ANNUAL DISTRICT REPORTS

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

FOREST RESEARCH LABORATORY

VICTORIA, BRITISH COLUMBIA

INFORMATION REPORT BC-X-16

DEPARTMENT OF FORESTRY AND RURAL DEVELOPMENT

APRIL, 1968

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R. L. Fiddick

FOREWORD

A number of changes in ranger assignments were made in 1967. C. B. Cottrell of the Vernon Laboratory replaced E. G. Harvey, who recently retired, as senior ranger of the mainland section of the Vancouver Survey District. R. O. Wood replaced C. B. Cottrell in the East Kamloops District as senior ranger, Kamloops Survey District. E. V. Morris of the Vernon Laboratory transferred to the Victoria Laboratory as senior ranger replacement for N. E. Alexander who resigned to accept a position at the B. C. Institute of Technology. Three new technicians were recruited to fill vacancies.

Current district assignments are recorded in the introductory remarks of the Senior Ranger for each Survey District.

A long period of hot dry weather caused direct symptoms of drought in widely scattered areas of the Province and probably predisposed trees to secondary agents on severe sites. These conditions also affected the development of some insect populations, possibly including black-headed budworm, which failed to build up as forecast by the previous fall's egg populations.

Black-headed budworm populations in the Interior declined to a low level.

Larch sawfly populations showed evidence of collapse from heavy parasitism. Defoliation was less severe than in 1966.

The known range of the larch casebearer was extended northward in the Nelson District.

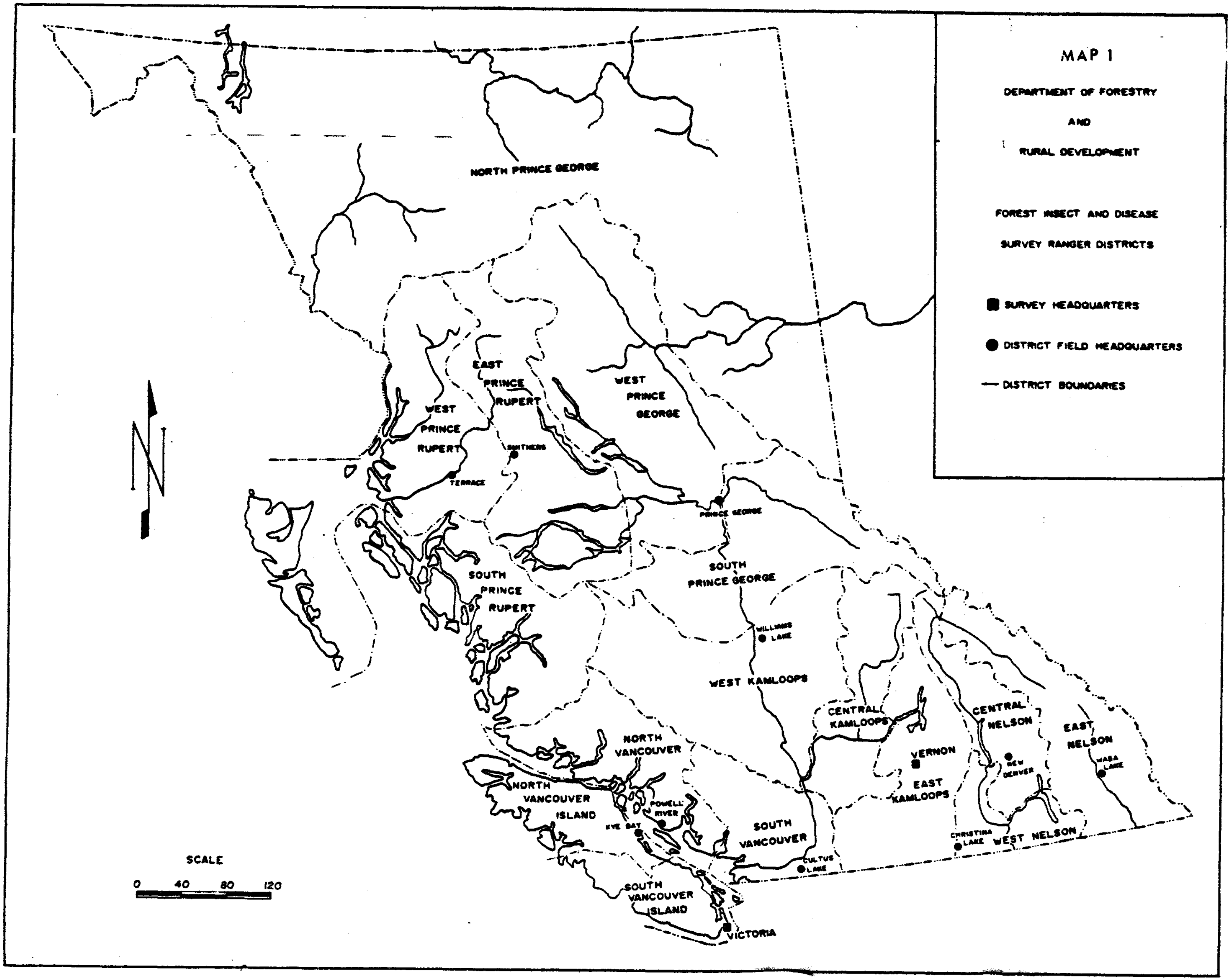
Beetle populations remained relatively low in all areas. There was an increase in Douglas-fir beetle activity in the Cariboo, however, where severe frost injury the previous spring may have predisposed many trees to beetle attack. The trees appeared to be recovering satisfactorily in 1967, although the full impact of the damage may not yet have been manifest.

Specific surveys were conducted throughout the Province to determine the distribution and incidence of Atropellis canker and Stalactiform rust of lodgepole pine.

Lombardy poplar in the Fraser Valley was examined for signs of infection by the canker disease caused by *Dothichiza populea* Sacc. & Briard, an introduction from Europe recently reported in Washington. The disease has not been found in British Columbia to date.

Totals of 7,691 insect and 950 disease collections were submitted to the Victoria and Vernon Laboratories. The majority of these collections were made by the ranger staff.

Map 1 shows the Forest Insect and Disease Survey districts and District headquarters in the Province. Drainage division boundaries are shown on individual maps in the District reports.



MAP 1
DEPARTMENT OF FORESTRY
AND
RURAL DEVELOPMENT
FOREST INSECT AND DISEASE
SURVEY RANGER DISTRICTS
SURVEY HEADQUARTERS
DISTRICT FIELD HEADQUARTERS
DISTRICT BOUNDARIES
NORTH PRINCE GEORGE
EAST PRINCE RUPERT
WEST PRINCE RUPERT
WEST PRINCE GEORGE
SMITHERS
TERRACE
PRINCE GEORGE
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SOUTH PRINCE GEORGE
WILLIAMS LAKE
WEST KAMLOOPS
CENTRAL KAMLOOPS
VERNON
EAST KAMLOOPS
CENTRAL NELSON
NEW DENVER
EAST NELSON
WASA LAKE
CHRISTINA LAKE
WEST NELSON
NORTH VANCOUVER
NORTH VANCOUVER ISLAND
POWELL RIVER
KYE BAY
SOUTH VANCOUVER
CULTUS LAKE
SOUTH VANCOUVER ISLAND
VICTORIA
N
SCALE
0 40 80 120

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

VANCOUVER SURVEY DISTRICT

VANCOUVER ISLAND SECTION

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

VANCOUVER SURVEY DISTRICT

VANCOUVER ISLAND SECTION

S. J. Allen and N. E. Alexander[1/]

This report discusses forest insect and disease conditions in the Vancouver Island part of the Vancouver Forest District. In 1967, N. E. Alexander surveyed the South Vancouver Island District and M. Bedford took over the North Vancouver Island District. Mr. Alexander resigned in August to accept a position at the B. C. Institute of Technology turning over the District to Mr. Allen.

The hemlock needle miner outbreak in Holberg-Mahatta River area decreased.

Pine butterfly populations dropped in most areas of the Chemainus and Nanaimo River valleys but green-striped forest looper populations increased on the west coast of Vancouver Island. Populations of the silver-spotted tiger moth increased.

Balsam woolly aphid surveys were continued by British Columbia Forest Service crews, but only a slight increase in the range was detected over the previous year.

1/ Forest Research Technicians, Forest Insect and Disease Survey Senior Rangers, Victoria, B. C.

Host Tree Abbreviations

Abbreviation	Common name	Abbreviation	Common name
Al	alder-general	P	pine-general
rAl	red alder	lP	lodgepole pine
Ar	arbutus	mP	Mugho pine
C	cedar-general	pP	ponderosa pine
wC	western red cedar	rP	red pine
Ch	cherry-general	sP	shore pine
lCy	Lawson cypress	scP	Scots pine
D	Douglas-fir	wwP	western white pine
wDo	western flowering dogwood	Po	poplar-general
F	fir-general	lPo	Lombardy poplar
alF	alpine fir	S	spruce-general
brF	bracted balsam fir	nS	Norway spruce
gF	grand fir	sS	Sitka spruce
Hw	hawthorn-general	wY	western yew
H	hemlock-general	E	elm-general
eH	eastern hemlock	W	willow-general
mH	mountain hemlock		
wH	western hemlock		
I	holly		
hCt	horse chestnut		
J	juniper-general		
roJ	Rocky Mountain juniper		
L	larch-general		
M	maple-general		
bM	broadleaf maple		
gO	Garry oak		

FOREST INSECT AND DISEASE SURVEY

SOUTH VANCOUVER ISLAND DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

SOUTH VANCOUVER ISLAND DISTRICT

1967

S. J. Allen and N. E. Alexander

INTRODUCTION

Silver-spotted tiger moth surveys and exotic plantation examinations were carried out in April and May. Routine field work, which started on June 6, was cut short by closure of the forests in early August due to extremely hot dry weather.

Special surveys were made for pine butterfly and silver-spotted tiger moth.

Green-striped forest looper and black-headed budworm populations increased in 1967.

Aerial reconnaissance of west coast portions of the District in July revealed no current problems.

Table 1 lists collections by hosts. Locations of collections and Drainage Division boundaries are shown on Map 1 and currently important insect and disease problems are shown in Table 2.

Table 1

Collections by Hosts

South Vancouver Island District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	18	3	Alder, red	3	2
Douglas-fir species	0	4	Arbutus	1	0
Douglas-fir	125	28	Cherry	3	1
Douglas-fir, blue	1	0	Dogwood, western flowering	4	2
Fir species	2	0	Elm species	1	0
Fir, alpine	2	0	Hawthorn species	1	0
Fir, amabilis	220	3	Holly species	1	0
Fir, bracted balsam	2	0	Horse-chestnut sp.	0	2
Fir, grand	186	6	Locust, black	0	1
Hemlock species	1	1	Maple species	0	1
Hemlock, eastern	1	0	Maple, broadleaf	1	1
Hemlock, western	76	12	Oak, Garry	27	1
Juniper species	0	1	Poplar species	3	1
Juniper, Rocky Mountain	0	1	Poplar, Lombardy	0	1
Larch species	0	1	Willow species	4	0
Pine species	2	8	Willow, bay-leaved	0	1
Pine, lodgepole	24	15	Willow, weeping	3	0
Pine Mugho	1	0			
Pine, western white	3	4			
Spruce species	0	1			
Spruce, Sitka	36	2			
Totals	700	90	Totals	52	14
			Miscellaneous hosts	32	10
			No host	52	2
			GRAND TOTALS	836	116

Table 2

Currently Important Insect and Disease[1]

Problems by Drainage Divisions, South Vancouver Island District, 1967

Insect and disease problem	Principal hosts[2]	Importance by drainage divisions[3] 001	002	003	004	005
Defoliators						
Pine butterfly	D	0	3	0	0	0
Green-striped forest looper	wH, D, wC	2	3	3	3	4
Silver-spotted tiger moth	D	3	3	0	3	0
Black-headed budworm	wH, D	0	3	2	0	1
Douglas-fir tussock moth	D, Pop	3	0	0	0	1
Sucking Insects						
Balsam woolly aphid	gF, aF	5	4	0	3	0
Foliage Diseases						
Dothistroma needle blight	Pines, Monterey	0	4	4	0	4

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

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

Defoliators

Pine Butterfly, Neophasia menapia (F. and F.)

Large adult flights and high egg counts in 1966 predicted an increase in larval populations for the following year in the Chemainus and Nanaimo River drainages, especially on the Chemainus River Road, Branch C21 and Branch F1 areas. However in 1967, the larval population was light in all areas except near the junction of Jenkins Creek and the south fork of Jump Creek on the Chemainus River Road where defoliation of Douglas-fir consisted of about 50% of the 1966 foliage.

The only significant adult flight was seen by Crown-Zellerback personnel in August, 1967, along Chemainus River Road.

Egg counts were made in the Nanaimo River and Chemainus River valleys using the same method as last year. Numbers of eggs were lower than those found in 1966 and indications were that the populations would decrease in 1968 (Table 3). No adult counts were made during August due to the high fire hazard throughout the District.

Table 3

Pine Butterfly Egg Counts, South Vancouver Island District

Location	Sq. ft. foliage 1967	Eggs per square foot					
		1966			1967		
		viable	unviable	total	viable	unviable	total
Chemainus R.							
Branch M	11.8	10.3	0.5	10.8	2.8	0.8	3.6
Mainline "B"	12.3	16.6	2.6	19.2	8.4	7.1	15.5
Mainline "D"	14.1	31.3	12.4	43.7	0.2	2.1	2.3
Reinhart Rd.	4.9	3.5	0.8	4.3	1.8	2.2	4.0
Nanaimo R.							
Chemainus Rd.	12.8	40.3	1.6	41.9	12.7	3.4	16.1
Branch J3	15.8	2.0	3.2	5.2	7.1	5.3	12.4
Branch R10	13.1	2.5	0	2.5	2.6	0.5	3.1
Nanaimo Lakes							
Branch M	14.0	2.4	0.7	3.1	0	0.1	0.1
J line	15.0	0.4	0	0.4	1.1	0	1.1
Green Cr.	13.8	5.3	0	5.3	0	0.6	0.6

Green-striped Forest Looper, <u>Melanolophia</u> <u>imitata</u> Wlk.

There has been an increase in the numbers of green-striped forest looper larvae found in 3-tree beating samples since 1964 and this increase continued in 1967. Populations have been most pronounced in Drainage Division 005 where they neared outbreak proportions.

In 1967 more than 45% of the collections made in the District (83% in Drainage Division 005) contained larvae (Table 4). Unless something unforeseen reduces the population in 005 it could result in an infestation in 1968.

Table 4

Summary of Green-striped Forest Looper Collections by Drainage Divisions, South Vancouver Island District

Drainage division	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
001	17	25	18	29	38	17	2.0	1.6	1.7
002	155	138	86	17	46	79	1.7	4.2	6.8
003	74	34	25	8	34	36	1.4	1.4	9.8
004	50	24	7	30	54	43	1.7	3.4	2.3
005	84	65	23	13	31	83	1.2	2.6	12.7
Totals	380	285	159	17	40	64	1.6	3.4	7.9

Silver-spotted Tiger Moth, <u>Halisidota</u> <u>argentata</u> Pack.

Silver-spotted tiger moth populations increased suddenly throughout the east coastal area between Victoria and Duncan. The populations, as determined by roadside web counts on Douglas-fir, had been relatively low since 1964 (Table 5).

Table 5

Roadside Web Counts of Silver-spotted Tiger Moth Colonies,

South Vancouver Island District

Areas surveyed	No. webs recorded					Average no. webs per mile				
	1963	64	65	66	67	1963	64	65	66	67
Victoria to Duncan	200	75	51	17	131	5.7	2.2	1.5	0.5	3.9
Duncan to Nanaimo	9	16	130	36	626	0.2	0.5	3.9	1.1	19.7
Nanaimo to Parksville	39	24	125	94	1,441	1.7	1.3	5.6	4.3	62.1
Parksville to Cameron Lk.	53	12	44	76	361	3.6	0.8	3.0	5.4	12.1
Duncan to Cowichan	23	33	5	5	16	1.2	1.8	0.3	0.2	8.4
Cowichan to Youbou	14	6	1	0	10	1.3	0.7	0.1	0.0	0.4
Totals	338	166	356	238	2,585	2.4	1.3	2.7	0.6	17.7

Black-headed Budworm, Acleris variana (Fern.)

Black-headed budworm populations nearly doubled in 1967. A total of 112 larvae were collected in 36 samples compared to 14 larvae in 10 samples in 1966. The populations increased mainly in Drainage Divisions 002, 003 and 005 (Table 6). Larvae were found on Douglas-fir and western hemlock.

Table 6

Summary of Black-headed Budworm Collections by Drainage Divisions,

South Vancouver Island District

Drainage division	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
001	15	5	16	20	0	0	1.0	-	-
002	145	80	87	4	9	36	1.4	1.4	3.2
003	57	29	25	2	7	20	1.0	3.5	3.2
004	50	26	7	2	8	0	1.0	2.3	-
005	72	56	23	1	0	4	3.5	-	1.0
Totals	339	196	158	4	6	23	1.4	1.9	3.1

Douglas-fir Tussock Moth, *Orgyia pseudotsugata* (McD.)

There was a small localized infestation of Douglas-fir tussock moth on Douglas-fir and poplar sp. at the Gorgevale Golf Club near Victoria. One open growing Douglas-fir was completely defoliated; other surrounding trees were lightly affected.

Sucking Insects

Balsam Woolly Aphid, *Adelges piceae* (Ratz.)

Surveys for distribution and occurrence of balsam woolly aphid were continued by B.C. Forest Service crews in 1967. Known boundaries of balsam woolly aphid were extended with the discovery of the aphid on amabilis fir at Gordon River. It now occurs on Vancouver Island south of Nanaimo, mostly on grand fir along the east coast.

Other Noteworthy Insects

European Pine Shoot Moth, *Rhyacionia buoliana* Schiff.

No European pine shoot moth were found on lodgepole pine examined in stands around Sooke, Spectacle Lake, Nanaimo Lakes, Copper Canyon and North West Bay Road. This introduced species apprers confined to ornamentals in cities and towns, particularly in the Victoria area.

Spruce Tip Moth, *Zeiraphera* sp.

Defoliation of Sitka spruce occurred in 1967 on lower crowns of thick Sitka spruce stands behind the shoreline of Long Beach. About 50% of current tips had been attacked and 10% of the foliage was affected. Damage was less than in 1966. Thirty-three larvae were submitted to the Laboratory for identification.

Coniferous Sawflies, *Neodiprion* spp.

Larvae of these sawflies occurred throughout the District and were collected in 49 samples. A small infestation occurred at Blakeney Creek near Port Renfrew where 500 larvae were found in a three-tree beating sample.

Table 7

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Choristoneura fumiferana (Clem.) Spruce budworm	D, lP	DD. 001 and 002	Defoliator. 10 collections averaged 1.4 larvae per sample.
Ectropis crepuscularia Schiff. Saddleback looper.	wH, wC, sS	DD. 002, 003, 005	Defoliator. 15 samples averaged 3.1 larvae compared with 4.2 in 1966.
Lambdina fiscellaria lugubrosa (Hulst) Western hemlock looper	D, wH, wC	DD. 002, 005	Defoliator. 3 samples contained 1 larva each.
Nyctobia limitaria (Wlk.) Yellow-lined forest looper	D, wH, wC	Throughout District	Defoliator. Population unchanged from 1966.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

Dothistroma Needle Blight _Scirrhia pini_ Funk and Parker.

This needle cast fungus continued to cause defoliation in planted exotic pines. Three of seven plantations examined were infected. The amount of defoliation and incidence of attack is shown in Table 8.

Table 8

Defoliation of Pines in Exotic Plantations Caused by

Dothistroma Needle Blight In South Vancouver Island District, 1967

Host	Plantation no.	% foliage loss	No. of trees infected
P. pinaster	189	14	90
	194	0	0
P. nigra	179	0	0
	182	0	0
	185	0	0
	186	17	90
P. echinata	193	0	0

Exotic Plantations

Fifteen exotic plantations were examined in 1967 compared to 34 in 1966. Table 9 shows the diseases found in exotic plantations excluding Dothistroma needle blight.

Table 9

Diseases Found in Exotic Plantation Examinations, 1967

XP number	Location	Exotic species	Remarks
187	Kennedy Lake Sand R. road	*Pseudotsugae wilsoniana*	Unidentified needle cast, 100% incidence, 60% of foliage gone.
194	Dunsmuir Cr. Nanaimo R.	*Pinus pinaster*	*Atropellis* sp. and *Cucurbitaria* sp., new host records.
182	Franklin Tract, Br. 209	*Abies grandis*	12% mechanical damage
		Pinus nigra	2 multi-tops
195	Copper Canyon Plantation #213	*Pinus pinaster*	Trees badly snowpressed, dead and broken branches common.

Canker Damage to Lodgepole Pine Caused by *Atropellis piniphila* (Weir) Lohman and Cash. and *Peridermium staliaciforme* Arth. and Kern

Nine 50-tree samples were taken in lodgepole pine stands. Cankers caused by *A. piniphila* were found in seven out of the nine areas (Table 10); no *P. stalictiforme* was found.

Table 10

Areas Where Canker Damage of Lodgepole Pines Caused by *A. piniphila* Was Found,

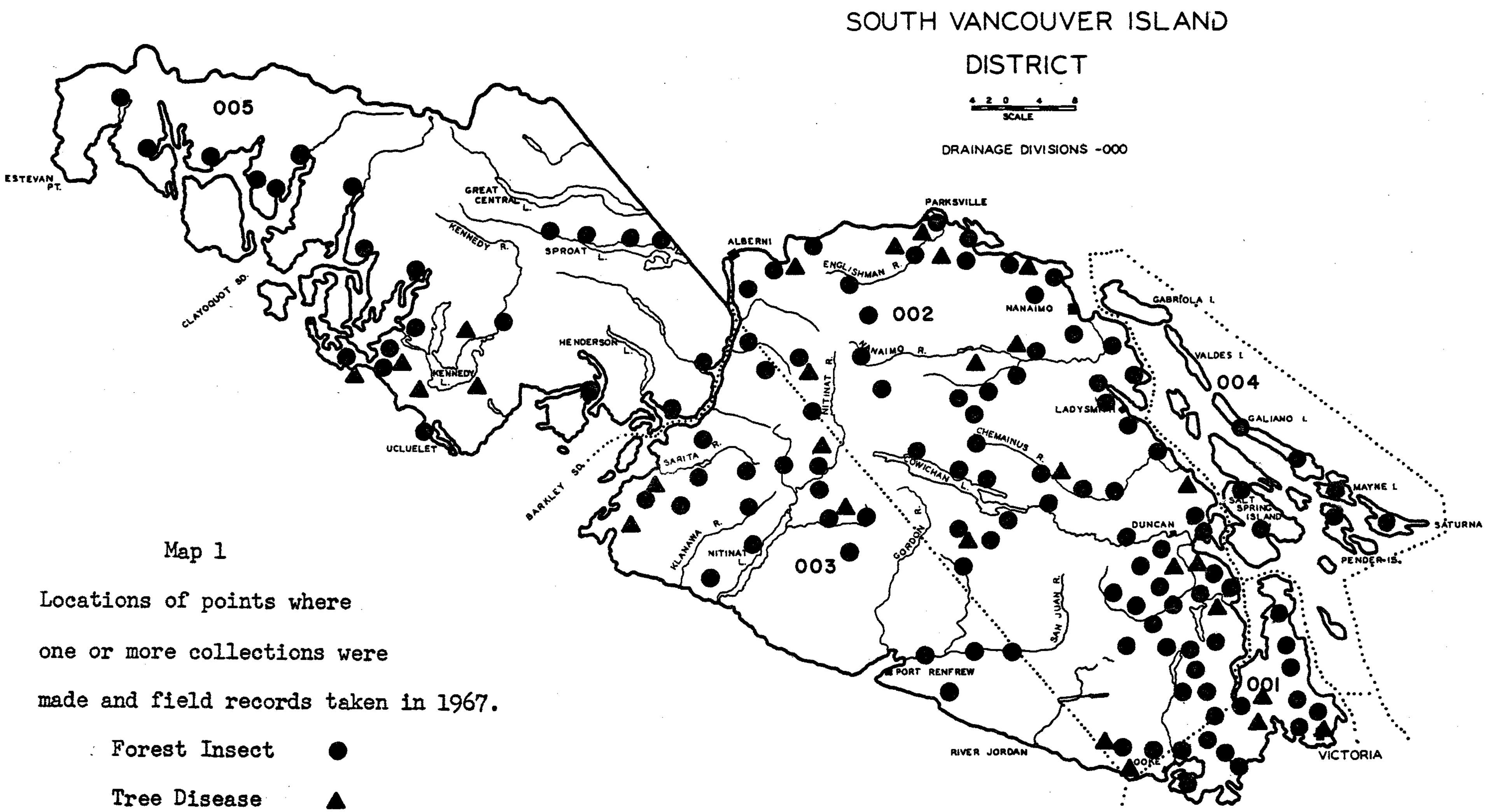
South Vancouver Island District, 1967

Location	% trees infected
N.W. Bay Road	16
E. of Underwood Cove	75
Copper Canyon Road	4
W. of Sooke Bay	14
Spectacle Lake	44
S. end of Lantzville Cut-off	28
Nanaimo Lakes Road	66

Table 11

Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Armillaria mellea Fr. Kummer Shoestring root rot	D	Gordon R., Caycuse Nitinat Div.	Root and butt rot found in overmature and reproduction areas.
Ganoderma oregonense Murr. Saprophyte, White rot	wH	Sand R., Kennedy Lake	Common throughout this area.
Tubercularia sp. Imperfect state of *Nectria* sp.	wDo	Victoria	Associated with dieback of some hardwoods.



Map 1

Locations of points where one or more collections were made and field records taken in 1967.

Forest Insect ●

Tree Disease ▲

FOREST INSECT AND DISEASE SURVEY

NORTH VANCOUVER ISLAND DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

NORTH VANCOUVER ISLAND DISTRICT

1967

M. R. BEDFORD[1/]

INTRODUCTION

Survey work in the North Vancouver Island District began in April with web counts of silver-spotted tiger moth. Exotic plantation examinations were carried out in April and May. Regular field work began on June 7 and ended on August 17. The premature end of the field season was brought about by closure of the forests in the latter part of August due to the extremely hot and dry summer weather. The aerial survey of the west coast was completed in the latter part of July. No major problems were observed during the flight.

Insect and disease collections made in the District are shown by host in Table 1; collection localities and Drainage Divisions are shown on Map 1. Principal insect and disease problems are tabulated by Drainage Divisions in Table 2. Details on individual problems follow this Introduction.

The number of positive collections increased considerably; 91% of beating collections contained larvae compared with 68% in 1966.

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

Table 1

Collections by Hosts

North Vancouver Island District, 1967

Coniferous hosts	Forest insect	Forest diseases	Broad-leaved hosts	Forest insect	Forest diseases
Cedar, Port-Orford	0	1	Alder, red	2	3
Cedar, western red	11	1	Cherry	1	0
Douglas-fir	91	15	Maple, broadleaf	1	0
Fir species	2	0	Oak, Garry	1	0
Fir, amabilis	14	1	Poplar species	1	0
Fir, grand	48	3	Poplar, Lombardy	0	2
Hemlock, mountain	1	0	Willow species	1	0
Hemlock, western	183	4			
Pine, lodgepole	14	16			
Pine, ponderosa	2	2			
Pine, red	0	2			
Pine, Scots	1	12			
Pine, western white	2	0			
Spruce species	2	0			
Spruce, Norway	2	3			
Spruce, Sitka	74	1			
Totals	447	61	Totals	7	5
			Miscellaneous hosts	4	1
			No host	5	0
			GRAND TOTALS	463	67

Table 2

Currently Important Insect and Disease Problems[1]

by Drainage Divisions, North Vancouver Island District, 1967

Insect and disease problems	Principal hosts[2]	Importance by drainage divisions[3] 021	022	023	024	025	026
Defoliators							
Hemlock needle miner	wH	0	0	0	0	3	0
Green-striped forest looper	D, wH, aF	4	4	4	3	3	3
Pine butterfly	D	2	2	2	2	0	0
White-striped forest looper	wH, aF	1	1	1	1	3	1
Weather Damage							
Drought	D, wH	3	3	3	3	0	3

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

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

Defoliators

Hemlock Needle Miner, *Epinotia tsugana* Freeman.

An infestation of a previously unknown needle miner on western hemlock, since described as *Epinotia tsugana*, was first observed on northern Vancouver Island in May 1965. There was appreciable defoliation in the Holberg area and south of Quatsino sound in the Buck Creek and Keith River drainages.

A detailed appraisal of the infestation was carried out in 1966. Ground and aerial surveys were undertaken to determine the extent of the infestation and damage to the trees.

The population subsided during the larval and pupal stages and there was a much reduced egg population in August 1966.

In February 1967, larvae were counted on five 18-inch branch samples from the upper third of the crown of 3 trees at each of 6 locations. There was a marked decrease in the larval population from the previous year except in the Stranby River area (Table 3).

Table 3

Hemlock Needle Miner Populations, North Vancouver Island

Locality	Number of larvae per 18-inch branch	
	Feb. 1966	Feb. 1967
End of N.E. 63	-	3.1
Access Road	37.8	1.9
End of 62 D.l.	12.5	0.1
Stranby River	19.1	8.3
End of S. 100	5.7	0
Denad Creek	-	0

During aerial reconnaissance in May, 1967 previously defoliated areas were quite conspicuous. Seven damage-appraisal strips were re-examined late in May before the buds flushed. Average defoliation of trees on these strips is shown in Table 4. Defoliation was heaviest in the Stranby River area where egg counts were highest in August, 1966.

Table 4

% Defoliation of Western Hemlock Caused by Hemlock Needle Miner,

North Vancouver Island

Crown class	1966 % defoliation by crown level			1967 % defoliation by crown level		
	Upper	Mid	Lower	Upper	Mid	Lower
Dominant	62	57	46	52	47	34
Co-dominant	58	53	45	43	42	32
Intermediate	46	43	33	33	32	21
Suppressed	41	39	37	24	26	23
	Overall average 51%			Overall average 39%		

There has been no tree mortality in the area to date, although some top-killing of a few overmature trees may result.

Strips established in 1966 will be re-examined in 1968 for further information on the impact of defoliation to hemlock stands in the Holberg-Mahatta River areas.

Green-striped Forest Looper, Melanolophis imitata Wlk.

Green-striped forest looper populations increased throughout the District, especially in the Nootka and Kyuquot Sound areas in Drainage Division 023 (Table 5). Populations also increased in Drainage Divisions 021 and 022.

Table 5

Summary of Green-striped Forest Looper Collections by

Drainage Divisions, North Vancouver Island District

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
021	70	107	117	10	12	71	2.4	3.1	7.1
022	48	60	50	27	15	70	5.2	2.9	5.5
023	73	58	32	23	46	84	2.0	3.5	16.0
024	41	41	35	12	17	37	1.0	3.4	4.8
025	53	58	72	4	36	40	2.3	2.6	6.2
026	7	5	9	29	100	33	2.3	3.9	2.7
Totals	292	329	315	16	25	60	2.9	3.3	7.7

Pine Butterfly, Neophasia menapia (F. and F.)

Pine butterfly populations declined to a much lower level than 1966. A number of counts were made of adults hovering around the crowns of Douglas-fir trees in D. D. 021, 023 and 024. The highest adult count was 20 per crown compared with 30 in 1966.

No egg survey was carried out this year.

White-striped Forest Looper, Epirrita pulchraria (Tayl.)

Very few larvae of this insect were found during the field season. The outbreak reported last year near Jeune Landing in D. D. 025 had declined. The area was surveyed twice during the field season in June and August, and no larvae were found.

Further examinations will be made in 1968.

Other Noteworthy Insects

Silver-spotted Tiger Moth, Halisidota argentata Pack.

Populations of this insect increased noticeably in 1967. Table 6 shows the number of webs counted in a roadside survey carried out in April from Parksville to Campbell River.

Table 6

Roadside Web Counts of Silver-spotted Tiger Moth Colonies,

North Vancouver Island District

Areas surveyed	Year	Total number of webs recorded	Average number of webs recorded per mile
Parksville to	1962	3,466	37.4
	1963	87	1.0
Campbell River	1964	32	0.4
	1965	211	3.8
	1966	289	4.2
	1967	1,519	20.0

Balsam Woolly Aphid, Adelges piceae (Ratz.)

Balsam woolly aphid has not been found in the District to date. Checks were made of grand and amabilis fir throughout the District during the field season, and British Columbia Forest Service crews carried out a limited survey around Campbell River.

Table 7

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Acleris variana (Fern.) Black-headed budworm	D, wH, aF, gF	All drainages	Defoliator. 10% of 308 collections averaged 1.7 larvae.
Choristoneura fumiferana (Clem.) Spruce budworm	D, wH, gF	021, 022, 026	Defoliator. 6% of 141 collections averaged 1.6 larvae
Ectropis crepuscularia Schiff. Saddleback looper	wC, D, aF, wH, sS	021, 022, 023 024, 025	Defoliator. 20 positive collections averaged 1.3 larvae each.
Galerucella carbo (Lec.) Pacific willow leaf beetle	W	021, 022	Willow leaf beetle again defoliated willow species although defoliation was less severe than 1966.
Lambdina fiscellaria lugubrosa (Hulst) Western hemlock looper	D, wH, gF	021, 022	Defoliator. 6% of 252 collections averaged 2.2 larvae.
Nyctobia limitaria (Wlk.) Yellow-lined forest looper	wC, D, aF, gF, wH, sS	All drainages	Defoliator. 40 positive collections averaged 3.2 larvae, compared with 2.7 larvae last year.
Neodiprion spp. Sawflies	Conifers	All drainages	Defoliator. 80 positive collections averaged 15.8 larvae. A minor infestation was found at Crawfish Lake, on Nootka Island, D.D. 023, where 500 larvae were collected from one beating sample. Light defoliation was observed in this area.

Table 7 (continued)

Insect	Hosts	Locality	Remarks
Orgyia antiqua badia (Hy. Ed.) Rusty tussock moth	rAl, D, aF, wH, sS	022, 023, 024, 025	Defoliator. 12 positive collections averaged 4.3 larvae each. Majority of the insects were collected in D.D. 025 on Drake Island and vicinity.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Weather Damage

Sun Scald and Drought Mortality

Near Gooseneck Lake and Tsolum River many areas of 10 to 15 year old Douglas-fir along with hemlock, grand and amabilis fir, cedar and willow reproduction were affected by partial or complete dieback due to lack of moisture. Most trees were on exposed dry rocky sites where soil moisture was, no doubt, extremely low in the dry summer months of 1967.

Other stands not examined have probably been affected by drought, especially on dry rocky sites. Needle discoloration and tree dieback will probably be more evident in 1968.

Dieback of Western Hemlock

Western hemlock reproduction between Campbell River and Gold River suffered top-killing due to drought. These conditions were evident in well drained, gravelly areas which probably lacked sufficient soil moisture.

Stem and Branch Diseases

Canker Damage to Lodgepole Pine Caused by *Atropellis piniphila* (Weir) Lohman and Cash and *Peridermium stalactiforme* A. and K.

Fifty lodgepole pine trees were examined at each of seven locations to determine the incidence of *A. piniphila* and *P. stalactiforme*. Stem cankers caused by *A. piniphila* were found north of Courtenay on the Williams Beach road and at Campbell River. *Peridermium stalactiforme* was not found.

Exotic Plantations

No new diseases were found during the spring examinations. However, some plantations were in extremely poor condition due to either insect or disease damage.

These damaging agents, summarized in Table 8, are and have been causing considerable damage for several years.

Table 8

XP number	Location	Exotic species	Remarks
3	Tsable River	*Pinus resinosa*	Trees healthy, minor snow breakage.
5	Ash River	*Pinus resinosa*	Trees healthy, minor snow breakage.
14	Tsolum River	*Picea abies*	34% of 1966 new shoots damaged by late spring frost.
18A	Tsolum River	*Picea abies*	22% of 1966 new shoots damaged by late spring frost.
15	Tsolum River	*Pinus sylvestris*	High incidence of a twig ascomycete, *Cucurbitaria* sp. The latter two XP's had a high incidence of needle cast, *Lophodermium pinastri* (Schrad ex Hook.) Chev.
16	" "	" "	
18B	" "	" "	
26	John Hart Lake	*Pinus sylvestris*	No insect or disease problems.
13	Tsolum River	*Pinus sylvestris*	" " " " "
34	Campbell River Experimental Forest	*Pinus ponderosa*	32% of the trees had been killed by a combination of factors. 85% of the living trees have *Vespamima* attack either old or presently active. 71% of the living trees have *Atropellis* stem cankers. Also considerable breakage is attributed to wind.

Table 8 (continued)

XP number	Location	Exotic species	Remarks
25	Echo Lake Camp 8	*Pinus ponderosa*	74% of the trees in the plot have been attacked by *Vespamima*, either presently active or old.
27	Echo Lake	*Pinus contorta* var. *latifolia*	24% of the trees in the plot were dead. 97% of the remaining trees have been damaged by current or old *Vespamima* attack. 79% of the living trees have recent or old *Cronartium* galls.
17	Tsolum River	*Chamaecyparis lawsoniana*	28% of the trees numbered have been damaged either by animals or snow. A few trees have a chlorotic appearance of unknown cause.
243	Courtenay Seed Orchard	*Populus* sp.	A few trees were damaged by weevil *Cryptorhinchus lapathi*. Deer rubbing has damaged the main stem of 25 numbered trees.

Other Noteworthy Diseases

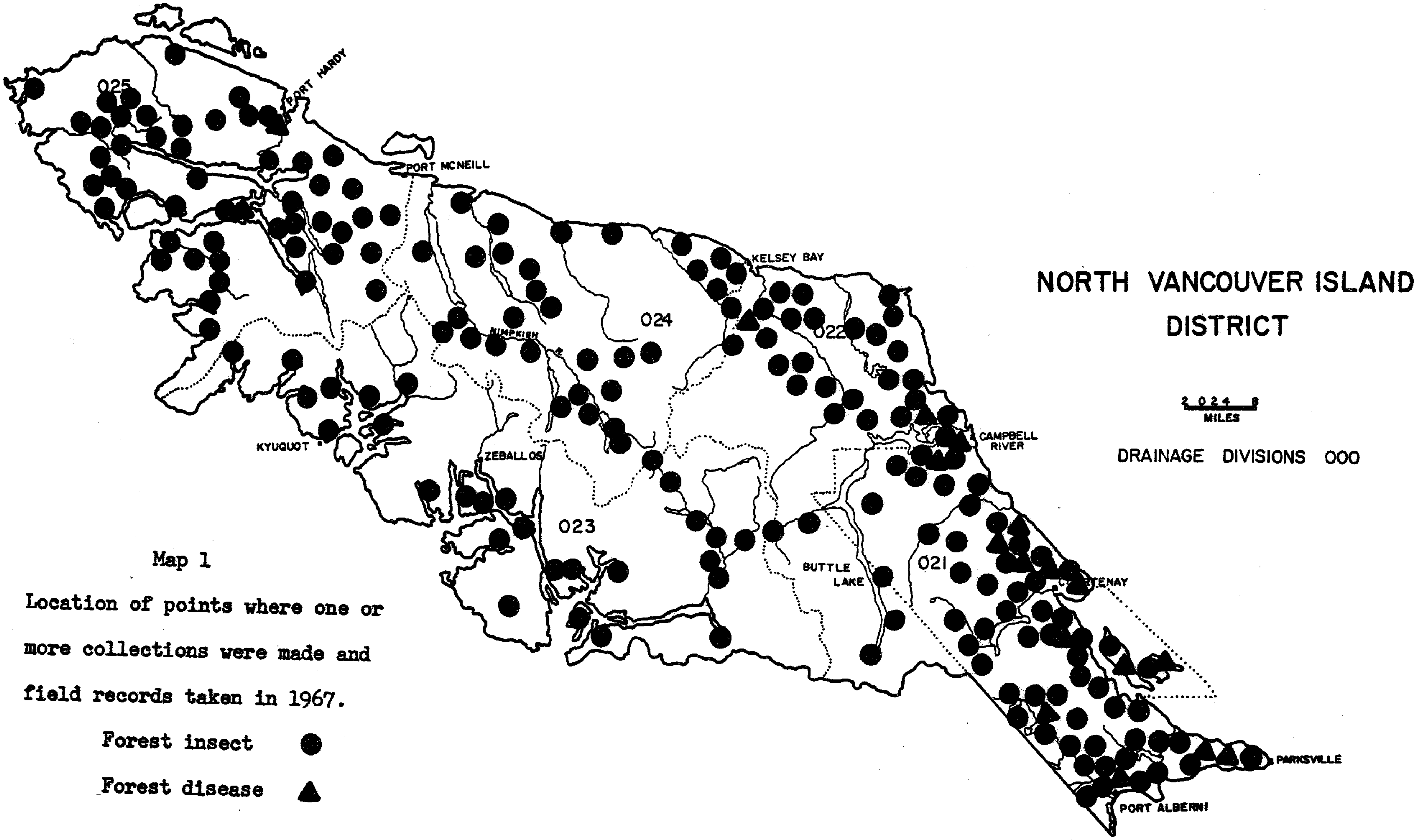
Table 9

Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Arceuthobium campylopodum Engelm. f. *tsugensis* (Rosendahl) Gill Dwarf mistletoe	wH	Horne Lake	A few of the reproduction trees in area were infected by this parasitic plant.

Table 9 (continued)

Organism and disease	Hosts	Locality	Remarks
Arceuthobium campylopodum Engelm. Dwarf mistletoe	lP	Dashwood	A considerable number of trees were infected.
Armillaria mellea (Vahl Kummer Shoestring root rot	D	Quinsam Lake	Three trees were infected.
Didymascella thujina (Durand) Maire Cedar leaf blight	wC	Union Bay	Wide spread in this location but of variable severity.
Peridermium pseudo-balsameum (Diet. and Holio.) Arith. and Kern Needle rust	gF	Denman Island	A white needle rust on the underside of 1966 needles of grand fir severely infected.
Phaeocryptopus gaeumannii (Rhode) Petr. Needle cast	D	Hornby Island	A few trees with foliage turning yellow due to infection.
Rhabdocline pseudotsugae Syd. Needle cast	D	Qualicum	Infection of a few young trees. This needle cast can cause severe loss of foliage.
Rhizina undulata Fr. Rhizina root rot	D	Oktwanch River	Causing mortality of some seedlings planted on recently burned areas. This disease appears to fruit in heavy duff areas and in close proximity to large old stumps.



Map 1

Location of points where one or more collections were made and field records taken in 1967.

Forest insect ●

Forest disease ▲

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

VANCOUVER SURVEY DISTRICT

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

VANCOUVER SURVEY DISTRICT

C. B. Cottrell [1/]

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

Special surveys by crews of the British Columbia Forest Service located new balsam woolly aphid attacks within the known boundaries of the infestation but there was no appreciable spread in distribution. More than 1,400 samples were submitted to the Forest Research Laboratory for identification.

Black-headed budworm caused heavy defoliation of western hemlock and balsam in limited areas near Hope. Egg counts made in the fall indicated a decline in populations in 1968.

Populations of green-striped forest looper remained high but declined from 1966. A fungus disease of larvae was prevalent in the North Vancouver District and the western part of the South Vancouver District.

Several other defoliating insects remained at a high level but caused no visible damage.

There was an increase in the number of beetle-killed Douglas-fir in the Fraser Canyon. A further increase may be expected in 1968 if mature and overmature trees have been weakened by drought.

Drought conditions in the summer of 1967 contributed to the death of some immature Douglas-fir and ponderosa pine on dry sites in the Fraser Canyon and Pemberton areas.

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

Host Tree Abbreviations

Abbreviation	Common name	Abbreviation	Common name
Al	alder - general	mH	mountain hemlock
rAl	red alder	wH	western hemlock
wB	white birch	-P	miscellaneous pine
wC	western red cedar	lP	lodgepole pine
bCo	black cottonwood	pP	ponderosa pine
D	Douglas-fir	sP	shore pine
F	fir - general	wwP	western white pine
alF	alpine fir	Po	poplar - general
aF	amabilis fir	eS	Engelmann spruce
gF	grand fir	sS	Sitka spruce

FOREST INSECT AND DISEASE SURVEY

SOUTH VANCOUVER DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

SOUTH VANCOUVER DISTRICT

1967

C. B. Cottrell

INTRODUCTION

Field work in the South Vancouver District began on May 4 and continued until October 19 except for a brief forest closure in the latter part of August. Special surveys were undertaken during the season for European pine shoot moth, black-headed budworm, and canker damage on lodgepole and shore pines. A check was made of Lombardy poplars in the Fraser Valley for possible introduction of a canker disease reported in Washington.

