys

Atropellis canker, Atropellis piniphila

Fifty lodgepole pine were examined in each of 20 stands for stem cankers caused by this disease. None were found.

Root rots

A survey was made of coniferous stands for root rots, Poria weirii, Armillaria mellea and Fomes annosus. None were found in stands surveyed.

Rhizina root rot

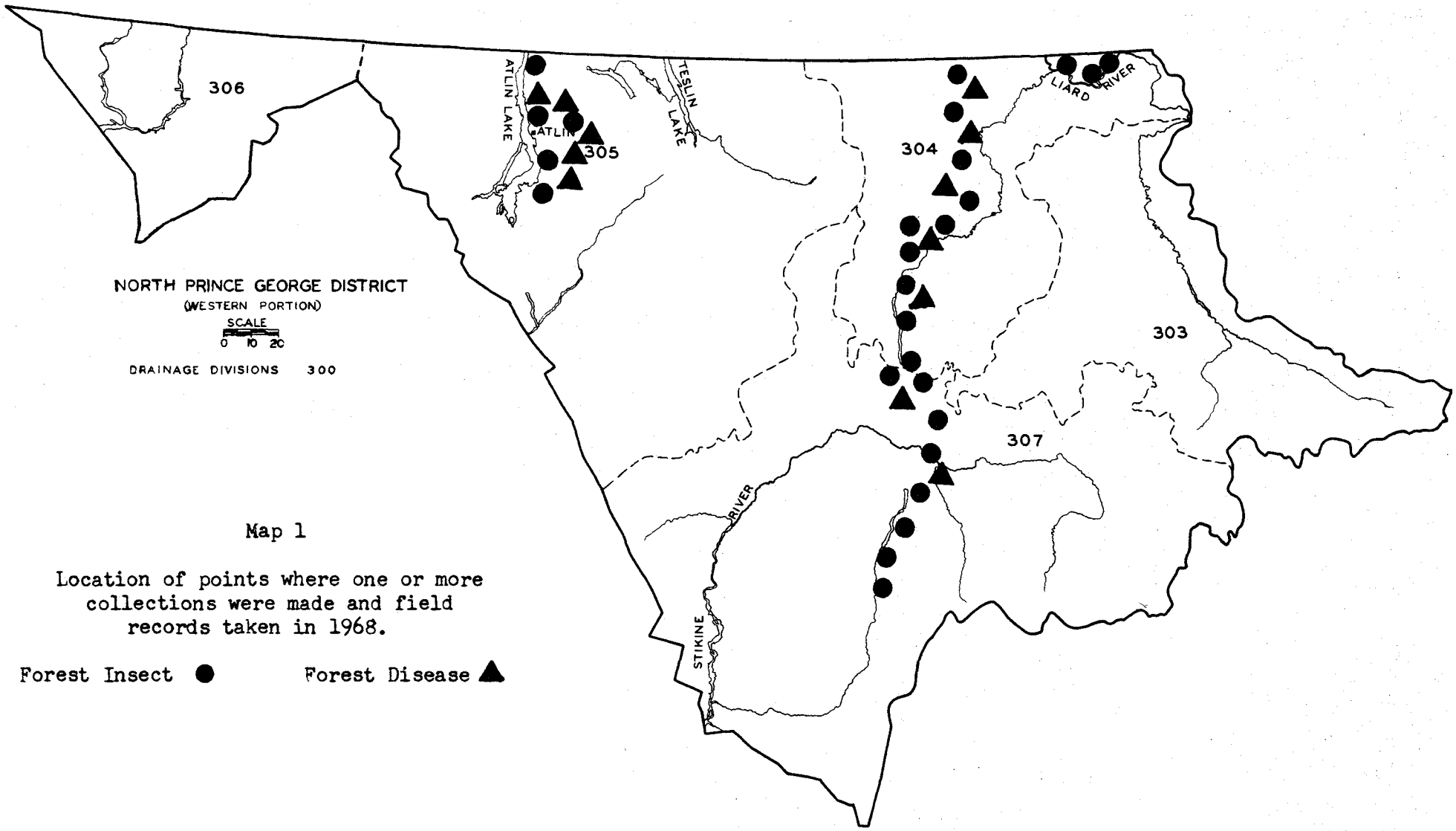
Occurring on recently burned areas, this disease infects the roots of conifer seedlings. The fungus was not found on the two accessible burns. There are no planted areas in the district.