An extensive survey for balsam woolly aphid was carried out by British Columbia Forest Service personnel in co-operation with the Forest Insect and Disease Survey.

The incidence of defoliating insects remained at a high level; 93% 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 District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	63	1	Alder, red	8	0
Douglas-fir	96	3	Arbutus	1	0
Fir, alpine	7	0	Hawthorn	1	0
Fir, amabilis	46	4	Maple, broadleaf	1	0
Fir, grand	12	2	Maple, Douglas	1	0
Hemlock, mountain	2	0	Poplar, species	2	2
Hemlock, western	125	13	Poplar, Lombardy	0	7
Pine, species	3	7	Miscellaneous	5	3
Pine, lodgepole	19	9			
Pine, ponderosa	5	0			
Pine, shore	15	0			
Pine, white	6	3			
Spruce, species	4	0			
Spruce, Engelmann	3	1			
Spruce, Sitka	7	0			
Yew, western	2	0			
Miscellaneous	6	0			
Totals	421	43	Totals	19	12
			GRAND TOTALS	440	55

Table 2

Currently Important Insect and Disease[1/] Problems by

Drainage Division, South Vancouver District, 1967

Insect and disease problems	Principal hosts[2/]	Importance by drainage divisions[3/] 040	041	042	043	044	045
Bark Beetles							
Douglas-fir beetle	D	1	2	1	1	3	1
Defoliators							
Black-headed budworm	wH, mH, alF, gF, aF, D, eS, sS	3	5	4	4	3	2
Green-striped forest looper	wC, wH, gF, aF, D, eS, sS	2	2	3	2	2	3
Western hemlock looper	wH, wC, D, aF, gF, sS	1	1	3	2	1	1
Spruce budworm	D, aF, wH	1	1	1	1	1	1
Saddleback looper	wC, wH, aF, gF D	1	1	2	1	1	1
Sucking Insects							
Balsam woolly aphid	aF, gF, F	3	0	5	3	0	1
Terminal Borers							
European pine shoot moth	-P	2	0	4	0	0	0
Weather Damage							
Drought	D, pP	3	3	3	3	4	4

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

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 potential 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* Hopk.

The number of beetle-killed Douglas-fir remained at a low level in most of the District, although there was a significant increase in the Fraser Canyon area. In May, 40 red-topped Douglas-fir were counted between Yale and Boston Bar, and in September, 301 were counted in the same area.

In the Skagit Valley there were 30 red-topped Douglas-fir in June and 75 in September. Presumably, the long, hot and dry summer weather caused the foliage of at least some of the 1967-attacked trees to turn colour the same year they were attacked. Only 25 beetle-killed Douglas-fir, however, were noted in the Pemberton area.

A further increase in the number of beetle-attacked trees may be expected in 1968 if drought conditions in 1967 have weakened trees enough to lower their resistance to beetle attack. Trees growing on dry rocky sites in the Fraser Canyon and Pemberton-D'Arcy areas could be particularly susceptible.

Defoliators

Black-headed Budworm, *Acleris variana* (Fern.)

Black-headed budworm populations have been increasing for several years in many parts of the District, especially north and east of Hope. Widespread defoliation was expected in 1967 but because of a high larval mortality due to parasitism and disease only limited defoliation occurred.

Larvae caused more damage in 1967 than in 1966 but not as much as was indicated by the large numbers of overwintering eggs. A Research Scientist, Dr. O. N. Morris, conducting studies in the Hope Slide area in May 1967, found that from 10 to 50% of the eggs were parasitized by insects. Larvae from the remaining eggs were numerous enough to cause extensive damage in limited areas but no tree mortality was noted.

Noticeable defoliation of western hemlock occurred in several localities in the eastern portion of the District. The most severe damage was along Nicolum, Berkley and Wray creeks in the vicinity of the Hope Slide. Trees in approximately 500 acres on the valley bottom lost up to 90% of their foliage. Light to moderate defoliation of current foliage occurred on an estimated 5,000 surrounding acres.

Near the headwaters of the Coquihalla River there were an estimated 500 acres of heavy defoliation of the current foliage of western hemlock and alpine fir plus 2,000 acres of light to moderate defoliation. Along a tributary, Boston Bar Creek, 100 acres of hemlock were moderately defoliated.

Heavy defoliation of hemlock and light defoliation of amabilis fir occurred over 100 acres along Inkawthia Creek, north-west of Yale. In the Ruby Creek Valley scattered pockets of immature hemlock were moderately defoliated. There was light to moderate defoliation in the vicinity of Boston Bar in the Scuzzy, Anderson and Stoyoma creek valleys.

In portions of the District west of Harrison Lake there were increases in the numbers of larvae per standard beating sample but no significant damage was observed.

A virus disease was present in most collections of larvae and averaged 18.5% for the District. Diseased larvae were most numerous at Port Douglas, Ruby Creek, Hope and Alta Lake.

Average larval parasitism in the Fraser Canyon ranged from 11% in the Boston Bar area to 18% near Hope. In the Harrison Lake region parasitism averaged 28%. Parasitism was less than 1% in the Squamish and Mission B.C.F.S. Ranger districts but averaged 14% in the Port Moody District.

It was not possible to obtain mass pupal collections for disease and parasitism studies in August because of the forest closure. Presumably some mortality would have taken place in the pupal stage, further reducing the population.

Although the number of larvae per positive sample increased in four of six Drainage Divisions (Table 3), egg counts were markedly lower in many areas, especially in the vicinity of the Hope Slide.

Egg counts were taken late in September and early in October. Two, 10-inch branch samples were taken from each of the upper, mid and lower crowns of three trees at each location. Table 4 shows the number of eggs in 1966, the resultant defoliation in 1967, the number of eggs collected in 1967 and the defoliation that may be expected in 1968.

Table 3

Summary of Black-headed Budworm Collections by Drainage Divisions, South Vancouver District

Drainage division	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
040	9	18	19	33	39	47	1.7	6.0	18.1
041	22	24	29	14	75	86	5.3	26.3	63.4
042	86	95	76	13	31	63	17.4	7.3	11.7
043	27	38	29	0	37	45	-	25.6	17.6
044	32	44	28	9	41	68	2.3	23.9	6.6
045	60	60	31	7	12	39	1.5	8.7	11.3
Totals	236	279	212	10	33	59	9.4	16.0	22.2

Table 4

Summary of Black-headed Budworm Egg Counts,

South Vancouver District, 1966 and 1967

Locality	Area	Av. no. eggs per 10" tip 1966	1967	% defoliation 1967 Current foliage	1967 Total foliage	1968[1/] Current foliage	1968[1/] Total foliage
Coquihalla Valley	Coquihalla	2.3	3.9	5	T[2/]	5	T
	Romeo	3.5	5.3	5	T	5-10	T
	Iago	4.4	6.0	5	T	5-15	5
	Boston Bar Cr.	2.2	1.1	5	T	T	T
North Bend	Scuzzy Cr. (2100')	9.1	1.8	10	T	T	T
	Scuzzy Cr. (3000')	4.0	1.6	5	T	T	T
Boston Bar	Anderson Cr.	3.5	2.7	5	T	5	T
	Stoyoma Cr.	2.0	4.5	5	T	5-10	T
Hope Slide	Mile 10	13.9	2.6	70	25	5	T
	Mile 11	11.3	3.9	55	20	5	T
	Mile 11.5	18.5	6.1	55	20	5-15	5
	Mt. Coulter	1.9	5.9	T	T	5-10	T
	Mile 13	17.9	3.2	40	15	5	T
	Mile 14	9.7	3.4	15	5	5	T
Ruby Cr.	Ruby Cr.	-	1.4	15	5	T	T
North Vancouver	Seymour Cr.	-	1.3	T	T	T	T
	Grouse Mtn.	-	6.1	5	T	5-15	5
	Cypress Cr.	-	4.8	5	T	5-10	T
	Furry Cr.	-	6.2	10	T	5-15	5

Based on the number of eggs taken in the fall of 1967 only light to moderate defoliation is expected in most of the District in 1968. Heavier damage might occur in the area north of Vancouver and east of Squamish where disease and parasitism were light.

[1/] Estimated defoliation in 1968 that will be caused by larvae hatching from 1967 eggs.

[2/] T = Trace

Green-striped Forest Looper, Melanolophia imitata Wlk.

Larvae were moderately numerous on western red cedar, western hemlock and Douglas-fir but caused no noticeable defoliation. The number of larvae per positive beating sample declined in four of six drainage divisions (Table 5). Larvae were most plentiful in the southwestern portion of the District, especially in the Capilano River Valley and in the vicinity of Squamish. The largest collection contained 69 larvae as compared with 112 in 1966.

A further decline is indicated in 1968 as 20% of the late-instar larvae collected in the Squamish area had been killed by a fungus disease, tentatively identified as Entomopthora sp. In the Capilano Valley 6% were diseased. No fungus or virus disease was noted in the remainder of the District.

Table 5

Summary of Green-striped Forest Looper Collections by Drainage Divisions, South Vancouver District

Drainage division	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
040	17	17	28	24	77	54	1.5	8.8	2.7
041	26	26	38	12	69	47	2.3	4.1	3.2
042	100	94	103	60	77	82	7.2	24.5	8.4
043	27	41	36	48	66	69	7.0	13.2	5.1
044	42	42	30	45	55	43	3.5	4.0	4.5
045	70	81	36	43	26	53	5.0	5.0	9.0
Totals	282	301	271	46	55	64	5.8	14.0	6.7

Western Hemlock Looper, Lambdina fiscellaria lugubrosa (Hulst)

The incidence of hemlock loopers increased slightly and the number of larvae per positive sample remained about the same as in 1966. The largest collections were 43 larvae from western hemlock at Rolley Lake and 23 from western red cedar near Weaver Lake. Only small numbers were taken from Douglas-fir or the true firs.

A comparison of collections containing hemlock looper larvae for the last three years is as follows:

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1965	1966	1967	1965	1966	1967	1965	1966	1967
239	301	261	22	17	24	2.5	4.9	4.8

Spruce Budworm, <u>Choristoneura fumiferana</u> (Clem.)

Populations on Douglas-fir remained at a low level throughout the District. In the Fraser Canyon 39% of collections contained an average of three larvae. From Pemberton to D'Arcy, 33% of collections contained an average of 2.5 larvae.

Saddleback Looper, <u>Ectropis crepuscularia</u> (Schiff.)

Larvae were commonly collected from western hemlock and western red cedar in Drainage Division 042 but not in significant numbers. The largest collection from western hemlock contained six larvae near Salsbury Lake, the largest from western red cedar was five from Seymour Creek and Stanley Park.

<u>Sucking Insects</u>

Balsam Woolly Aphid, <u>Adelges piceae</u> (Ratz.)

The B.C.F.S. Protection Division in co-operation with the Forest Insect and Disease Survey continued an extensive survey of the incidence of balsam woolly aphid attacks on true firs. New infestations were located in the Stave River Valley and in Tretheway and Bremner Creek valleys on the west side of Harrison Lake, where the first known attacks on alpine fir were recorded. However, the known boundaries of the infested area were not appreciably extended.

A study on the biology of the insect is being continued by Dr. L. H. McMullen on Seymour and Grouse mountains.

Terminal Borers

European Pine Shoot Moth, <u>Rhyacionia buoliana</u> Schiff.

Exotic and native pines in residential gardens and parks were heavily attacked in 1967 although to a lesser degree than in 1966. Many trees which had been repeatedly attacked were removed giving the impression that the infestation had declined.

Native stands of shore and lodgepole pine in the vicinity of infested residential and nursery trees were examined but no infested trees were found.

Other Noteworthy Insects

Table 6

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
<u>Altica</u> spp. Leaf beetles	Exotic poplars	Fraser Valley	Skeletonizer. Light damage in exotic plantations.
<u>Caripeta divisata</u> Wlk. Gray spruce looper	wH, D	Fraser Valley	Defoliator, scarce. Largest collection contained 11 larvae in Chilliwack R. Va.
<u>Dendroctonus ponderosae</u> Hopk. Mountain pine beetle	wwP	Birkenhead Lake	Bark beetle. 35 trees killed.
<u>Dichomeris marginella</u> F. Juniper web worm	Ornamental junipers and cedars	Greater Vancouver	Defoliator. Common heavy damage. Some tree mortality. Attacks native junipers but not known to attack native cedars.
<u>Epirrita autumnata</u> Gn. Green velvet looper	wH, aF	Fraser Valley	Defoliator. Populations very low. Eleven collections.
<u>Galerucella punctipennis</u> Mann. Leaf beetle	rAl	Hope, Harrison B.C.F.S. Ranger districts	Leaf skeletonizer. Light to moderate damage general throughout area, extremely heavy on east side of Harrison Lake.

Table 6 (Continued)

Insect	Hosts	Locality	Remarks
Halisidota argentata Pack. Silver-spotted tiger moth	sP, D	North and West Vancouver	Defoliator. Very few webs on D. Common on sP in Pt. Atkinson Park, up to 10% defoliation.
Hyphantria cunea (Drury) Fall webworm	rAl, wB, bCo	Fraser Valley	Defoliator. Decline from 1966. Common on E. side Harrison Lake. Damage negligible.
Neodiprion spp. Sawflies	wH, D, lP, aF, gF, alF, pP, eS, sS	Widespread	Defoliators, up to 111 on wH at Furry Cr., up to 39 on D near China Bar. No significant damage.
Neomyzaphis abientina Wlk. Spruce aphid	sS	Fraser Valley	Sucking insect. Trees in residential areas severely defoliated.
Nepytia phantasmaria (Stkr.) Phantom hemlock looper	D, wH, wC, gF	Widespread	Defoliator. Decrease from 1966, largest collections Hope Park (8), Stave Lake (6).
Nyctobia limitaria (Wlk.) Green balsam looper	wH, D, aF, gF	Fraser Valley	Defoliator. Scarce, decrease from 1966. 24 collections.
Orgyia antiqua badia (Hy. Ed.) Rusty tussock moth	wC, wH, gF, D, sS	Widespread	Defoliator. Up to 25 larvae on wC, Stanley Park
Sawfly unidentified	rAl	Fraser Valley	Defoliator. Common on immature trees, especially along roads.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Weather Damage

Drought

Drought damage on broadleaf and vine maples in Central and Upper Fraser Valley appeared as early as June and July. The leaves of many trees in the valley bottoms discolored and fell during the summer.

In September, dead Douglas-fir seedlings were common in the Pemberton area especially on powerline right-of-ways, along roads and on rocky sites. In the Fraser Canyon numerous immature Douglas-fir and ponderosa pine were killed. The full extent of the damage will not be known for several years as trees weakened in 1967 may succumb to secondary disease or insect attack.

Exotic Plantations

Plantations of exotic tree species are examined at least once every three years. Fifteen of the 38 were examined this year and their condition is summarized in Table 7.

Table 7

Summary of Disease Conditions on Exotic Plantations

XP number	Location	Exotic species	Remarks
20	Port Hammond	*Populus regenerata*	Not many trees left. Survivors in poor condition. Repeatedly flooded and damaged by voles.
41	Golden Ears Park	Mixed conifers and hardwoods	Several white ash and white spruce knocked down by falling trees. Two Dahurian larch killed by lesion-causing disease, two more infected.
43	Whalley Green Timbers	*Pinus sylvestris*	Heavy infections of a needle cast disease, *Lophodermium pinastri*.

Table 7 (Continued)

XP number	Location	Exotic species	Remarks
44	Whalley Green Timbers	*Pinus sylvestris*	Heavy infections of a needle cast disease, *Lophodermium pinastri*.
45	Whalley Green Timbers	*Pinus resinosa*	Trees healthier than surrounding Scots pine; no problems found.
46	Whalley Green Timbers	*Quercus robur*	Trees healthy.
47	Agassiz	Mixed conifers and hardwoods	Trees healthy.
52	Herrling Island	*Populus regenerata* *P. robusta*	Trees suppressed by native black cottonwood. No disease or insects found.
77	Whalley Green Timbers	*Pinus resinosa*	Trees alive but suppressed; in poor shape.
165	Haney, U.B.C. Forest	*Pinus pinaster* *P. thunbergii* *P. densiflora* *P. muricata*	Trees planted in 1958, mortality in early years but surviving trees healthy.
166	Haney, U.B.C. Forest	*Pinus sylvestris*	Good survival, trees healthy.
192	Sumas Mtn.	*Populus robusta*	Trees healthy. Light defoliation by flea beetles.
234	Haney, U.B.C. Forest	*Populus euramericana*	Trees healthy.
244	Mission T.F.L.	*Pinus resinosa*	Trees healthy.
245	Fraser R. island, Rosedale	*Populus robusta*	Trees healthy but gradually being suppressed by native black cottonwood.

Other Noteworthy Diseases

Canker Damage to Lodgepole Pine

Lodgepole pine stands were examined for two canker diseases, *Atropellis piniphila* (Weir) Lohm. and Cash and *Peridermium stalactiforme* Arth. and Kern., where there were sufficient trees. Fifty-tree plots were established in the Skagit and Nahatlatch valleys and in the Alta Lake - Pemberton region. No infections were found.

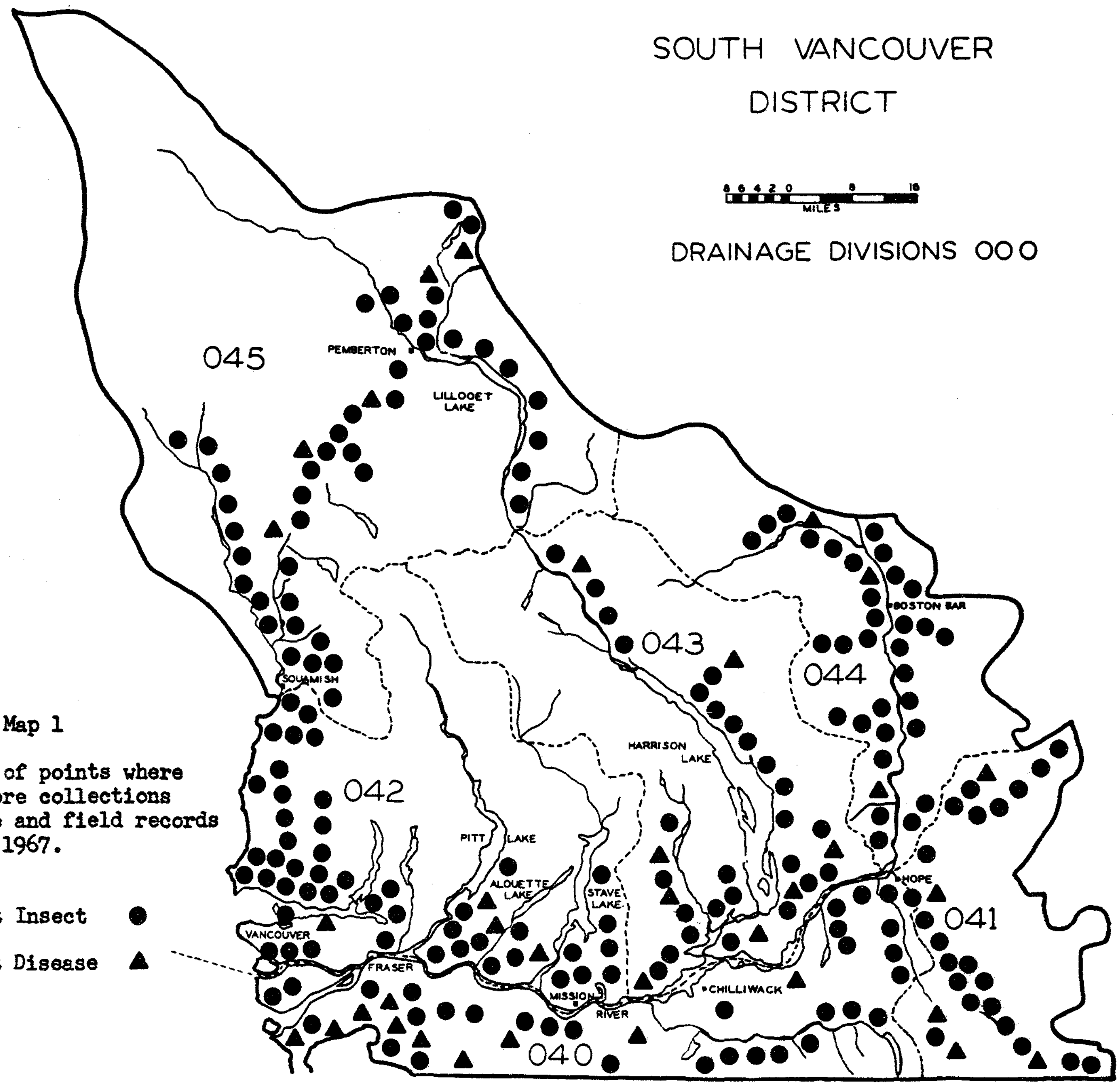
A Canker on Lombardy Poplar

A canker disease caused by *Dothichiza populea* Sacc. and Briard, was recently discovered near Olympia, Washington. This disease is not known to occur in British Columbia but because of the seriousness of the disease, numerous trees in the Fraser Valley were examined, but no infections were found.

Table 8

Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Arceuthobium americanum Nutt. ex Engelm., Dwarf mistletoe	lP	Lillooet River	Heavy infections near Roger Creek. New distribution record for coastal B. C.
Arceuthobium campylopodum Engelm. f. *tsugensis* (Rosendahl) Gill. Dwarf mistletoe	wH	Hope and Harrison B.C.F.S. Ranger districts	Eastern distribution records were established in the Skagit, Coquihalla and Nicolum valleys. Other new areas were Big Silver and Sawmill creeks.
Botrytis cinerea Pers. ex Fr.	eS	Whalley, Green Timbers	New host record. Kills immature needles and current year shoots.
Rhabdocline pseudotsugae Syd., Douglas-fir needle case	D	Haney	Prevalent in plantations of Interior B.C. stock.
Rhizina undulata Fr., Rhizina root rot	D	Mission, Pemberton	Associated with mortality of planted seedlings. So far confined to burnt areas.

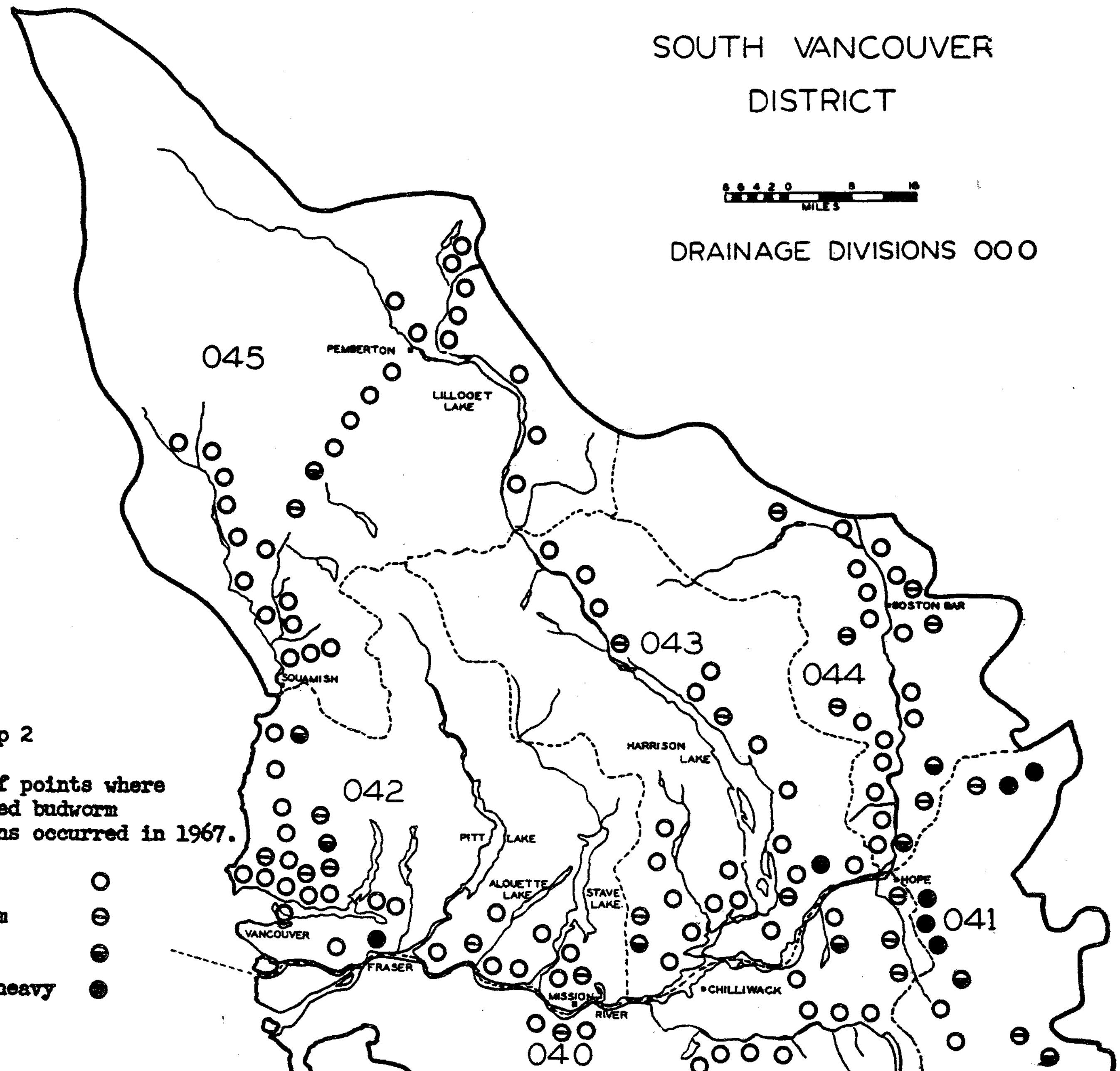


Map 1

Location of points where one or more collections were made and field records taken in 1967.

Forest Insect ●

Forest Disease ▲



Map 2

Location of points where black-headed budworm infestations occurred in 1967.

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

FOREST INSECT AND DISEASE SURVEY

NORTH VANCOUVER DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

NORTH VANCOUVER DISTRICT

1967

A. K. Jardine 1/

INTRODUCTION

The 1967 field season in the North Vancouver District began May 11 and ended August 24. The northern portion was surveyed by aircraft with R. G. Brown, Ranger for the South Prince Rupert District. For the second consecutive year the Protection Division of the British Columbia Forest Service, under the guidance of the Forest Insect and Disease Survey, carried out an extensive survey for the balsam woolly aphid, a serious pest of true firs.

There was a slight increase in the number of defoliators found in field collections; 91% of beating samples contained larvae compared to 89% in 1966.

The green-striped forest looper population increased slightly. There was an increase in both numbers and distribution of the saddleback looper. Populations of other species of commonly occurring larvae were relatively unchanged.

Young Douglas-fir and hemlock appeared to be suffering from drought due to the hot, dry summer weather.

Totals of 404 insect and 14 tree disease collections were made during the field season. Collections are listed by hosts in Table 1. Map 1 shows the Drainage Division boundaries and location of points where collections were made and information taken. The principal current problems for each Forest Insect and Disease Survey Drainage Division are shown in Table 2.

Detailed information on important insects and disease are found in the text of this report.

1/

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

Table 1

Collections by Hosts

North Vancouver District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	120	2	Alder, red	3	0
Douglas-fir	96	2	Apple species	1	0
Fir, amabilis	3	1	Poplar species	1	0
Hemlock, western	136	4	Willow species	1	0
Pine, lodgepole	12	4			
Pine, red	0	1			
Pine, western white	3	0			
Spruce, Sitka					
Totals	395	14	Totals	6	0
			Miscellaneous hosts	2	0
			No host	1	0
			GRAND TOTALS	404	14

Table 2

Currently Important Insect and Disease[1] Problems by Drainage Divisions, North Vancouver District, 1967

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	3	3	3	2	2	2	2	2	3
Saddleback looper	wC, wH, D, sS	1	2	3	2	1	1	1	1	1
Western hemlock looper	wH, D, wC	1	2	1	1	1	1	1	1	1
Conifer sawflies	wH, aF	1	2	2	1	1	1	1	1	1

Table 2 continued

Insect and disease problems	Principal hosts 2/	Importance by drainage divisions 3/ 060	061	062	063	064	065	066	067	068
Black-headed budworm	wH, D, aF	1	1	1	1	1	1	1	1	1
Sucking Insects										
Balsam woolly aphid	aF, gF	0	5	0	0	0	0	0	0	0
Terminal Borers										
A pine coneworm		0	3	0	0	0	0	0	0	0
Weather Damage										
Drought damage	wH, D	1	1	4	1	0	0	0	0	0
Foliage Diseases										
Needle casts of lodgepole pine	lP	3	2	3	2	2	2	2	2	2
Cedar leaf blight	wC	2	3	2	2	2	2	2	2	2

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

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 at present - 3.
Static or falling population and/or moderate numbers and/or no potential 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* Wlk.

A large population of this potentially dangerous defoliator occurred over much of the North Vancouver District on western hemlock, western red cedar and Douglas-fir. Larvae were found in 84% of the collections compared to 65% in 1966 (Table 3). The highest populations were found in Drainage divisions 060, 061, 062, and 068. Largest collections were: 91 larvae from Douglas-fir in Prince of Wales Reach at the mouth of Jervis Inlet, 80 larvae from western hemlock near Lund and 84 from western red cedar opposite Boyd Point in Butte Inlet. Light defoliation was visible where the highest collections were made and in the Butte Inlet area heavy defoliation occurred in the lower crowns of the trees.

A fungus disease *Entomophthora* was present in most collections made during the latter part of the season. This pathogen, which is influenced by climatic conditions, may be a very effective natural control agent. There was an insignificant amount of parasitism in larval samples.

It is expected that the populations of this insect will continue in 1968 but at a reduced level.

Table 3

Summary of Green-striped Forest Looper Collections by Drainage Divisions, North Vancouver District

Drainage division	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
060	21	24	17	24	23	82	2.5	3.4	11.0
061	193	267	171	45	66	82	3.5	10.1	12.4
062	64	29	24	31	67	100	2.5	11.1	13.5
063	44	36	44	77	78	90	3.2	13.0	11.6
064	37	19	19	43	84	94	2.1	12.0	4.4
065	22	4	10	18	75	100	1.6	32.1	5.3
066	9	11	15	33	72	67	3.5	3.5	4.6
067	12	6	8	50	66	25	2.2	4.6	1.0
068	16	10	6	25	50	66	2.2	5.3	4.0
Totals	418	406	314	43	65	84	3.1	10.8	11.0

Saddleback Looper, Ectropis crepuscularia (Schiff.)

The population and distribution of this defoliator increased in the North Vancouver District in 1967 but did not attain damaging levels. It was found in association with the green-striped forest looper. A total of 118 samples made throughout the District averaged 3.7 larvae each.

Western Hemlock Looper, Lambdina fiscellaria lugubrosa (Hulst)

There was an increase in the number of samples containing hemlock looper larvae and a slight increase in the average number of larvae per positive sample. Following is a summary of collections for the District.

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1965	1966	1967	1965	1966	1967	1965	1966	1967
353	423	259	11	9	22	1.6	2.1	2.5

This insect is capable of causing heavy damage but there has been a consistently low population in this area since the outbreak in the Rainy River area in 1946.

Conifer Sawflies, Neodiprion spp.

Thirty-four collections made throughout the District contained sawfly larvae. The largest samples of 50 and 45 larvae were taken from lodgepole pine near Appleton Creek and Powell Lake respectively.

The light outbreak on western hemlock east of Haslam Lake declined and no larvae were found in 1967.

Black-headed Budworm, Acleris variana (Fern.)

There has been a considerable increase in the population of this insect in the South Vancouver District but no indication of a build up in the North Vancouver District. The number of samples containing the insect doubled over 1966 but the number of larvae per positive sample decreased slightly. The largest sample from hemlock contained five larvae. Following is a summary of black-headed budworm collections for the District.

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1965	1966	1967	1965	1966	1967	1965	1966	1967
341	343	276	8	4	8	1.0	1.8	1.7

Sucking Insects

Balsam Woolly Aphid, Adelges piceae (Ratz.)

The survey of balsam stands for balsam woolly aphid by crews from the Protection Division of the British Columbia Forest Service continued in the North Vancouver District. Bark samples were sent to the Laboratory from 162 locations throughout the area but the known infestation boundary was changed little. A new distribution record was made with the discovery of aphid damage to grand fir on Keats Island near Vancouver.

Terminal Borers

A Terminal Feeder, Dioryctria sp.

Shoot damage caused by Dioryctria sp. occurred in lodgepole pine stands at several locations and was common from Powell River north to Lund. In most cases the terminal leaders were killed. This type of damage appears to be increasing, although all areas of attack observed were classed as light.

Other Noteworthy Insects

Table 4

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Caripeta divisata Wlk. Gray spruce looper	D, wH aF, wC	Scattered over district	Defoliator. Decline in numbers from 1966. Average 1.7 larvae per collection.
Dendroctonus pseudotsugae Hopk. Douglas-fir beetle	D	Naton Lake	Bark beetle, endemic population. Attacking damaged trees.

Table 4 continued

Insect	Hosts	Locality	Remarks
Epirrita autumnata Gn. Green velvet looper	wH, D aF, wC	Sechelt Peninsula, Powell River Texada Island	Defoliator. Population remains low. Average 1.6 larvae per positive sample.
Halisidota argentata Pack. Silver-spotted tiger moth	D, wC gF	Thormanby Island Pasley Island Powell Lake	Defoliator, low population. Larvae found singly.
Hyphantria cunea (Drury) Fall webworm	Al	Sechelt	Defoliator, low population. Only one web found.
Malacosoma pluviale Dyar Western tent caterpillar	*Malus* sp, Al	Texada Island Central rd. Dakota Creek Sechelt Peninsula	Defoliator. Several colonies found damaging trees. Localized.
Mindarus abietina Roch. Balsam twig aphid	gF	Gilles Bay Texada Island Irvings Ldg. Mission Pt. Sechelt	Sucking Insect. Causing considerable damage to foliage in these areas.
Nyctobia limitaria (Wlk.) Green balsam looper	wH, wC gF	Scattered over the District.	Defoliator. An average of 2.2 larvae from 41 positive samples.
Orgyia antiqua badia (Hy. Ed.) Rusty tussock moth	wH, wC	Toba, Knight Call and Seymour Inlets	Defoliator. Population remains low. Average one larva per collection.
Pissodes sitchensis Hopk. Sitka spruce weevil	sS	Homathko River	Terminal Insect. Damage caused to 50% of young spruce examined.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Weather Damage

Drought Damage to Hemlock and Douglas-fir

Damage, presumably caused by the hot dry weather during the summer, showed up in young hemlock and Douglas-fir stands in the form of dying foliage and branch tips. The most heavily affected areas of hemlock were found in the Freda Creek and Sliamon Lake areas. There was heavy loss of one-year-old foliage of young Douglas-fir in the Malibu area of Princess Louisa Inlet. Associated with this were light traces of a needle cast *Phaeocryptopus gaeumannii* (Rohde) Petr. It is expected that further damage caused by the abnormal weather will show up during the 1968 season.

Foliage Diseases

Needle Cast of Lodgepole Pine, *Hypodermella ampla* (J. J. Davis) Dearn.

Light infection of one- and two-year-old needles by this pathogen was common in lodgepole pine stands in the Powell River area and in the Appleton Creek Valley near Sliamon Lake, although it was not as prevalent in the District as in 1966. A needle cast, *Hemiphaciduim* sp., was found associated with it.

Needle Cast of Lodgepole Pine, *Hypodermella concolor* (Dearn.) Darker

Medium to heavy infection of one-year-old needles was found in localized areas on Texada Island. In most cases previous year's needles were 100% infected. Associated with this disease were light infections of *Hendersonia pinicola* Wehm. Infection caused the needles to drop giving the trees a thin appearance.

Cedar Leaf Blight, *Didymacella thujina* (Durand) Maire

Although damage by this disease was found in varying degrees of intensity throughout the host range, it was particularly noticeable on western red cedar in the Freda Creek area where 30 to 40% of the foliage was affected.

Porcupine Damage

Considerable damage and mortality was caused by porcupines to young stands of lodgepole pine in the Burnet Creek area near Sechelt. Stems and branches were girdled. This is possibly the first recorded occurrence of damage by this animal in the District.

Exotic Plantation

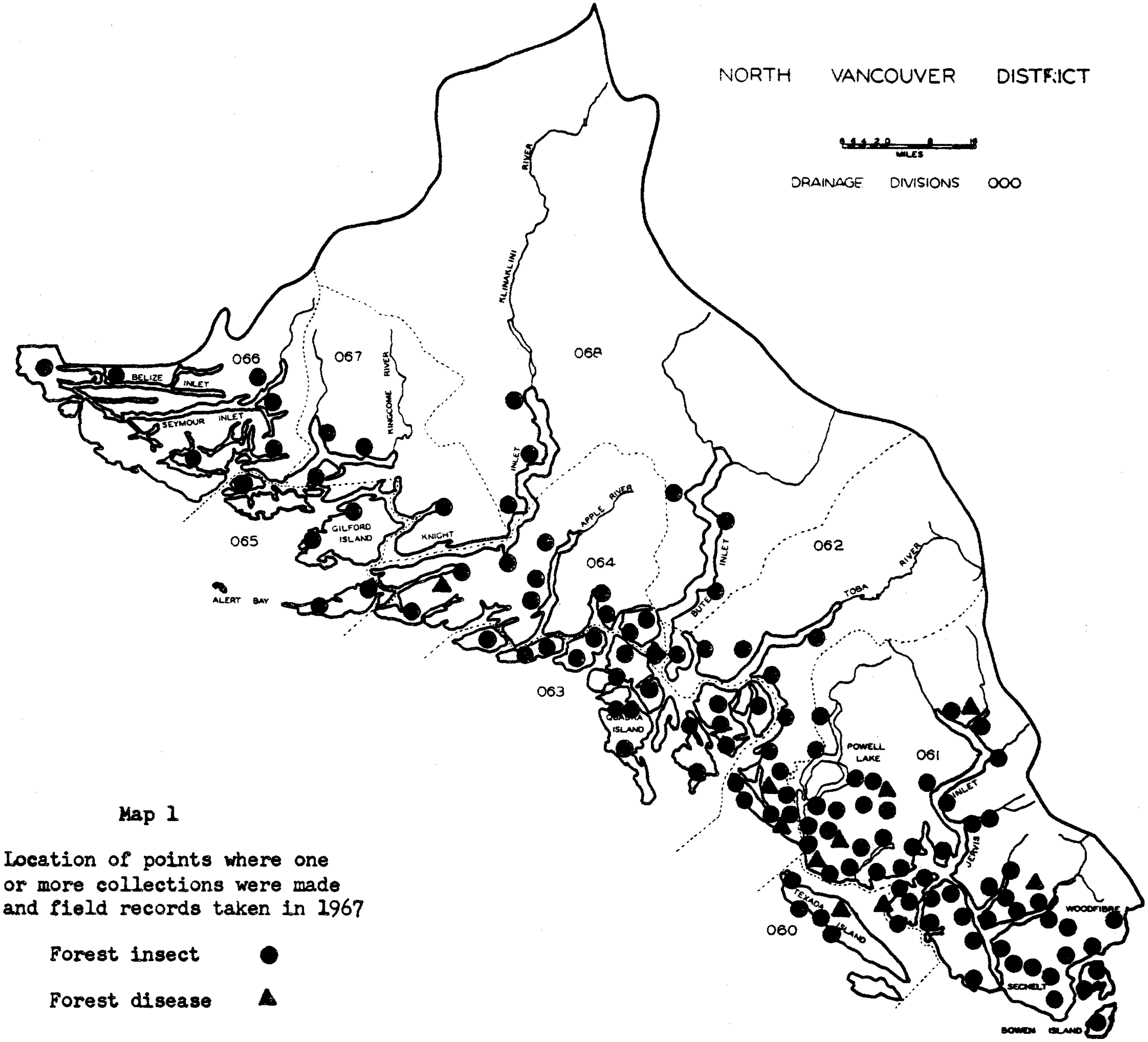
Only one disease of importance was found in the plantation at Powell River. A species of Hypodermataceae, which causes needle cast, appeared on all 23 remaining red pine, resulting in heavy defoliation. The 12 remaining black locust are very branchy but putting on good growth. Trees living, but very slow growing are as follows: seven grand fir, two balsam fir, five European larch and one tulip poplar.

Other Noteworthy Diseases

Table 5

Other Diseases of Current Minor Significance

Organism and disease	Host	Locality	Remarks
Atropellis piniphila (Weir) Lohm and Cash. A branch and stem canker of hard pines	lp	Sliamon Lake	Caused branch cankers. Common in this area.
Arcethobium campylopodum Englm. f. tsugensis (Rosendahl) Gill Dwarf mistletoe	wH	Call Inlet	Mistletoe. Light infection. Distribution record.
Dasyscyphus sp. A branch and stem canker	gF	Near Westview	Branch canker. Single infection.
Taphrina populina Fr. Yellow leaf blister	Po	Misery Creek	Rust. Light infection on three trees.

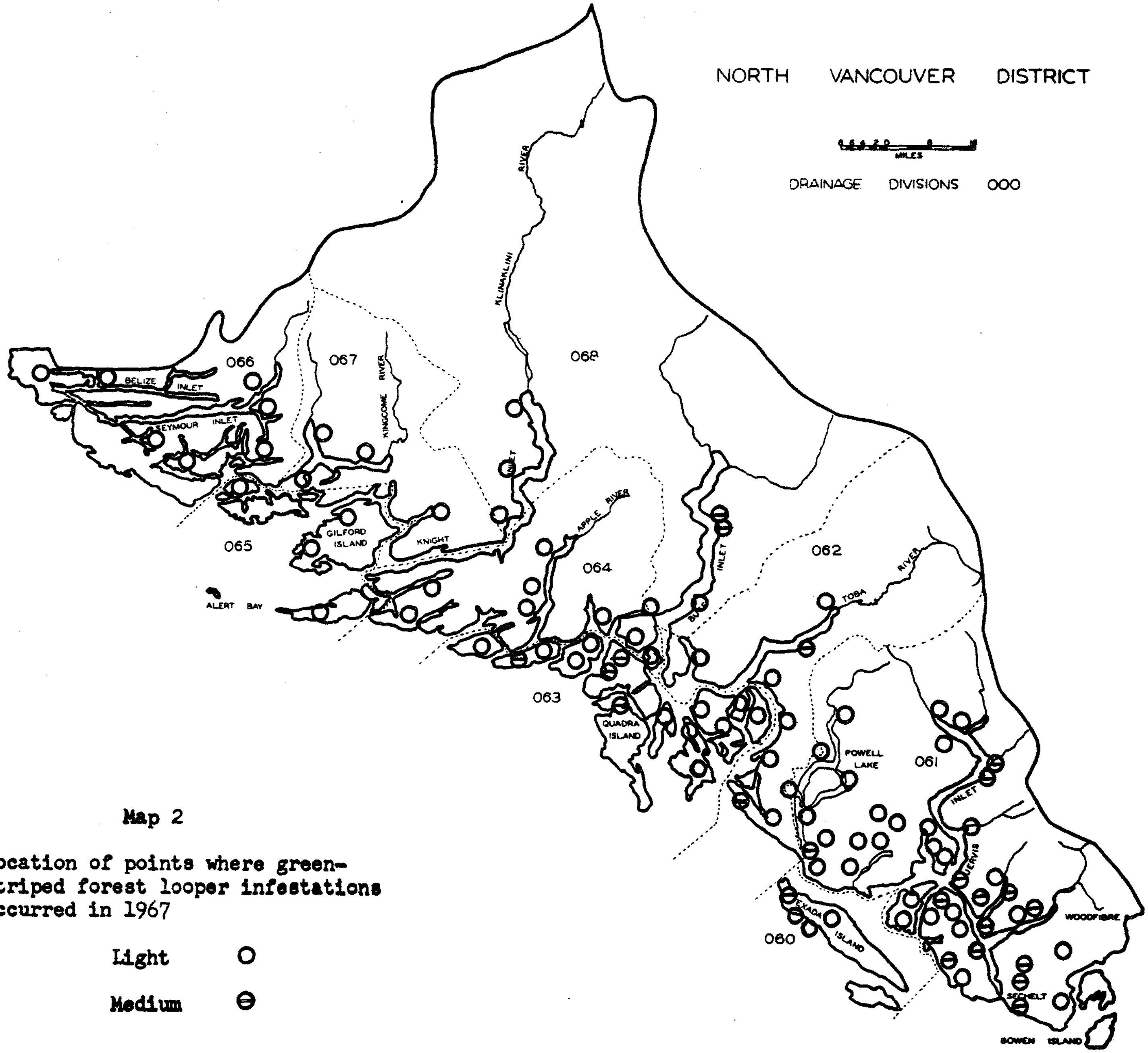


Map 1

Location of points where one or more collections were made and field records taken in 1967

Forest insect ●

Forest disease ▲



Map 2

Location of points where green-striped forest looper infestations occurred in 1967

Light ○

Medium ⊖

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

PRINCE RUPERT SURVEY DISTRICT

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

PRINCE RUPERT SURVEY DISTRICT

S. J. Allen[1/]

The Prince Rupert Forest Insect and Disease Survey District includes the southern part of the Prince Rupert Forest District. The Stikine River drainage northward to the Yukon border is included in the Prince George Survey District and is reported separately.

Personnel taking part in the survey of the Prince Rupert Survey District were: G. Brown and D. Collis in the South Prince Rupert District; J. Monts in the East Prince Rupert District and S. J. Allen in the West Prince Rupert District.

Aircraft were used in detection surveys in some areas of the District. East and West Prince Rupert rangers collaborated in aerial surveys in the West Prince Rupert District, in appraisal plot examinations and in the survey of Tweedsmuir Park lakes in early August.

Spruce beetle attacks remained at a low level and no balsam mortality was found. Spruce aphid damage occurred at Prince Rupert and on the Queen Charlotte Islands. Green-striped forest looper populations increased in the South Prince Rupert District. Sitka spruce plantations north of Terrace were attacked by Pineus sp.

A survey of canker damage to lodgepole pine was conducted throughout the District and the distribution of dwarf mistletoe on western hemlock was surveyed in coastal areas.

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

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		
		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
		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 DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

WEST PRINCE RUPERT DISTRICT

1967

S. J. Allen

INTRODUCTION

The survey of the West Prince Rupert District commenced on May 25 with examination of exotic tree species plantations near Terrace and terminated on September 26.

An outbreak of spruce aphid in the Prince Rupert area and on Queen Charlotte Islands caused defoliation of some trees in 1967.

Examinations of mortality plots in areas of the recent green-striped forest looper infestation on Queen Charlotte Islands were continued. Five more trees died but healthy living trees showed full recovery from the defoliation.

Dead and dying western hemlock were observed while flying over Moresby Island during July.

Incidence of diebacks and rusts in Douglas-fir plantations in the Nelson River area dropped to less than 20% in 1967.

Table 1

Collections by Hosts

West Prince Rupert District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	29	0	Alder, mountain	1	0
Douglas-fir	2	6	Alder, red	1	0
Fir, alpine	36	3	Aspen, trembling	5	0
Fir, amabilis	31	3	Birch, western white	1	0
Fir, grand	0	2	Cottonwood, black	2	4
Hemlock, mountain	7	0	Poplar spp.	0	8
Hemlock, western	187	33	Willow spp.	3	1
Larch, European	0	3			
Larch, Japanese	0	2			
Larch, western	1	0			
Pine sp.	1	0			
Pine, lodgepole	14	46			
Pine, ponderosa	0	1			
Pine, red	0	1			
Pine, Scots	0	1			
Pine, shore	0	1			
Spruce, Sitka	99	10			
Spruce, western white	17	1			
Totals	424	109	Totals	13	13
			Miscellaneous hosts	1	4
			No hosts	1	0
			GRAND TOTALS	439	126

Table 2

Currently Important Insect and Disease[1] Problems

by Drainage Divisions,

West Prince Rupert District,

1967

Insect and disease problems	Principal hosts[2]	Importance by drainage divisions[3]						
		100	101	102	103	104	105	106
<u>Defoliators</u>								
Green-striped forest looper	wH, wC, sS, aF, alF	3	3	0	0	2	2	0
<u>Sucking Insects</u>								
Spruce aphid	sS	3	3	0	4	0	0	0
<u>Terminal Borers</u>								
Spruce terminal damage	sS	2	2	0	0	0	0	0

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

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

Defoliators

Green-striped Forest Looper, Melanolophia imitata Wlk.

Populations of green-striped forest looper increased slightly in 1967 (Table 3). Trees on seven study plots established on the Queen Charlotte Islands during the 1964 infestation were examined during September (Table 4). Top-kill and mortality, which occurred only in plot 1, showed a slight increase with five additional dead trees in 1967. The other six plots continued to show good recovery with normal foliage growth.

Table 3

Summary of Green-striped Forest Looper Collections by Drainage Divisions, West Prince Rupert District

Drainage division	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
100	24	31	27	0	0	7	-	-	2.0
101	42	31	37	0	0	3	-	-	1.0
102	9	13	8	11	15	0	1.0	1.0	-
103	20	26	26	0	0	0	-	-	-
104	12	13	64	0	8	9	-	1.0	1.3
105	9	9	48	22	11	19	1.0	1.0	1.5
106	15	45	49	7	2	0	3.5	1.0	-
Totals	131	168	259	3	3	7	1.6	1.0	1.4

Table 4

Ocular Estimate, by Crown Classes, of Defoliation, Top-kill and Mortality

Caused by Green-striped Forest Looper, Queen Charlotte Islands

Plot	Crown[1/] class	Tree sp.	No. trees	Av. % defoliation 1965	1966	1967	Trees top-killed /67 No.	Av. ft.	Dead /67 Killed by insects	Other causes
	D	wC	34	91	33	0	5	6.8	15	0
		wH	27	81	25	2	7	9.0	8	0
1	CD	wC	18	93	33	2	2	9.0	9	0
Port Clements		wH	16	89	32	0	3	11.0	6	0
W. end of	I	wC	23	93	56	0	3	4.0	10	0
Lot 1828		wH	15	83	27	0	1	4.0	7	0
	S	wC	33	90	52	2	1	4.0	14	0
		wH	18	78	23	0	0	-	1	0
	All trees		184	86	36	1	22	7.6	70	0
	D	wH	15	44	2	0	0	-	0	0
2	CD	wC	1	63	0	0	0	-	0	0
Port Clements		wH	17	37	1	0	0	-	0	0
Masset Road	I	wC	0	-	-	-	-	-	-	-
Lot 412		wH	12	25	3	0	0	-	0	0
	S	wC	4	33	0	0	0	-	0	0
		wH	7	30	5	0	0	-	0	0
	All trees		56	36	2	0	0	-	0	0
	D	wC	11	41	3	0	0	-	0	0
3		wH	7	52	23	0	2	10.5	0	0
Port	CD	wC	2	50	0	0	0	-	0	0
Clements		wH	9	57	22	0	1	5.0	0	0
Masset Road	I	wC	1	25	0	0	0	-	0	0
Lot 424		wH	7	50	13	0	0	-	0	0
	S	wC	1	45	0	0	0	-	0	0
		wH	25	45	17	0	2	5.0	0	0
	All trees		63	47	10	0	5	7.2	0	0

Table 4 (cont'd)

Plot	Crown class	Tree sp.	No. trees	Av. % defoliation 1965	1966	1967	Trees top-killed /67 No.	Av. ft.	Dead /67 Killed by insects	Other causes
4 Port Clements Masset Road Lot 404	D	wC	4	21	0	0	0	-	0	0
		wH	0	-	-	-	-	-	0	0
	CD	wC	5	42	7	0	0	-	0	0
		wH	8	34	0	0	0	-	0	0
	I	wC	4	35	6	0	0	-	0	0
		wH	42	32	3	0	0	-	0	0
	S	wC	1	46	0	0	0	-	0	0
		wH	19	36	2	0	0	-	0	0
	All trees		83	33	3	0	0	-	0	0
5 Port Clements Masset Road Lot 1828	D	wC	3	28	0	0	0	-	0	0
		wH	1	32	2	0	0	-	0	0
	CD	wC	6	38	0	0	0	-	0	0
		wH	7	36	3	0	0	-	0	0
	I	wC	13	36	5	0	0	-	0	0
		wH	45	38	2	0	0	-	1	0
	S	wC	4	31	3	0	0	-	0	0
		wH	25	31	6	0	0	-	0	0
	All trees		104	35	3	0	0	-	1	0
6 Port Clements Tlell Road (2½ mi. SE/ Port Clements)	D	wC	7	21	7	0	0	-	0	0
		wH	5	13	2	0	0	-	0	0
	CD	wC	0	0	0	0	0	-	0	0
		wH	17	18	0	0	0	-	0	0
	I	wC	6	29	5	0	0	-	0	0
		wH	28	20	2	0	0	-	1	0
	S	wC	0	0	0	0	0	-	0	0
		wH	29	17	2	0	0	-	0	0
	All trees		92	18	2	0	0	-	1	0
7 S. end of Mayer Lake	D	wC	14	0	0	0	0	-	0	0
		wH	13	0	0	0	0	-	0	0
	CD	wC	13	0	0	0	0	-	0	0
		wH	10	0	0	0	0	-	0	0
	I	wC	20	0	0	0	0	-	0	0
		wH	5	0	0	0	0	-	0	0
	S	wC	12	0	0	0	0	-	0	0
		wH	4	0	0	0	0	-	1	1
	All trees		91	0	0	0	0	-	1	1

1/ D = Dominant, CD = Co-dominant, I = Intermediate, S = Suppressed.

Sucking Insects

Spruce Aphid, *Neomyzaphis abietina* Wlk.

Spruce aphid caused loss or discolouration of 20% to 60% of the old foliage on about 20% of the Sitka spruce in the wooded areas around the north-east part of Prince Rupert. Lighter damage by this insect occurred on scattered trees on the Queen Charlotte Islands in the Sandspit-Alliford Bay and Skidegate - Tlell areas.

Terminal Borers

Spruce Terminal Damage

In 1966, terminal and lateral damage on Sitka spruce reproduction at Sandspit, Skidegate Lake and Juskatla had declined. Frost damage to new buds in April, 1966, may have been the cause of some adventitious growth found during the survey in July, 1967.

Other Noteworthy Insects

Western Hemlock Looper, *Lambdina fiscellaria lugubrosa* (Hulst)

The hemlock looper population increased in 1967 throughout the mainland portion of West Prince Rupert District. A total of 132 larvae were found in 60 collections in 1967. In 1966, 36 larvae were found and in 1965, 14 larvae were found.

Aspen Leaf Miner, *Phyllocnistis populiella* (Chamb.)

There was an increase in aspen leaf miner attack in 1967, especially in the Oliver Creek area (Table 5). Parasitism of cocoons declined and adult survival increased (Table 6). This would indicate a heavier attack in 1968.

Table 5

Aspen Leaf Surfaces Mined and Number of Adults Produced per 100 Leaf Surfaces, West Prince Rupert District

Plot location	% leaf surfaces mined		No. adults produced per 100 leaf surfaces	
	1966	1967	1966	1967
Cedarvale	22.4	39.9	1.2	4.2
Oliver Cr.	33.0	82.0	1.8	10.2
Terrace	36.3	32.4	1.8	0.7
Beam Stn. Rd.	9.4	35.1	0.3	0.9
Averages	24.3	45.6	1.1	3.0

Table 6

Mortality of Aspen Leaf Miner in 100-cocoon Samples at Four Locations, West Prince Rupert District

Plot location	% mortality			
	Parasitism		Other causes	
	1966	1967	1966	1967
Cedarvale	42	36	21	2
Oliver Creek	58	44	4	1
Terrace	55	52	7	2
Beam Stn. Road	38	31	27	18
Averages	48.2	40.8	14.2	5.8

Yellow-headed Spruce Sawfly, *Pikonema alaskensis* Roh.

A localized infestation of yellow-headed spruce sawfly occurred in a 1.3 acre plantation of white spruce (XP-147) in the vicinity of Nelson River north of Terrace. Larvae caused 10 to 90% defoliation of current foliage on about 50% of the saplings and some defoliation of old foliage on two saplings. This plantation of white spruce is more than 50 miles from the natural range of native white spruce and is completely surrounded by a Douglas-fir plantation. There has never been more than an endemic population of this insect recorded in the District prior to this year.

Spruce Gall Aphids, *Pineus* sp. and *Adelges cooleyi* Gill.

Spruce gall aphid attacks were found in plantations of Sitka spruce and in one plantation of white spruce in the Nelson River area. *Pineus* galls, which were the more numerous, and *Adelges* galls, were present on about 10% of the spruce in the area. *Adelges* attacks cause galls which usually kill lateral current growth and cause adventitious growth behind the dead galled area. Branch development usually continues beyond *Pineus* galls.

Table 7

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Acleris variana (Fern.) Black-headed budworm	wH, alF	Throughout District	Defoliator. Dropped from 1966. Found singly in 4 collections.
Choristoneura fumiferana (Clem.) Spruce budworm	alF, aF, wH, sS	Copper R., Skeena Crossing, Lakelse, Kitimat, Kitsumkalum L., Sand L.	Defoliator. Found singly in 7 samples.
Epirrita autumnata (Gn.) Green velvet looper	wH, aF, alF, wC, sS	Throughout District	Defoliator. Light population. Found in 50 samples.
Malacosoma disstria Hbn. Forest tent caterpillar.	bCo, W	Exstew, Kitsumkalum R.	Defoliator of hardwoods. Very light population.
Neodiprion spp. Sawflies	wH, aF, alF, sS, lP	Throughout District	Defoliator. Small infestation at Williams Creek.
Nyctobia limitaria (Wlk) Yellow-lined forest looper	wH, aF, alF, sS, wS	Throughout District	Defoliator. Light population. Found in 32 samples. Increase over 1966.
Pikonema dimmockii Cress. Green-headed spruce sawfly	sS, wS, mH	Throughout District	Defoliator. Light population. Found in 32 samples. Increase over 1966.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Hemlock Mortality

Dying and dead hemlock were observed during aerial surveys of the Queen Charlotte Islands over approximately 1,500 to 2,000 acres on the upper west slopes of Louise Island and on adjacent Moresby Island from 500 to 1,500 feet elevation. More than 20% of the timber was previously killed or red-topped.

Severe black-headed budworm defoliation occurred throughout this area in 1944-45, 1954-55 and in 1958. Drought conditions prevailed during the summers of 1958 and 1965 and trees on steep slopes, ridges and plateaus appeared to be suffering from lack of moisture.

At Kleanza Creek Park, northeast of Terrace, hemlock mortality detected in 1966 was examined in 1967 but no definite causal agent was found. Of 79 trees, 23 were dead compared to 19 in 1966 (Table 8). Most heavily defoliated trees lost more foliage in the lower and mid-portions of the crown.

Table 8

Conditions of Western Hemlock at Kleanza Creek,

West Prince Rupert District

Crown class	No. trees	Previous dead	Dead		% defoliation	
			1966	1967	1966	1967
D	11	1	0	0	23	30
CD	26	1	2	4	45	44
I	25	3	4	4	30	29
S	17	7	1	3	52	54
All trees	79	12	7	11	38	39

Canker Damage to Lodgepole Pine Caused by *Atropellis piniphila* (Weir) Lohman and Cash and *Peridermium stalactiforme* Arth. and Kern.

Lodgepole pine stands were examined for canker damage at 21 locations from Skeena Crossing to Terrace, in the Kitsumkalum River Valley and in the Nass River Valley as far north as Moore Creek. Six stands were infected with one or both diseases (Table 9).

Table 9

Areas Where Canker Damage of Lodgepole Pines Caused by P. stalactiforme and/or A. piniphila were found, West Prince Rupert District, 1967

Location	% trees infected	
	P. stalactiforme	A. piniphila
Oliver Creek	2	10
6 mi. N/Oliver Creek	0	14
Kitwanga, NE 4 mi.	0	32
Williams Creek	14	0
Terrace S. side	0	20
Usk	0	20

Dwarf Mistletoe, Arceuthobeum campylopodum Engelm.(f.) tsugensis (Rosend.) Gill.

During 1967 a survey was carried out to determine the distribution of dwarf mistletoe throughout the West Prince Rupert District. It was found on western hemlock in 24 coast localities, including the Queen Charlotte Islands. In the coast-interior transition zones, however, western hemlock comprises a smaller part of the stand and the occurrence of dwarf mistletoe was lighter. The species was also found on the lower branches of a heavily limbed Sitka spruce in Radley Park at Kitimat.

Indian Paint Fungus, Echinodontium tinctorum Ellis and Everh.

The indian paint fungus was collected from western hemlock in the Nass River Valley for distribution records; four samples were collected from Kiteen River to Kwinageese Lake. The disease causes heart rot in hemlock.

Exotic Plantations

Thirty-six of the 39 exotic plantations in the District were examined in 1967. Fifty trees were examined in each plantation. Eight Douglas-fir plantations in the Nelson River area were infected by a needle rust, Melampsora occidentalis Jacks., although damage was lighter than in 1966. Trees had lost from 60 to 70% of their 1966 foliage and loss of 1967 foliage should average about 10 to 20% with some trees unaffected. Terminal growth was vigourous and normal in 1966 and 1967. Small cankers formed on 1967 terminals but caused no apparent damage. Adelges cooleyi (Gill.) attacked Douglas-fir in some plantations causing yellow spotting of the needles but no serious damage.

Hybrid poplar plantations were examined at Shames, Whitebottom, Nelson River and Kiteen River areas. Plantations 133, 230 and 233 in the Shames to Exstew River area were overgrown by black cottonwood and most of the hybrids had died or been suppressed. Cytospora sp., associated with heavy dieback, was found on hybrid poplars in 1966; in 1967 it was detected on black cottonwood, a new host record.

Two species of larch, L. decidua and L. eurolepis, planted in the Nelson River, Camp Creek and Beaver River areas, showed good growth and form. Willow, black cottonwood and trembling aspen protected the seedlings from wind damage and snow binding. Pinus sylvestris, P. resinosa and P. ponderosa in the Nelson River area showed good growth and a minimum of breakage.

Grand fir in two Nelson River plantations showed very slow development. No insects or disease have apparently affected these seedlings. Table 10 shows significant problems in exotic plantations where disease occurred in 1967.

Table 10

Diseases Found in Exotic Plantation Examinations,

West Prince Rupert District, 1967

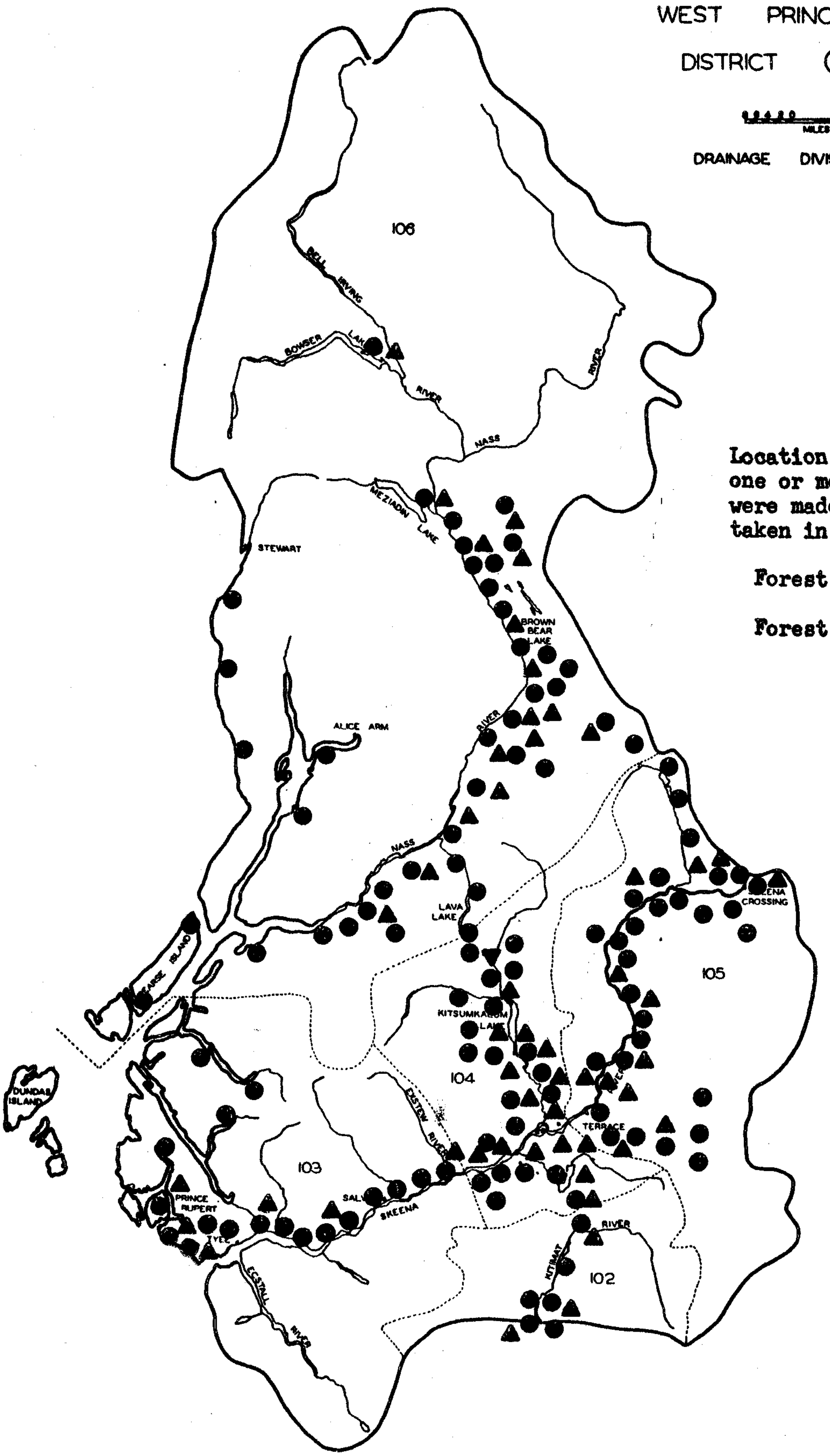
XP no.	Location	Exotic species	Remarks
126	Nelson R.	Douglas-fir	50% of trees infected by Melampsora occidentalis Jacks.
147	Camp Cr.	White spruce	Trees infested by Pikonema alaskensis Roh. (see under insect report.)
229	Kiteen R. (Burn)	Poplar sp. (hybrid)	Heavy top mortality in cuttings, recovery in August in form of root-sucker growth.
230	Shames	Poplar sp. (hybrid)	90%-95% mortality. Most of plantation grown over by black cottonwood.
232	Nelson R.	Poplar sp. (hybrid)	80% dieback on old tops, new root-sucker growth.
233	Shames	Poplar sp. (hybrid)	90%-95% mortality. Choked out with native poplars.
249	Whitebottom (Lakelse R.)	Poplar sp. (hybrid)	50% cuttings died back, survival questionable.
254	Nelson R.	Grand fir	Newly established plantation. Survival questionable. (Seedlings scarce).

Other Noteworthy Diseases

Table 11

Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Cryptosporium sp. Wilt disease	Poplar hybrids	Lakelse R., Shames, Exstew	Found on both dead and living branch tissue.
Discocainia treleasei (Sacc.) J. Reid and Funk Canker disease	wH	Caspaco	Caused dieback on tips of some lower branches. Light infection.
Lirula macrospora (Hartig) Darker Needle cast	sS	Juskatla, Moresby Camp	Found in association with spruce aphid feeding on previous year's needles. Formerly *Lophodermium macrosporum*.
Melampsora epitea Thuem. Needle rust	alF	Bowser L.	Light incidence on lower sides of needles of lower branches of true firs.
Puccinia caricina DC. Rust disease	Ribes sp.	Nelson R.	Found on currant in vicinity of exotic tree plantations.



Map 1

Location of points where one or more collections were made and field records taken in 1967.

Forest insect ●

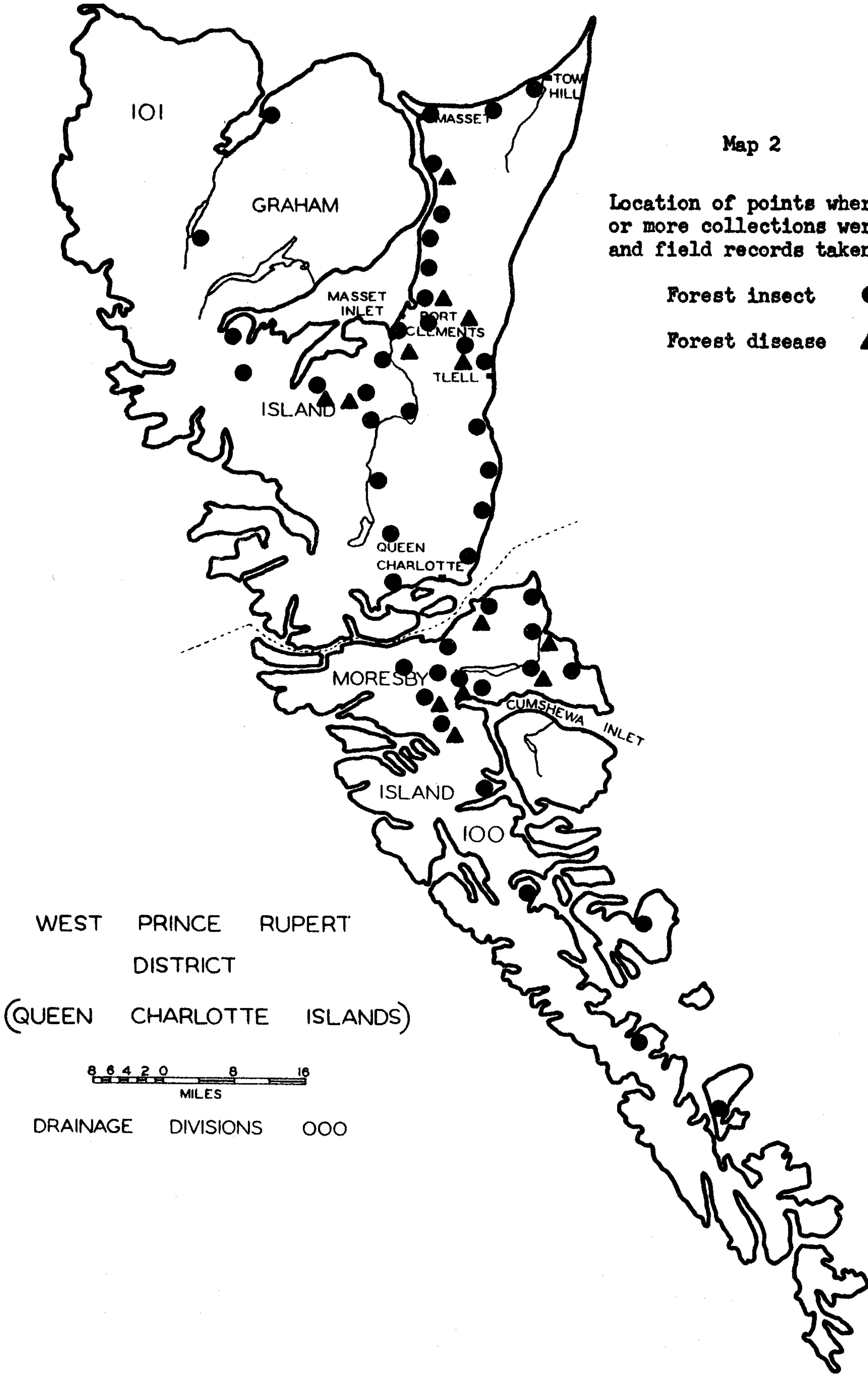
Forest disease ▲

Map 2

Location of points where one or more collections were made and field records taken in 1967.

Forest insect ●

Forest disease ▲



FOREST INSECT AND DISEASE SURVEY

SOUTH PRINCE RUPERT DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

SOUTH PRINCE RUPERT DISTRICT

1967

R. G. Brown and D. G. Collis [1/]

INTRODUCTION

The forest insect and disease survey of the District began July 11 and ended July 22. The main coastal survey was accomplished using float-equipped aircraft and the Bella Coola Valley was surveyed by motor-vehicle.

Insect populations in the District increased slightly in 1967. Green-striped forest looper increased notably in all drainages and western hemlock looper increased in the Bella Coola Valley.

Totals of 117 forest insect and 20 forest disease collections were made. Eighty-six per cent of 114 beating collections taken contained larvae. A special survey of canker damage of lodgepole pine caused by *Atropellis piniphila* (Weir) Lohman and Cash and *Peridermium stalactiforme* Arth. and Kern was undertaken.

Table 1 shows insect and disease collections by hosts. Table 2 presents the principal insect and disease problems in each Drainage Division. Map 1 shows the locations of collections and Drainage Division boundaries.

[1/] Forest Research Technicians, Forest Insect and Disease Survey; respectively, Ranger and Insect Appraisal Group Leader, Victoria, B. C.

Table 1

Collections by Hosts

South Prince Rupert District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	16	1	Alder, red	2	0
Douglas-fir	10	2	Birch, western white	2	0
Fir, alpine	0	1	Cottonwood, black	1	0
Fir, amabilis	9	2			
Hemlock, western	58	5			
Pine, lodgepole	3	7			
Pine, whitebark	1	1			
Spruce, Sitka	15	1			
Totals	112	20	Totals	5	0
			GRAND TOTALS	117	20

Table 2

Currently Important Insect and Disease[1] Problems

by Drainage Divisions

South Prince Rupert District, 1967

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,	3	3	3	2
Western hemlock looper	wH, D, sS, wC, aF	0	3	3	0
Terminal Borers					
Sitka spruce weevil	sS	0	2	3	0
Weather Damage					
Frost damage	wC, wH, aF, sS	0	4	0	4

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

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

Defoliators

Green-striped Forest Looper, *Melanolophia imitata* Wlk.

The population of green-striped forest looper increased in distribution and numbers compared to 1966 (Table 3). Throughout the District, 67 positive samples contained 367 larvae. No appreciable damage is expected in 1968.

Table 3

Summary of Green-striped Forest Looper Collections

by Drainage Divisions,

South Prince Rupert District

Drainage division	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
080	14	20	17	0	0	88	0	0	5.4
081	27	39	32	19	15	94	2.0	7.3	5.7
082	35	33	24	11	21	75	1.6	2.0	7.6
083	35	36	34	0	3	12	0	7.0	1.0
Totals	111	128	107	8	11	63	1.8	4.4	5.8

Western Hemlock Looper, *Lambdina fiscellaria lugubrosa* (Hulst.)

There was a marked increased in the western hemlock looper population at lower elevations in the Bella Coola Valley in 1967 (Table 4). One sample 2 miles east of Bella Coola contained 51 larvae. Thirty-one positive collections contained 169 larvae. No appreciable damage is expected in 1968.

Table 4

Summary of Western Hemlock Looper Collections by

Drainage Divisions, South Prince Rupert District

Drainage division	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
080	14	20	17	0	0	0	0	0	0
081	27	38	32	7	21	41	1.0	2.9	6.3
082	34	35	24	50	57	63	2.3	3.6	5.6
083	35	36	34	0	0	0	0	0	0
Totals	110	129	107	17	22	26	2.2	3.4	5.9

Terminal Borers

Sitka Spruce Weevil, *Pissodes sitchensis* (Hopk.)

Spruce weevil damage was intermittent throughout the lower Bella Coola Valley. There was a concentrated attack in a small area of the lower Salloomt River Valley where approximately 40% of the Sitka spruce reproduction was attacked.

Other Noteworthy Insects

Table 5

Other Insects of Current Minor Significance

Insects	Hosts	Locality	Remarks
Acleris variana (Fern.) Black-headed budworm	wH	Nusatsum River	Defoliator. Population very low in 1967. One larva collected.

Table 5 - Continued

Insects	Hosts	Locality	Remarks
Adelges cooleyi (Gill.) Cooley spruce gall aphid	D, S	Bella Colla Valley	Sucking insect. Found on Douglas-fir needles and in galls on spruce tips at Firvale and scattered locations throughout the Valley.
Adelges tsugae (Annand) Hemlock woolly aphid	wH	Emsley Cove	Sucking insect. Found on suspected fume damaged trees near Kitimat.
Choristoneura fumiferana (Clem.) Spruce budworm	aF	Necleetsconnoy Valley	Defoliator. Population very low. Two pupae collected from 1 positive sample.
Ectropis crepuscularia (Schiff.) Saddle-back looper	wH, wC, Al, sS	Widespread	Defoliator. Slight increase in population. Fifteen positive samples contained 45 larvae.
Epirrita autumnata Wlk. Green velvet looper	wH, aF	Kelp Pass, Foch Lagoon, Cousins Inlet	Defoliator. Found occasionally in small numbers. Three positive samples contained 15 larvae. Thirteen of these larvae were taken at Kelp Pass.
Eupithecia spp. Loopers	wH, sS, D	Widespread	Defoliator. Found in small numbers. Ten positive samples contained 12 larvae.
Lithocolletis salicifoliella (Cham.) Willow leaf-miner	W spp., bCo	Bella Coola Valley	Leaves of willow species, between Firvale and Stuie, were moderately infested in 1967. Light attacks occurred in other parts of the Valley.
Neodiprion spp. Hemlock sawflies	wH, wC, Al, sS	Widespread	Defoliator. Common in small numbers in all drainages. Thirty-six positive collections contained 446 larvae.

Table 5 - Continued

Insects	Hosts	Locality	Remarks
Nyctobia limitaria (Wlk.) Green balsam looper	wH, sS, aF	Widespread	Defoliator. Common in small numbers in most drainages. Forty-one larvae were taken in 22 positive samples.
Orgyia antiqua badia (Hy. Edw.) Rusty tussock moth	wH, wC, Al, sS	Widespread	Defoliator. Common in small numbers in all drainages. Forty larvae were found on hemlock and alder at Emsley Cove near Kitimat. Fifteen positive samples contained 62 larvae.
Pikonema spp. Spruce sawflies	sS, wH	Widespread	Defoliator. Found occasionally in small numbers in most drainages. Fourteen larvae taken in 9 positive samples.
Pineus spp. A woolly aphid	lP	Stuie	Sucking insect. Found on needles of pine.
Scolytidae Twig miners	D	Bella Coola Valley	Up to 15% twig mortality around Firvale. Red flagging also noticed throughout the Valley and in spots along Dean Channel and South Bentinck Arm.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Weather Damage

Frost Damage

Winter damage to branch tips and foliage of western hemlock western red cedar, amabilis fir and Sitka spruce occurred at Kynoch Inlet, along Mathieson Channel to Hird Point, along the west side of Walker Lake, and on King Island from Rattenbury Point to Jenny Inlet. On many branch tips up to 2 years old, needle growth had died.

Stem Diseases

A special survey of lodgepole pine stands for *Atropellis piniphila* (Weir) Lohman and Cash and *Peridermium stalactiforme* Arth. and Kern was undertaken in 1967. A number of 50 - tree samples were made to determine the occurrence and intensity of damage in the District (Table 6).

Table 6

Canker Damage of Lodgepole Pine Caused by *A. piniphila* and *P. stalactiforme*,

South Prince Rupert District, 1967

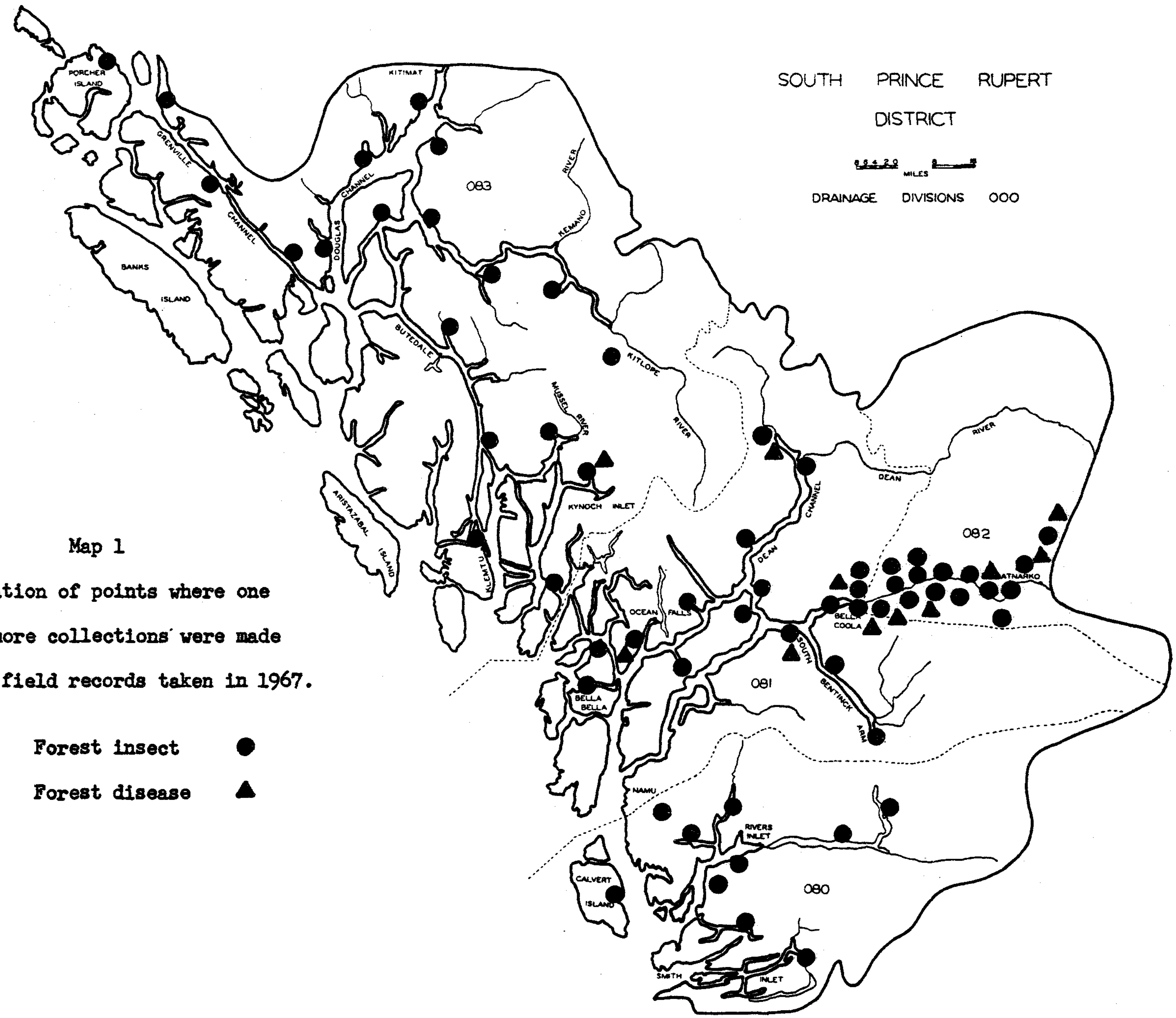
Location	% stems infected by Atropellis	% stems infected by Peridermium
Stuie	0	2
Young Creek	40	4
Heckman	0	8

Other Noteworthy Diseases

Table 7

Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Arceuthobium campylopodum f. *tsugensis* Western dwarf mistletoe	wH	Necleetsconnoy R., Menzies Point, Dean Channel	Broomsand stunted natural regeneration were noted throughout the District.
Didymascella thujina (Durand) Maire Cedar leaf blight	wC	East of Bella Coola	Light infection.
Discocainia treleasei (Sacc.) J. Reid and Funk, Branch canker	wH	Cousins Inlet	Light infection.
Rhabdocline pseudotsugae Syd. Douglas-fir needle cast	D	Nusatsum Mtn.	Light infections throughout the Bella Coola Valley



Map 1

Location of points where one or more collections were made and field records taken in 1967.

Forest insect ●

Forest disease ▲

FOREST INSECT AND DISEASE SURVEY

EAST PRINCE RUPERT DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

EAST PRINCE RUPERT DISTRICT

1967

J. S. Monts[1/]

INTRODUCTION

The forest insect and disease survey of the East Prince Rupert District commenced in late May and was complete in early September. There was a slight increase in the occurrence of all common defoliators in the District.

Spruce beetle trap logs were felled in the spring and examined in the fall for beetle population and survival studies. Populations changed little from the previous year.

A special survey was conducted to determine the incidence and distribution of two pine canker diseases.

Populations of black-headed budworm increased throughout the District and there was a localized infestation in the Morice Forest on alpine fir.

A total of 335 insect collections and 49 disease collections are listed by hosts in Table 1. Map 1 shows the location of points where one or more collections were made and the boundaries of the Drainage Divisions referred to in the text of the report.

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

Table 1

Collection by Hosts

East Prince Rupert District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	15	1	Alder, red	3	1
Douglas-fir	2	0	Birch species	2	0
Fir, alpine	74	4	Cottonwood, black	1	0
Fir, amabalis	4	0	Willow species	4	0
Hemlock, mountain	11	1			
Hemlock, western	24	1			
Pine, lodgepole	71	36			
Spruce, white	119	2			
Spruce species	1	1			
Totals	321	46	Totals	10	1
			Miscellaneous hosts	0	2
			No host	4	0
			GRAND TOTALS	335	49

Table 2

Currently Important Insect and Disease[1/] Problems by Drainage Divisions

East Prince Rupert District, 1967

Insect and disease problems	1	Importance by drainage divisions[3/] 120	121	122	123
Bark Beetles					
Spruce bark beetle	wS	2	2	2	1
Mountain pine beetle	lP	0	0	1	0
Dryocoetes-Ceratocystis complex	alF	1	1	1	2
Defoliators					
Black-headed budworm	wS, alF	2	4	3	2

Table 2 Continued

Insect and disease problems	Principal hosts[2/]	Importance by drainage divisions[3/] 120	121	122	123
Defoliators (Cont'd)					
Two-year-cycle spruce budworm	alF, wH	1	1	1	1
Spruce tip moth	wS	1	1	3	2
Leaf Miners					
Aspen leaf miner	tA	2	3	2	2
Terminal Borers					
Engelmann spruce weevil	wS	1	2	1	0

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

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

Spruce beetle, *Dendroctonus obesus* (Mann.)

Spruce beetle populations remained at a low level in 1967. Current beetle attacks were observed at Old Fort and beetle-attacked trees were reported in the Smithers Landing area by B. C. Forest Service personnel.

Trap trees were felled at Chapman lake, Taltapin lake and at Mile 33 on the Morice Forest Development Road. Late fall trap log examinations were made for overwintering populations at Chapman lake and Morice access. Logs at Taltapin lake were not examined due to transportation difficulties. Spruce beetle populations and development are shown in Table 3.

Table 3

Spruce Beetle Development in Trap Logs

East Prince Rupert District

Location	Exposure of log	Total number of insects 1965	1966	1967	% living adults 1965	1966	1967	% living larvae 1965	1966	1967
Chapman	open	-1/	55	64	--	12	8	--	88	92
Lake	shade	--	153	93	--	6	4	--	94	96
Taltapin	open	55	44	*2/	91	10	*	9	90	*
Lake	shade	31	58	*	90	21	*	10	79	*
Morice	open	50	*2/	43	22	*	7	78	*	93
Access Road	shade	76	*	57	8	*	18	92	*	82

-1/ - Logs not attacked.

*2/ - Trees not felled and/or not examined at these points.

Mountain Pine Beetle, Dendroctonus ponderosae Hopk.

Mountain pine beetle declined further in areas of the former infestation. No aerial surveys were carried out in the District in 1967. A few single, beetle-attacked lodgepole pine trees were observed in the Wright Bay and Hagan Arm areas of Babine Lake (Drainage Division 122).

Balsam Mortality Caused by the Dryocoetes-Ceratocystes Complex

Current mortality of alpine fir was somewhat reduced throughout the District in 1967. Red-topped alpine fir trees were observed in a high elevation stand at Swordgrass Lake, on the Kispiox Forest Development Road, Drainage Division 123. No beetles were found during examinations of individual red-topped trees.

Defoliators

Black-headed Budworm, Acleris variana (Fern.)

There was a general increase in the occurrence of this defoliator throughout the District in 1967 (Table 4). A localized infestation between mile 35 and mile 38 on the Morice Forest Development Road caused medium tip defoliation on alpine fir and white spruce. Collections of 79 and 52 larvae were taken from alpine fir and white spruce respectively at Gosnell Creek.

There was an increase in larval populations in the remainder of the Morice Forest but feeding was not visible.

Table 4

Summary of Black-headed Budworm Collections by Drainage Divisions

Drainage divisions	Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
120	87	82	8	16	12	25	3.4	1.7	5.0
121	19	47	71	5	32	42	1.0	9.9	8.1
122	34	55	125	21	0	11	2.7	--	3.3
123	0	13	22	--	15	5	--	2.2	1.0
Totals	140	197	226	16	13	21	3.1	6.3	4.3

Light tip feeding occurred along the Telkwa River at Milk Creek (Drainage Division 121) and Pinkut Lake and Ling Creek (Drainage Division 122) where 13, 22 and 14 larvae were found in collections from alpine fir regeneration. Egg counts, made in late fall at Gosnell Creek averaged 1.7 eggs per 18 inch branch sample. It is expected there will be a slight increase in the black-headed budworm population in this area in 1968.