Other Noteworthy Diseases

Table 9. Other diseases of current minor significance

Organism	Hosts 1/	Locality	Remarks
Cronartium comandrae	lP	Atlin	Stem rust. Causes blistering of stem and branches, deforming tree. Light infection.
Elytroderma deformans	lP	Mile 530.5 Alaska Hwy.	Needle cast. Light infection.
Lirula macrospora	bS	widespread	Needle cast. Fairly common.
Melampsora epitea	W, alF	Atlin	Leaf rust. 8 willow trees had up to 90% of their leaves infected.

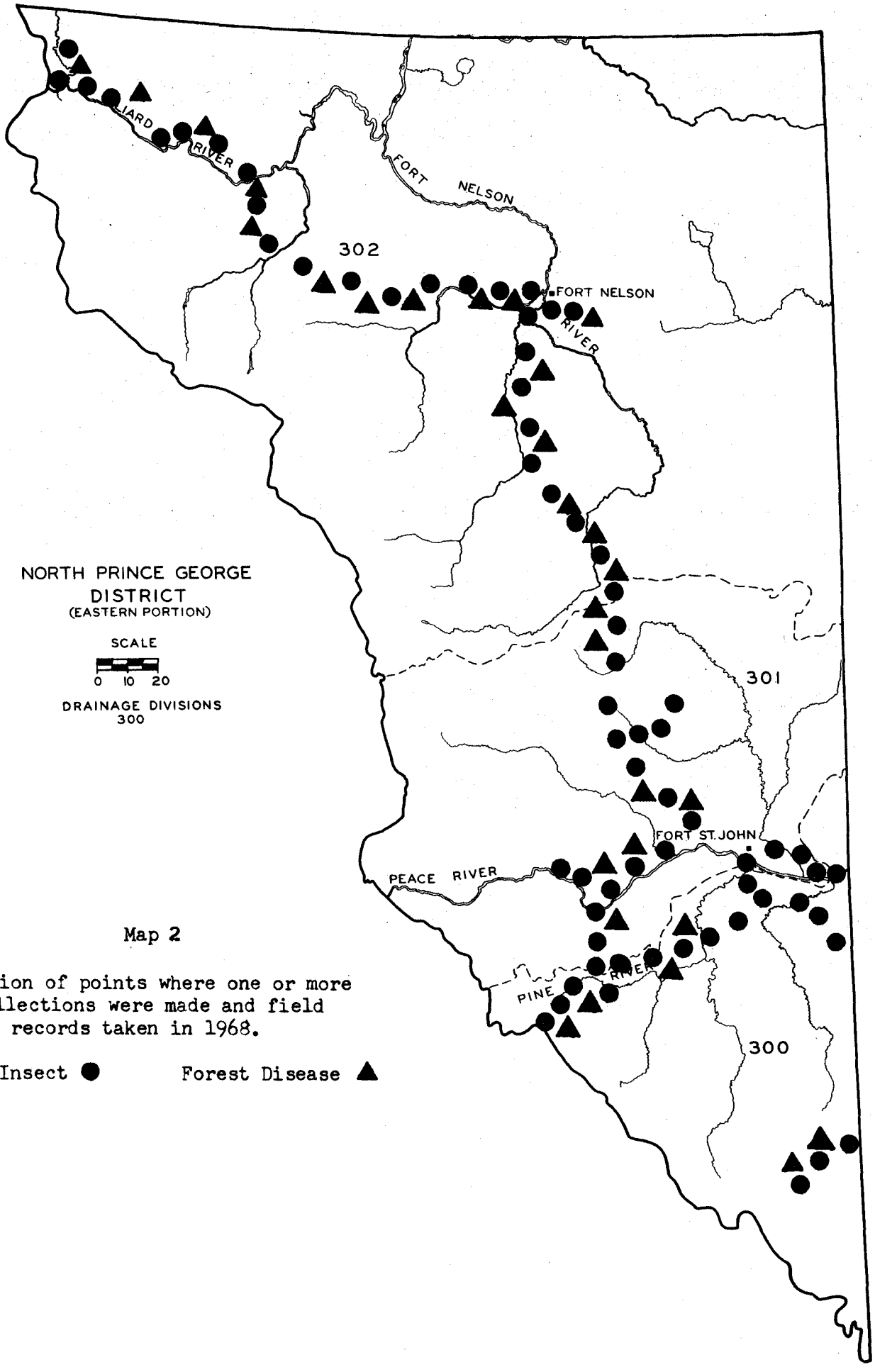
1/ See host code in Survey District Introduction.