Two-year-cycle Spruce Budworm, *Choristoneura fumiferana* (Clem.)

Spruce budworm populations remained endemic in all areas of the District. No larvae were found and no current defoliation occurred on any of the branch samples examined at the five plot locations in 1967. No larvae were found in three-tree beating samples taken in conjunction with the branch samples in these areas. The largest beating sample contained 4 larvae collected from white spruce at Ling Creek, (Drainage Division 122). Trees continued to put on good lateral and terminal growth.

A plot at Topley Landing was obliterated by road construction. A new plot will be established in Drainage Division 122 in 1968.

Following is a summary of two-year-cycle spruce budworm collections in the East Prince Rupert District.

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1965	1966	1967	1965	1966	1967	1965	1966	1967
236	162	192	4	7	3	2.9	1.6	.65

Spruce Tip Moth, *Zeiraphera* spp.

There was light tip feeding by this Tortricid on white spruce understory trees at Pinkut Lake, Drainage Division 122. On the Silver Landing road 15% of the current tips of white spruce were infested for a distance of 2 miles. Random samples from white spruce averaged 20 larvae each along Pinkut and Ling creeks.

Leaf Miners

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.

Leaf mining by the aspen leaf miner increased in the East Prince Rupert District throughout the range of the host tree, *Populus tremuloides* Michx. Heavy mining occurred in the Bulkley Valley from Moricetown to Walcott.

A new study plot was established east of Smithers in place of the damaged Telkwa plot. All four study plots were examined late 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 District

Plot location	% leaf surfaces mined		No. of adults produced per 100 leaf surfaces	
	1966	1967	1966	1967
Priestly Road	29.9	43.3	6.6	12.3
Babine Lake	63.3	63.9	10.5	12.4
Moricetown	52.8	66.4	7.8	10.7
West of Telkwa	56.1	72.0	10.9	18.8

Table 6

Mortality of Aspen Leaf Miner in 100-cocoon Samples

East Prince Rupert District

Location	% mortality			
	Parasitism		Other causes	
	1966	1967	1966	1967
Priestly Station Road	24	9	10	3
Babine Lake	15	7	8	6
Moricetown	39	41	17	18
West of Telkwa	28	21	14	4

Terminal Borers

Engelmann Spruce Weevil, Pissodes engelmanni Hopk.

Spruce weevil attacks occurred in spruce regeneration stands throughout the District. Light to medium attacks occurred south of Houston over a two mile area, west of the beginning of the Morice West Forest Development road. The leaders of 20% of 25 trees examined at this location had been attacked.

Other Noteworthy Insects

Western Hemlock Looper, Lambdina fiscellaria lugubrosa (Hulst)

There was no increase in the population of this defoliator in the East Prince Rupert District. The largest sample of seven larvae was collected from western hemlock in a localized stand on the Silver Standard Mine road (Drainage Division 122). Following is a summary of hemlock looper collections for the East Prince Rupert District.

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive sample		
1965	1966	1967	1965	1966	1967	1965	1966	1967
280	166	249	3	8	5	2.9	2.7	2.2

Table 7

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Adelges cooleyi Gill. Cooley spruce gall aphid	wS	Smithers, Telkwa	Sucking insect, common in regeneration stands.
Caripeta divisata Wlk. Grey spruce looper	wS, wH	North Skeena	Defoliator, common in D.D. 122. 6 positive collections contained an average of 2.1 larvae.
Epirrita autumnata Gn. Green velvet looper	alF, wS	Moricetown	Defoliator, common in D.D. 122. 13 larvae from one sample on alpine fir.
Feralia sp. A cutworm	alF, wH	Kispiox River	Defoliator, low population. 13 collections contained 15 larvae.
Melanolophia imitata Wlk. Green-striped forest looper	alF, wS	Bulkley Valley	Defoliator, low population, 4 collections averaged 1.0 larvae.
Neodiprion spp. Sawflies	wS, alF, lP	Kispiox River	Defoliators, widespread distribution. 12 collections contained 15 larvae.
Orgyia antiqua badia (Hy. Ed.) Rusty tussock moth	wS, wH	North Skeena	Defoliator, scattered occurrence. 9 collections contained 10 larvae.

Table 7 (Continued)

Insect	Hosts	Locality	Remarks
Pikonema alaskensis Roh. Yellow-headed spruce sawfly	wS, lP	Burns Lake	Defoliator. Found in small numbers. 11 positive collections contained an average of 1.5 larvae.
Pikonema dimmockii (Cress.) Green-headed spruce sawfly	wS, lP	Babine Lake	Common defoliator. Found in small numbers. 29 collections averaged 1.5 larvae.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Stem Diseases

Canker Damage to Lodgepole Pine

Fifty lodgepole pine trees were examined in 16 separate locations to determine the incidence of canker damage caused by *Atropellis piniphila* (Weir) Lohm. & Cash and *Peridermium stalactiforme* Arth. & Kern (Table 8).

Medium to heavy *Atropellis* canker damage was present in drainage divisions 120 and 122. Multiple cankers on the stems had caused mortality of a number of pole-sized trees at Suskwa River and Wisteria.

Canker damage caused by *P. stalactiforme* was widespread in drainage divisions 120, 121 and 122. Stems were girdled by cankers and up to 75% of the saplings and seedlings examined south of Houston and at Pinkut Creek were dead.

Table 8

Incidence of Canker Damage of Lodgepole Pine as Determined by 50-tree Examinations East Prince Rupert District, 1967

Locality	Drainage division	% of trees with canker damage caused by Atropellis	Peridermium
Babine Lake			
Augier Lake	122	3	2
Pinkut Creek	122	2	14
Hazelton			
John Brown Creek	121	3	0
Fifteen mile Creek	122	43	0
Suskwa River	122	46	0
Houston			
North of Owen Lake	121	1	8
North of Peacock Creek	121	0	34
Parrot Lakes	121	0	6
North of Ootsa Lake			
Uncha Lake	120	6	0
Danskin	120	7	4
Tatalaska Lake	120	12	9
Henson Lake	120	14	4
Island Lake	120	8	2
Ootsa Landing	120	4	11
Wisteria	120	3	0
West of Wisteria	120	24	14

Other Noteworthy Diseases

Foliage Diseases

Spruce Needle Rust, *Chrysomyxa weirii* Jacks

White spruce regeneration along the Kispiox Forest Development Road, Drainage Division 123, were infected by this rust which caused some needle loss. Open growing saplings at Sweeten River had 70% of their previous year's foliage infected and single trees had noticable needle drop in roadside stands south to Ironside Creek. Light infections occurred on saplings at Old Fort and Pinkut Creek, Drainage Division 122.

Stem Diseases

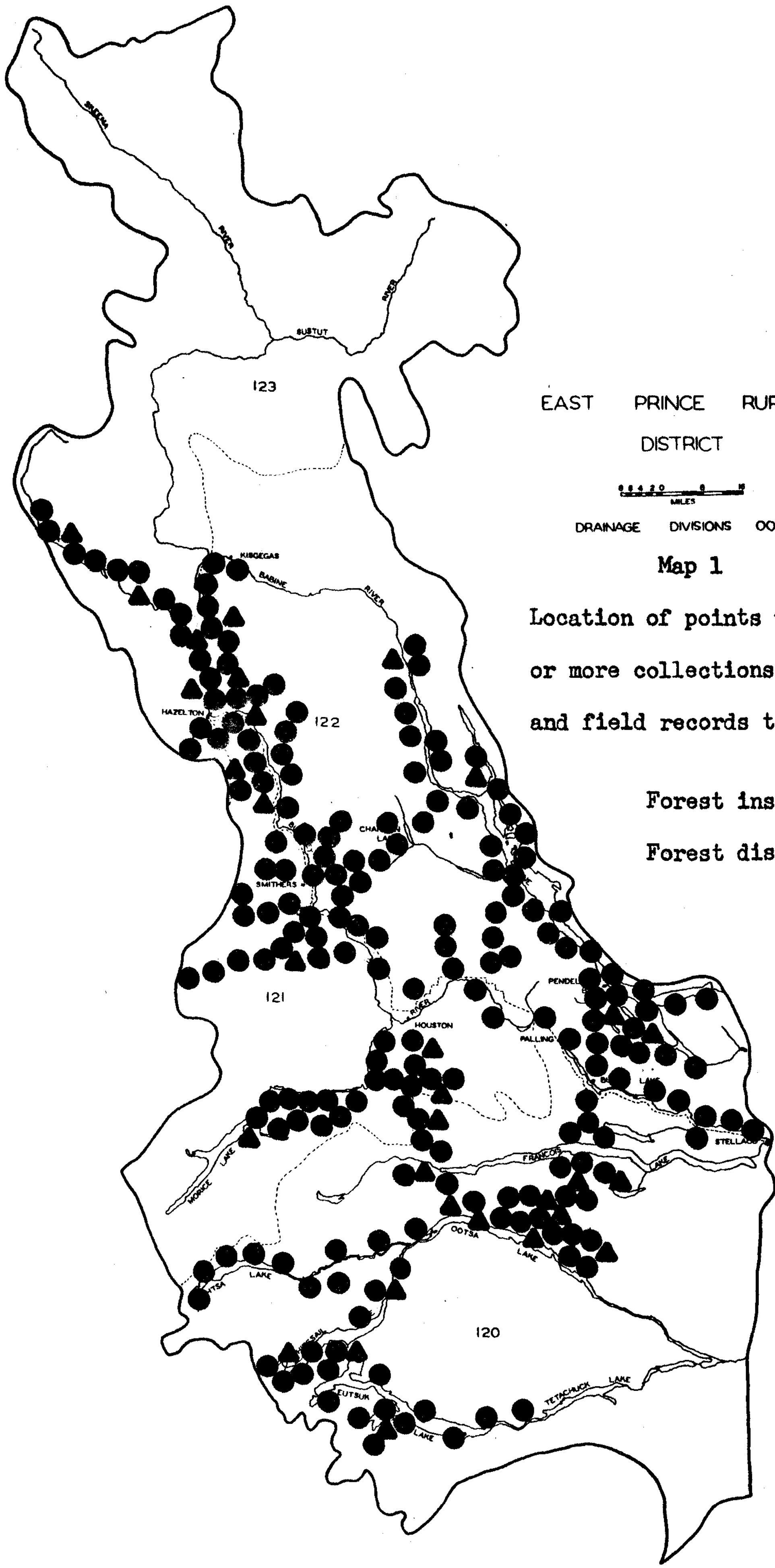
Western Gall Rust, Peridermium harknessii J. P. Moore

Lodgepole pine trees were heavily infected with rust galls along Pinkut Creek, from Pinkut Lake to Taltapin Lake, Drainage Division 122. Galls were present on 80% of the saplings west of Taltapin Lake and at Pinkut Lake 40% were infected. A small percentage of seedlings were dying at both locations.

Table 9

Other Diseases of Current Minor Significance

Disease	Host	Locality	Remarks
Cronartium comandrae Peck Rust on lodgepole pine	lP	Burns Lake, Smithers Houston	Light infections, widespread in the District.
Didymascella thujina (Durand) Maire Cedar leaf blight	wC	North Skeena	Common in D.D. 123. Caused light foliage loss.
Echinodontium tinctorium E. & E. Indian paint fungus	mH	Whitesail Lake	Common decay fungus, light infections on mountain hemlock.
Epipolaeum tsugae (Dearn.) Shoem. A sooty mold	wH	Skeena River	Attacked 1966 foliage on 10 saplings examined (D.D. 123).
Lophomerum autumnale (Darker) Magasi A needle cast	alF	Eutsuk Lake	Heavy infections on 1966 needles on 3 trees (D.D. 120).
Peridermium holwayi Syd. A needle rust	alF	Babine Lake	Light infections on 1966 needles. Common in D.D. 122.



EAST PRINCE RUPERT
DISTRICT

MILES

DRAINAGE DIVISIONS 000

Map 1

Location of points where one or more collections were made and field records taken in 1967.

Forest insect ●

Forest disease ▲

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

KAMLOOPS SURVEY DISTRICT

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

KAMLOOPS SURVEY DISTRICT

R. O. Wood [1]

The Kamloops Forest Insect and Disease Survey District encompasses the Kamloops Forest District.

There were two changes in ranger personnel in the Kamloops Survey District in 1967. In East Kamloops District, R. O. Wood replaced C. B. Cottrell who was transferred to the Victoria Laboratory. D. F. Doidge was assigned to Central Kamloops District and N. J. Geistlinger remained in West Kamloops District. D. G. Lund from the Prince George Survey District assisted the Plant Protection Branch of the Federal Department of Agriculture in the European pine shoot moth survey in May in the Okanagan Valley and Kamloops area. A special survey for balsam woolly aphid in the South Okanagan Valley was conducted by the B. C. Forest Service Protection Division aided by Forest Insect and Disease Survey personnel.

Bark beetle populations increased sharply from 1966 in many localities. Mountain pine beetles doubled losses in ponderosa pine stands at Chapperon Lake and several new areas of tree mortality were found in the southern portion of the District. There was an increase in numbers of red-top lodgepole pine northeast of Williams Lake and in the drainages of Hat and Mission creeks. Some new areas of beetle damage were observed in the Merritt region. Tree mortality caused by Douglas-fir beetles increased, particularly in the vicinity of Deadman River, along the Fraser River and from Williams Lake to 100 Mile House.

Black-headed budworm infestations caused light to severe defoliation of western hemlock over more than 90,000 acres in 1967. The heaviest damage occurred in the northeast section of the East Kamloops District. Some defoliation was present near Blue River and a new infestation was found near Quesnel and Mitchell lakes. The hot, dry summer may have contributed to high mortality of black-headed budworm larvae resulting in a generally low egg count in 1967. Larch sawfly caused intermittent defoliation of western larch on 14,400 acres along the east side of Okanagan Lake. A small infestation of spruce budworm on Douglas-fir occurred near Shalalth. Forest tent caterpillars defoliated 3,600 acres

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[1] Forest Research Technician, Forest Insect and Disease Survey, Senior Ranger, Vernon, B. C.

of trembling aspen along the Wells Gray Park Road. Fall webworm populations were very high in the Okanagan Valley and along the Thompson and Nicola rivers. Populations of other important defoliators such as western hemlock looper, Douglas-fir tussock moth and a looper on Douglas-fir, *Nepytia freemani* Munroe, were low in 1967.

The balsam woolly aphid was found for the first time in the Okanagan Valley at two locations.

Wood-borer larvae were numerous and damaging to logs cut in the Yellow Lake area and were also present in standing, fire-damaged timber near Monte Lake.

The majority of Douglas-fir trees damaged by frost in the Williams Lake area in 1966 have apparently recovered.

A needle cast of ponderosa pine continued to cause damage throughout the sampled range of this host. Douglas-fir trees in many parts of the District suffered from drought damage in 1967.

Above normal temperatures and lack of precipitation during July and August resulted in some disastrous forest fires.

Following is a list of standard tree abbreviations used in the three Kamloops districts:

Host Tree Abbreviations

Abbrev.	Common name	Abbrev.	Common name
wC	Cedar, western red	wwP	Pine, western white
D	Douglas-fir	eS	Spruce, Engelmann
F	Fir, general	Al	Alder species
alF	Fir, alpine	tA	Aspen, trembling
wH	Hemlock, western	wB	Birch, western white
roJ	Juniper, Rocky Mountain	bCo	Cottonwood, black
aL	Larch, alpine	M	Maple species
wL	Larch, western	W	Willow species
lP	Pine, lodgepole		
pP	Pine, ponderosa		

FOREST INSECT AND DISEASE SURVEY

EAST KAMLOOPS DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

EAST KAMLOOPS DISTRICT

1967

R. O. Wood

INTRODUCTION

Regular field work in the District began on May 16 and terminated on September 22. Black-headed budworm egg sampling and a population study of wood-borers in fire-damaged timber was done between October 10 and 31. Two special surveys within the District were made in 1967: for European pine shoot moth on exotic pines in the Okanagan Valley and Kamloops area (May and June), and for balsam woolly aphid on ornamental and native true firs in the southern Okanagan Valley (June and July). Seven and one-half hours of flying time were used for tree damage appraisal.

Insect and disease collections made in the District are shown by hosts in Table 1; 168 of the insect collections were taken by personnel conducting the balsam woolly aphid appraisal. Collection localities and drainage divisions are shown on Map 1. Table 2 shows the principal problems in each Forest Insect and Disease Survey drainage division.

Tree mortality resulting from Douglas-fir beetle attack was low in 1967 but mountain pine beetles caused an increase in mortality of lodgepole and ponderosa pines. Populations of conifer defoliators were low with the exception of the black-headed budworm and larch sawfly which again damaged many acres of western hemlock and western larch. Fall webworm infested a variety of deciduous hosts near Okanagan Lake. Balsam woolly aphid was found in the Okanagan Valley for the first time in 1967. Wood-borer larvae caused damage to sawlogs in the Yellow Lake area and larvae were present in fire-damaged trees near Monte Lake.

Needle cast of ponderosa pine was widespread and damaging in the District. A stem canker on lodgepole pine was found at several widely-separated points. Dwarf mistletoe on Douglas-fir was severe along the Ashnola River Valley. Drought conditions in 1967 caused damage to Douglas-fir trees in many parts of the District.

Table 1

Collections by Hosts,

East Kamloops District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	20	0	Alder species	2	0
Douglas-fir	88	7	Aspen, trembling	10	1
Fir, alpine	168	4	Birch species	4	0
Fir species	46	0	Chokecherry	2	0
Hemlock, western	47	1	Cottonwood, black	2	0
Juniper species	3	0	Maple, Douglas	4	0
Larch, western	18	3	Willow species	4	2
Pine, lodgepole	26	47			
Pine, ponderosa	40	2			
Pine, western white	4	2			
Spruce, Engelmann	31	0			
Yew, western	4	0			
Totals	495	66		28	3
			Miscellaneous hosts	11	5
			GRAND TOTALS	534	74

Table 2

Currently Important Insect and Disease [1/] Problems by Drainage Divisions, East Kamloops District, 1967

Insect and disease problems	Principal hosts [2/]	Importance by drainage division [3/]						
		180	181	182	183	184	185	186
Bark Beetles								
Mountain pine beetle	lP, pP, wwP	4	4	2	0	0	0	3
Douglas-fir beetle	D	2	2	0	2	0	0	2

Table 2 Continued

Insect and disease problems	Principal hosts 2/	Importance by drainage division 3/						
		180	181	183	183	184	185	186
Defoliators								
Black-headed budworm	wH, eS, alF	1	0	5	0	5	2	0
Larch sawfly	wL	0	4	3	0	0	0	0
Sucking Insects								
Balsam woolly aphid	F	0	2	0	0	0	0	0
Wood-borers								
A sawyer beetle	eS, D, pP, alF	0	4	0	3	0	0	0
Foliage Diseases								
Pine needle cast *Elytroderma deformans* (Weir) Darker	pP, lP	4	5	1	3	3	0	0
Larch needle cast *Hypodermella laricis* Tub.	wL	0	2	2	0	1	0	0

Includes only weather-induced and foliage diseases subject to notable annual fluctuation.

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

Mountain Pine Beetle, Dendroctonus ponderosae Hopk.

Aerial surveys in 1967 indicated an increase in mortality of lodgepole and ponderosa pine and a decrease in western white pine.

The most notable increase of lodgepole pine red-tops occurred near the junction of Joe Rich and Mission creeks where 900 were counted in 1966 and 1,500 in 1967. An additional 1,025 were counted along Mission Creek.

An 8-acre cruise strip through the Joe Rich Creek infestation on July 31 produced the following results:

No. trees examined	% of trees			
	Healthy	Current attack	Red	Old grey
708	33	32	18	17

The B. C. Forest Service is considering salvage operations in this infestation.

The most concentrated number of beetle-killed ponderosa pine was near Jura, northeast of Princeton where 1,000 red-tops were counted. In mid-September, a 2-acre cruise strip resulted in 382 stems tallied of which 26% were healthy, 18% currently attacked and 56% dead. Three-toed woodpeckers, Picoides sp., were feeding on beetles in infested trees.

The beetle infestation in ponderosa pine near Salmon Lake has now spread to join the one at Chapperon Lake; numbers of red-tops in this area are included in the Central Kamloops District report. Table 3 shows aerial counts of beetle-killed pine in the District. Volume losses are calculated from diameter and height measurements of beetle-killed trees in areas affected.

Table 3

Number and Volume of Pine Killed by Mountain Pine Beetle, East Kamloops District, 1965 and 1966 as determined in 1967

Pine species	Location	No. trees killed	Est. volume (cu. ft.)
Lodgepole	Ashnola River	650	13,000
	Princeton northeast to Peachland Cr.	245	4,900
	Hoe Rich Cr.	1,500	30,000
	Mission Cr.	1,025	20,500
	Lambly Cr.	255	5,100
	Whiteman Cr.	200	4,000
		3,875	77,500
Ponderosa	Princeton to Aspen Grove	1,315	52,600
	Wolf Cub Cr.	1,020	30,600
	Bearpaw Cr.	105	3,150
	Darke Lake Park #1	30	900
	Belgo Cr.	100	3,000
	Powers Cr.	45	1,350
	McDougal Cr.	60	1,800
	Duncans Cr.	20	600
	Wood Lake	25	750
	Whiteman Cr.	25	750
	Equesis Cr.	20	600
	O'Keefe	25	750
	Kentucky Lake	20	600
		2,810	94,750
Western white	Sugar Lake	50	2,000
	Adams Lake	230	9,200
		280	11,200
Totals, all pine species			
1965		12,150	363,000
1966		3,950	109,000
1967		6,965	183,450

Douglas-fir Beetle, Dendroctonus pseudotsugae Hopk.

The number of beetle-killed Douglas-fir trees observed in the District decreased to 178 from 440 in 1966. Forty red-tops were recorded in the Missezula Lake area, 48 at Penticton and Liddell creeks, 30 at Monte Lake, 5 at Alleyne Lake and 55 at Adams Lake. The estimated volume loss was 10,680 cubic feet.

Defoliators

Black-headed Budworm, Acleris variana (Fern.)

Populations of black-headed budworm in western hemlock collections were comparable to those of 1966 but areas of defoliation increased from 37,000 acres in 1966 to 46,500 in 1967. Larvae were common in collections from Engelmann spruce and alpine fir but in much lower numbers. A comparison of the number of larvae in standard beating collections from western hemlock for 1966 and 1967 is as follows:

No. samples taken during larval period		% samples containing larvae		No. larvae per positive sample	
1966	1967	1966	1967	1966	1967
34	30	85	80	50.5	55.7

On Engelmann spruce, 60% of the collections were positive with an average of 11.1 larvae; on alpine fir 61% were positive with 6.6 larvae per sample.

Defoliation of western hemlock varied from light to heavy in the watersheds of Holstein, Sim, Crazy and Wap creeks, Perry, Eagle and Shuswap rivers and Sugar and Shuswap lakes (Map 2). Table 4 shows the acres of defoliation in each region. Damage was restricted to elevations between 3,000 and 4,000 feet and was heaviest along the Perry River, parts of the Eagle River and Crazy and Holstein creeks. Understory alpine fir in some areas suffered extensive defoliation.

Table 4

Defoliation of Western Hemlock by Black-headed Budworm
as Determined by Aerial Surveys, East Kamloops District, 1967

Location	Acres of defoliation	
	Light to moderate	Moderate to heavy
Holstein Cr.	0	3,000
Cherry and Outlet Cr.	2,500	0
Sugar L.	1,000	500
Shuswap R.	1,500	7,000
Wap Cr.	3,000	5,500
Eagle R.	4,000	3,500
Crazy Cr.	0	3,000
Perry R.	2,000	8,500
Shuswap L.	500	1,000
Totals	14,500	32,000

Parasitism in mass larval collections made at Sim, Crazy, Holstein and Reiter creeks ranged from 29 to 73%. The high rate of parasitism combined with extremely high temperatures with no precipitation during July and August, could possibly account for the low numbers of pupae present in mid-August. Sampling of up to 25 trees in each of the four areas produced only occasional live pupae.

Egg counts in October were done in the same manner as in 1966. Three western hemlock trees were felled at each sample point and two 10-inch branch tips were taken from each of the lower, mid and upper crown sections. The egg counts were made at the Vernon laboratory using a caustic solution and filter system. Egg populations had dropped to a very low level at the 13 locations sampled in East Kamloops District (Table 5).

Table 5

Black-headed Budworm Defoliation and Egg Counts on
Western Hemlock, East Kamloops District 1966 and 1967

Locality	% defoliation				Av. no. eggs per branch sample	
	Current year's foliage		Total foliage			
	1966	1967	1966	1967	1966	1967
Crazy Cr. No. 1	40	5	15	trace	2.6	0.9
Crazy Cr. No. 2	20	15	5	trace	4.1	0.7
South Pass Cr.	5	10	trace	5	5.3	0.9
Sim Cr. No. 1	5	30	trace	10	14.4	0
Sim Cr. No. 2	5	10	trace	5	4.3	0.4
Sim Cr. No. 3	10	10	5	5	16.3	0.4
Noisy Cr.	5	15	15	5	2.4	0
Kingfisher Cr.	trace	trace	trace	trace	3.3	0.7
Reiter Cr. No. 1	30	trace	5	trace	4.5	0.3
Reiter Cr. No. 2	10	5	5	trace	6.7	0
Holstein Cr. No. 1	5	15	trace	5	8.4	1.0
Holstein Cr. No. 2	15	5	5	trace	22.9	0.4
Perry R.		trace	-	trace	-	0.3

Using the criterion that from one to seven eggs per branch tip will cause only light defoliation the following year, 1/ damage by the black-headed budworm is expected to be light in 1968.

Larch Sawfly, Pristiphora erichsonii (Htg.)

Infestations of the larch sawfly persisted in 1967. An estimated 13,400 acres of western larch were defoliated in pockets along the eastern slopes of the Okanagan Valley from Osoyoos to Vernon (Map 2). Of this area, 1,200 acres were heavily defoliated, most of which were in the vicinity of Pearson and Mission creeks. Only one small infestation was seen at Harris Creek in the Lumby region, although larvae were common in beating collections.

On September 21, a square-foot duff sample containing sound and unsound cocoons was taken from beneath each of 10 tagged trees at each of two plots, one near Becker Lake and another near Aberdeen Lake. Sound cocoons are those which contain sawfly larvae, either healthy or parasitized. Unsound cocoons are those which are empty, either from the emergence of a sawfly or a parasite or from attack by a predator. A comparison of the number of sound and unsound cocoons at each plot with that found in

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1/ Forest Insect and Disease Survey Report, East Kamloops District, 1966.

1965 and 1966 was as follows:

Location	Sound			Unsound		
	1965	1966	1967	1965	1966	1967
Becker Lake	510	502	238	321	783	656
Aberdeen Lake	330	270	204	261	518	385

As in 1965 and 1966, mammal predation accounted for most of the destruction of larch sawfly cocoons found in 1967. Parasitism by Mesoleius tenthredinus Morley decreased while that caused by Tritneptis klugii (Ratz.) increased. Data from examination of unsound (empty) cocoons in 1967, compared with 1965 and 1966 examinations, are shown in Table 6. Several years' mortality and emergence is included because it is difficult to determine the year in which damage or emergence occurred.

Ten sound cocoons (from which adults will emerge in the spring to produce next year's population) from each tree were opened and the larvae dissected to study parasitism. Mouldy and dried larvae were excluded and results were based only on healthy and parasitized larvae. There was a slight decrease in parasitism by Mesoleius sp. but Tritneptis sp. was noticeably present for the first time in three years (Table 7).

Larch sawfly larvae fall from the foliage early in the autumn and spin cocoons in which they overwinter in the ground. Funnel traps were set under trees at each plot to catch these larvae and thereby determine the amount of larval diapause through the next summer. The project was unsuccessful as grazing animals disturbed the traps and very few larvae were caught.

Basing predictions of defoliation on the number of cocoons present the previous autumn has not proved very reliable. The average number of cocoons in square-foot duff samples at Becker Lake in two successive years indicated comparable populations for each year but the amount of defoliation each year differed greatly. An average of 51 sound cocoons per square foot in the autumn of 1965 resulted in an estimated defoliation of 65% in 1966. An average of 50 cocoons at this plot in 1966 produced a sawfly population in 1967 which caused only 25% defoliation. Nevertheless, it is expected that the average of 24 cocoons per sample at Becker Lake and 27 at Aberdeen Lake in 1967 should result in only light defoliation in 1968.

Sucking Insects

Balsam Woolly Aphid, Adelges piceae (Ratz.)

Balsam woolly aphid was discovered on planted ornamentals in the

Table 6

% Emergence and Cocoon Mortality Determined from Unsound Cocoons of Larch Sawfly, in Duff Samples, East Kamloops District

Location	% emerged			% apparently destroyed by														
				Predation						Parasites						Miscellaneous agents		
				Mammal			Elaterid			Mesoleius			Tritneptis					
	'65	'66	'67	'65	'66	'67	'65	'66	'67	'65	'66	'67	'65	'66	'67	'65	'66	'67
Becker L.	19	29	39	59	57	35	10	3	10	1	9	3	0	1	2	11	1	11
Aberdeen L.	39	28	32	22	62	27	10	3	3	8	4	3	0	1	4	21	1	31

Table 7

Condition of Larch Sawfly Larvae in Sound Cocoons at Two Plots, East Kamloops District

Location	% healthy			% parasitized by					
				Mesoleius			Tritneptis		
	'65	'66	'67	'65	'66	'67	'65	'66	'67
Becker L.	92	61	39	8	39	34	0	0	27
Aberdeen L.	92	66	61	7	34	24	0	0	15

Okanagan Valley in 1967. Three silver fir, Abies alba Mill., near Oliver and two white fir, Abies concolor (Gord. and Glend.), in Penticton were infested; all trees were approximately 10 inches dbh.

The silver fir were imported from Holland and planted at Oliver in 1928. It is not known whether the aphid had supported itself on these trees for 39 years or if they had somehow been infested later, probably through exposure to other infested imported trees. European records show that the former is possible. Bark and branch samples were taken from each tree on May 15 and examined at the Vernon laboratory with the following results:

Tree no.	Bark samples (sq. in.) No. samples examined	Av. no. eggs	Av. no. crawlers	Branch samples (24 in.) No. examined	Av. no. crawlers
1	6	1,890	45	2	32
2	7	252	26	2	33
3	8	246	16	2	12

The trees were sprayed and subsequently felled and burned.

The origin and date of transplant of the two white fir trees at Penticton is unknown. Both trees had only a light population of crawlers and all were on branches. The trees were sprayed with a mixture of Thiodan and Sevin (1 lb. per 100 gallons of water) applied at the rate of about 70 gallons per tree. Later samples showed no living evidence of the aphid and it is believed the spray was effective.

Survey crews supplied by the B. C. Forest Service and supervised by members of the Forest Insect and Disease Survey from the Victoria Laboratory conducted a survey of ornamental firs from the United States border to Penticton during June and July. The two infested white fir in Penticton, mentioned above, were found during this survey.

All infested ornamental fir were less than 15 miles from native alpine fir stands, well within the limits of potential dispersion of the insect by air currents. However, no evidence of the balsam woolly aphid was observed in an aerial survey of these stands.

Wood Borers

A Sawyer Beetle, Monochamus sp.

Mixed decks of Douglas-fir, Engelmann spruce and alpine fir logs from the Yellow Lake region southwest of Penticton were infested with Monochamus sp. larvae in 1967. The logs had been cut in the winter of 1966-1967 and were examined in the Penticton mill yard of the Oliver Sawmill Co. on August 23. Larvae had penetrated to a depth of three inches in Douglas-fir and four inches in spruce by that date. Only occasional alpine fir logs were infested. All these logs were sawn before September; no information could be obtained regarding damage to lumber.

Assessment of wood-borer populations in fire-damaged timber was made in the Paxton Valley and Falkland areas in October. Samples consisted of square-foot bark samples on trees over 10 inches dbh, and 12-inch-wide strips from the circumference of the bole on smaller trees; each plot consisted of 10 trees. Results of examinations of Douglas-fir trees were as follows:

Location	No. sq. ft. bark examined	Av. no. Monochamus per sq. ft.
Paxton Valley	23.5	9.7
Falkland	26.1	0.2

The samples were small and the results do not necessarily apply to the whole burned area. However, they did indicate that, in some parts of the Paxton Valley fire at least, there is a potentially damaging population of Monochamus sp.

No Monochamus sp. larvae were found in ponderosa pine at either location.

Other Noteworthy Insects

Cooley Spruce Gall Aphid, Adelges cooleyi (Gill.)

Attacks by the spruce gall aphid on Douglas-fir were lighter than in 1966. The percentage of needles infested varied greatly between plots (Table 8). Samples consisted of the current year's growth from five branch terminals from each of five trees at each plot.

Table 8

Percentage of Douglas-fir Needles Infested by Cooley Spruce Gall Aphid, East Kamloops District

Location	No. needles examined 1966	No. needles examined 1967	% infested 1966	% infested 1967
Coalmont	1,692	1,343	34.2	13.4
Keremeos	2,306	1,605	7.4	26.0
Kelowna	2,263	1,350	22.7	3.0
Falkland	1,657	2,299	0.9	0.1
Monte Creek	2,056	1,801	28.9	0.9
Lumby	2,857	2,025	3.5	2.2

Fall Webworm, Hyphantria cunea (Drury)

There was a general increase in populations of the fall webworm in 1967. Chokecherry was the principal host but webs were common on black cottonwood, trembling aspen, rose and other deciduous hosts. The heaviest infestations occurred along both sides of the north arm of Okanagan Lake and at Okanagan Landing. Many bushes up to 12 feet high were completely denuded. Webs occurred as far north as Mile 3, Scotch Creek Road and up to 3,400 feet elevation southeast of Armstrong. Table 9 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 9

Fall Webworm Web Counts, East Kamloops District, 1967

Host and locality	No. webs per mile: Mile 0-1	1-2	2-3	3-4	Av. per mile
Okanagan Lake					
Chokecherry	576	522	325	222	411
Black cottonwood	0	14	21	0	9
Miscellaneous	22	41	88	34	46
All Species 1967	598	577	434	256	466
All species 1966	210	186	157	1,042	399

Table 9 Continued

Host and locality	No. webs per mile				Av. per mile
	Mile 0-1	1-2	2-3	3-4	
Woodsdale					
Chokecherry	26	126	-	-	76
Black cottonwood	59	88	-	-	74
Miscellaneous	257	123	-	-	190
All species 1967	342	337	-	-	340
All species 1966	99	198	-	-	149

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.

The heaviest population of aspen leaf miner on trembling aspen occurred in the Salmon Arm region in 1967. The four leaf miner plots in the District were examined early in September. At all but one a change in the number of leaf surfaces mined coincided with a corresponding change in the number of adults produced; at Carlin there was an increase in the number of surfaces mined but a decrease in adults emerging from these mined leaves (Table 10). Samples consisted of one 12-inch branch sample from each of 10 trees at each plot.

Table 10

Aspen Leaf Surfaces Mined and Number of Adults Produced per 100 Leaf Surfaces, East Kamloops District

Location	% leaf surfaces mined			No. adults produced per 100 leaf surfaces		
	1965	1966	1967	1965	1966	1967
Carlin	26	22	78	13	29	13.9
Phillips Lake	34	89	72	14	21	5.4
McCulloch	48	4	18	13	1	8.1
Aspen Grove	5	27	5	0.4	7	11.3

Parasitism and mortality from other causes in the cocoon stage, as indicated in 100-cocoon samples, combined to cause a substantial increase in mortality at all but the McCulloch plot (Table 11), at least partially explaining the population reduction noted in Table 10.

Table 11

Mortality of Aspen Leaf Miners in 100-cocoon Samples, East Kamloops District, 1965-1967

Location	% mortality					
	Parasitism			Other causes		
	1965	1966	1967	1965	1966	1967
Carlin	26	18	50	3	11	15
Phillips Lake	37	18	56	3	7	17
McCulloch	30	4	18	4	28	1
Aspen Grove	44	22	38	9	18	10

European Pine Shoot Moth, Rhyacionia buoliana (Schiff.)

The Plant Protection Division of the Canada Department of Agriculture, assisted by the Forest Insect and Disease Survey, again assessed European pine shoot moth damage in the Okanagan Valley and in the city of Kamloops. The survey commenced on May 1 and ended on June 15.

In 1967, an intensive examination was made of exotic pines in nurseries, plantations and landscape projects; inspection of native pine stands was only casual. A total of 35,675 trees was inspected. No evidence of European pine shoot moth was found in home gardens or nurseries but damage attributed to it was found on Scots pine, Pinus sylvestris Linn., at two plantations at Kelowna and on two native ponderosa pines near one of the plantations. 1/

An attempt was made in 1967 to trap European pine shoot moth adults at Summerland and near Glenmore where shoot moth damage had previously been found. The traps were baited with live virgin females and were examined at five to seven day intervals. No moths were caught. 2/

Leaf Mites, Eriophyes brevitarsus (Fockeu)

There was a moderate population of this leaf mite on mountain alders along the Asp Creek road northwest of Princeton. Figure 1 shows erinea on an alder leaf collected on July 19. Identification of the insect was made by Dr. C.V.G. Morgan of the Summerland Research Station, Canada Department of Agriculture.

1/ Hamilton, J.C. 1967. European pine shoot moth survey, Interior British Columbia, 1967. Can. Dep. Agric. Unpubl. rept.

2/ Ross, D. A. 1967. The European pine shoot moth in the Interior of British Columbia, 1967. Dep. For. and Rural Dev., For. Res. Lab., Victoria, B. C. Inform. Rept. BC-X-13.

Mealy Bug, Puto cupressi (Colem.)

The infestation of mealy bug on conifers near Asp Creek persisted and caused severe dwarfing and deformation, especially on lodgepole pine and alpine fir. Trees up to 6 inches dbh displayed heavy deposits of black, sooty mold growing on honey-dew exuded by the bug. The B. C. Forest Service reported another area of mealy bug damage southwest of the known infestation. The extent of both infestations will be determined in 1968.

Western Balsam Bark Beetle, Dryocoetes confusus Sw.

A total of 450 red-topped alpine firs were counted during aerial surveys in 1967 in the East Kamloops District. The distribution of these trees was as follows: Olivine Mt. - 100; Lambly Cr. - 200; Sicamous Cr. - 50; Latewhos Cr. - 50; Smyth Cr. - 50.

Table 12

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Archips cerasivoranus (Fitch) Ugly nest caterpillar	Choke-cherry	Vernon, north end of Okanagan L.	Defoliator. Numerous roadside bushes infested.
Choristoneura fumiferana (Clem.) Spruce budworm	wH, alF, eS, D, wL	Throughout District	Defoliator. Most common on D; from May 1 to July 15, 15% of 53 collections were positive with an average of 1.3 larvae.
Contarinia spp. Douglas-fir needle midges	D	Throughout District	Needle miners. Average of 6.6% of needles mined at 7 plots.
Dendroctonus obesus (Mann.) Spruce beetle	eS	Bolean L.	Bark beetle. Light attack on felled trees in June.
Dendroctonus valens Lec. Red turpentine beetle	pP	O'Keefe	Bark beetle. Fifteen trees infested in 1967.

Table 12 Continued

Insect	Hosts	Locality	Remarks
Dichomeris marginella Fabr. Juniper webworm	Juniper species	Okanagan Valley	Needle miner and web-maker. Numerous ornamental shrubs in towns and cities were severely damaged.
Hemichroa crocea (Four.) Striped alder sawfly	W	Sugar L.	Defoliator. Several roadside bushes were 100% defoliated.
Lambdina fiscellaria lugubrosa (Hulst) Western hemlock looper	wH, D, eS	Throughout District	Defoliator. Of 30 wH collections in 1967, 17% were positive with 1.6 larvae each.
Malacosoma pluviale Dyar Western tent caterpillar	tA, W	Shuswap L.	Defoliator. Only occasional webs were observed.
Neophasia menapia (F. & F.) Pine butterfly	pP	Vernon, N.E. Arm of Okanagan L., Postill L. Rd.	Defoliator. Numerous adults in flight but only light defoliation.
Nepytia freemani Munroe A looper on Douglas-fir	D	Throughout District	Defoliator. Very low population.
Nymphalis j. album Bev. & Lec. Compton tortoise-shell butterfly	In flight	South Pass and Wap crks.	Defoliator. Hundreds of adults in flight on July 24.
Pikonema spp. Spruce sawflies	eS	Throughout District	Defoliator. Very low populations.
Zeiraphera improbana Walker A larch bud moth	wL	Osoyoos, Harris Cr.	Defoliator. One small area of defoliation near Osoyoos; moderate numbers of larvae at Harris Cr.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

Pine Needle Cast, *Elytroderma deformans* (Weir) Darker

This needle cast was general on ponderosa pine throughout most of its range in the East Kamloops District but the most severe infections occurred in the vicinity of Okanagan Lake. A few lodgepole pines along the Bear Creek road were moderately infected.

The two plots established to obtain progressive records of infection on ponderosa pine were examined in July. The numbers of living trees and the estimated percentage of foliage infected from 1965 to 1967 were as follows:

Location	No. living trees			Estimated % foliage infected		
	1965	1966	1967	1965	1966	1967
Carr's Landing	62	60	57 1/	22	24	29
Glenemma	56	54	54	29	24	22

1/ Three trees not found

Larch Needle Cast, *Hypodermella laricis* Tub.

Sporadic occurrence of damage to western larch caused by *H. laricis* was observed between Lumby and Sugar Lake, along Mission Creek east of Kelowna and in the Falkland area. Only one or two trees at each location appeared to be infected.

Mistletoe Diseases

Douglas-fir Dwarf Mistletoe, *Arceuthobium douglasii* Engelm.

The area of most severe infection on Douglas-fir again was in the Ashnola River Valley. From miles 8 to 15 the majority of mature Douglas-firs were infected. Severely disfigured trees were observed from the valley bottom to the tops of ridges visible from the road.

A small number of Douglas-firs along the Carmi Road east of Penticton were infected.

Lodgepole Pine Dwarf Mistletoe, Arceuthobium americanum Nutt. ex Engelm.

Infected lodgepole pines were noted throughout much of the southern part of the District in 1967. The area of heaviest infection was at Mile 10, Carmi Road, east of Penticton.

Stem Diseases

A Canker on Lodgepole Pine, Atropellis piniphila (Weir) Lohman and Cash.

Surveys to determine the distribution of this disease in the District were made by examining 20 randomly selected plots of 50 trees in lodgepole pine stands. Table 13 gives the locations where A. piniphila was found and the percentage of trees infected at each location.

Table 13

Location and Percentage of Lodgepole Pines Damaged by A. piniphila (50-tree plots), East Kamloops District, 1967

Location	% trees infected	Max. no. of cankers per infected tree
Mile 14, McCulloch Rd.	4	2
Mile 15, Mission Cr. Rd.	8	3
Bear Lake	18	4
Mile 4.7, Aberdeen L. Rd.	4	1
Aberdeen Lake	12	4
Mile 3.6, Doreen L. Rd.	6	2
Becker L. Rd.	26	4
Mile 7, Silver Star Rd.	32	4
Mile 12.7, Silver Star Rd.	26	3
Range Road	10	2

A Stem Rust on Lodgepole Pine, Peridermium stalactiforme Arth. and Kern

A survey to determine the distribution of damage to lodgepole pine by P. stalactiforme was made in conjunction with the examinations for Atropellis piniphila; 50 trees were examined in widely-separated locations. Although the organism is suspected of being present in a number of locations, it was found only at Mile 12.7 Silver Star Road.

Indian paint brush, Castilleja sp., the alternate host of P. stalactiforme, was noted only at Friday Creek south of Princeton and at the plot on Silver Star Road.