Map 1

Location of points where one or more collections were made and field records taken in 1968.

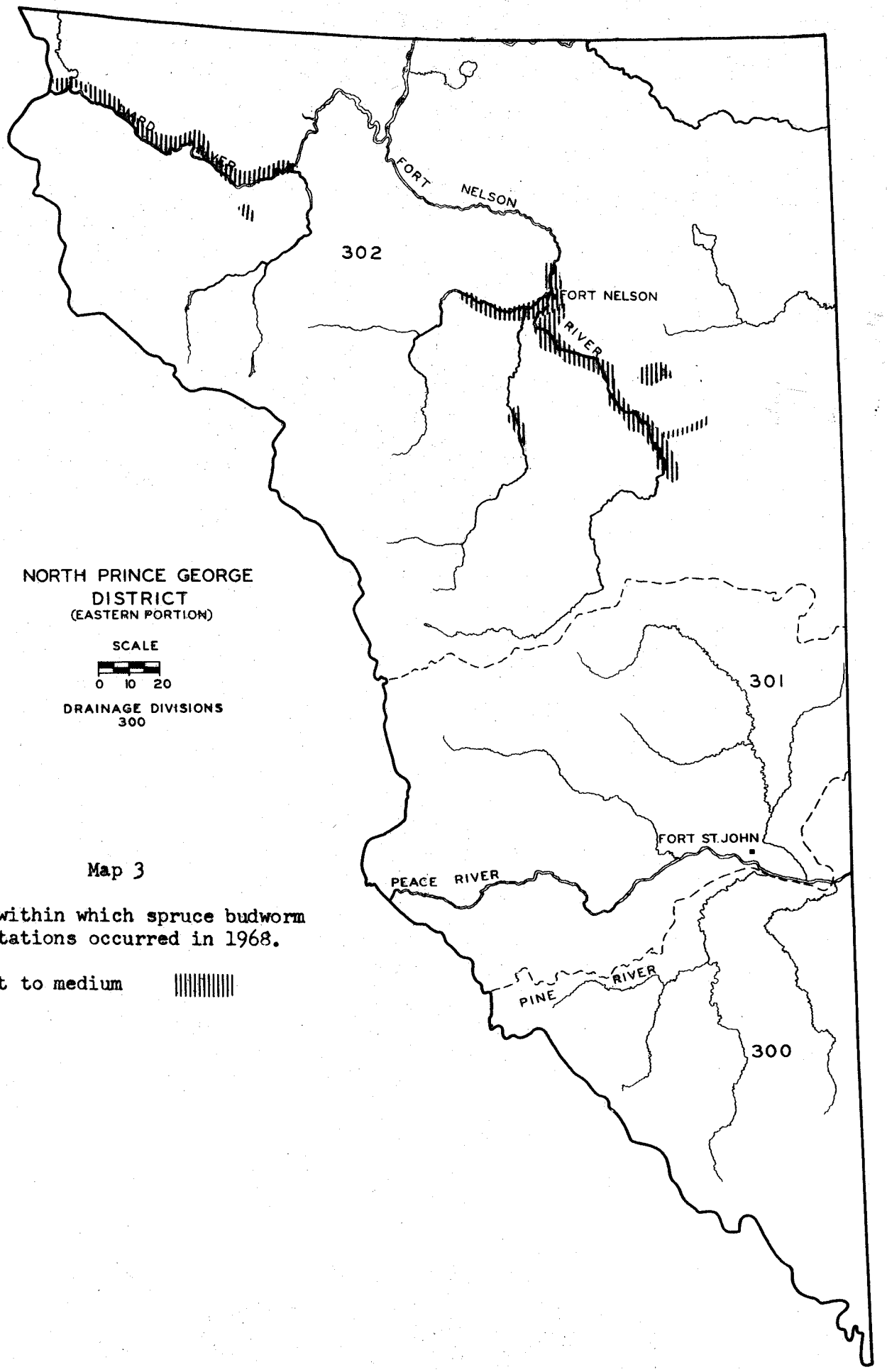
Forest Insect ● Forest Disease ▲



Map 2

Location of points where one or more collections were made and field records taken in 1968.

Forest Insect ● Forest Disease ▲



Map 3

Areas within which spruce budworm infestations occurred in 1968.

Light to medium