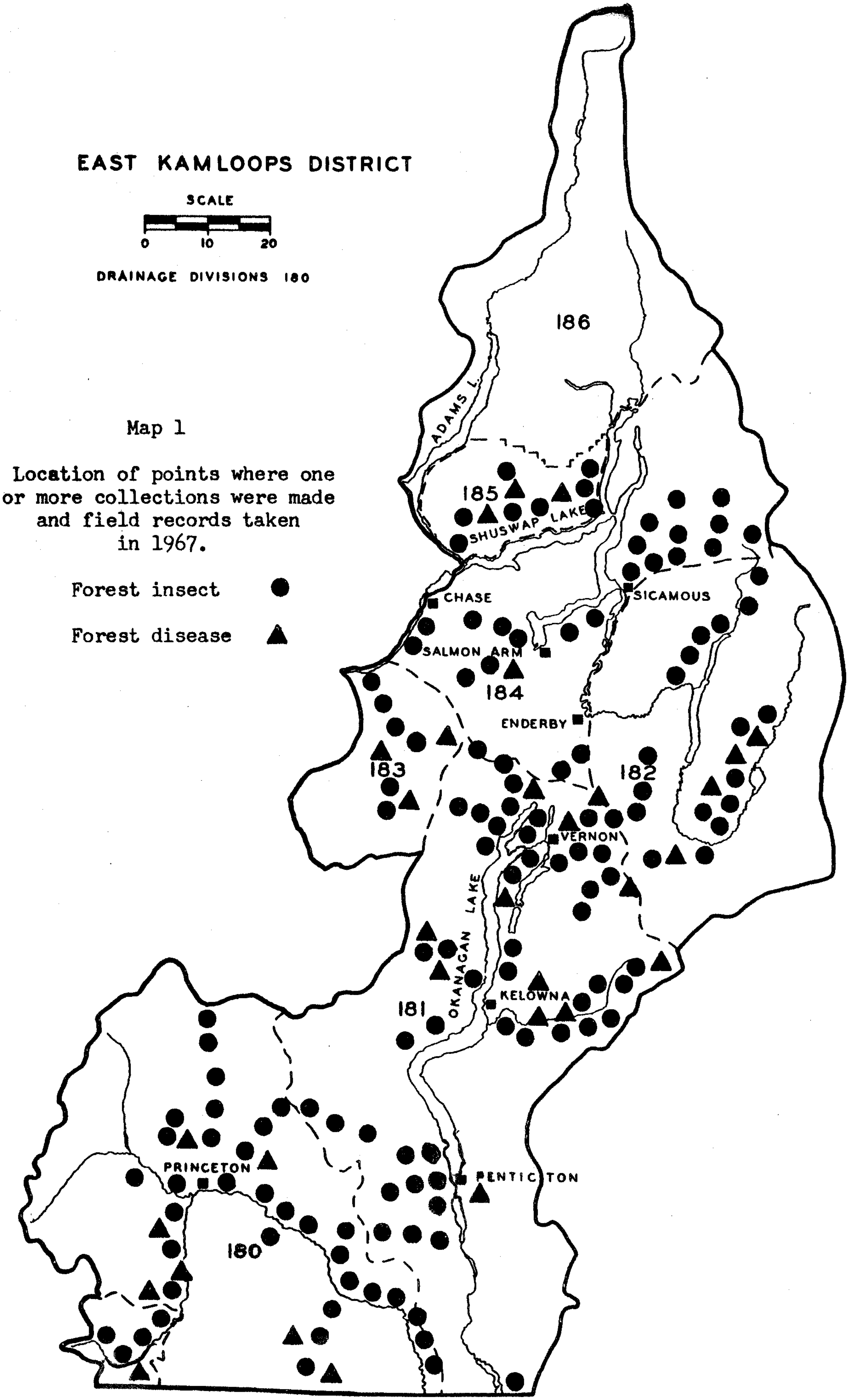
Weather Damage

Drought conditions in 1967 adversely affected Douglas-fir trees in some parts of the District. Symptoms of damage were a reddening of foliage and thinning of the crown. Trees up to about 15 feet in height were the most seriously damaged although mature trees also lost some needles. This condition was most severe in the Spallumcheen District Municipality north of Vernon and along the Similkameen River between Keremeos and Princeton.

Table 14

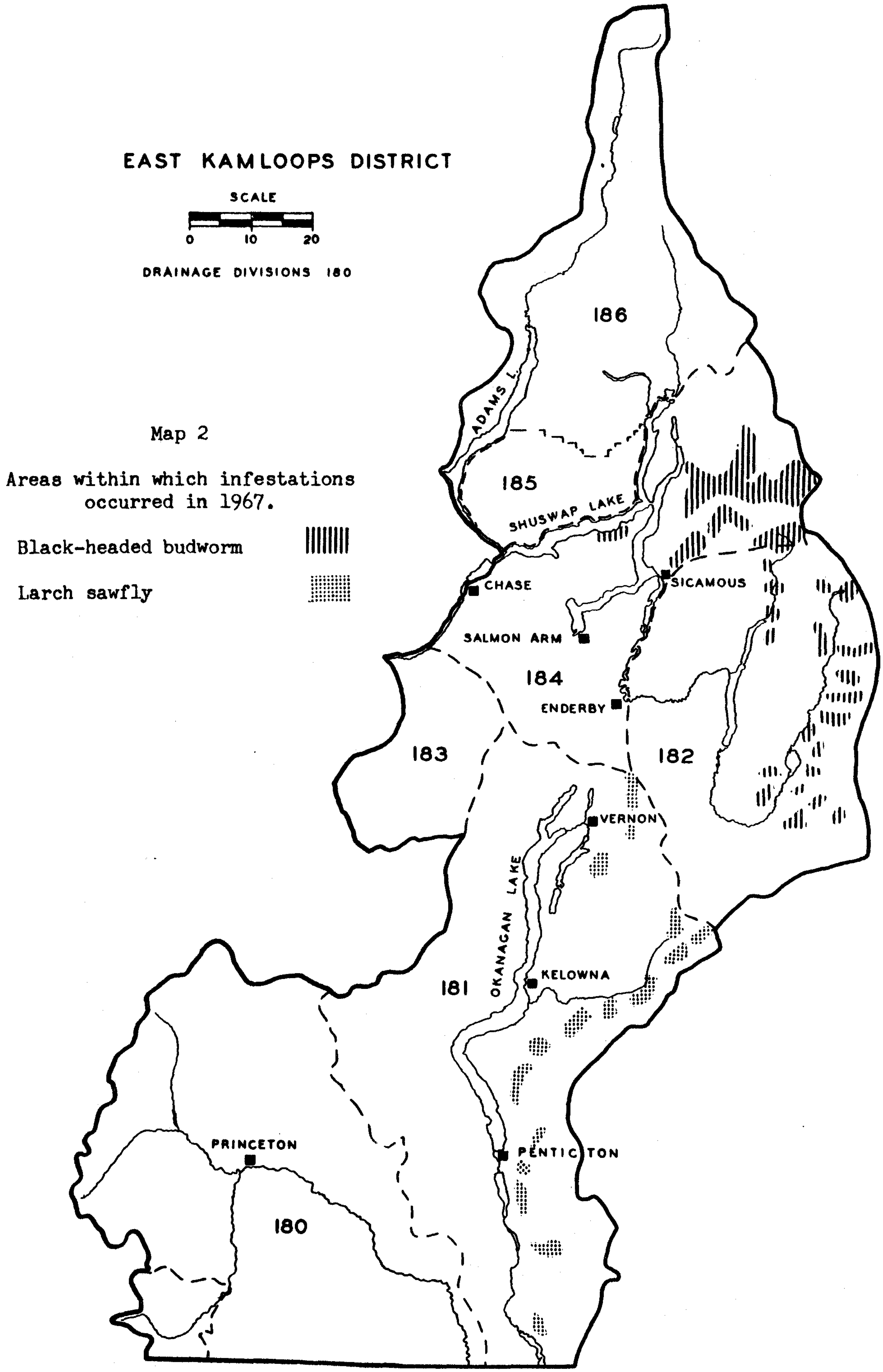
Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Hypodermella concolor (Dearn.) Darker A needle cast	lP	Manning Park	One of the most virulent needle cast fungi on lodgepole pine.
Lophodermium laricinum Duby A needle cast	aL	Manning Park	Infection in a small stand at 6,300 foot elevation.
Melampsora medusae Thuem. A needle rust	D	Shuswap L.	Light infection. Alternate host is trembling aspen.
Melampsora occidentalis Jacks. A needle rust	D	Shuswap L.	Light infection. Alternate host is black cottonwood.
Pucciniastrum epilobii Otth. A needle rust	alF	Manning Park	Occasional trees at elevations up to 5,600 feet were infected.
Rhabdocline pseudotsugae Syd. Douglas-fir needle cast	D	Kalamalka L. Becker L.	Light degree of infection noted.
Rhabdogloeum pseudotsugae Syd. A needle cast	D	Kalamalka L.	Five trees infected.
Sclerophoma.sp.	D	Reiter Creek	A fungus which causes blue stain; light infection.



Map 1

Location of points where one or more collections were made and field records taken in 1967.



Map 2

Areas within which infestations occurred in 1967.

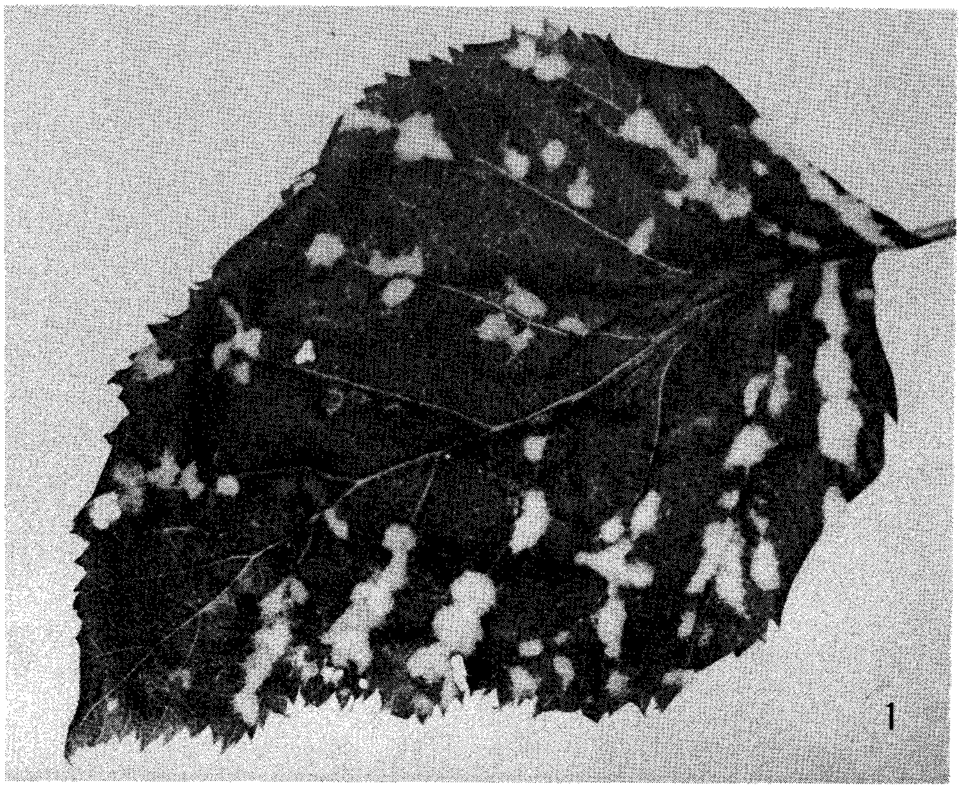


Fig. 1. Eriophyid mites, Eriophyes brevitarsus (Fockeu), on leaves of Sitka alder, Asp Creek, East Kamloops District, July, 1967. J. K. Harvey

FOREST INSECT AND DISEASE SURVEY

CENTRAL KAMLOOPS DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

CENTRAL KAMLOOPS DISTRICT

1967

D. F. Doidge [1]

INTRODUCTION

The 1967 field season in the Central Kamloops District began on May 29 and continued until October 24. Nine hours flying time were used in the Central Kamloops District aerial survey in August. One week in mid-May was spent at Mackenzie in the West Prince George District in connection with a wood borer control project in log decks. September 24 to October 5 was spent assisting with the annual spruce beetle survey in the South Prince George District. Two weeks in October were spent on the black-headed budworm survey in East and West Kamloops districts.

Mountain pine beetle and forest tent caterpillar were the only insects present in the District in epidemic proportions. Mountain pine beetles attacked ponderosa pine at Chapperon Lake, Pritchard, Cache Creek, Barnes Lake and in the Merritt-Spences Bridge areas. Forest tent caterpillars defoliated 3,600 acres of trembling aspen along the Wells Gray Park road. Black-headed budworm remained at a low level in the Blue River area and very few eggs were found in the fall survey.

Table 1 shows the forest insect and tree disease collections by host; Map 1 shows the distribution of collections and field records taken. The principal problems in each Forest Insect and Disease Survey Drainage Division are shown in Table 2. These Drainage divisions are illustrated on Map 1.

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

Table 1

Collections by Hosts,

Central Kamloops District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	6	0	Alder species	6	0
Douglas-fir	116	6	Aspen, trembling	17	0
Fir, amabilis	2	0	Birch, species	1	0
Fir, alpine	18	2	Cottonwood, black	2	0
Hemlock, western	21	0	Willow species	6	0
Juniper, Rocky Mtn.	10	0			
Larch, western	0	1			
Pine, lodgepole	35	44			
Pine, ponderosa	33	0			
Pine, Scots	1	0			
Spruce, Engelmann	23	1			
Totals	265	54	Totals	32	0
			Miscellaneous hosts	12	3
			GRAND TOTALS	309	57

Table 2

Currently Important Insect and Disease [1/] Problems by Drainage Divisions, Central Kamloops District, 1967

Insect and disease problems	Principal hosts [2/]	Importance by drainage divisions [3/]					
		160	161	162	163	164	165
<u>Bark Beetles</u>							
Mountain pine beetle	pP, wwP, lP	5	4	3	4	2	3
Douglas-fir beetle	D	2	1	1	4	1	1
<u>Defoliators</u>							
Black-headed budworm	wH, eS, D, alF	1	1	1	1	1	1
Forest tent caterpillar	tA	1	0	1	1	5	0
<u>Leaf Miners</u>							
Aspen leaf miner	tA	1	1	1	1	0	0
<u>Foliage Diseases</u>							
Pine needle cast, <u>Elytroderma deformans (Weir) Darker</u>	pP	4	2	4	3	0	0
Pine needle cast, <u>Hypodermella concolor (Dearn.) Darker</u>	lP	1	4	4	1	2	0

Includes only weather-induced and foliage diseases subject to annual fluctuation.

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 potential problem - 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* Hopk.

Damage to ponderosa pine in the central and southern parts of the District and to western white pine near Adams Lake increased in 1967. An estimated 15,000 red-topped ponderosa pine, 700 western white pine, and 60 lodgepole pine were observed during aerial surveys. This is approximately twice as many red-tops as were counted in 1966. Table 3 shows the location, species, number and volume of mountain pine beetle-killed trees observed as compared with 1966. 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 pine trees.

Table 3

Number and Volume of Pine Trees Killed by Mountain Pine Beetle as Estimated from Aerial Surveys, Central Kamloops District

Pine species	Location	Est. no. trees killed		Est. gross vol. (cu.ft.)	
		1966	1967	1966	1967
Ponderosa	Chapperon L.	5,000	11,200	150,000	336,000
	Pritchard	500	830	15,000	24,900
	Cache Cr.	-	550	-	16,500
	Barnes L.	-	405	-	12,150
	Skaynaneichst Cr.	-	350	-	10,500
	Skeikut Cr.	470	375	14,100	11,250
	Soap L.	-	320	-	9,600
	Deadman R.	150	175	4,500	5,250
	Criss Cr.	-	140	-	4,200
	Promontory Mth.	-	109	-	3,270
	Tranquille Cr.	315	90	9,450	2,700
	Skukum Cr.	80	50	2,400	1,500
	Abbot Cr.	-	50	-	1,500
	Spius Cr.	-	45	-	1,350
	Durand Cr.	30	27	900	810
	Shakan Cr.	-	25	-	750
	Scottie Cr.	-	25	-	750
	Codey Cr.	-	25	-	750
	Jacko L.	-	25	-	750
	Niskonlith L.	-	25	-	750
	Jamieson Cr.	100	20	3,000	600
	Copper Cr.	-	20	-	600
	Canford	-	15	-	450
	Robins L.	-	10	-	300

Table 3 Continued

Pine species	Location	Est. no. trees killed		Est. gross vol. (cu.ft.)	
		1966	1967	1966	1967
Ponderosa	Dairy Cr.	-	5	-	150
	Doherty Cr.	-	5	-	150
	Paul Cr.	15	5	450	150
	Highland Va.	20	- -	600	-
	Guichon Cr.	20	-	600	
	Shumway L.	-	65	-	1,950
	Pinantan L.	285	-	8,550	-
Total ponderosa pine		6,985	14,986	209,550	449,580
Western white	Blue R.	500	330	15,000	9,600
	Johnson L. (w)	---	100	-	3,000
	E. Barriere R.	---	65	-	1,950
	Murtle R.	---	60	-	1,800
	N. Barriere L.	-	50	-	1,500
	Momich R.	---	40	-	1,200
	Clearwater R.	---	30	-	900
	Adams R.	---	15	-	450
	Garnett Cr.	---	10	-	300
Total western white pine		500	700	15,000	20,700
Lodge-pole	Whitewood Cr.	-	50	-	1,500
	Nicola	-	12	-	360
Total lodgepole pine		-	62	12,500	471,860
GRAND TOTALS		7,485	15,748	224,500	472,140

Color change plots at Chapperon Lake were examined at regular intervals from June to October. In recent years ponderosa pines lost up to 95% of their foliage by the end of the second year after attack, with most loss occurring during the second year. Trees which had been attacked in 1966 had lost 44% of their foliage by October 1967; this could be due to the extremely hot dry summer of 1967. Table 4 shows the record of color change and needle loss as determined from examinations of the plot at Chapperon Lake for the years 1964-1967.

Table 4

A Progressive Record of Foliage Color Change and Needle Loss of Beetle-killed Ponderosa Pine, Chapperon Lake, Central Kamloops District, 1964 - 1967

	18 trees attacked in 1964				30 trees attacked in 1965				20 trees attacked in 1966			
Date of examination	Green	Fading	Red	Av. % needle loss	Green	Fading	Red	Av. % needle loss	Green	Fading	Red	Av. % needle loss
1964												
Aug	18	0	0	0								
Nov	5	12	1	0								
1965												
May	0	5	13	0								
Jul	0	1	17	2								
	0	0	18	4								
Oct	0	0	18	20	30	0	0	0				
1966												
May	0	0	18	61	4	21	5	2				
Jul	0	0	18	69	3	19	8	3				
Oct	0	0	16 1/	83	0	0	25 1/	39				
1967												
Jun			0 2/	95	0	0	0 2/	97	0	20	0	5
Aug									0	0	20	18
Oct									0	0	20	44

Remainder of the trees logged.
2/ Trees have lost more than 85% foliage and therefore are classed as grey.

Douglas-fir Beetle, Dendroctonus pseudotsugae Hopk.

There was a marked increase in the number of red-topped Douglas-fir trees counted in the District in 1967. Table 5 gives the location, number and volume of beetle-killed trees during aerial surveys in 1967 as compared with 1966.

Table 5

Number and Volume of Douglas-fir Trees Killed by Douglas-fir Beetle as Estimated from Aerial Surveys, Central Kamloops District, 1967

Locality	Est. no. trees killed		Vol. per tree (cu. ft.)	Est. gross vol.	
	1966	1967		1966	1967
Criss Cr.	-	395	100	-	39,500
Tranquille Cr.	145	276	100	14,500	27,600
Deadman R.	60	165	90	5,400	16,500
Carabine Cr.	-	60	100	-	6,000
S. end Adams L.	-	55	100	-	5,500
Spius Cr.	-	45	85	-	3,840
Scottie Cr.	-	40	90	-	3,600
Dutch L.	-	40	100	-	4,000
Loon Lake	425	35	70	29,750	2,450
Glimpse L.	-	7	80	-	560
Cultus L.	-	150	90	-	13,500
Niskonlith L.	-	25	100	-	2,500
Canford	40	20	80	3,200	1,600
Sabiston Cr.	-	15	80	-	1,200
Lopez Cr.	-	10	80	-	800
Rosseau Cr.	-	10	80	-	800
Barnes L.	-	5	80	-	400
Mt. Durand	-	5	80	-	400
Vavenby	10	-	100	1,000	-
Mamette L.	10	-	90	900	-
Louis Cr.	10	-	90	900	-
Highland Va.	100	-	90	9,000	-
Totals	800	1,358		64,650	130,750

Bark beetle larvae and teneral adults were present in logging slash left on landings at Glimpse Lake. British Columbia Forest Service reported an infestation in decked cull logs in Wells Gray Park in August. All stages of the beetle were present in logs at two mill-sites near Spanish Creek. The average number of each per square foot was as follows: larvae—

14, pupae - 22, callow adults - 16. The British Columbia Forest Service intended to burn these cull logs as soon as weather permitted.

The color change plot at Glimpse Lake was examined at intervals to assess the needle loss of trees which had been attacked in 1966, Needles on seven out of 10 of the trees examined in June 1967 were still green, with very little needle loss; in October an average of 81% of the needles on seven trees had been lost and three trees had recovered.

Defoliators

Black-headed Budworm, Acleris variana (Fern.)

Populations of this budworm were light on Engelmann spruce, alpine fir, and Douglas-fir in 1967. The largest numbers of larvae per sample were collected from western hemlock in the Blue River area, especially around Mud Lake, although fewer larvae were collected than in previous years:

No. samples taken during larval period			% samples containing larvae			No. larvae per positive sample		
1965	1966	1967	1965	1966	1967	1965	1966	1967
34	22	14	71	64	93	28.5	27.9	7.6

Defoliation estimates and egg counts were made in late October. Light defoliation was visible from the air. Defoliation, which was estimated on 10 trees at each egg sample location, was 5-10% of the current year's growth and a trace of old foliage. Egg counts were made on six 10-inch branch tips, two from the upper, middle and lower crown levels, of three trees at each plot. At the laboratory a caustic solution and filter system were used to remove the eggs from the foliage samples. A comparison of egg counts from 1965-1967 is as follows:

Location	Variation in no. eggs per branch			Av. no. eggs per branch		
	1965	1966	1967	1965	1966	1967
Mud L.	1-12	0-23	0-7	4.4	10.3	1.9
Blue R.	1-23	1-15	0-6	8.1	6.5	1.3

It is expected that populations of the black-headed budworm will be light in 1968.

Forest Tent Caterpillar, Malacosoma disstria Hbn.

Defoliation of trembling aspen extended over an estimated 3,600 acres along the Wells Gray Park road compared with 150 acres in 1966. Forest tent caterpillar egg sampling was done late in October on three randomly selected co-dominant trees 5 to 6 inches dbh and 35 to 55 feet in height at two locations. The tree height, dbh and distance from the ground to first green foliage was recorded. The crown was divided into equal lengths and numbered A, B. and C from the top to bottom and for this study each crown level included all foliage and branches in the measured section. Each crown level was examined and number of egg masses recorded (Table 6).

Table 6

Forest Tent Caterpillar Egg Counts on Trembling Aspen, Wells Gray Park Road, Central Kamloops District, 1967

Location	Tree no.	Length of crown (ft.)	Crown level	No. of egg masses
Mile 19 Wells Gray Park Road	1	16	A	3
			B	1
			C	0
	2	21	A	11
			B	4
			C	7
	3	20	A	23
			B	2
			C	3
Mile 21 Wells Gray Park Road	1	24	A	13
			B	6
			C	2
	2	15	A	2
			B	1
			C	0
	3	14	A	0
			B	1
			C	1

One half of the trees sampled had more than 10 egg masses; heavy defoliation can be expected in 1968.

Leaf Miners

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.

Infestations of aspen leaf miner in Central Kamloops District were generally light in 1967. A comparison of plot records taken since 1964 showed a fluctuating population. The number of adults per 100 leaf surfaces decreased at every plot in 1967 (Table 7). Data on parasitism at five plots are shown in Table 8. The Deadman River plot was dropped in 1967 as beavers had cut down all the trees, and there were insufficient trees in the area to establish another plot. A plot was established on the Tunkwa Lake Road.

Table 7

Aspen Leaf Surfaces Mined and Number of Adult Leaf Miners Produced per 100 Leaf Surfaces, Central Kamloops District

Location	% leaf surfaces with mines			No. adults produced per 100 leaf surfaces		
	1965	1966	1967	1965	1966	1967
Paul Creek	26	28	32	0.7	8.2	5.0
Semlin Ranch	29	5	3	1.7	1.3	0.1
Campbell Range	28	21	12	2.1	9.9	1.0
Coldwater River	44	3	0	4.0	1.1	0.0
Tunkwa	-	-	4	-	-	0.9

Table 8

Mortality of Aspen Leaf Miners in 100-cocoon Samples, Central Kamloops District

Location	% mortality					
	Parasitism			Other causes		
	1965	1966	1967	1965	1966	1967
Paul Creek	46	27	50	14	1	16
Semlin Ranch	55	27	17	5	2	34
Campbell Range	69	22	50	14	0	13
Coldwater River	42	46	0	20	5	-
Tunkwa	-	-	25	-	-	18

OTHER NOTEWORTHY INSECTS

Two-year-cycle Spruce Budworm, Choristoneura fumiferana (Clem.)

Two-year-cycle budworm larvae were collected only in the Jamieson-Whitewood creeks area with a maximum of 21 larvae in a collection. Estimated defoliation of overstory Engelmann spruce and alpine fir at the Jamieson Creek plot was from 0 to 5%; on 100 understory trees it ranged from 0 to 2%. Only 10 larvae were found on approximately 17 square feet of foliage examined. No evidence of the insect was found near Grizzly or McGillivray lakes where plots have been sampled annually since 1960.

Douglas-fir Needle Midges, Contarinia spp.

A maximum of 3.4% of needles of Douglas-fir were infested with needle midges at sample plots in the District in 1967. Samples consisted of five current year's terminals from each of five trees at each plot. A comparison between 1966 and 1967 needle counts at three plots showed very little variation in population levels.

Location	No. needles examined		% needles infested	
	1966	1967	1966	1967
Cherry Creek	1,724	2,326	0.7	0.5
Heffley Creek	2,766	2,574	1.1	1.5
Barriere	2,811	2,984	2.8	3.4

Fall Webworm, Hyphantria cunea (Drury)

Roadside counts of webs were made along both sides of the road for 3 miles west of Savona and 7 miles along the Nicola River east of Spences Bridge. The average number of webs per mile near Savona increased for the second consecutive year from 15 in 1965 and 94 in 1966, to 300 in 1967; near Spences Bridge the average number of webs increased from 11 in 1966 to 91 in 1967 (Table 9).

Table 9

Roadside Web Counts of Fall Webworm,
Central Kamloops District, 1967

Hosts	No. webs per mile							Av. per mile
Mile	0-1	1-2	2-3	3-4	4-5	5-6	6-7	
<u>Savona</u>								
Black cottonwood	168	183	250	-	-	-	-	200
Chokecherry	79	5	30	-	-	-	-	35
Miscellaneous	67	132	86	-	-	-	-	95
Totals 1967	314	320	266	-	-	-	-	300
1966	188	50	46	-	-	-	-	94
<u>Nicola River</u>								
Black cottonwood	77	36	83	21	69	39	5	47
Chokecherry	5	10	0	5	7	0	0	4
Miscellaneous	51	72	61	55	26	17	1	42
Totals 1967	133	118	144	81	102	56	6	91
1966	46	5	12	2	10	0	1	11

Engelmann Spruce Weevil, *Pissodes engelmanni* Hopk.

There was a decline in the number of current attacks on reproduction Engelmann spruce at two of the three locations checked in the Clearwater area. One hundred trees are examined at each location. The same locations are examined every year although the trees themselves may differ.

Location	% trees			
	Current attack		Uninfested	
	1966	1967	1966	1967
Reflector Lake	15	1	72	88
Grizzly Lake	2	4	92	70
Candle Creek	25	6	66	77

Table 10

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Adelges cooleyi (Gill.) Cooley spruce gall aphid	D, eS	Barriere, Cherry Cr., Heffley Cr.	Sucking insect. A total of 7,884 needles examined at these locations; average of 4.7% infested.
Choristoneura fumiferana (Clem.) One-year-cycle spruce budworm	eS, wH, D, alF.	Jamieson Cr., N. Thompson, McGillivray L.	Defoliator. Population low. An average of 2.7 larvae in 14 positive collections.
Dioryctria abietivorella Grote A cone pyralid	D, lP	Barriere	Cone or cambium feeder. Present in stems and branches of lodgepole pine.
Dioryctria cambiicola (Dyar) A ponderosa pine tip borer	pP, lP	Merritt, Barriere	Shoot borer. In pitch gobs on pP stems and lP branches. Light attack.
Dryocoetes confusus Sw. Western balsam bark beetle	alF	Clearwater (Moira L.)	Bark beetle. Only 75 trees noted in 1967 aerial survey compared with 500 in 1966.
Lambdina f. lugubrosa (Hulst) Western hemlock looper	wH	N. Thompson River Valley	Defoliator. Of 14 collections during larval period, 29% were positive with an average of 1.5 larvae.
Neodiprion sp. A hemlock sawfly	wH	Blue River (Mud Lake)	Defoliator. Approximately 300 larvae per beating sample collected at Mud Lake.
Nepytia freemani Munroe A Douglas-fir looper	D	General	Defoliator. Of 88 collections during larval period, 16.8% were positive averaging 1.8 larvae.
Orgyia pseudotsugata (McD.) Douglas-fir tussock moth	D	Heffley Cr.	Defoliator; only one larva collected in 1967.

Table 10 Continued

Insect	Hosts	Locality	Remarks
Pikonema alaskensis Roh. Yellow-headed spruce sawfly	eS	Clearwater, Bridge L., Cache Cr.	Defoliator. Of 9 collections during larval period, 20% were positive averaging 1.0 larvae.
Cryptorhynchus lapathi (L.) Poplar-and-willow borer	W	Kamloops City, Wells Gray Park Rd., N. Thompson Va.	Stem borer. There were 251 emergence holes in a 4 ft. x 3 in. bole sample from Wells Gray Park.
Stilpnotia salicis (L.) Satin moth	bCo, tA	Barnhartvale, Pinantan L., Kamloops	Defoliator. No notable infestation in District; small groups of trees infested.
Vespamima sequoiae (Hy. Edw.) Sequoia pitch moth	lP	Barriere	Cambium borer. A small group of infested lodgepole pine on Barriere Lake Rd.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

Needle Cast of Ponderosa Pine, Elytroderma deformans (Weir) Darker

This needle cast infection was widespread throughout the range of ponderosa pine in the District. There were areas of intense infection on Promontory Mountain and around the south end of Nicola Lake. Other localities with moderate to severe infection were: Tranquille Creek, Westsyde, from Kamloops to Jamieson Creek, south side of Kamloops Lake from Kamloops to Savona, and along Nicola Lake.

Two permanent plots established in the District to record the effect of the disease on ponderosa pine were checked in the latter part of July. In the plot on Lac Le Jeune road 25% of the trees had more than 50% infection compared with only 8% in 1966. On Promontory Mountain 60% of the trees had more than 50% infection compared with 36% in 1966. There were 26 dead ponderosa pine at the Lac Le Jeune plot and four at the Promontory Mountain plot; most trees had been killed by bark beetles.

Data from observations at these plots for the years 1965 to 1967 are recorded in Table 11.

Table 11

Needle Cast Damage on Ponderosa Pine at Two Sample Plots, Central Kamloops District, 1965-1967

Est. % foliage infected	No. of trees and infection class					
	Promontory Mountain			Lac Le Jeune		
	1965	1966	1967	1965	1966	1967
0	0	0	0	4	1	0
10	8	5	4	22	18	15
20	3	4	5	4	9	6
30	0	4	1	6	2	2
40	0	3	1	2	5	2
50	6	1	2	3	3	2
60	0	1	5	1	2	3
70	4	3	0	4	0	3
80	0	1	4	0	4	6
90	8	2	4	6	0	6
100	0	2	0	0	0	0
Dead	1	4	4	19	26 1/	26 1/

1/ Includes five trees killed by bark beetles

A Needle Cast, Hypodermella concolor (Dearn.) Darker

Lodgepole pine trees along the Mamette Lake, Highland Valley and Bridge Lake roads had 100% of the previous year's needles killed by *H. concolor*. The infection on the Mamette Lake road commenced at Mile 10 and continued until Mile 35 and covered the whole valley bottom. A hyperparasite *Hendersonia pinicola* Wehm. was present on the needles infected by *H. concolor*.

Other Noteworthy Diseases

Mistletoe Diseases

Dwarf Mistletoe, Arceuthobium americanum Nutt. ex Engelm.

Dwarf mistletoe affected lodgepole pines throughout the District. At Mile 10 on the Mamette Lake road, 50 trees were examined and all were heavily infected. Infection occurred on lodgepole pines along the Highland Valley, Meadow Creek, Scottie Creek, and Tranquille Creek roads.

Stem Diseases

Lodgepole Pine Stem Canker, Atropellis piniphila (Weir) Lohm. and Cash. and a Rust on Lodgepole Pine, Peridermium stalactiforme Arth. & Kern.

A survey was made throughout the District to determine the incidence of canker damage on lodgepole pine caused by A. piniphila and P. stalactiforme. Twenty stands of lodgepole pine at least 5 miles apart were examined; 50 trees in a straight line at each location were checked for stem cankers. Only seven stems infected with A. piniphila and three stems with P. stalactiforme were found (Table 12). At each plot the presence or absence of Indian paint brush, the alternate host of P. stalactiforme, was also noted.

Table 12

Results of Atropellis piniphila and Peridermium stalactiforme Survey on Lodgepole Pine, Central Kamloops District, 1967

Location	% stems infected by:		Indian paint brush present
	Atropellis	Peridermium	
Barriere	0	0	
Mi. 12.3 Mamette L. Rd.	6	0	x
17.3	6	0	
22.4	0	2	x
27.5	0	0	x
Mi. 7.8 McGillivray L. Rd.	0	0	
Mi. 10.0 Barriere L. Rd.	0	0	
Mi. 14.4 Bridge L. Rd.	0	0	
Mi. 19.4 Bridge L. Rd.	0	0	
Mi. 9.5 Thuya L. Rd.	0	0	
Mi. 0.2 Meadow Cr. Rd.	0	0	x
Mi. 5.2 Meadow Cr. Rd.	0	0	x
17.0	0	0	
Mi. 3.0 Highland Valley Rd.	0	0	
7.8	0	2	x
12.8	0	0	

Table 12 Continued

Location	% stems infected by: Atropellis	Peridermium	Indian paint brush present
Mi. 4.8 Wells Gray Park Rd.	2	2	x
Mi. 100.3 N. Thompson Hwy.	0	0	
Blue River	0	0	
Mi. 1.8 S. of Albreda	0	0	

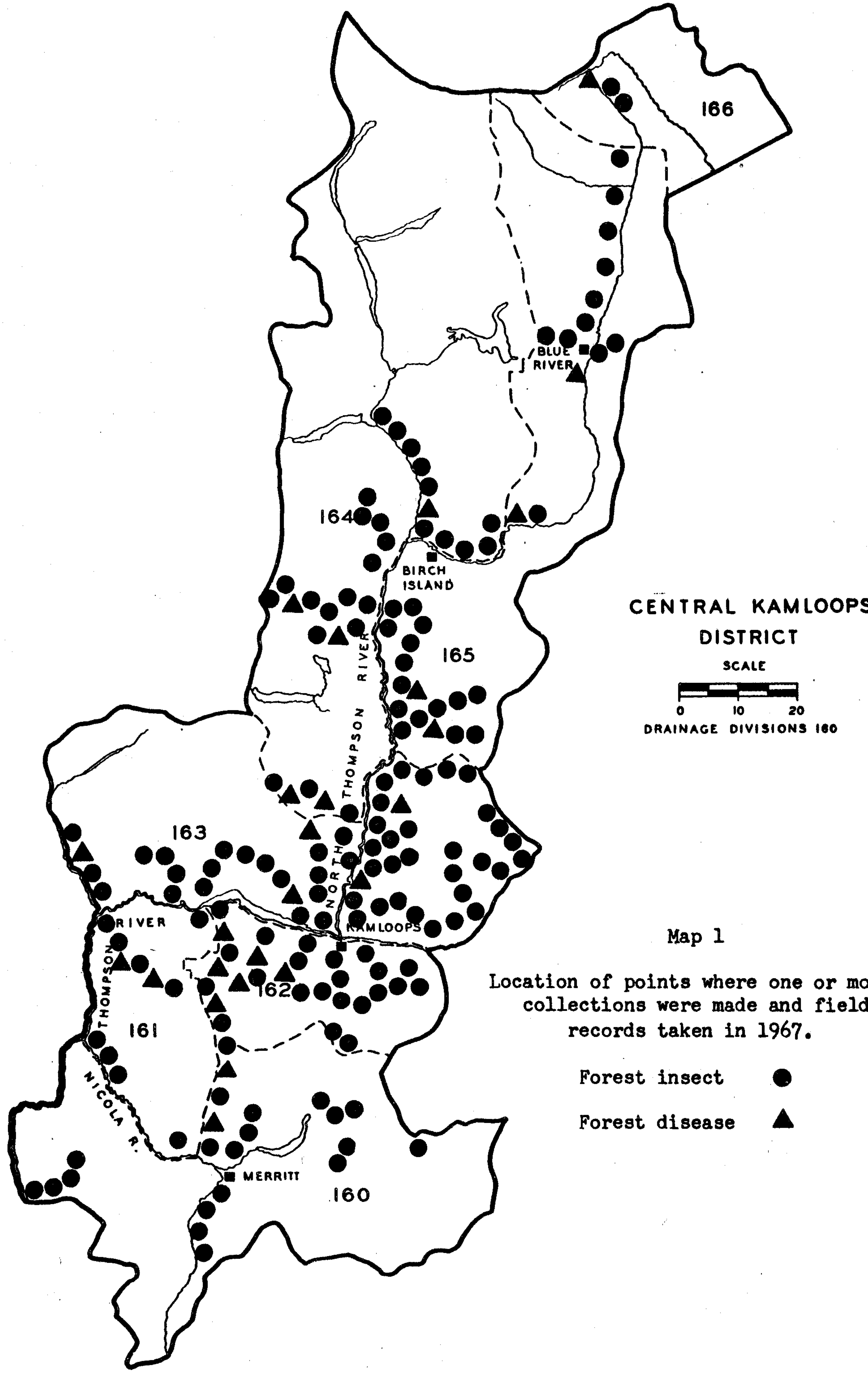
Table 13

Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Cronartium comandrae Peck A stem rust on lodge-pole pine	lP	Mamette L. Rd.	Light infection. Mamette L., Meadow Cr., High-land Valley roads.
Epipolaeum abietis A needle rust on alpine fir	alF	Jamieson Cr.	First herbarium host record.
Lophodermium macrosporum (Hart) Rehm. Spruce needle rust	eS	Barriere	Light infection.
Melampsora medusae Thuem. A foliage rust	D	Barriere Merritt	Light infection on current year's needles.
Peridermium holwayi Syd. Alpine fir needle rust	alF	Jamieson Cr.	Light infection on 1 year old needles.
Phaeocryptopus gaeumanii (Rohde) Petr. A Douglas-fir needle cast	D	McLure	Attacks previous year's needles on young trees, very damaging because of heavy needle loss.
Pucciniastrum epilobii Otth. Alpine fir needle rust	alF	McGillivray L., Jamieson Cr.	Heavy infection in localized areas.

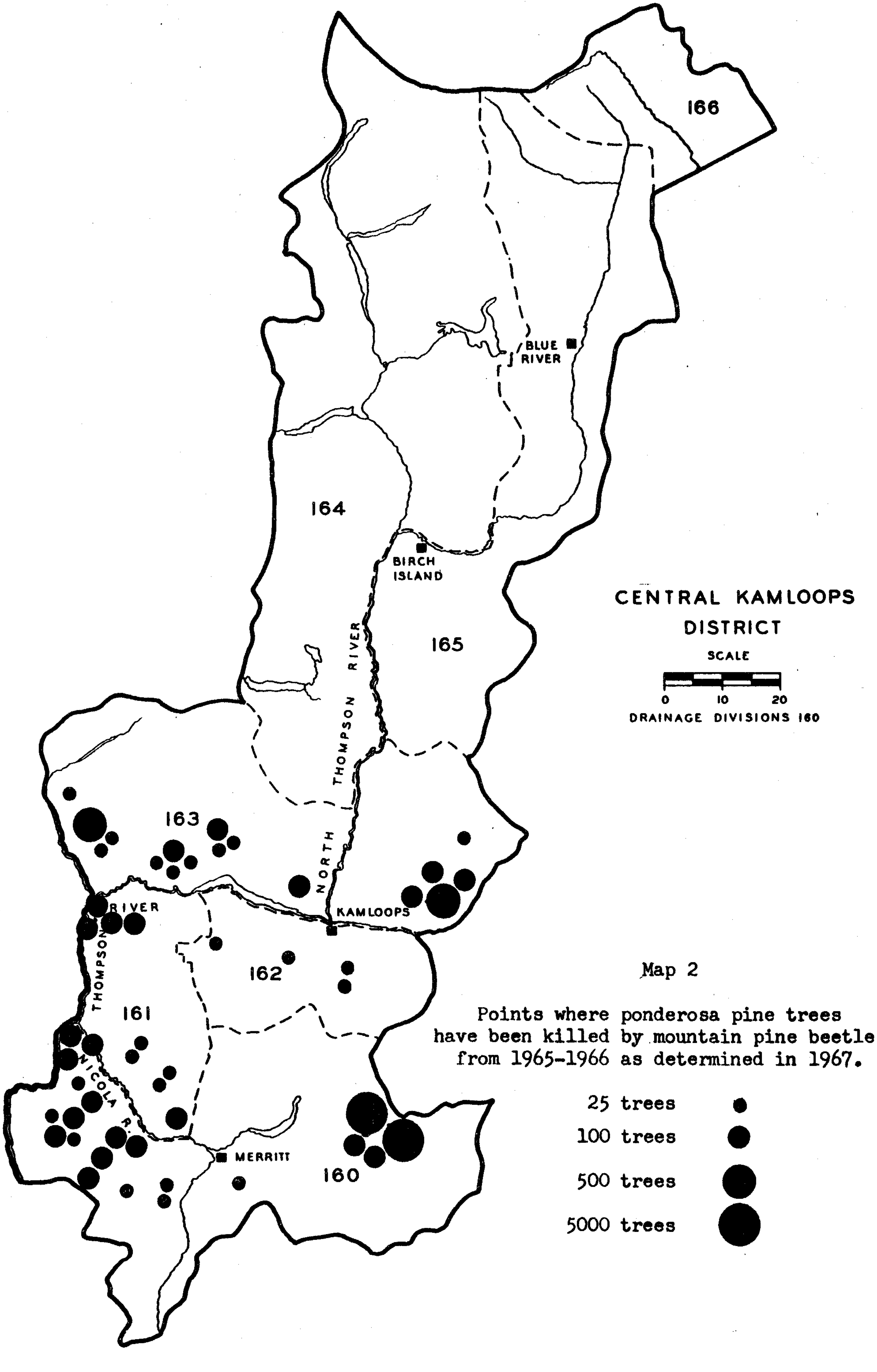
Table 13 Continued

Organism and disease	Hosts	Locality	Remarks
Puccinia coronata Corda A plant rust	*Shepherdia canadensis*	Tunkwa L. Rd.	Common throughout.
Uromyces lupini Berk & Curt A plant rust	*Lupinus*	Barriere	Heavy infection.



Map 1

Location of points where one or more collections were made and field records taken in 1967.



Map 2

Points where ponderosa pine trees have been killed by mountain pine beetle from 1965-1966 as determined in 1967.

FOREST INSECT AND DISEASE SURVEY

WEST KAMLOOPS DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

WEST KAMLOOPS DISTRICT

1967

N. J. Geistlinger 1/

INTRODUCTION

Regular field work in the District commenced on May 15 and ended on October 16. The only special survey conducted in the District was the examination of plots and strips established in the Williams Lake area to determine the impact of a severe frost on Douglas-fir trees in April 1966. This survey was carried out late in August by a Survey appraisal crew assisted by the author, Approximately 10 hours flying time were used to determine tree mortality attributable to bark beetles and to map black-headed budworm defoliation. An additional three and one-half hours were used for black-headed budworm egg sampling in the Quesnel Lake area. Assistance was given in spruce beetle sampling during the first week of June and in spruce budworm sampling during the last week of June in the Central Kamloops District. The last week of September and the first week of October were spent assisting in spruce beetle surveys in Prince George Forest District.

Table 1 shows by host the insect and disease collections made in the District. Map 1 shows locations where collections were made or field records taken in 1967 as well as the drainage divisions of the District. Principal problems in each Forest Insect and Disease Survey Drainage Division are shown in Table 2.

Douglas-fir beetles caused an increase in Douglas-fir tree mortality in 1967 as did the mountain pine beetle in lodgepole and ponderosa pine stands. Black-headed budworm larvae defoliated western hemlock along Quesnel and Mitchell lakes and lightly defoliated Douglas-fir in a small area west of Ashcroft.

Spruce budworm lightly defoliated Douglas-fir in Mission Pass above Seton Lake.

Pine needle cast infections were more severe in 1967 especially in the vicinity of Clinton and west of Ashcroft. Stem cankers of lodgepole pine were found in the eastern portion of the District. Most Douglas-fir trees damaged by a late frost in 1966 recovered remarkably well, although some top-kill was observed on the slopes above Pablo Creek, southwest of Williams Lake.

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

Table 1

Collections by Hosts

West Kamloops District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	1	0	Alder species	2	0
Douglas-fir	133	5	Aspen, trembling	22	2
Fir, alpine	30	2	Birch species	2	0
Hemlock, western	8	0	Cottonwood, black	1	0
Juniper, common	4	0	Maple species	2	2
Juniper, Rocky Mtn.	27	0	Willow species	2	1
Pine, lodgepole	55	48			
Pine, ponderosa	25	0			
Pine, Scots	0	1			
Spruce, Engelmann	56	1			
Totals	339	57	Totals	30	5
			Miscellaneous hosts	2	0
			No host	1	0
			GRAND TOTALS	372	64

Table 2

Currently Important Insect and Disease 1/ Problems by Drainage Divisions, West Kamloops District, 1967

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	1	3	3	1	2
Mountain pine beetle	pP, lP	4	1	1	1	5	1	4
Defoliators								
Black-headed budworm	wH, D	1	1	1	1	4	3	4
One-year cycle spruce budworm	D	4	1	1	1	1	1	1
Weather damage								
Frost damage of Douglas-fir	D	0	0	0	3	3	0	0
Foliage diseases								
Pine needle cast	pP	0	0	0	0	4	0	0

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

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* Hopk.

There was again a decline in the total number of red-topped Douglas-fir trees observed during aerial surveys in 1967 (Table 3). Because of the rapid color change of 1967-attacked trees, they would have been included in counts made during aerial surveys; normally foliage does not turn color until the year following attack. Largest numbers of infested Douglas-fir were in the Lac la Hache - Williams Lake area and west of the Fraser River in the Gaspard and Churn Creek areas. Scattered groups of red-tops occurred in the frost-damaged area south of Williams Lake.

Table 3

Number and Volume of Douglas-fir Trees Killed by Douglas-fir Beetles in Two-year Periods as Determined from Aerial Surveys, West Kamloops District

Period	Year of survey	No. of trees killed	Est. total volume (cu. ft.)
1961 - 1962	1963	37,016	2,878,900
1962 - 1963	1964	29,590	2,227,900
1963 - 1964	1965	26,301	1,959,800
1964 - 1965	1966	5,280	393,400
1965 - 1967	1967	2,933	212,642

In all likelihood, attacks by Douglas-fir beetle will increase in 1968 if brood mortality is low during the winter of 1967-68. This is indicated by the large beetle populations in windfalls and decked logs and the wide range of standing trees attacked in 1967.

Foliage color change plots were not established in 1967 as no accessible green-infested trees were found during ground surveys.

Mountain pine beetle, *Dendroctonus ponderosae* Hopk.

A significant increase in the number of red-topped lodgepole pine trees killed by this beetle was observed during aerial surveys in 1967. There was a decrease from 1966 in the total number of red-topped ponderosa pines (Table 4). Map 3 shows the estimated numbers and general locations of red-topped pines.

Largest numbers of infested ponderosa pine trees were along Hat Creek and near Clinton. Smaller numbers were noted near Gunn Lake and in Venables Valley.

Greatest numbers of red-topped lodgepole pines were observed on Bull Mountain, near Tyee Lake and along Gott Creek, a tributary of Cayoosh Creek.

Table 4

Number and Volume of Ponderosa and Lodgepole Pine Killed by Mountain Pine Beetle in Two-year Periods as Determined from Aerial Surveys, West Kamloops District

Period	No. of trees killed	Est. total volume (cu. ft.)
Ponderosa pine		
1960 - 1961	172	7,260
1961 - 1962	412	20,420
1962 - 1963	2,115	88,450
1963 - 1964	3,075	123,980
1964 - 1965	4,810	197,210
1965 - 1966	3,123	128,043
Lodgepole pine		
1960 - 1961	62	1,356
1961 - 1962	476	11,219
1962 - 1963	15,525	373,917
1963 - 1964	10,047	250,035
1964 - 1965	14,540	319,880
1965 - 1966	21,528	473,616

Foliage color change

Plots established to record foliage color change and needle loss of infested pines were examined in May, July and October. Information gathered from these plots is used to determine the optimum time for aerial surveys during which annual counts of beetle-killed trees are made. Records were kept of infested ponderosa pine trees near Clinton (Table 5). The following shows data gathered from infested lodgepole pines on Bull Mountain near Williams Lake.

Table 5

A Progressive Record of Foliage Color Change and Needle Loss of Beetle-killed Ponderosa Pine near Clinton, West Kamloops District

Date of examination	Trees attacked in 1964				Trees attacked in 1965				Trees attacked in 1966			
	Green	Fading	Red	Av. % needle loss	Green	Fading	Red	Av. % needle loss	Green	Fading	Red	Av. % needle loss
May 1965	35	0	0	0								
June 1965	0	26	9	0								
August 1965	0	0	35	5								
October 1965	0	0	35	10								
May 1966	0	0	35	56	0	30	0	5				
July 1966	0	0	35	66	0	0	30	7				
October 1966	0	0	35	78	0	0	30	38				
May 1967	0	0	26*	96	0	0	30	64	1	13	0	6
July 1967	0	0	13*	98	0	0	25*	81	0	7	7	11
October 1967	0	0	0*	100	0	0	24*	91	0	0	14	39

* Remainder of trees had lost 100% of their foliage.

Year of attack	% foliage loss				
	1966		1967		
	July	October	May	July	October
1965	0	25	47	63	70
1966			1	16	28

Continuing examinations of these plots show that both ponderosa and lodgepole pine trees killed by beetles lose most of their foliage complement within two and one-half years of attack.

It is expected that infestations in lodgepole pine stands on Bull Mountain and in ponderosa pine along Hat Creek will continue, although there was a decline in the total number of red-tops observed along Hat Creek. The number of red-topped ponderosa pines near Clinton dropped sharply in 1967, and in all probability this infestation will collapse in the near future.

Defoliators

Black-headed Budworm, Acleris variana (Fern.)

Defoliation of western hemlock occurred over approximately 47,300 acres in the Quesnel and Mitchell lakes area in 1967. Heavy defoliation was mapped at the east end of the east arm and along the southeast side of the north arm of Quesnel Lake, along Niagara Creek and near Mitchell Lake. Light to moderate defoliation was observed near Bosk Lake.

Noticeable feeding damage was observed on Douglas-fir trees along the Oregon Jack-Upper Hat Creek road and larvae were common in beating samples in this area. Larvae and pupae were also collected from Douglas-fir on Mission Mountain.

Numbers of larvae taken in random beating samples increased in 1967. The average number of larvae per positive sample was 6.2 for Douglas-fir and 3.3 for Engelmann spruce.

Egg sampling was done in October to give an indication of 1968 populations. Three western hemlock trees were felled at each sample point and two 10-inch branch tips were taken from each of the upper, mid and lower crown levels. The eggs were removed from the needles with a caustic solution and counted at the Vernon Laboratory. Table 6 shows defoliation estimates caused by the current larvae and egg counts representing next year's populations made at five locations along Quesnel lake.

Mass collections of larvae or pupae were not taken from the infestation area because it is inaccessible except by air or boat. Judging from the overwintering egg population it is expected that damage caused by black-headed budworm will be light in the Quesnel Lake area in 1968.

Table 6

Black-headed Budworm Defoliation Estimates and Egg Counts at Five Locations, West Kamloops District, 1967

Location	% defoliation		Av. no. eggs per 10-inch branch sample
	Current year's foliage	Total foliage	
Roaring River	50	37	1.6
Bouldery Creek	trace	trace	1.0
Deception Point	10	trace	1.7
Goose Point	35	10	0.3
Summit Creek	30	10	0.8

One-year-cycle Spruce Budworm, <u>Choristoneura fumiferana</u> (Clem.)

There was moderate to heavy defoliation of current year's foliage of Douglas-fir trees between the 3,500 and 3,900 foot levels on Mission Mountain. Adults were in flight and a few new egg masses were found late in July. Only one recently hatched egg mass was found during a survey early in September.

Spruce budworm larvae were generally scarce in random conifer beatings in 1967. No evidence of larval feeding or egg masses was found at the permanent plots in the Lillooet district when they were examined in August.

The occurrence of spruce budworm larvae in Douglas-fir beating samples taken between June 1 and July 15, 1965-1967 was as follows:

No. of samples taken during larval period			% samples containing larvae			Av. no. of larvae per positive sample		
1965	1966	1967	1965	1966	1967	1965	1966	1967
51	78	71	6	17	11	1.0	1.5	2.0

Other Noteworthy Insects

Western Balsam Bark Beetle, Dryocoetes confusus Swaine

A total of 300 red-topped alpine fir trees observed during aerial surveys south of Bosk Lake. Scattered groups of up to 10 trees were observed at other locations in the Quesnel and Horsefly lakes area.

Fall Webworm, Hyphantria cunea (Drury)

Heaviest infestations occurred on bitter cherry, chokecherry and wild rose at Seton Lake beach and on chokecherry and wild rose north of Lytton. Some chokecherry trees along the highway north of Lytton were wholly enveloped with webbing. Many black cottonwood trees along the Murray Creek road near Spences Bridge were infested.

Counts of tents on the two, five-mile-long roadside strips were done late in July. Two tents were observed on chokecherry, one on willow and one on black cottonwood on the Texas Creek strip while only one tent was noted on black cottonwood on the Fraser River strip south of Lillooet. No webs were seen on the Texas Creek strip in 1966.

A Pine Seed Moth, Laspeyresia prob. miscitata Heinr.

Samples of 50 ponderosa pine cones were examined from each of five locations in the District. Percentage infestation ranged from 28 at Clinton to 64 at Lytton (Table 7).

Table 7

Percentage of Ponderosa Pine Cones Infested by a Pine Seed Moth, West Kamloops District

Locality	% cones infested				
	1963	1964	1965	1966	1967
Venables Valley	66	48	58	44	38
Lytton	60	80	84	76	64
Lillooet	24	88	92	68	56
Lower Hat Creek	24	24	12	30	34
Clinton	0	26	30	20	28
Averages	34	53	55	48	44

Pine Butterfly, Neophasia menapia Feld.

Pine butterflies were numerous on Mission Mountain north of Seton Lake although no defoliation was evident. Up to 10 adults were counted fluttering about the crowns of single ponderosa pine trees. Adults were also common in other portions of the District within the range of ponderosa pine.

Douglas-fir Tussock Moth, Orgyia pseudotsugata (McD.)

Collections of 12 and 7 larvae were taken in two Douglas-fir beating samples near the site of a previous infestation at Carquile. No defoliation was evident.

Aspen Leaf Miner, Phyllocnistis populiella Cham.

Aspen leaf miner populations remained low throughout the District in 1967. Infestations at the Clinton, Soda Creek and Williams Lake permanent sample plots declined. At the Oregon Jack Creek plot 32 of 1,518 leaf surfaces were infested. Because infestations were nonexistent or extremely light, no data were obtained on percentage emergence, parasitism and cocoon mortality.

Pine Needle-sheath Miner, Zelleria haimbachi Busck

Populations of this needle miner remained relatively light throughout the southern portion of the District in 1967. Twenty-five tips from each of four ponderosa pine trees at five locations were examined; percent of tips infested ranged from 6 at Venables Valley to 34 at Lillooet (Table 8).

Table 8

Percentage of Ponderosa Pine Tips Infested by the Pine Needle-sheath Miner, West Kamloops District

Locality	% tips infested				
	1963	1964	1965	1966	1967
Lillooet	28	16	6	12	34
Lytton	8	9	3	2	16
Spences Bridge	1	0	0	26	8
Venables Valley	2	0	0	1	6
Lower Hat Creek	2	0	0	10	13
Averages	7.8	5.0	1.8	10.2	15.4

Table 9

Other Insects of Current Minor Significance

Insect	Host	Locality	Remarks
Adelges cooleyi (Gill.) Cooley spruce gall aphid	D	Northern portion of Dist.	Sucking insect. Light to moderate populations on understory trees.
Contarinia spp. Douglas-fir needle midges	D	Widespread	Needle miner. Light populations. No damage evident.
Cryptorhynchus lapathi (L.) Poplar-and-willow borer	W	Southern portion of Dist.	Bores in stems. Light to moderate populations.
Dendroctonus obesus (Mann.) Spruce beetle	eS	Likely Rd.	Bark beetle. Light populations in right-of-way logs felled in 1966.
Lambdina fiscellaria lugubrosa (Hlst.) Western hemlock looper	D	Widespread	Defoliator. Light populations. No damage.
Malacosoma pluviale Dyar Western tent caterpillar	W, rose	Fountain Valley	Defoliator. Tents common on roadside hosts.
Nepytia freemani Munroe A looper on Douglas-fir	D	Southern portion of Dist.	Defoliator. Light populations. No damage.
1967 Pissodes terminalis Hopping Lodgepole terminal weevil	lP	Central portion of Dist.	Terminal borer. Light populations.
Xyela sp. A sawfly in staminate flowers	pP	Southern portion of Dist.	Infests staminate flowers. From 10 to 67% of flowers at sample points infested.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Weather Damage

Late Frost Damage to Douglas-fir

Douglas-fir trees in the Williams Lake area damaged by a late frost in April 1966 appeared to have made a satisfactory recovery by August 1967. No tree mortality directly attributable to frost damage occurred on any of the permanent strips or plots established in 1966. Five immature trees felled near Pablo Creek were infected with a fungus (Valsa sp.) on the main stem and branches of the upper crown. One tree was also infested with wood borers in the upper crown.

Douglas-fir trees attacked by bark beetles in 1967 within frost-damaged areas were noted during aerial surveys. There were scattered red-tops throughout the Chimney Lake plateau south of Williams Lake. It is expected that with the increasing populations of Douglas-fir beetle in the District, an increase in the number of infested trees will occur in frost damaged areas in 1968. Some tree mortality may result from attack by secondary insects or diseases.

Foliage Diseases

Needle Cast on Ponderosa Pine, *Elytroderma deformans* (Weir) Darker

Infection of ponderosa pine trees by this needle cast was more severe in 1967 than in 1966. Heaviest infections were observed in Hat Creek and Venables valleys, along the Kelly Lake road and between Cache Creek and Clinton. Discolored foliage and brooming were also noted along the Oregon Jack Creek road.

Permanent plots to record progress of the disease at Lower Hat Creek and Clinton were examined on July 14. Table 10 shows results of a four year-study of these plots.

Table 10

Needle Cast Damage on Ponderosa Pine Trees at Two Sample Plots, West Kamloops District

Est. % of foliage infected	No. of trees							
	Lower Hat Creek				Clinton			
	1964	1965	1966	1967	1964	1965	1966	1967
0	14	11	7	6	6	3	4	7
10	2	3	5	9	4	3	7	6
20	1	3	4	4	5	5	4	5
30	0	2	4	1	2	4	2	0
40	3	1	3	3	1	2	2	5
50	4	3	2	1	3	1	4	3
60	1	1	0	1	0	4	0	0
70	0	0	0	0	0	4	0	0
80	1	1	2	0	8	2	3	4
90	2	2	0	2	6	5	6	5
100	0	1	1	1	3	3	3	1
No. of dead trees	2	2	2	2	4	4	5	5

Stem Canker Diseases of Lodgepole Pine, _Atropellis piniphila_ (Weir) Lohm. and Cash and _Peridermium stalactiforme_ Arth. and Kern

Fifty-tree plots were examined at 20 locations in the District to determine incidence of stem cankers caused by these agents. Infection by _Atropellis_ was most commonly found in the northeastern portion of the District. Cankers caused by _Peridermium_ were found at three locations, also in the northeastern portion of the District (Table 11). The presence of Indian paint brush, an alternate host of _Peridermium stalactiforme_ was also recorded at each plot.

Table 11

Lodgepole Pine Stem Canker Survey, West Kamloops District, 1967

Location	% of stems infected by *Atropellis piniphila*	% of stems infected by *Peridermium stalactiforme*	Indian paint brush present
Jesmond	4	0	x
Pavilion Summit	2	0	x
Big Bar Rd., Mi. 12	0	0	x
Big Bar Rd., Mi. 25	0	0	x
Dog Cr. Rd., Mi. 19	0	0	x
Spout Lake	22	8	x
Spokin Lake	2	0	x
Horsefly Rd.	6	0	x
Gravel Creek	4	2	x
Likely Rd., Mi. 8.5	22	0	x
Borland Cr.	2	0	x
Cariboo Hwy., Mi. 90	0	0	
Bull Mountain	4	0	x
Bridge Lake Rd., Mi. 15	18	2	x
Deka Cr.	0	0	
Withrow Cr.	0	0	x
Alexis Lake Rd.	0	0	
Alexis Lake	0	0	x
Puntzi Lake	0	0	
Anahim Lake	0	0	x

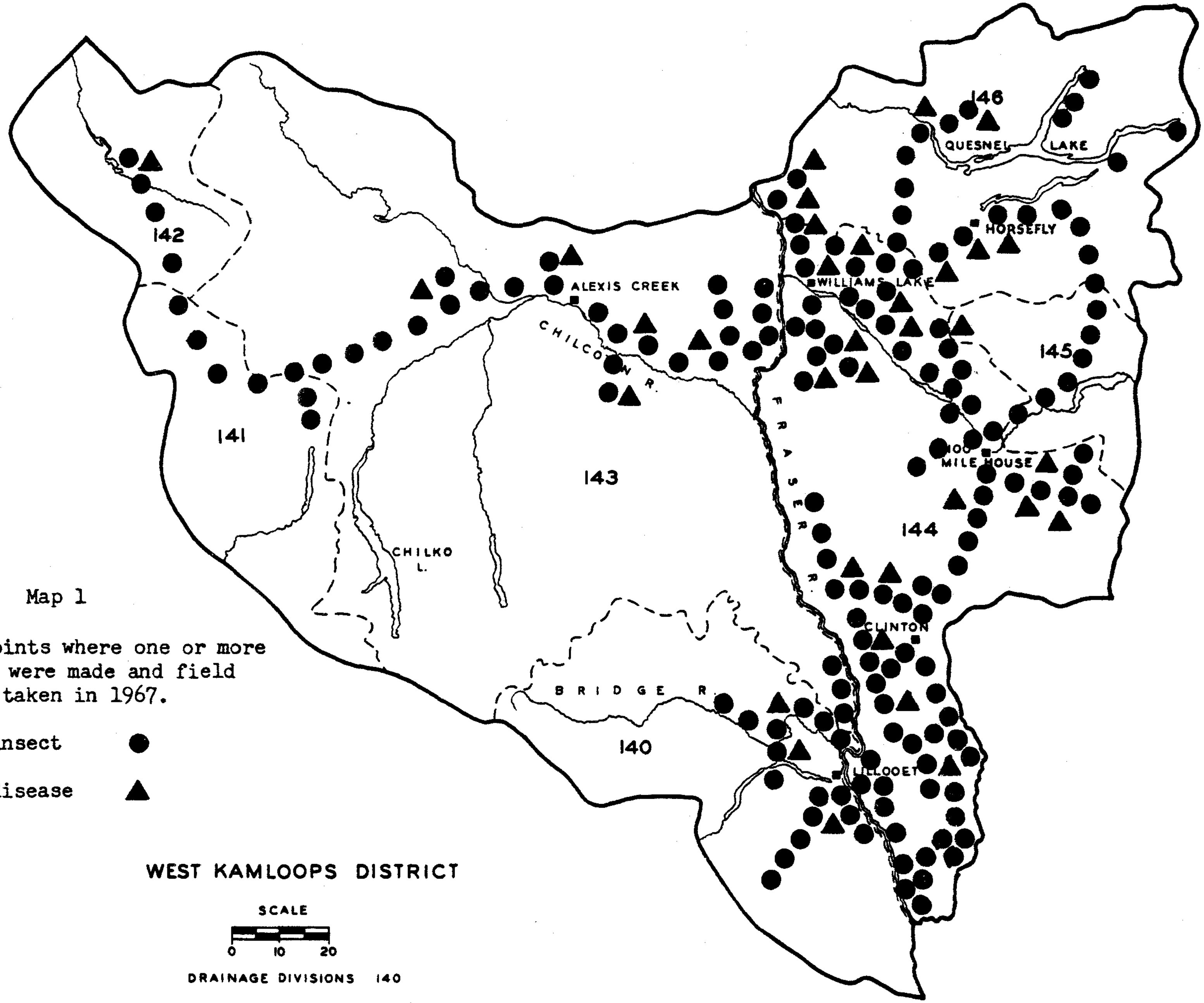
Exotic Plantations

Exotic plantation, XP 183 of Scots pine, *Pinus sylvestris* was examined late in May and again in September. Almost all trees in the plantation have suffered browsing damage especially to the leader. Six of the 50 trees examined were infected by the western gall rust, *Peridermium harknessii* J. P. Moore.

Table 12

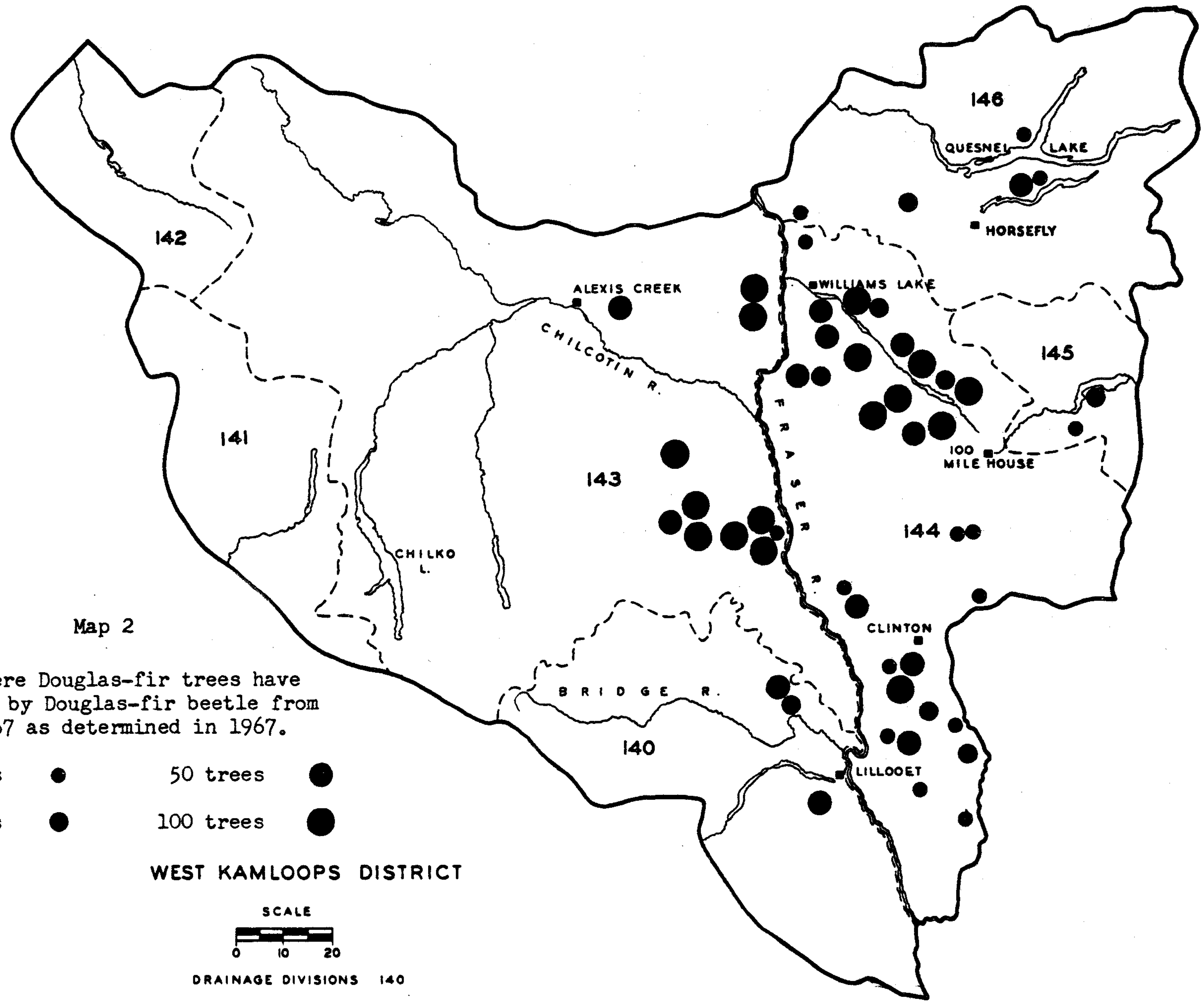
Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Hypodermella concolor (Dearn.) Darker Needle cast	lP	Alexis L.	Severe infections in this area.
Peridermium harknessii J. P. Moore Western gall rust	lP	Borland Cr., Spout L., Spokin L.	Heavy infection of reproduction.
Peridermium holwayi Syd. A needle rust	alF	Rollie Cr.	Light infections of understory trees.
Peridermium stalactiforme Arth. and Kern A stem rust	lP	Rail L., Spout L.	Severe infections on reproduction.
Rhabdocline pseudotsugae Syd. Douglas-fir needle cast	D	Hartwig L.	Severe infection on some understory trees.



Map 1

Location of points where one or more collections were made and field records taken in 1967.



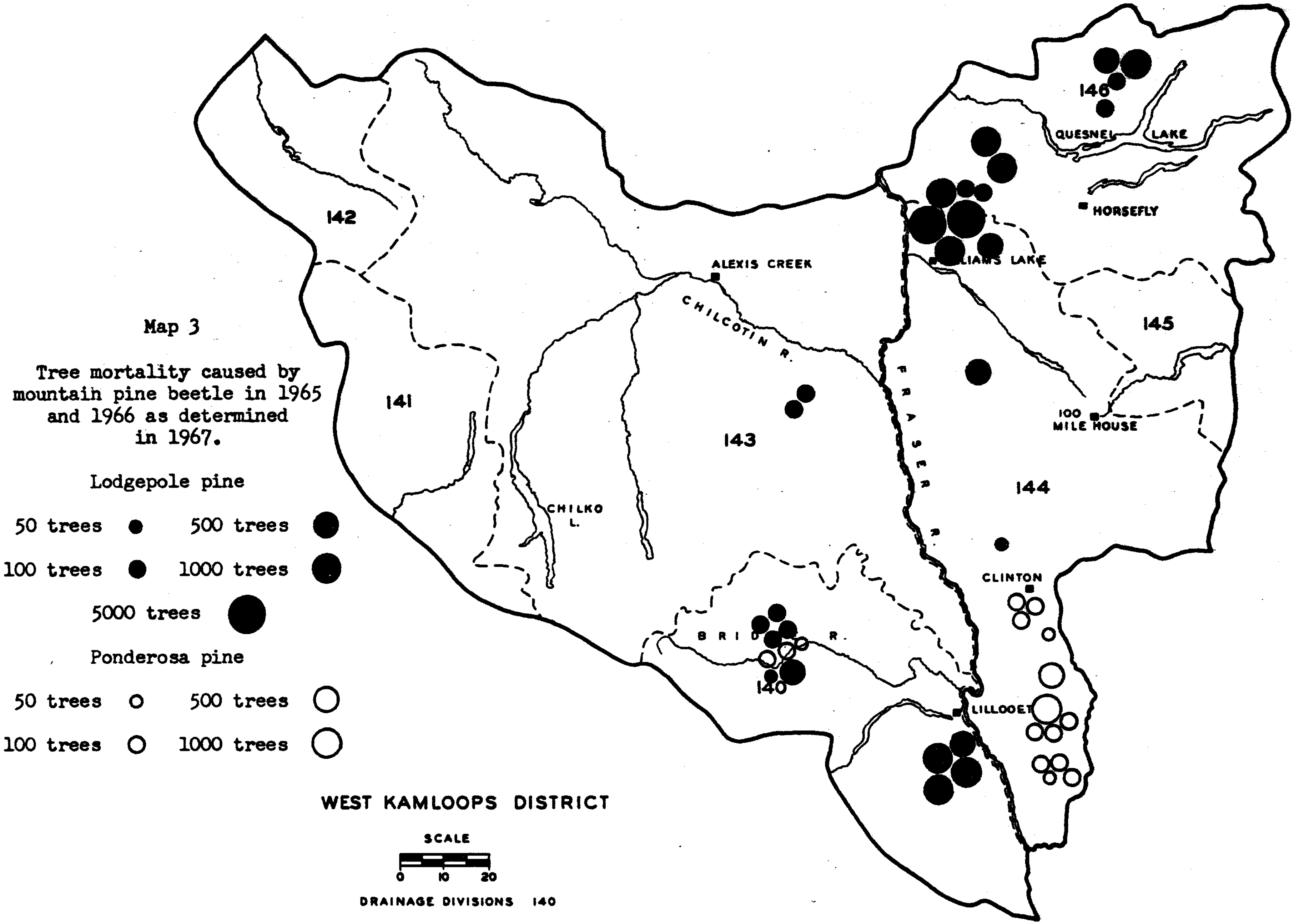
Map 2

Points where Douglas-fir trees have been killed by Douglas-fir beetle from 1965-1967 as determined in 1967.

WEST KAMLOOPS DISTRICT

Map 3

Tree mortality caused by mountain pine beetle in 1965 and 1966 as determined in 1967.



FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

NELSON SURVEY DISTRICT

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

NELSON SURVEY DISTRICT

R. J. Andrews [1/]

The Nelson Forest Insect and Disease Survey District coincides with the Nelson Forest District. Ranger personnel assigned to the Nelson Forest District in 1967 were: N. Bauman, East Nelson; E.V. Morris, Central Nelson and R.J. Andrews, West Nelson. H. Vanderwal replaced E. V. Morris who was transferred to Victoria in September.

Effects of drought conditions which prevailed throughout much of the field season were noticeable on insect populations and on one tree species. Larch trees had begun to change color and lose foliage by August.

Surveys in overmature spruce-balsam stands along Storm and Harvey creeks and observations along Bighorn Creek indicated an increasing spruce beetle population in the Flathead River drainage. Infestations were mostly limited to overmature spruce trees in the valley bottoms.

Counts of beetle-killed Douglas-fir trees were more numerous in 1967 than in several previous years. Red-topped Douglas-fir trees were counted at the following locations: Beaverdell south to Rock Creek, Kettle River, Midway, Christina Lake, Wigwam River and from Boat Encampment to Donald.

Increased mortality of all species of pine from mountain pine beetle attack was recorded throughout the District. Red-topped white pine totalled 2,200 trees, mainly in the central wet belt area. Infestations in lodgepole pine stands continued at Redgrave and along Coyote and Elk creeks in the eastern portion of the District; new outbreaks were recorded in the Westkettle River drainage. Attacked ponderosa pines were more numerous in the dry belt area west of Christina Lake than in past years with groups of red-topped trees noted at Grand Forks, Anarchist Mountain and along the Westkettle River.

Larch sawfly populations were more widespread, although defoliation was not as intensive as in 1966. Populations of the parasites _Tritneptis klugii_ (Ratz.) and _Mesoleius tenthredinis_ Morley depleted

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

sawfly populations greatly. In October, duff samples produced comparatively low numbers of sound cocoons.

Area of black-headed budworm infestations increased in 1967. Defoliation was less severe in stands that had been infested for two years. Defoliation in mature and pole-sized trees at lower elevations was more pronounced than in previous years. Some new infestations were found in isolated stands in the West Nelson District. The population was greatly reduced presumably by an increase in parasitism and high temperatures. Egg counts in October indicated that populations of black-headed budworm will be relatively low in 1968.

Larch budmoth populations decreased in 1967. No visible defoliation of any high elevation western larch stands was observed.

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 Report

Larch Casebearer, Coleophora laricella (Hbn.)

INTRODUCTION: In 1967 western larch collections containing larch casebearer had a wider distribution (Map 1). Surveys determined that the western limit for the second year was two miles west of Christina Lake while the eastern range extended to north of 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. Casebearer populations have consolidated and expanded within the known 1966 range. Locations where light populations were noted in 1966, and increased significantly in 1967 were: Nelson, Fruitvale and northeast of Creston to Kid Creek.

METHODS: Five permanent sampling points established in 1966 near Salmo, Creston and Yahk were sampled in April and October, 1967. The method used to determine population density was to average the 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), 30 per branch (medium), and 30+ per branch (heavy).

The optimum time for sampling was April, before the new growth flushed, and when larvae were still overwintering. Larvae were also counted in October to determine the density of the overwintering generation and to more reliably predict populations for 1968.

Mass collections for parasite rearing were taken in May (518 larvae) and June (846 pupae).

RESULTS: Populations at the Salmo, Yahk and Porthill plots increased from April to October, remained the same at one plot near Creston, and declined at the other (Table 1).

Table 1

Branch Sampling of Western Larch for Larch Casebearers at Five Localities, Nelson Forest District, 1967

Locality	Av. no. casebearers per 18-inch branch	
	April	October
Salmo	33	55
N. Creston	164	75
W. Creston	85	81
Porthill	80	207
Yahk	8	23

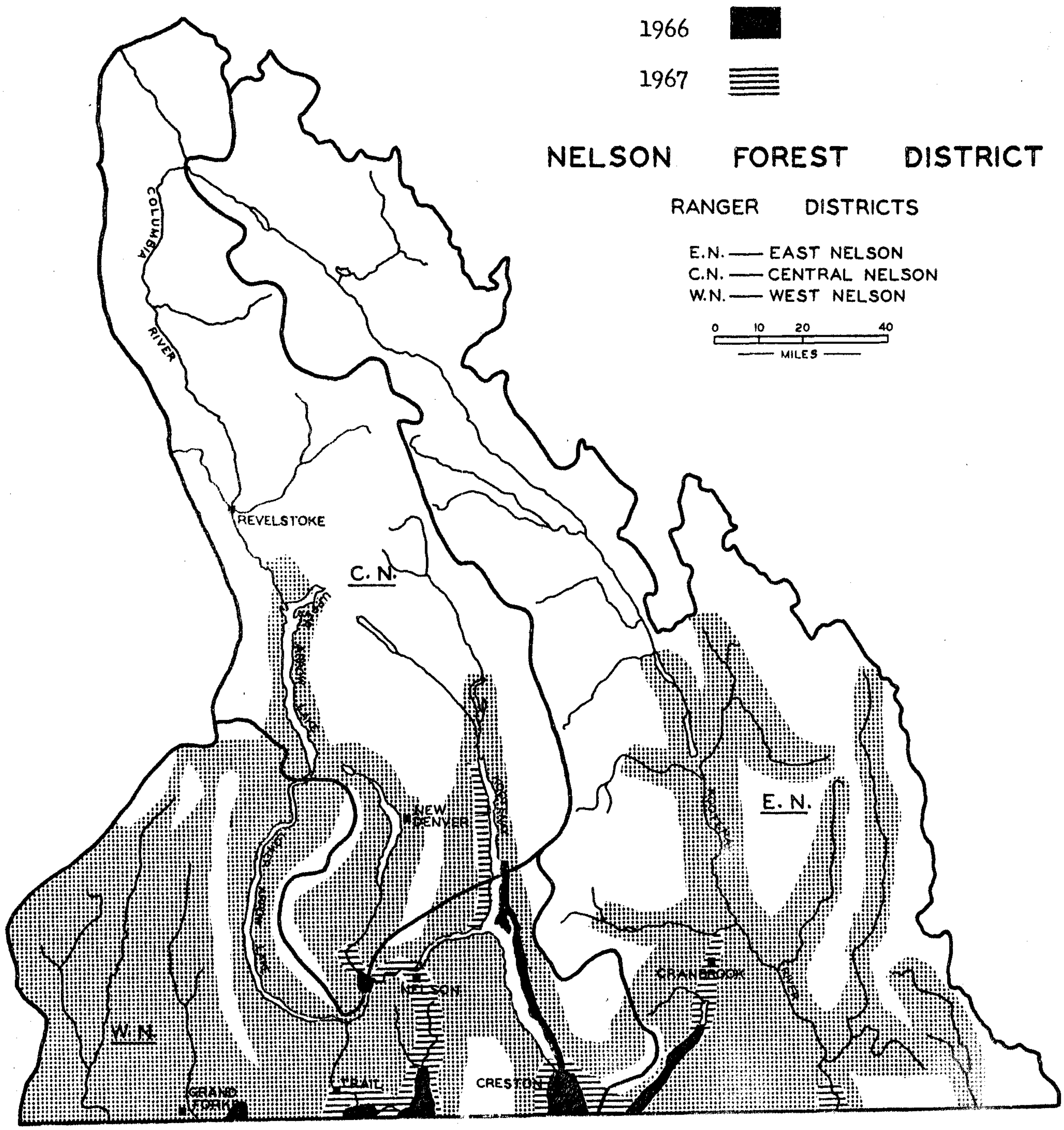
Defoliation in June was heavy near Creston and light to moderate south of Salmo. Both open and close-grown larch were markedly discolored from Wynndel south to the International Boundary and east to Kitchener. Light to moderate discoloration of larch foliage extended for two miles south of the Sheep Creek crossing near Salmo.

A total of 1,360 larvae and pupae from Creston and Salmo were sent to the Vernon Laboratory for rearing. Eight hundred and seventy-nine moths successfully emerged; two hymenopterous parasites, Scambus decorus Wly., were reared. No Spilochalcis albifrons (Walsh) were reared during 1967.

DISCUSSION: Increases in populations as well as wider distribution may be expected in 1968. Parasitism in the more heavily defoliated areas was negligible in 1967; therefore, barring any unforeseen circumstances, severe browning of western larch may be expected in an expanded area near Creston and Salmo in 1968.

Map 1

Distribution of western larch and locations where larch casebearer was collected in 1966 and 1967.



FOREST INSECT AND DISEASE SURVEY

WEST NELSON DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

WEST NELSON DISTRICT

1967

R. J. Andrews

INTRODUCTION

Field work began on April 15 and ended on November 15. Special surveys within the District were: larch casebearer, April 17-21, October 23-27; larch sawfly, May 2-5, September 15-29; aerial survey, August 7-13; black-headed budworm October 2-13; wood borer studies in fire-damaged stands, October 23-27. In addition, two weeks were spent in the Central Nelson District with H. Vanderwal assisting with black-headed budworm egg survey and wood-borer studies and two weeks in the East Nelson District with N. Bauman assisting with aerial and spruce beetle surveys.

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

Totals of 319 insect and 52 forest disease collections were taken 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 District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	9	0	Alder	3	0
Douglas-fir	72	7	Birch, western white	1	0
Fir, alpine	30	1	Aspen, trembling	5	0
Fir, grand	9	3	Cottonwood, black	1	0
Hemlock, western	69	0	Willow	8	0
Juniper, Rocky Mtn.	1	0			
Larch, western	51	1			
Pine, lodgepole	16	40			
Pine, ponderosa	14	0			
Pine, western white	5	0			
Spruce, Engelmann	20	0			
Totals	296	52	Totals	18	0
			Miscellaneous hosts	5	0
			GRAND TOTALS	319	52

Table 2

Currently Important Insects and Disease 1/ Problems by Drainage Divisions, West Nelson District, 1967

Insect and disease problems	Principal hosts 2/	Importance by drainage division 3/			
		200	201	202	203
<u>Bark Beetles</u>					
Douglas-fir beetle	D	4	4	4	0
Mountain pine beetle	lP, pP	4	4	0	0
<u>Defoliators</u>					
Larch casebearer	wL	0	0	2	3
Larch sawfly	wL	5	5	5	5
Black-headed budworm	wH, eS, alF	4	0	4	4
<u>Weather Damage</u>					
Drought damage	wL	0	3	3	3
<u>Foliage Diseases</u>					
Pine needle cast	lP	4	4	0	0
Douglas-fir needle cast	D	0	08	3	0

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* Hopk.

Mortality of Douglas-fir resulting from bark beetle attack increased greatly in 1967; an estimated 2,026 trees were killed by Douglas-fir beetles in the dry-belt area of West Nelson District (Table 3).

Table 3

Douglas-fir Trees Killed by Douglas-fir Beetle from 1965 to 1966 as Determined in 1967, West Nelson District

Location	No. of attacked trees	Estimated volume (cu. ft.)
Westkettle River		
Rhone-Taurus	90	5,220
Little Goat Cr.	150	8,700
Tuzo Cr.	128	7,424
Cranberry Ridge	55	3,190
Carmi	15	870
Beaverdell	35	2,030
China Butte to Beaverdell Cr.	650	37,700
3 Mi. W. of Midway	75	4,350
Ingram Cr.	8	464
Christina Lake	50	2,900
Kettle River		
Williamson-Fiva Cr.	85	4,930
Westbridge-Crouse Cr.	85	4,930
Crouse Cr.	40	2,320
Crouse-Dear Cr.	120	6,960
Dear Cr.	405	23,490
Thone-Williamson Cr.	35	2,030
Totals	2,026	117,508

Intensity of attack varied on individual trees from strip attacks on one side of the bole to heavy infestations. Drought conditions in 1967 may have been responsible for the mortality of even lightly attacked trees.

By June many 1966-infested trees were beginning to lose needles. In a 36-tree plot near Beaverdell 50% of the trees were dropping green needles and seven of the trees had lost up to 90% of their needle complement. It was necessary, therefore, during aerial surveys (August 7-13), to include, when counting groups of attacked trees, those that had only a light complement of red foliage as well as those with a conspicuous thinning of green foliage.

Mountain Pine Beetle, Dendroctonus ponderosae Hopk.

Increased attack by bark beetles was observed on all species of pine in 1967. Infestations in mature and pole-sized lodgepole and ponderosa pine were mostly confined to the dry-belt area west of Grand Forks. The infestation continued in overmature ponderosa pine near Beaverdell Creek and Lois where there were 100 red-topped trees in 1966 and 150 in 1967. There were an estimated 250 infested pole-sized trees in five groups near the summit of Anarchist Mountain, 70 near Rock Creek and 75 along the Granby River Valley, two miles north of Grand Forks.

On a 1 by 10 chain strip in the beetle-infested ponderosa pine stand at Anarchist Mountain 63% were healthy, 7% currently attacked, 14% red and 16% were old grey or dead.

The infestation of mountain pine beetle in lodgepole pine at Winnifred and Mohr creeks continued to decline in 1967; only 35 red-topped trees were counted. Mountain pine beetles have infested lodgepole pine in this area for the past 10 years.

In the Westkettle Valley north of Beaverdell infested lodgepole pine were observed at: Beaverdell Creek, 50 trees; Lakevale to Lois, 110 trees; and near Kallis Creek, 125 trees.

Infested white pine were found at only one locality. Twelve trees were heavily attacked near the Champion Lake road near Fruitvale.

Increased occurrence of attack and drought conditions in 1967 indicate a continuing increase of beetle damage in 1968.

Defoliators

Larch Sawfly, Pristiphora erichsonii (Htg.)

Damage to western larch by larch sawfly was moderate to heavy over an estimated 600 square miles in the West Nelson District in 1967 (Map 2). Defoliation in most areas was less severe in 1967 than in 1965 or 1966. Areas in which defoliation was mapped in 1967 but not in 1965 or 1966 were the Westkettle Valley from Lois to Westbridge and from Midway north to Eholt.

The 100-tree plot, established in 1966 south of Salmo to determine annual defoliation and its impact on the trees, was checked in September, 1967. Defoliation was light on 74% of the trees, moderate on 22% and heavy on 4%. In 1966 at this location, defoliation was light on 4%, moderate on 8% and heavy on 88%. No tree mortality was observed.

Near Fauquier and along Inonoaklin Creek, sawfly adults and early instar larvae were numerous and heavy defoliation was anticipated. However, by the end of June few larvae were observed and in August during an aerial survey of this area defoliation was negligible. A few dried larvae were observed on the duff beneath infested trees, presumably killed by above normal temperatures. Dried larvae were found in cocoons for the first time.

Cocoon populations were measured by counting the number of cocoons in one square-foot samples of duff and soil taken from beneath each of 10 marked trees at each of 10 localities in 1967. The numbers of sound (unopened and apparently undamaged) and unsound (empty) cocoons were recorded for each locality.(Table 4).

Table 4

Cumulative Number of Larch Sawfly Cocoons in 10 square-foot Duff Samples at Each of 10 Localities, West Nelson District

Locality	Number of cocoons					
	Sound			Unsound		
	1965	1966	1967	1965	1966	1967
Whatshan	903	154	97	353	469	377
Fauquier	486	554	167	73	584	477
Nelson	346	113	28	198	339	254
Salmo	312	510	230	360	575	917
Paulson	531	179	41	73	483	242
Beaverdell	179	262	52	21	214	204
Gray Creek	-	473	185	-	534	407
Eholt	-	-	203	-	-	336
Beaverdell N.	-	-	352	-		148
Salmo N.			191	-	-	269

Unsound cocoons were examined to determine the percentage of successful emergence and the number that had been destroyed by predators, parasites and miscellaneous agents (Table 5).

To determine parasitism by Tritneptis klugii (Ratz.) and Mesoleius tenthredinis Morley, 100 overwintering larvae in cocoons from each of 10 plots were dissected and the results compared with those from similar studies conducted in 1965 and 1966 (Table 6). When a cocoon containing a dried or mouldy larva was encountered it was replaced by one which would fulfill the requirements, i.e., healthy or parasitized by *Tritneptis* or *Mesoleius*. The percentage of mouldy cocoons (39%) encountered could be an accumulation in the duff of several years' infestations, while the dried larvae (6%) were presumed to have died as a result of the drought conditions in 1967.

Table 6

Classification of Larvae from 100 1/ Sound Cocoons at each of 10 Plots, West Nelson District

Locality	Healthy			Percentage of cocoons Parasitized By *Tritneptis*			By *Mesoleius*		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
Whatshan	94	49	18	0	2	67	6	49	15
Fauquier	80	44	18	9	33	55	11	23	27
Nelson	100	93	41	0	0	53	0	7	6
Salmo	77	19	54	9	70	23	14	11	25
Paulson	97	60	63	2	16	31	1	24	6
Beaverdell	94	58	22	0	13	67	6	29	11
Gray Cr.	-	91	36	-	1	52	-	18	0
Eholt	-	-	18	-	-	82	-	-	0
Beaverdell N.	-	-	13	-	-	80	-	-	7
Salmo N.	-	-	13	-	-	87	-	-	0

1/ 1967 samples contained less than 100 cocoons.

The percentage of healthy cocoons generally was much lower in 1967 than in 1966, while the percentage infested by *Tritneptis klugii* (Ratz.) increased considerably. Numerous *Tritneptis* adults were swarming about sawfly-infested larch trees near Salmo in May, and near Creston in August.

A plot was established in 1966 to trap sawfly larvae for information on larval diapause. The traps consisted of a funnel with a two-square-foot opening suspended over a metal 6 x 5 inch box with a copper screen bottom and incurved upper edges, sunk to a depth of 3 to 4 inches in the forest floor. Duff and soil was placed in the box and it was covered with 1/3 inch-mesh hardware cloth to exclude shrews and mice. The traps were set under infested larch trees in June. In September, 5 of the 10 traps were removed and returned to the Vernon Laboratory. The cocoons were removed and 100 placed in separate vials for rearing. After rearing, the remainder were dissected to determine mortality and diapause.

Table 5

Cumulative % Emergence and Cocoon Mortality, West Nelson District

Locality	% emergence			% cocoons apparently destroyed: By predation: Mammal			Elaterid			By parasites: Mesoleius			Tritneptis			By miscellaneous agents		
	'65	'66	'67	'65	'66	'67	'65	'66	'67	'65	'66	'67	'65	'66	'67	'65	'66	'67
Whatshan	24	27	48	62	65	29	7	4	5	5	1	5	0	1	5	0	2	7
Fauquier	38	53	40	18	11	24	22	8	4	4	6	7	18	22	14	0	0	11
Nelson	18	53	61	53	34	25	15	6	4	7	3	1	5	2	2	2	2	7
Salmo	20	31	37	66	37	25	7	3	4	2	7	3	4	19	15	1	3	16
Paulson	43	26	28	30	60	43	27	6	7	0	6	4	0	1	3	0	1	13
Beaverdell	68	68	59	16	18	23	11	3	3	0	9	5	5	2	4	0	0	6
Gray Cr.	-	42	32	-	44	37	-	5	6	-	5	2	-	4	12	-	0	9
Eholt	-	-	10	-	-	42	-	-	2	-	-	1	-	-	30	-	-	15
Beaverdell N.	-	-	11	-	-	27	-	-	55	-	-	2	-	-	47	-	-	8
Salmo N.	-	-	26	-	-	7	-	-	5	-	-	9	-	-	41	-	-	12

In June, the remaining five traps were removed to the Vernon Laboratory where cocoons were counted and dissected.

Heavy mortality of larvae in fall collected samples, and of pupae in spring collected material, prevent any conclusions being reached on the incidence of larval diapause.

Black-headed budworm, Acleris variana (Fern.)

Black-headed budworm occurred in many isolated stands from McRae Creek east of Christina Lake to Goat River watershed east of Creston and from the International Boundary north to Watshan Lake (Map 3). Some infestations such as those near Crawford and Smallwood creeks and Whatshan Lake had decreased in intensity from 1966 but had expanded to include lower elevation pole-sized hemlock-white pine-Douglas-fir stands. At Giveout Creek and Mackie Mountain infestations had increased in size as well as in intensity. Heavy defoliation of current year's growth of Engelmann spruce and alpine fir occurred in 1967, usually in areas where timber type changed from hemlock-cedar to spruce-balsam, such as the valleys of Boundary, Inonoaklin and Giveout creeks. Regeneration and pole-sized spruce and alpine fir in an overstory lodgepole pine stand lost up to 65% current year's foliage along the upper Kettle River road from the Monashee Highway to Winnifred Creek.

Black-headed budworm larvae were commonly collected from western hemlock, Engelmann spruce, alpine fir and Douglas-fir (Table 7).

Table 7

Summary by Hosts of Black-headed Budworm Collections during Larval Period June 1 - August 15

Host	No. of samples taken during larval period			% samples containing larvae			Av. no. of larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
Western hemlock	17	39	47	41	95	96	13	54	96
Engelmann spruce	32	10	17	12	80	82	1	3	29
Alpine fir	23	13	23	0	23	70	0	2	62
Douglas-fir	49	58	59	4	22	19	1	1	1

A total of 3,260 larvae and pupae were sent to the Vernon Laboratory for rearing to determine the incidence of parasitism in the population (Table 8). Insectary rearing substantiated field observations that parasitism of late instar larvae was greater than in 1966. Sixty-seven per cent of the parasites emerging from larvae were Hymenoptera, and from pupae, 97%.

Table 8

Results of Mass Rearing of Black-headed Budworm, West Nelson District, 1967

Locality	No. and stage collected	Percentage 1/			Adult emergence
		Pupation	Parasitism		
			Larvae	Pupae	
Edgewood	94L	26	1	0	22
	88L	44	3	0	31
	165P	-	-	25	48
Arrow Park	212L	12	43	0	7
Giveout Cr.	300L	36	22	5	35
	400P	-	-	22	33
Boundary Cr.	112L	32	14	2	20
Queens Bay	72L	39	35	0	22
Crawford Cr.	345L	36	24	2	24
	375P	-	-	7	41
Mackie Mtn.	200L	27	21	0	20
	150P	-	-	25	11
Burton	96L	24	23	16	21
	25P	-	-	6	30
Smallwood Cr.	448L	2	35	0.	0.
	178P		-	15	58

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

A 100-tree plot was established in 1966 at Crawford Creek to record occurrence of top kill or tree mortality resulting from heavy defoliation. The trees were numbered and defoliation was estimated by crown level in 1966 and 1967. Defoliation in 1966 ranged from 40% to 92% of current foliage and in 1967 from 10% to 33%. There was no evidence of top-kill in 1966 but in 1967 there was from 2 to 6 feet of top-kill on 12 trees ranging from 6 to 18 inches dbh.

Black-headed budworm egg sampling was completed in October. Three dominant western hemlock trees were felled at each plot, defoliation was recorded, and two 10-inch branch samples were taken from each of three crown levels of each tree. Samples were processed at the laboratory and the eggs counted (Table 9). Prediction of next year's defoliation was based on the average number of eggs per 10-inch branch as follows: light, 1 to 7 eggs; moderate, 8 to 15, and heavy 16 or more eggs;

Table 9

Results of Black-headed Budworm Defoliation and Egg Surveys, West Nelson District

Locality	% defoliation				Av. no. of eggs per branch sample	
	Current year's foliage		Total foliage			
	1966	1967	1966	1967	1966	1967
Crawford Cr. 1/	63	47	29	50	23.6	0.2
Gray Cr.	16	61	11	18	22.0	0.3
Giveout Cr. 1/	63	78	8	26	20.6	1.0
Smallwood Cr.	86	23	31	33	12.6	0.2
Mackie Mtn.	11	70	5	23	5.5	0.0
Stevens Cr.	36	42	9	24	16.2	0.0
Cariboo Pass	63	40	25	23	24.1	0.0
Inonoaklin Cr.	-	42	-	8	-	4.8
Boundary Cr.	-	65	-	15	-	1.4

1/ Tops of some trees were completely stripped at the Giveout Creek plot, and top-kill occurred at Crawford Creek.

Based on the number of eggs per branch in 1967 predicted defoliation for 1968 will be light.

Other Noteworthy Insects

White Pine Cone Beetle, *Conophthorus monticolae* Hopk.

There was a large population of *Conophthorus* in white pine cones found beneath trees near Crawford Bay in August. Most of the cone crop had dropped.

Eggs of this species are laid in May and early June; larvae mine the cones during June and July and adults are found during August. The cones are retained on the tree, usually until the insect reaches the adult stage, at which time the cones, with overwintering adults, drop to the ground. 1/

1/ Williamson D. L., Schenk J. A., Barr W.F. 1966. The biology of *Conophthorus monticolae* in northern Idaho. Forest Science 12: 234-240.

Midge and Aphid Damage on Douglas-fir *Contarinia* spp. and *Adelges cooleyi* (Gill.)

In 1967 foliage loss from aphid damage equalled that caused by midges in some localities. Counts of current year's needles from five terminals of five trees at six locations indicated light damage (Table 10).

Table 10

Percentage of Douglas-fir Needles Infested by *Contarinia* spp. and Adelges cooleyi (Gill.) West Nelson District, 1967

Locality	No. of needles examined	% infestation Adelges	% infestation Contarinia
Syringa Cr.	1,790	8.0	8.9
Westbridge	2,198	29.0	4.2
Coffee Cr.	1,858	12.9	12.7
Kokanee Cr.	2,296	6.4	10.9
Gray Cr.	2,500	6.2	5.6
Grand Forks	2,012	3.5	10.7

Fall Webworm, *Hyphantria cunea* (Drury)

Fall webworm tents were more numerous in 1967 than in the past four years. Near Genelle and Wynndel counts of tents on various hosts on both sides of three miles of road were made from a slow-moving vehicle (Table 11).

Table 11

Roadside Web Counts of Fall Webworm near Genelle and Wynndel, West Nelson District 1967

Locality	Hosts	Mi. 0 - 1	1 - 2	2 - 3	Av. per mile
Genelle	Chokecherry	0	4	0	1.3
	Cottonwood	262	51	23	112.0
	Elm	50	3	0	17.6
	Birch	18	5	5	9.3
	Elderberry	10	0	0	3.3
	Alder	0	10	11	7.0

Table 11 Continued

Locality	Hosts	Mi. 0 - 1	1 - 2	2 - 3	Av. per mile
Totals		340	73	39	150.60
1966		9	78	0	14.0
Wynndel	Chokecherry	5	60	6	23.6
	Cottonwood	36	1	5	14.0
	Alder	25	0	4	9.6
Totals		66	61	15	47.3
1966		29	16	9	18.0

Aspen Leaf Miner, Phyllocnistis populiella Cham.

Infestations of aspen leaf miner in the West Nelson District were generally light in 1967. The number of adults produced per 100 leaf surfaces increased greatly near Crawford Creek and remained low at the remainder of the sampling areas. Near Grand Forks insufficient infested leaf surfaces made it impossible to determine the number of emerged adults (Table 12).

Table 12

Percentage of Aspen Leaf Surfaces Mined and Number of Adult Leaf Miners Produced per 100 Leaf Surfaces, West Nelson District

Locality	Percentage of leaf surfaces with mines			No. of adults produced per 100 leaf surfaces		
	1965	1966	1967	1965	1966	1967
Greenwood	17	17	4.4	3	1.4	2.4
Grand Forks	54	3	1.1	21	0.5	-
Phoenix	51	6	2.3	15	1.5	0.03
Crawford Cr.	13	62	87.2	3	1.4	26.2

The percentage mortality from parasitism and other causes showed no marked changes from 1966 levels (Table 13).

Table 13

Mortality of Aspen Leaf Miners in 100-cocoon Samples, West Nelson District

Locality	% mortality					
	Parasitism			Other causes		
	1965	1966	1967	1965	1966	1967
Greenwood	27	30	35	1	15	5
Grand Forks	29	35	-	7	18	-
Phoenix	19	15	20	4	5	0
Crawford Cr.	12	18	10	4	10	15

Larch Bud Moth, Zeiraphera improbana (Walker)

The larch budmoth caused no noticeable defoliation in the West Nelson District in 1967. Near Rossland, at the site of a large infestation in 1966, a 12-inch diameter larch tree was felled to determine population density. An estimated 25% of the fascicles had been lightly fed upon.

Random beating collections yielded a maximum of 75 larvae per three-tree sample near the Santa Rosa Summit and Creston. Two mass collections of late instar larvae were made at these locations.

Table 14

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Choristonerua fumiferana (Clem.) Spruce budworm	D	Widespread	Defoliator. Of 47 collections during larval period, 27% averaged 1.3 larvae.
Datana ministra (Drury) Yellow-necked caterpillar	wwB, Saskatoon	Grand Forks, Christina L.	Defoliator. Light to heavy defoliation on understory hosts.
Galerucella sp. A leaf beetle	W	Lower Arrow Lake	Moderate to heavy defoliation.

Table 14 Continued

Insect	Hosts	Locality	Remarks
Lambdina fiscellaria lugubrosa (Hulst) Western hemlock looper	wH	Wetbelt forests	Defoliator. Low population.
Malacosoma pluviale Dyar Western tent caterpillar	wCh	Grand Forks	Defoliator. Light population.
Melanolophia imitata Wlk. Green striped forest looper	D	Widespread	Of 50 collections during larval period, 60% averaged 1.7 larvae.
Neophasia menapia (F. & F.) Pine butterfly	wwP, pP	Whatshan L., Broadwater	Defoliator. Up to 5 adults in flight at tree tops.
Cryptorhynchus lapathi (L.) Poplar-and-willow borer	W	Grand Forks	Willow commonly infested throughout Ranger District.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Weather Damage

Drought Damage

Near Castlegar, Greenwood and Grand Forks four groups, (1 to 5 acres) of regeneration and pole-sized larch trees were beginning to discolor by mid-August. At Grand Forks, no insect or disease damage was evident and it was presumed that the trees had been affected by the unusually hot weather which prevailed during the summer.

Foliage Diseases

Douglas-fir Needle Cast Rhabdocline pseudotsugae Syd.

Moderate to heavy infection of previous year's foliage was observed over five-acre areas along the Cascade Highway and near Taghum. Damage caused by Rhabdocline pseudotsugae Syd. has not been reported in the District since 1960.

Needle Cast on Lodgepole Pine, Elytroderma deformans (Weir) Darker

Moderate to heavy damage to lodgepole pine caused by this organism was evident from Inonoaklin Crossing to the Kettle River near the Monashee Highway. Light to medium damage occurred in 1966 and in 1967 more intensified infection caused many of the trees to become "ratty" in appearance from browning and loss of foliage.

Stem Diseases

White Pine Blister Rust, Cronartium ribicola J.C. Fisch. ex.Rab.

The high percentage of white pine trees infected by white pine blister rust along Summit Creek was again noteworthy in 1967. Attacks by the mountain pine beetle, Dendroctonus ponderosae Hopk. were observed on three trees that were heavily infected by this disease. A permanent plot will be established in 1968 to determine the occurrence of beetle attack on infected and non-infected trees.

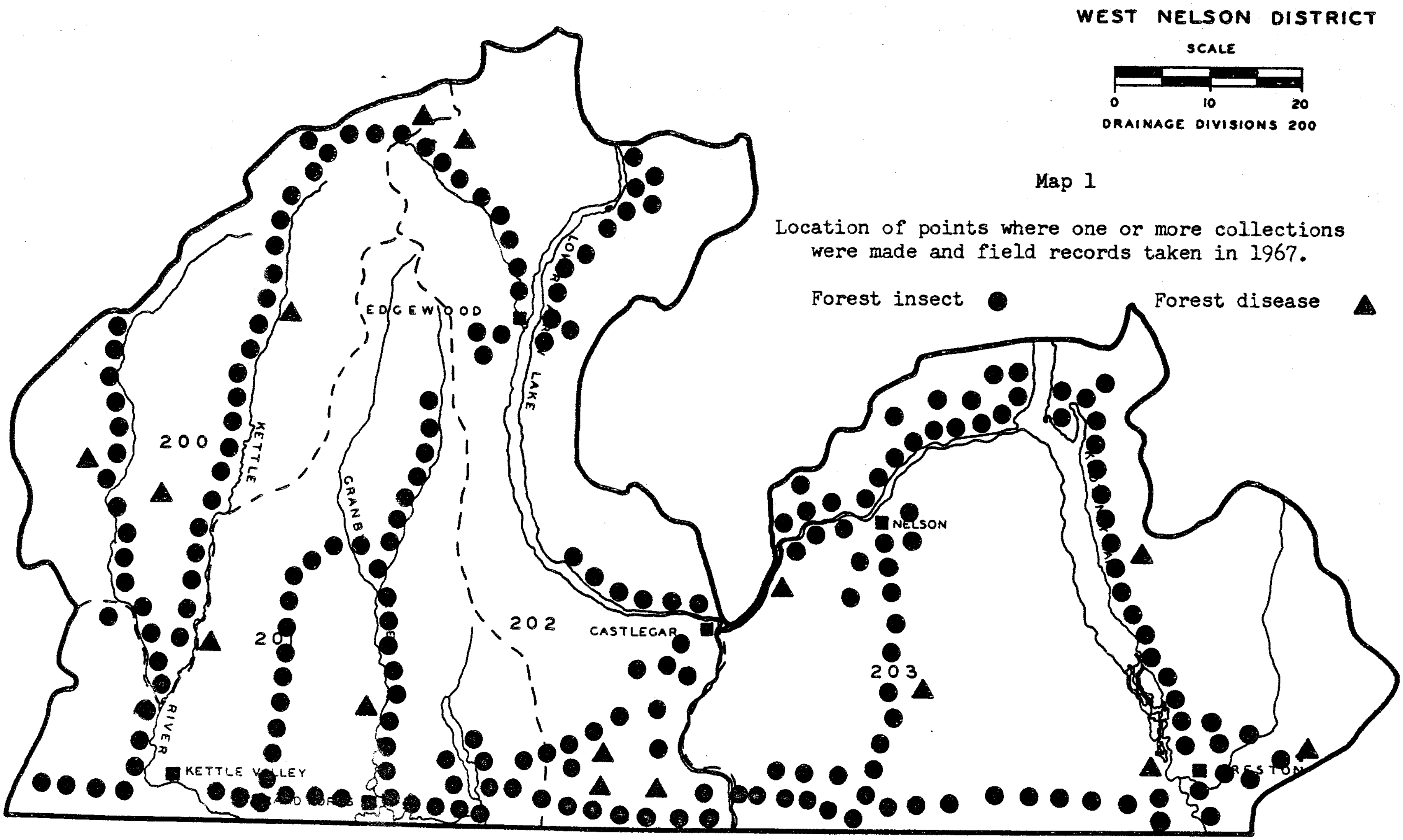
Stem Cankers of Lodgepole Pine, Atropellis piniphila (Weir) Lohman and Cash and Peridermium stalactiforme Arth. and Kern.

Twenty randomly selected stands of lodgepole pine were examined to determine the occurrence of these cankers on lodgepole pine. Injury was prevalent at only two locations: near Cookson, 14% of the 50 trees examined were infected with Atropellis and near State Creek, 4% were infected. No infections of P. stalactiforme were found.

Table 15

Other Diseases of Current Minor Significance

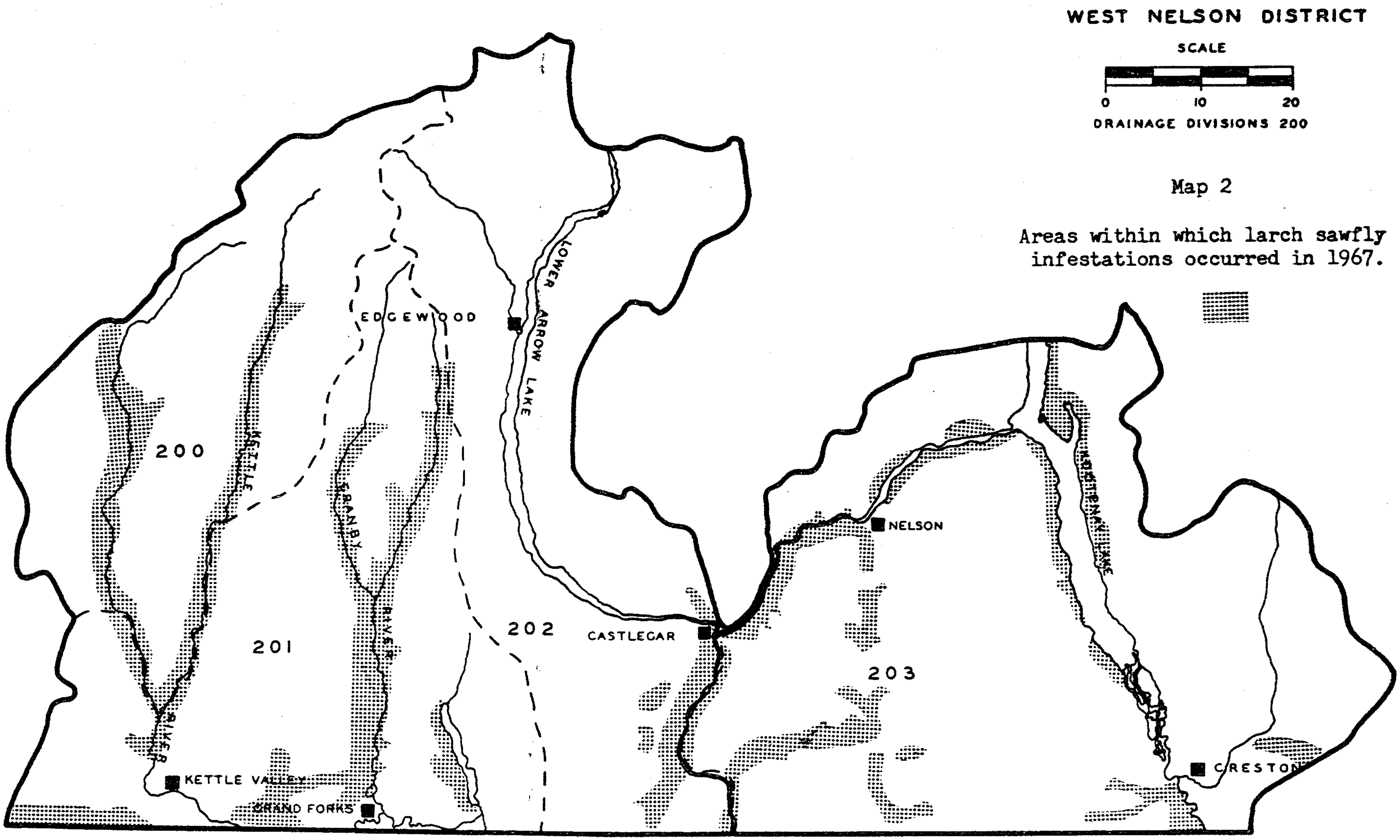
Organism and disease	Host	Locality	Remarks
Armillaria mellea (Fr.) Kummer Shoestring root rot	D	Akokli Cr.	Two groups of 3 and 5 trees killed.
Caliciopsis pseudotsugae Fitz. Branch canker	D	Akokli Cr.	Heavy on regneration trees.
Camarosporium sp. Bud necrosis	D	State Cr.	Light.
Melampsora medusae Thuem. A foliage rust	D	Smallwood Cr., Pass Cr.	Moderate to heavy infection.
Peridermium pseudo-balsameum (Diet. & Holw.)	gF	Akokli Cr.	Heavy infection on 1966 foliage.
Phacidiopycnis sp.	gF	3 Mi. N. of Salmo	Light occurrence. New record for this host.



Map 1

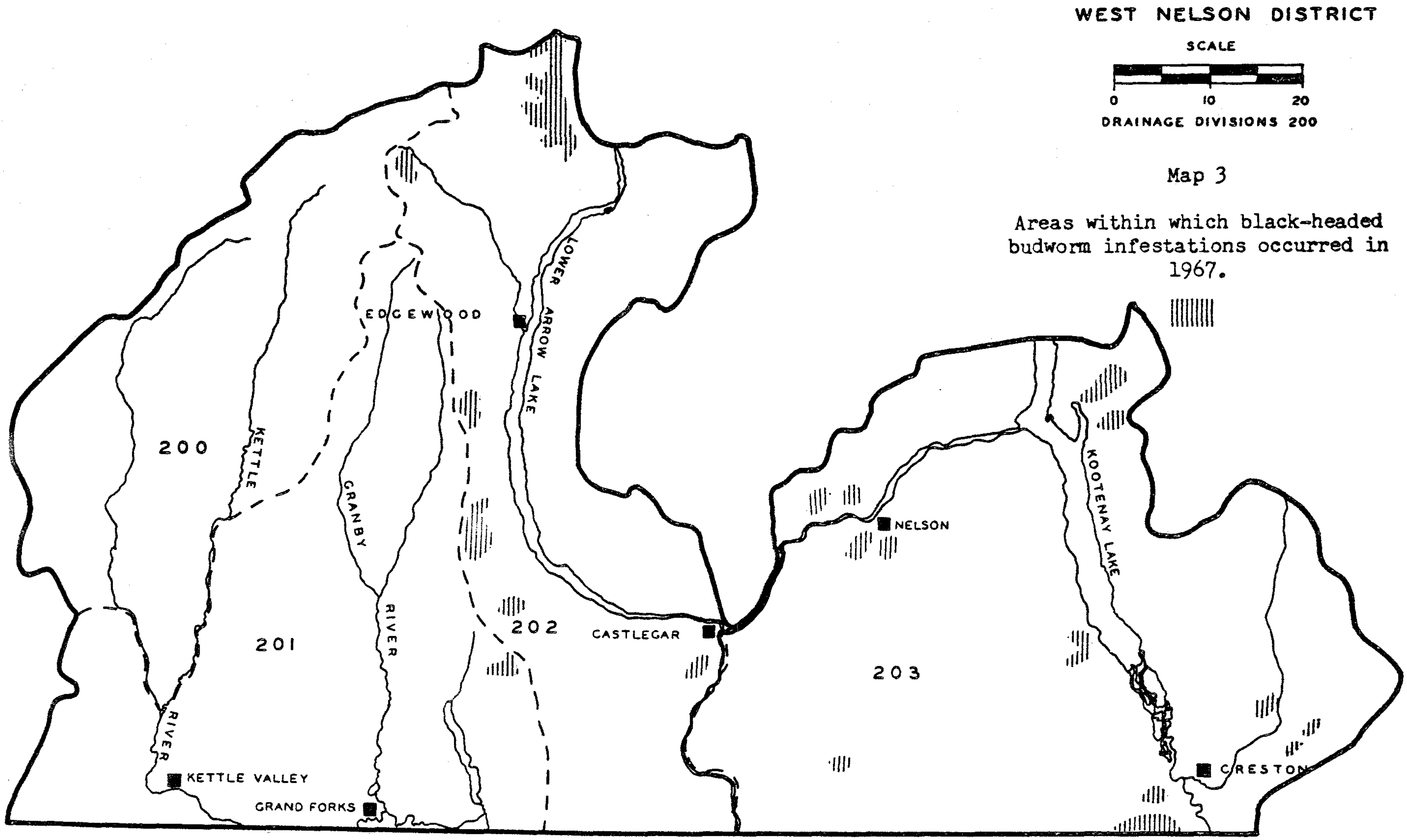
Location of points where one or more collections were made and field records taken in 1967.

Forest insect ●   Forest disease ▲



Map 2

Areas within which larch sawfly infestations occurred in 1967.



Map 3

Areas within which black-headed budworm infestations occurred in 1967.

FOREST INSECT AND DISEASE SURVEY

CENTRAL NELSON DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

CENTRAL NELSON DISTRICT

1967

E.V. Morris and H. Vanderwal [1]

INTRODUCTION

Field work in the District started in early May and continued to the end of October. During this period two weeks were spent on black-headed budworm egg sampling and defoliation in October and one week was spent on cocoon sampling for larch sawfly population studies. Earlier in the season two weeks were used for larch casebearer surveys and aerial reconnaissance in the Nelson Forest District. Special disease surveys were conducted during regular survey work on the distribution of *Atropellis* and *Peridermium* cankers on lodgepole pine, the occurrence of recent pole blight lesions on white pine and the assessment of *Fomes annosus* spore populations.

There was an increase in the numbers of larval defoliators found in field collections in 1967; 95% of beating collections contained larvae compared with 89% in 1966 and 80% in 1965.

Black-headed budworm and larch sawfly larval populations that were epidemic in 1966 declined in 1967. Budworm egg sampling indicated a further decline in larval populations for 1968. Larch sawfly cocoon sampling for sawfly population studies also indicated a reduced larval population for 1968.

Larch casebearer surveys in the District show a further spread of this insect in western larch stands from 1966.

There was an increase in the number of mountain pine beetle-attacked white pine trees counted during aerial surveys.

Insect and Disease collections made in the District are shown in Table 1. Collection points and Drainage Divisions are shown on Map 1. Principal problems in each Forest Insect and Disease Survey Drainage Division are shown in Table 2. These Drainage Divisions are illustrated in Map 1.

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[1] Forest Research Technicians, Forest Insect and Disease Survey Ranger, Vernon, B. C.

Table 1

Collections by Hosts

Central Nelson District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	44	1	Alder species	1	0
Douglas-fir	69	3	Aspen, trembling	5	0
Fir, alpine	15	3	Willow species	3	0
Fir, grand	2	0			
Hemlock, western	98	2			
Larch, western	13	1			
Pine, lodgepole	25	40			
Pine, ponderosa	4	0			
Pine, western white	24	11			
Spruce, Engelmann	24	2			
Totals	318	63	Totals	9	0
			Miscellaneous hosts	7	1
			GRAND TOTALS	334	64

Table 2

Currently Important Insect and Disease [1] Problems by Drainage Divisions, Central Nelson District, 1967

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	1	3	1	1
Defoliators							
Black-headed budworm	wH	4	1	4	4	4	4
Larch sawfly	wL	4	4	1	1	0	0
Larch casebearer	wL	1	1	1	1	0	0

[1] Includes only weather - induced and foliage diseases subject to notable annual fluctuation.

[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

Mountain Pine Beetle, **Dendroctonus** ponderosae Hopk.

Counts of red-topped white pine increased from 990 in 1966 to 2,005 in 1967. The largest increase occurred in the Trout Lake area where 1,000 beetle infested pines were counted compared with 100 in 1966. Table 3 gives the number of red-topped white pine killed in 1966 as determined in 1967 by aerial and ground surveys. An average of 42 cubic feet per tree was used to calculate the volume of timber killed at each locality. This figure was based on measurements of beetle-killed trees at several localities.

Table 3

White Pine Trees Killed by Mountain Pine Beetle in Central Nelson District, 1966, as Determined by Aerial and Ground Surveys, 1967

Locality	No. of Trees killed	Volume (cu. ft.)
West Shore Upper Arrow Lake	650	27,300
Trout Lake	1,000	42,000
Meadow Creek	175	7,350
Akolkolex River	90	3,780
Wilson Creek	90	3,780
Totals	2,005	84,210

No accessible trees were found to make observations on foliage colour change and needle loss on 1966 beetle-killed white pine trees. The colour change plots established on 1965 beetle-killed white pine trees were examined in June to record needle loss (Table 4). Colour change plots have shown over the past four years that white pine trees dead for more than one year had lost all their foliage and that the optimum time for aerial surveys for detecting red-topped white pine killed the previous year is the latter part of July and early August.

Table 4

Colour Change and Needle Loss of 1965 Beetle-attacked Western White Pines, Central Nelson District, 1967

Location and date examined	No. of trees with red foliage	% needle loss
Mosquito Creek		
September 1966	20	50
June 1967	0	100
Low Pass		
September 1966	7	68
June 1967	0	100
Wilson Creek		
September 1966	13	78
June 1967	0	100
Poplar Creek		
September 1966	10	79
June 1967	0	100
Slewiskin Creek		
September 1966	12	62
June 1967	0	100

Five hundred lodgepole pine red tops were counted along the Canoe River north of Boat Encampment.

Defoliators

Black-headed Budworm, *Acleris variana* (Fern.)

Black-headed budworm feeding continued to cause light to moderate defoliation in mature and overmature western hemlock forests throughout much of the District. Larval populations were lower in the north and increased in the southern portion of the District in 1967, with several new infestations occurring in the south. The occurrence and average number of larvae taken in three-tree beating samples from western hemlock during the larval period for 1964 to 1967 are shown in the following summary:

No. of samples during larval period				% samples containing larvae				Av. no. of larvae per positive sample			
1964	1965	1966	1967	1964	1965	1966	1967	1964	1965	1966	1967
56	48	63	62	36	68	92	93	3.8	42.2	48.9	61.8

Defoliation was heaviest in mature and overmature hemlock-cedar stands above 2,500 feet elevation. Lighter feeding occurred on hemlock in mixed coniferous stands at lower elevations. Larval populations were low on Engelmann spruce, alpine fir, Douglas-fir and western red cedar with little feeding evident except at Summit Lake where budworm feeding on alpine fir and Engelmann spruce reproduction was noticeable. Table 5 summarizes collections of black-headed budworm from these four hosts during the larval period in 1967.

Table 5

Summary of Black-headed Budworm Collections, Central Nelson District, 1967

Host	No. samples taken during larval period	% samples containing larvae	Av. no. larvae per positive sample
Engelmann spruce	20	95	8.5
Alpine fir	13	69	13.4
Douglas-fir	50	64	3.3
Western red cedar	35	34	2.3

Aerial surveys were carried out in the latter part of August to map areas of budworm infestations; discoloured hemlock foliage was visible on approximately 396 square miles (Map 3), a small decrease in area from 1966. Some damage was evident along the Columbia River Valley from Revelstoke to Boat Encampment, but the main areas were at the following localities: Upper Arrow Lake from Low Pass to Arrowhead, along the west side of the Mosquito Creek Valley, Nakusp to Beaton, Arrowhead to Revelstoke, Jordan River, Rogers Pass Highway, Beaton-Trout Lake and along the Lardeau River from Gerrard to Meadow Creek. Several small infestations were found in the south along Kootenay Lake at Fry, Fletcher and Woodbury creeks, and in the Slocan Valley at Carpenter, Koch, Russel, and Airy creeks.

Mass collections of budworm larvae and pupae were made at several localities for parasitism and virus studies (Table 6). Parasitism in laboratory reared material was lower in 1967 than 1966.

Table 6

Black-headed Budworm Parasitism in Laboratory Reared Material
Central Nelson District, 1967

Locality	Number reared		% parasitism	
	Larvae	Pupae	Larvae	Pupae
Sandon	93	143	19	28
Summit Lake	143	92	40	26
Box Lake	169	-	27	-
Cusson Creek	101	-	25	-

A high percentage of the larvae and pupae died from unknown causes. Possibly a contributing factor to this high mortality was the extremely high temperatures throughout the District during July and August. Temperatures in the southern portion of the District at Castlegar reached over 100 degrees for several days with a maximum of 104 degrees. In the north at Revelstoke temperatures were over 90 degrees with a maximum of 101 degrees.

A survey was conducted in October to determine the severity of defoliation caused by budworm feeding and to ascertain the overwintering egg population and the population trend for 1968. Twelve localities were sampled in the infestation areas. The method of sampling used was to select three trees at random and estimate the percentage defoliation of the current year's growth and total defoliation. Egg counts were made on five 10-inch branch samples selected at random from each of the three trees.

Egg sampling in 1965 and 1966 indicated that from one to seven eggs per 10-inch branch sample may be expected to produce a larval population which will cause light defoliation the following year, 8 to 15 medium, and 16 or more eggs per sample, heavy defoliation. Egg sampling in 1967 showed that the infestation collapsed at all localities where samples were made except along the Rogers Pass Highway where light defoliation may be expected in 1968 (Table 7).

Table 7

Summary of Black-headed Budworm Egg Counts
Central Nelson District, 1966 and 1967

Locality	No. eggs per 10 inch tip		% defoliation 1967		% defoliation 1968 1/	
	1966	1967	Current foliage	Total foliage	Current foliage	Total foliage
Upper Arrow Lake						
Galena Bay	12.0	0.1	10	5	trace	trace
Kuskanax Cr.	8.4	0.3	15	5	trace	trace
Saddle Mt.	10.6	0.0	0	0	0	0
Mi. 6 Halfway R.	5.2	0.9	25	25	trace	trace
Mi. 7.5 Halfway R.	4.8	0.0	5	5	0	0
Mi. 4 Wilson L.	3.7	0.0	45	10	0	0
Revelstoke Area						
Cougar Creek	11.4	1.3	25	25	light	light
Rogers Pass	8.2	3.8	15	15	light	light
Beaton-Trout Lake						
Beaton Junction	59.2	0.5	85	60	trace	trace
Trout L.	27.8	0.7	50	10	trace	trace
Kootenay Lake						
Mi. 4 Keen Cr.	2.7	0.3	10	5	trace	trace
Mi. 5 Keen Cr.	6.4	0.4	25	10	trace	trace

1/ Estimated defoliation in 1968 that will be caused by larvae hatching from 1967 eggs.

A 100-tree plot, established in the Beaton area in an overmature hemlock stand to study the effects of budworm defoliation, was examined in October (Table 8). Three of the understory trees were 100% defoliated and numerous other trees were heavily defoliated in the upper crown. It is expected some tree mortality will result at this plot.

Table 8

Average Defoliation of Western Hemlock
on 100-Tree Plot, Beaton 1967

Crown level	Average % defoliation		
	New foliage	Old foliage	Total foliage
Upper	69	39	54
Mid	57	25	41
Lower	43	15	29
Average	56	26	41

Larch Sawfly, Pristiphora erichsonii (Htg.)

Sawfly larval populations on western larch decreased throughout infestation areas in 1967. Defoliation was patchy throughout the Slocan Valley where heavy defoliation occurred in 1965 and 1966. There were several small infestations along Kootenay Lake from Ainsworth north to Lardeau. The following summary shows the numbers of larch sawfly larvae in three-tree beating collections during the larval period from 1964 to 1967:

Number of samples taken during larval period				% samples containing larvae				Av. no. of larvae per positive sample			
1964	1965	1966	1967	1964	1965	1966	1967	1964	1965	1966	1967
13	25	21	8	10	48	47	44	1.0	41.8	63.5	58.6

Aerial surveys showed approximately 107 square miles of larch sawfly defoliation in the Slocan Valley and along the Upper Kootenay Lake. The main areas of defoliation were: Slocan Valley from South Slocan to Slocan Lake, South Slocan to Castlegar, Koch Creek and along Kootenay Lake from Ainsworth to Lardeau (Map 4). Defoliation was lighter in 1967 than in 1965 and 1966. At the four cocoon sample plots, there was 35% defoliation at West Demars, 66% at Passmore, 75% at Perry Siding and 72% at Kaslo. The 100-tree plot at Perry Siding established to study the effects of defoliation on larch trees by larch sawfly showed an average of 75% defoliation in 1966 and 1967. No mortality has resulted to date at this plot from sawfly defoliation.

Larch sawfly cocoon sampling for predicting the 1968 population level was done in September in plots at four localities; Kaslo, West Demars, Perry Siding and Passmore. A square-foot duff sample was removed from beneath each of ten dominant and co-dominant trees. Cocoons were separated from duff samples and classified as sound and dead or empty (Table 9).

Table 9

Number of Larch Sawfly Cocoons in Ten Square-foot Duff Samples at Each of Four Localities, Central Nelson District, 1965-1967

Locality	No. of cocoons					
	Sound			Dead or empty		
	1965	1966	1967	1965	1966	1967
West Demars	261	202	70	125	416	366
Perry Siding	604	521	321	313	913	1,175
Passmore	515	597	345	312	535	836
Kaslo	-	616	166	-	260	349

The empty cocoons and cocoons with dead larvae were examined and classified as emerged, probably destroyed by mammals or Elateridae, or parasitized by *Mesoleius tenthredinus* Morley or *Tritneptis klugii* (Ratz.) (Table 10). The results of Table 10 indicate that the biggest factors causing mortality in sawfly cocoons is predation by mammals and parasitism by *Tritneptis klugii* (Ratz.).

Table 10

Cumulative % Sawfly Emergence and Cocoon Mortality, Central Nelson District

Locality	% emerged		% Cocoons apparently destroyed by							
			Predation				Parasites			
			Mammal		Elateridae		Mesoleius		Tritneptis	
	1966	1967	1966	1967	1966	1967	1966	1967	1966	1967
West Demars	29	48	29	16	6	3	33	6	2	5
Perry Siding	46	37	24	11	16	8	3	1	5	12
Passmore	56	33	28	17	7	4	3	1	4	7
Kaslo	49	20	27	8	6	4	2	1	9	19

One hundred sound cocoons from each plot were opened and the larvae dissected to determine percentage parasitism (Table 11). The parasite *Tritneptis klugii* (Ratz.) increased at all plots and should be a controlling factor in sawfly population levels in 1968.

Table 11

Classification of Larvae from 100 Sound Cocoons
at Four Plots, Central Nelson District

Locality	% healthy			% cocoons parasitized by:					
				Tritneptis			Mesoleius		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
West Demars	64	40	72	0	2	6	36	58	22
Perry Siding	100	69	53	0	27	47	0	4	0
Passmore	93	72	40	4	27	56	2	1	4
Kaslo	-	44	22	-	55	68	-	1	10

Larch Casebearer, Coleophora laricella (Hbn.)

Larch casebearers were found on western larch five miles south of Lardeau on Kootenay Lake. This locality is a 15-mile northward extension of the known distribution of larch casebearers in 1966. Casebearers were also found again along the Kootenay River from South Slocan to Castlegar. Only a trace of needle damage was evident at these localities on reproduction and sapling-sized trees.

The plot established at Thrums to follow the population trend was sampled in April. Four 18-inch branch samples were taken from each of four trees at mid crown and the number of casebearers counted on each branch sample. An average of one casebearer per branch sample was found at this plot.

Other Noteworthy Insects

Spruce Budworm, Choristoneura fumiferana (Clem.)

Spruce budworm larvae were scarce on the two preferred hosts, Douglas-fir and western hemlock. The highest number of larvae were collected from western hemlock at Cusson Creek where 52 were taken in a three-tree beating sample.

The following summary compares spruce budworm collections taken during the larval period from June 1 to July 31 from Douglas-fir and western hemlock in Central Nelson District 1964 to 1967:

Host	No. of samples taken during larval period				% samples containing larvae				Av. no. of larvae per positive sample			
	1964	1965	1966	1967	1964	1965	1966	1967	1964	1965	1966	1967
Douglas-fir	44	55	50	42	14	18	16	16	1.7	1.6	1.6	2.3
Western hemlock	71	56	80	66	6	17	11	22	1.2	1.5	2.2	5.2

Douglas-fir Needle Midges. Contarinia spp.

There was a marked decline in the midge damage to Douglas-fir needles throughout the range of this tree species in the District. Five terminal twigs from each of five trees in five sample plots were examined in August to determine the percentage of current needles mined by Contarinia spp. (Table 12).

Table 12

% Current Douglas-fir Needles Mined by Needle Midges at Five Plots, Central Nelson District

Locality	% current year's needles mined		
	1965	1966	1967
Thrums	37	58	1
Lemon Creek	30	38	0
Gwillum Creek	44	10	0
Vallican	68	40	0
Little Slocan River	43	40	1

Douglas-fir Beetle, Dendroctonus pseudotsugae Hopk.

No red-topped Douglas-fir trees were counted during aerial and ground surveys in 1967.

Western Balsam Bark Beetle, Dryocoetes confusus Sw.

Few red-topped alpine fir trees were counted during aerial surveys. There were several small groups of red tops in the subalpine forests along the west shore of the Upper Arrow Lake from Fosthall Creek to Shelter Bay.

A Willow Leaf Beetle, Galerucella sp.

High populations of willow leaf beetles again attacked willow, and to a lesser degree, mountain alder, in the Summit Lake and Mosquito Creek drainages where up to 100% of the willow leaves were skeletonized. Spot infestations were common in the southern portion of the District.

Western Hemlock Looper, Lambdina fiscellaria lugubrosa (Hulst)

Western hemlock looper populations remained low in 1967. The highest numbers of larvae collected in random samples were 10, from Douglas-fir at Ferguson, 5 from western red cedar at Trout Lake and 3 from western hemlock at Gerrard. Table 13 summarizes collections from four coniferous hosts from 1964 to 1967 during the larval period.

Table 13

Summary of Western Hemlock Looper
Collections Central Nelson District

Host	No. samples taken during larval period				% samples containing larvae				Av. no. larvae per positive sample			
	1964	1965	1966	1967	1964	1965	1966	1967	1964	1965	1966	1967
Western hemlock	88	82	85	79	36	32	19	16	2.3	2.0	1.5	1.3
Engelmann spruce	26	19	22	23	12	31	9	8	2.3	1.6	1.0	2.5
Western red cedar	61	31	23	43	38	10	26	18	5.3	4.3	3.0	1.6
Douglas-fir	60	62	57	62	5	2	5	3	2.3	1.0	1.9	5.5

Green-Striped Forest Looper, Melanolophia imitata Wlk.

There was an increase in the number of samples containing green-striped forest looper larvae in 1967, although the number of larvae per sample remained low (Table 14).

Table 14

Summary of Green-Striped Forest Looper
Collections, Central Nelson District 1967

Hosts	No. samples taken during larval period	% samples containing larvae	Av. no. larvae per positive sample
Western hemlock	74	44	2.5
Western red cedar	38	52	2.7
Douglas-fir	51	76	3.2
White pine	22	30	1.5

A Hemlock Sawfly, Neodiprion sp.

Hemlock sawfly populations decreased in 1967. There was an average of 10.1 larvae per sample in 43% of western hemlock collections, compared with 22.2 larvae per sample in 48% of the collections in 1966. The highest number of larvae found in a three-tree beating sample was 45 at Goldstream River along the Big Bend Highway.

A Looper, Nepytia freemani Munroe

Populations of Nepytia larvae remained at a low level in 1967. Thirty per cent of the Douglas-fir collections contained larvae with an average of 1.6 larvae per positive sample. Three per cent of the hemlock collections contained larvae with an average of one larva per positive sample.

Aspen Leaf Miner, Phyllocnistis populiella Cham.

Aspen leaf miner infestations continued to cause light to moderate damage to trembling aspen in the District. A decrease in the percentage of leaves mined was recorded at the Mckay Creek and Summit Lake plots.

Leaf samples were examined at five plots. A 12-inch branch was cut from each of 10 trees at each locality and the leaves examined. Table 15 shows the percentage of leaf surfaces mined and Table 16 shows the results of cocoon examinations.

Table 15

Comparison of Aspen Leaf Surfaces Mined and Number of Adults Produced per 100 Leaf Surfaces at Five Plots, Central Nelson District, 1964 to 1967

Locality	Percentage of leaf surfaces with mines				No. of adults produced per 100 leaf surfaces			
	1964	1965	1966	1967	1964	1965	1966	1967
Revelstoke	76	72	53	55	43	43	17	33
Mckay Creek	41	64	38	14	14	52	10	3
Summit Lake	1/	69	38	33	1/	49	8	20
New Denver	67	67	49	50	44	42	16	37
Winlaw	55	69	50	49	15	22	6	14

1/ not sampled; heavy tent caterpillar defoliation.

Table 16

Mortality of Aspen Leaf Miner in 100-cocoon Samples at Five Locations, Central Nelson District, 1964 to 1967

Locality	% mortality							
	Parasitism				Other causes			
	1964	1965	1966	1967	1964	1965	1966	1967
Revelstoke	33	20	18	15	7	13	30	15
Mckay Creek	33	12	22	26	10	20	12	26
Summit Lake	1/	8	16	19	1/	17	12	12
New Denver	21	13	12	8	4	11	40	16
Winlaw	36	24	15	23	11	15	30	31

1/ not sampled; heavy tent caterpillar defoliation.

Table 17

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Adelges cooleyi (Gill.) Cooley spruce gall aphid	D	Southern portion of District	Sucking insect, causing noticeable discoloration of foliage. Damage not as heavy as in 1966.
Corythucha sp. Lace bugs	W	Summit Lake and Mosquito Creek areas	Sucking insect, spot infestations found in 1967.
Lyonetia saliciella Busck A leaf blotch miner	wB W, Al	Trout Lake Kootenay Lake Kaslo River Valley	Leaf miner, common at these localities.
Monochamus spp. Sawyer beetles	wwP	Mosquito Creek	Woodborers infesting beetle killed and blowdown white pine.
Neophasia menapia Feld. Pine butterfly	D, wwP	Upper Arrow Lake, Trout Lake	Defoliators, adults noted in flight in pole-sized Douglas-fir-white pine stands, throughout these drainages.
Cryptorhynchus lapathi (L.) Poplar-and-willow borer	W bCo	Summit Lake Enterprise Creek Kane Creek Wilson Creek	Borer, willow clumps and cottonwood saplings infested.

FOREST DISEASE CONDITIONS

Currently Important Diseases

White Pine Blister Rust, Cronartium ribicola J.C. Fisch. ex Rab.

Infections of Cronartium ribicola on white pine were found over much of the range of white pine in the District. Heavy infections occurred along the Kaslo River Valley from Kaslo to New Denver, along Trout Lake from Gerrard to the town of Trout Lake and along the Upper Arrow Lake from West Arrow Park to Arrowhead.

Porcupine Damage

During aerial surveys numerous areas of high elevation lodgepole pine and alpine fir damaged by porcupines, Erethizon dorsatum nigrescens Allen, were observed. In most areas the trees had top kill and damage to the lateral branches. Heavy damage occurred along Enterprise Creek, Slocan Lake, along the Kaslo River and Woodbury Creek. Lodgepole pine was the most severely damaged.

Canker Damage to Lodgepole Pine

A survey was carried out in the southern portion of the District to determine the distribution of two diseases which cause cankers on lodgepole pine, Atropellis piniphila (Weir) Lohm. and Cash and Peridermium stalactiforme Arth. and Kern. A total of 18 lodgepole pine stands were examined at a minimum of 5 miles apart, and 50 trees were examined in a straight line in each stand. The following table shows the locality and the percentage of lodgepole pine trees with Atropellis cankers; Peridermium cankers were not found.

Table 18

Results of Examination of Lodgepole pine Stands for Atropellis Canker, Central Nelson District 1967

Locality	% trees with Atropellis cankers
Upper Arrow Lake	
East Arrow Park	0
Slewiskin Creek	12
Brouse	24
Celgar Landing	4
Galena Bay Road (Mi. 9)	30
Slocan Valley	
Wilson Creek	0
New Denver	0
Enterprise Creek	0
Little Slocan Acc. Rd. (Mi. 2)	0
" " " " (Mi. 5)	0
Lemon Creek	0
Perrys Siding	0
Vallican	0
South Slocan	0
Kootenay Lake	
Buchanan Lookout	0
Kaslo	20
Fletcher Creek	40
Coffee Creek	16

Fomes annosus (Fr.) Karst.

Wood discs cut from white pine were set out at monthly intervals from May to September in the Wilson Creek area to trap and determine the aerial concentration of *Fomes annosus* spores. The location and time of month for each exposure was the same. Fifteen discs $\frac{1}{4}$-inch thick and 5 to 6 inches diameter were cut and wrapped in sterilized newspaper. Ten of the discs were taken out of the newspaper and set out for 2 hours, then wrapped again in sterilized newspaper. The other 5 discs were used for control. Table 19 shows the results of this work.

Table 19

Aerial Spore Concentration of *Fomes annosus*

Month	No. discs control	No. discs exposed	No. colonies control	No. colonies exposed	No. exposed discs colonized
May	5	10	0	39	4
June	5	10	0	2	1
July	5	10	0	4	1
August	5	10	0	20	7

Pole Blight Range Survey

An examination of white pine was made at seven localities in stands comprising a minimum of 15% white pine to determine the occurrence of recent pole blight lesions. Ten pines were examined in each stand and the presence of new or old pole blight lesions recorded. Table 20 gives the locality and the percentage of white pine trees with new or old pole blight lesions.

Table 20

Incidence of Lesions on White Pine Caused by Pole Blight at Plots, Central Nelson District, 1967

Locality	% white pine with old or new lesions
Upper Arrow Lake	
Kuskanax Creek Road (Mile .1)	0
" " " (Mile 4.2)	0
" " " (Mile 9.9)	40
Pingston-Shelter Bay Rd. (Mile 9.3)	60
Slocan Lake	
Shannon Creek Road (Mile 2.7)	90
" " " (Mile 6)	0
Kootenay Lake	
Buchanan Lookout Road (Mile 1.6)	0

Exotic Plantations

Exotic plantations in the District were examined in August (Table 21).

Table 21

Summary of Disease Conditions on Exotic Plantations 1967

XP number	Location	Exotic species	Remarks
167	Marble Head	Mixed hardwoods	No disease damage found. Trees that have not been damaged by livestock and heavy snow are doing well.
216	Mosquito Creek	*Picea sitchensis* (Bong.) Carr.	No disease damage found.
217	Low Pass Camp	*Picea sitchensis*	Inaccessible in 1967; not examined.
218	Plante Creek	*Picea sitchensis*	Heavy underbrush at this plot; no disease damage found.

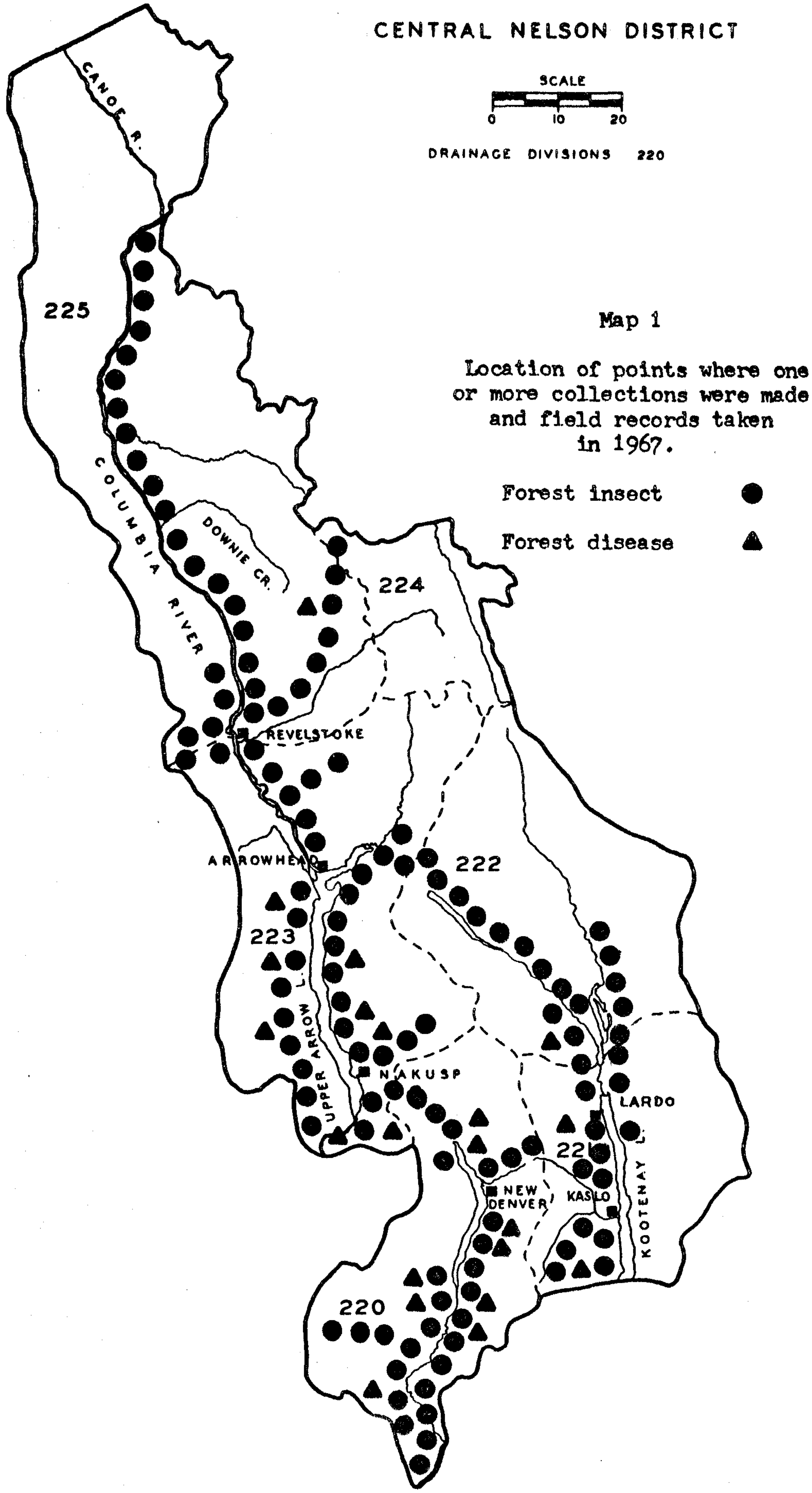
Table 22

Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Arceuthobium campylopodum Engelm. f. *laricis* (Piper) Gill Dwarf mistletoe	wL	Wilson Creek Howser Ridge	Common on overmature larch.
Arceuthobium campylopodum Engelm. Dwarf mistletoe	lP	South Slocan	Light infection on pole-sized trees.
Armillaria mellea (Fr.) Krummer Shoestring root rot	D, wwP	Common throughout District	Douglas-fir and white pine seedlings and saplings infected.
Caliciopsis pseudotsugae Fitzp. Branch canker	D	Gwillum Creek	Common on Douglas-fir reproduction branches.
Delphinella balsameae (Waterm.) E. Mueller Foliage disease	alF	Winlaw	Found on open growing alpine fir saplings.
Hendersonia pinicola Wehm. A hyperparasite	lP	Pass Creek Gwillim Creek	Common in pole-sized lodgepole pine stands.
Herpotrichia juniperi (Duby) Petr. Snow blight	eS	Glacier	Common on understory Englemann spruce.
Hypodermella concolor (Dearn.) Darker A needle cast	lP	Pass Creek	Heavy infection on pole sized lodgepole pine trees.
Hypodermella laricis Tub. Larch needle cast	wL	Howser Ridge	Light infection on reproduction western larch trees in old burn.
Melampsora medusae Thuem. Needle rust	D	Little Slocan Access Road	Common on understory trees.
Melampsora occidentalis Jacks. Needle rust	D	Little Slocan Access Road	Common on understory trees.

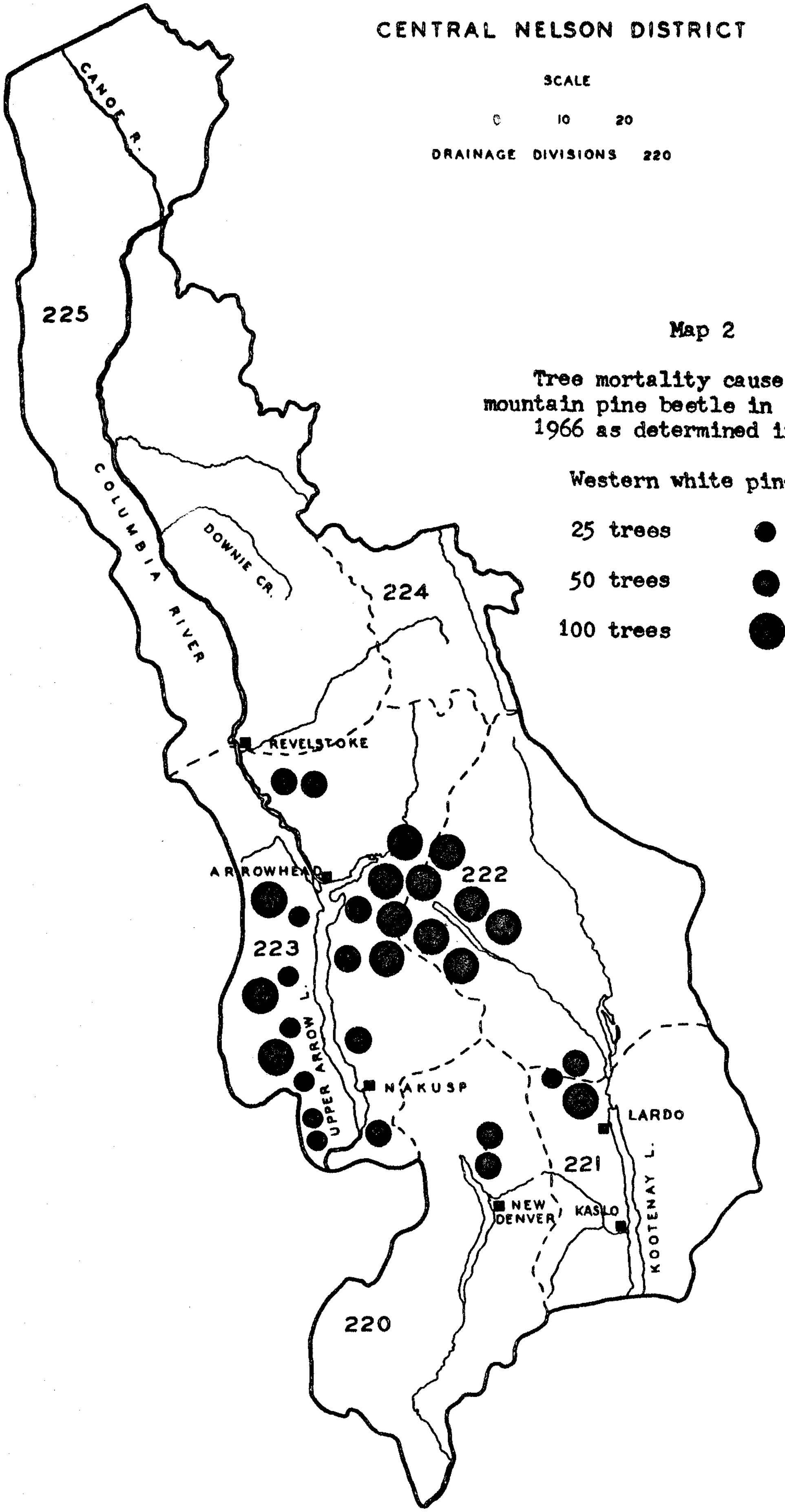
Table 22 continued

Organism and disease	Hosts	Locality	Remarks
Pucciniastrum epilobii Otth. Fir needle rust	alF	Little Slocan Access Road	Roadside alpine fir trees moderately infected.
Rhabdocline pseudotsugae Syd. Douglas-fir needle cast	D	Little Slocan Access Road Carpenter Creek	Heavy infection on roadside Douglas-fir saplings.



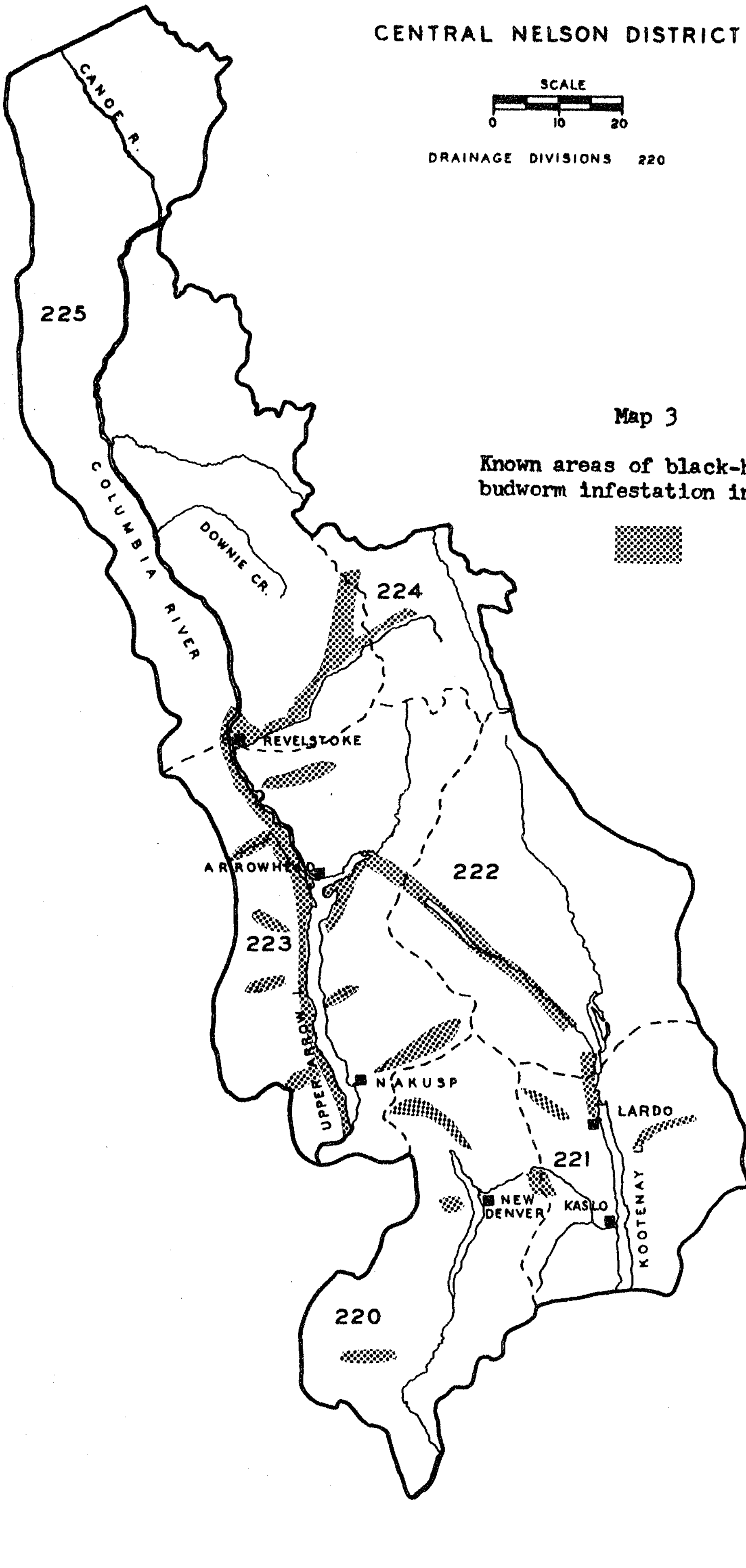
Map 1

Location of points where one or more collections were made and field records taken in 1967.



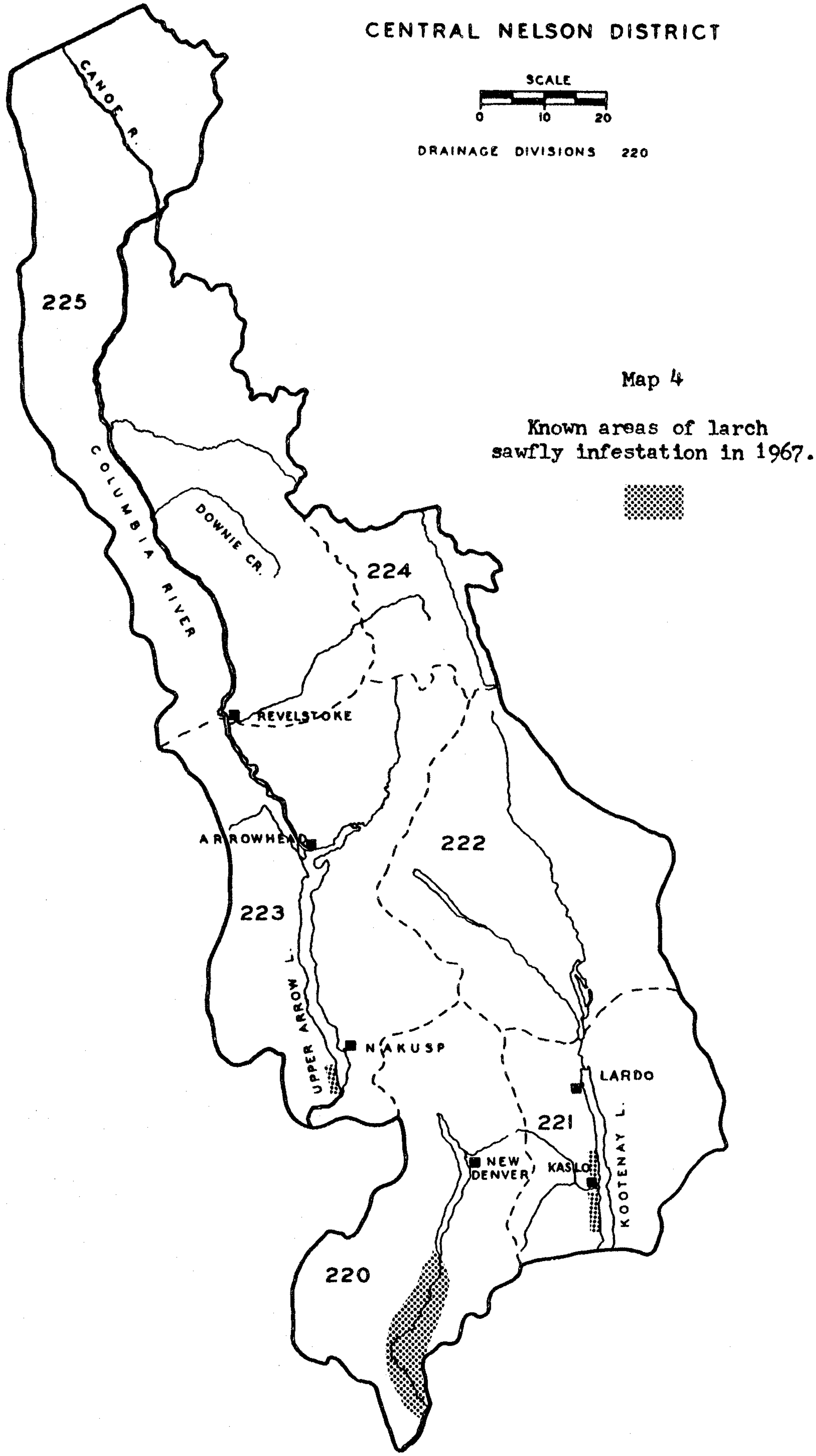
Map 2

Tree mortality caused by mountain pine beetle in 1965 and 1966 as determined in 1967.



Map 3

Known areas of black-headed budworm infestation in 1967.


CENTRAL NELSON DISTRICT
SCALE
0 10 20
DRAINAGE DIVISIONS 220
Map 4
Known areas of larch sawfly infestation in 1967.
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 DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

EAST NELSON DISTRICT

1967

N. G. Bauman 1/

INTRODUCTION

Field work in the East Nelson District began May 23 and ended November 2. Special surveys within the district were as follows: July 27-28, aerial survey of East Nelson District; September 19 to 21, larch sawfly cocoon sampling; October 24 to 26, larch casebearer survey; October 30 to November 2, spruce beetle cruises in Flathead-Wigwam River drainages.

The number of larval defoliators found in field collections increased slightly in 1967; 67% of the insect collections contained larvae as compared with 60% in 1966.

The depredations of the larch sawfly increased in this District in 1967 causing heavy defoliation to an estimated 36,760 acres. The mountain pine beetle increased in intensity while a serious spruce beetle problem may be developing in the Flathead River-Wigwam River systems.

The number of insect and disease collections made in the District in 1967 is shown by host in Table 1; drainage divisions and locations where one or more collections were taken are shown on Map 1. The principal problems in each Forest Insect and Disease Survey Drainage Division are outlined in Table 2. Details on individual insect and disease problems follow this Introduction.

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

Table 1

Collections by Hosts

East Nelson District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	12	0	Alder, Sitka,	1	0
Douglas-fir	111	11	Aspen, trembling	5	0
Fir, alpine	32	8	Birch, western white	0	1
Hemlock, western	22	1	Willow species	2	0
Juniper, common	3	1			
Juniper, Rocky Mtn.	15	0			
Larch, European	1	0			
Larch, western	48	9			
Pine, lodgepole	52	74			
Pine, ponderosa	16	4			
Pine, Scots	1	1			
Pine, western white	4	0			
Pine, whitebark	0	2			
Spruce, Engelmann	43	1			
Yew, western	0	1			
Totals	360	113	Totals	8	1
			Miscellaneous hosts	3	7
			No host	1	7
			GRAND TOTALS	372	121

Table 2

Currently Important Insect and Disease 1/ Problems by Drainage Division, East Nelson District, 1967

Insect and disease problems	Principal hosts 2/	Importance by drainage divisions 3/				
		240	241	242	243	244
Bark Beetles						
Mountain pine beetle	lP	0	0	0	4	4
Spruce beetle	eS	0	3	3	0	0
Douglas-fir beetle	D	0	3	0	2	4
Defoliators						
Larch sawfly	wL	4	4	4	2	0
Larch casebearer	wL	3	1	0	0	0
Short-snouted weevils *Scythropus* spp.	pP, D	1	1	0	3	0
Leaf Miners						
Pine needle-sheath miner	lP	2	0	0	0	0
Aspen leaf miner	tA	2	0	0	2	2
Foliage Diseases						
A pine needle cast *Hypodermella concolor* (Dearn.) Darker	lP	4	3	3	3	0
Pine needle cast *Elytroderma deformans* (Weir) Darker	lP	1	1	0	3	0
Larch needle cast	wL	3	3	0	0	0
Douglas-fir needle cast	D	1	1	0	3	0

Includes only weather-induced and foliage diseases subject to notable annual fluctuation.

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

Mountain Pine Beetle, Dendroctonus ponderosae Hopk.

Mountain pine beetle continued to be a serious problem in lodgepole pine and to a lesser extent in western white pine stands in the East Nelson District. Although there was an overall increase of 500 beetle-killed trees recorded in the District (Table 3), tree mortality at Coyote Creek, one of the major sites of damage, dropped to 500 trees this year from 2,000 in 1966. Map 2 shows the locations and numbers of trees killed as determined by the 1967 aerial survey. It is likely that some of the red-topped trees recorded in 1966 were again recorded in 1967 as most beetle-attacked trees take two years to lose their needles and therefore may be counted twice.

Table 3

Estimated Number of Lodgepole and Western White Pine Killed by Mountain Pine Beetle, 1965 and 1966 as Determined by Aerial Surveys, 1967

Location	Host tree species	Number of red-tops		
		1965	1966	1967
Bush River	lP	1,500	250	60
Redgrave	lP	2,000	3,000	3,500
Waitabit Creek	lP	2,000	-	-
Parson	lP	10	-	-
Horsethief Creek	lP	165	-	105
Dutch Creek	lP	155	-	173
Findlay Creek	lP	120	-	150
Elk Creek	lP	1,200	265	1,000
Coyote Creek	lP	3,500	2,000	500
Kootenay River-White River	lP	1,120	350	300
Forster Creek	lP	150	-	106
Steamboat Mtn.	lP	25	-	70
Palliser River	lP	250	-	-
Cross River	lP	200	-	-
Harvey Pass	lP	-	25	-
Canal Flats	lP		-	200
Toby Creek	lP	-	-	295
Bush River	wwP	200	-	142
Kinbasket Lake	wwP	25	10	-
Blackwater Lake	wwP	15	-	-
Totals		12,635	5,900	6,601

Spruce Beetle, Dendroctonus obesus (Mann.)

There was a significant rise in the spruce beetle population in the southeastern portion of the District in 1967. This area had severe outbreaks of spruce beetle between 1952 and 1959 which caused a loss of 12 million cubic feet of spruce timber. In 1964, high winds felled approximately 9,500 acres of merchantable and pole-sized Engelmann spruce, creating a large volume of host material suitable for spruce beetle population build-up. In subsequent years there were moderate to high populations of spruce beetle in this blowdown although negligible damage was done to standing trees.[1/] In 1966 there was a small population of spruce beetles in standing trees along Harvey Creek and in windfelled trees along 29 Mile Creek.

In the fall of 1967 a preliminary cruise of 14 chains was run along Storm Creek with the aid of J. L. Humphrey, Ranger, British Columbia Forest Service to determine the extent of spruce beetle infestation in Timber Sale X64080 to be logged by Crows Nest Coal Co. Ltd. Sixty three percent of the spruce trees on the cruise strips were healthy, 24% were presumably killed by spruce beetle attacks (1952-1959), and 13% were currently infested by spruce beetle.

During the last week of October a more intensive survey was made in the Storm, Harvey, and Bighorn Creek drainages. Only a small pocket of spruce beetle infested trees was found near Storm Creek. In the 13 acres cruised, there was in excess of 3,000 cubic feet of spruce currently infested with spruce beetle (Table 4).

Table 4

Summary of Data Obtained from Spruce Beetle Cruise near Storm Creek, 1967

	Healthy	Currently attacked	Dead
Percentage of stems	70	7	23
Average no. stems/acre	42	4	14
Average vol./tree in cu. ft.	50	62	56
Volume/acre in Ccu. ft.	21	3	8

A cruise was run along Harvey Creek for 60 chains starting at a point one quarter mile east of Harvey Pass. This cruise followed the valley bottom where the heavily infested overmature spruce trees were located. Beyond 9 chains from the creek the stand consisted of smaller spruce and

1/ Annual District Reports 1964-1966, Forest Insect and Disease Survey Forest Research Laboratory, Victoria, B. C.

and lodgepole pine and was almost totally free from spruce beetle attack. In the 6 acres cruised, 9,000 cubic feet of spruce were currently infested (Table 5).

Table 5

Summary of Data Obtained from Spruce Beetle Cruise, Harvey Creek, 1967

	Healthy	Currently attacked	Dead
Percentage of stems	67	30	3
Average number stems/acre	58	26	3
Average vol./tree in cu. ft.	35	59	31
Volume/acre in Ccu. ft.	21	15	1

Only two currently infested trees were found in the main stand along Bighorn Creek, but 25 overmature trees were heavily attacked in an isolated stand near the junction of Bighorn Creek and Wigwam River.

Aerial and ground surveys will be made of suspect areas during the spring and summer of 1968 to determine the amount of spruce beetle activity in this District.

Douglas-fir Beetle, Dendroctonus pseudotsugae Hopk.

Although the number of trees infested with Douglas-fir beetle in the Kootenay River-Whiteswan Lake area dropped substantially in 1967 there were increases along the Big Bend Highway and near Wigwam River. The number of trees attacked in 1967 was 13% higher than in 1966 (Table 6).

Table 6

Estimated Number of Douglas-fir Trees Killed by Douglas-fir Beetle, 1965 and 1966 as Determined by Aerial Surveys 1967

Location	Number of red-tops		
	1965	1966	1967
Windermere	30	-	0
Kootenay River	115	55	50
Whiteswan Lake-White River	765	425	40
Gold Creek-Caven Creek	770	-	0
Elko-Roosville	40	-	0
Toby Creek		15	0
Wigwam River	-	-	156
Blackwater Creek	-	-	132
Kinbasket Lake			24
Boat Encampment	-	-	157
Albert River	-	-	12
Totals	1,720	495	571

Defoliators

Larch Sawfly, Pristiphora erichsonii (Htg.)

The larch sawfly continued its depredations throughout most of the range of western larch in the District in 1967. Although there were fewer large infestations, the estimated area defoliated increased from 33,000 acres in 1966 to 36,760 acres in 1967 (Map 3).

One new permanent cocoon sampling plot at Olson was established while the plot at Bull River was inaccessible and consequently not sampled. Cocoon populations were measured by counting the number of cocoons in one-square-foot duff samples taken from beneath each of 10 trees at four locations and classifying them as "sound" or "unsound".

Sound cocoons contain larvae some of which may be parasitized while unsound cocoons do not contain larvae and show the results of parasitism, predation, successful emergence or mortality from miscellaneous causes. An undetermined percentage of sound cocoons contain larvae that are in diapause from previous years. Unsound cocoons are composed of accumulations of cocoons from previous year's as well as current year's cocoons so trends only are indicated and an accurate figure cannot be arrived at for any given year.

The average number of sound cocoons per square foot dropped 28%

from the 1966 level while the number of dead or empty cocoons increased only at Jim Creek (Table 7).

Table 7

Average Number of Larch Sawfly Cocoons per Square Foot Duff Sample, East Nelson District

Location	Average number of cocoons per square foot			
	Sound		Unsound	
	1966	1967	1966	1967
Olson	-	49	-	38
Hosmer	60	24	65	69
Jim Creek	31	6	2	23
Sunrise Creek	25	19	47	31

The unsound cocoons were examined to determine the percentage successful emergence and mortality caused by parasites and predators (Table 8). The average number with successful emergence increased 87% from 1966 while those destroyed by mammals decreased by 67%. Parasitism by *Mesoleius tenthredinis* Morl. and *Tritneptis klugii* (Ratz.) increased, but accounted for only 3% and 2%, respectively, of the total number of cocoons destroyed.

Table 8

Cumulative % Emergence and Mortality of Unsound Larch Sawfly Cocoons from 10 Square Foot Duff Samples at each of Four Plots, East Nelson District

Location	% Emerged		% apparently destroyed by									
			Predators				Parasitism				Miscellaneous	
			Mammal		Elaterid		Mesoleius		Tritneptis			
	'66	'67	'66	'67	'66	'67	'66	'67	'66	'67	'66	'67
Olson	-	60	-	19	-	8	-	2	-	3	-	8
Hosmer	32	70	66	16	1	4	0.1	2	1	9	-	7
Jim Cr.	19	54	56	20	12	9	0.0	6	13	3	-	8
Sunrise Cr.	42	67	56	19	1	5	0.0	4	1	3	-	2

While 100 apparently sound cocoons previously were dissected from each location, this year, because of the small number of sound cocoons at some plots, only between 38 and 99 sound cocoons could be dissected. In the four plots examined, current parasitism by Mesoleius dropped slightly while the occurrence of Tritneptis increased significantly in 1967. Parasitism by Tritneptis ranged from 3% to 35% and by Mesoleius from 5% to 21% (Table 9).

In Table 9 the percentages were based on only those sound cocoons with either healthy or parasitized larvae present. Of the total number of dissected sound cocoons, 26% of the larvae were mouldy and 12% were dried. The high percentage of mouldy larvae in cocoons was probably an accumulation of larvae from previous years while the dried larvae were presumably the result of drought in 1967.

Table 9

Classification of Larvae from 100 Sound Larch Sawfly Cocoons at each of Four Plots, East Nelson District

Location	% Healthy			% Parasitized by					
				Tritneptis			Mesoleius		
	'65	'66	'67	'65	'66	'67	'65	'66	'67
Sunrise Cr.	94	66	53	1	11	26	5	23	21
Olson	-	-	69	-	-	10	-	-	21
Hosmer	-	56	44	-	2	35	-	42	21
Jim Cr.	-	91	92	-	0	3	-	9	5

The reduction in the number of sound cocoons indicates that the population is declining.

Larch Casebearer, *Coleophora laricella* Hbn.

See the larch casebearer report following the introduction for the Nelson Forest District.

Short Snouted Weevils, *Scythropus* spp.

In June 1967, weevils tentatively identified as *Scythropus elegans* Couper and *S. californicus* Horn. caused widespread defoliation and browning of Douglas-fir and ponderosa pine between Cranbrook and Canal Flats. Damage, which was particularly noticeable between Wasa and Fort Steele, and in the Canal Flats Christmas tree cutting area could result in trees being degraded, culled, or left uncut.

The damage was caused by adults feeding along the needle edges and killing them. Typical damage is shown in Figures 1, 2, and 3.

Needle Miners

Pine Needle Sheath-Miner, *Zelleria haimbachi* Busck

This needle sheath miner caused light to moderate damage to lodgepole pine at an elevation of 2,900 feet between Ryan and Tochty, approximately 35 miles southwest of Cranbrook.

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.

Aspen leaf miner populations remained about the same in 1967 with only two plots showing any change. There was an increase in the number of leaf surfaces mined, in the plot at Nicholson and a decrease in the plot at Findlay Creek (Table 10). A corresponding relationship was also noted in the average number of adults produced per 100 leaf surfaces.

Table 10

Percentage of Aspen Leaf Surfaces Mined and Average Number of Adult Aspen Leaf Miners Produced per 100 Leaf Surfaces at Five Locations, East Nelson District

Location	% leaf surfaces mined			Av. no. of adults produced per 100 leaf surfaces		
	1965	1966	1967	1965	1966	1967
St. Mary's Lake	89	70	67	56	26	20
Nicholson	48	31	52	15	13	22
Findlay Creek	38	38	12	11	6	3
Moyie Lake	36	52	52	24	25	27
Dutch Creek	78	62	60	11	6	5

Parasitism ranged from 19% to 40% in cocoon samples taken during 1967 (Table 11).

Table 11

Aspen Leaf Miner Mortality in 100-cocoon Samples at Five Locations, East Nelson District

Location	Percentage mortality					
	Parasitism			Other causes		
	1965	1966	1967	1965	1966	1967
St. Mary's Lake	13	26	30	13	11	13
Nicholson	38	16	28	13	16	11
Findlay Creek	17	22	19	9	13	9
Moyie Lake	11	12	27	8	8	6
Dutch Creek	34	36	40	18	14	14

Other Noteworthy Insects

Black-headed Budworm, Acleris variana (Fern.)

The black-headed budworm population remained low in the East Nelson District, in 1967. Twenty-three positive 3-tree beating collections from all hosts contained a total of 282 larvae and pupae. A maximum of 96 larvae was taken in a collection from western hemlock at Redding Creek, 20 miles southwest of Kimberley.

Cooley Spruce Gall Aphid, Adelges cooleyi (Gill.)

There was a significant rise in populations of the Cooley spruce gall aphid on Douglas-fir in this District in 1967. Plots at Invermere, Edgewater, and Brisco each had increases of approximately 50%, but the plot at Canal Flats showed a decrease of 50%. Between 14% and 52% of the needles examined were infested with this aphid (Table 12).

Table 12

Percentage of Douglas-fir Needles Infested by Cooley Spruce Gall Aphid, East Nelson District

Location of sample	% of needles infested	
	1966	1967
Canal Flats	31	14
Invermere	16	28
Edgewater	20	52
Brisco	14	35

Douglas-fir Needle Midges, Contarinia spp.

The Douglas-fir needle midge population was almost non-existent in Christmas tree cutting areas in 1967. The highest numbers of midges occurred at Invermere where only 1% of the needles examined were infested. The three other plots at Canal Flats, Edgewater, and Brisco averaged 0.1% of the needles infested by Contarinia spp.

Western Balsam Bark Beetle, Dryocoetes confusus Swaine

Again there was a significant decrease in the number of alpine fir trees killed by this bark beetle in the East Nelson District in 1967. The only known infestation occurred at Meachen Creek where 40 red-topped alpine fir trees were counted.

A Leaf Blotch Miner, Lyonetia saliciella Busck

A heavy infestation of this blotch miner occurred along the Big Bend Highway between Bush River and Kinbasket Lake on black cottonwood, alder, willow, and birch. In heavily attacked areas the trees were a distinct brown color.

Engelmann Spruce Weevil, Pissodes engelmanni Hopk.

One hundred trees in the Engelmann spruce weevil plot north of Corbin were examined in September, 1967, to determine the incidence of this weevil on young spruce trees. The results of this examination showed that 15% of the trees had current terminal attack, 55% had had old terminal attacks, and 30% were healthy.

Table 13

Other Insects of Current Minor Significance

Insect	Host	Location	Remarks
Anoplonyx spp. Native larch sawfly	wL	Cranbrook	Defoliator; increase, maximum of 18 larvae per collection.
Choristoneura complex Spruce budworm	alF	Moyie	Defoliator; very scarce; only one larva collected.
Ips spp. Engraver beetles	lP	Kimberley	Bark beetles; in right-of-way logs beside road, also in a few standing trees.

Table 13 Continued

Insect	Host	Location	Remarks
Lambdina fiscellaria lugubrosa (Hulst) Western hemlock looper	wH lP	Hosmer Tochty	Defoliator; only 3 larvae collected.
Malacosoma disstria Hbn. Forest tent caterpillar	tA	Golden	Mortality and egg sampling plots at Golden checked; results all negative.
Nepytia freemani Munroe A looper on Douglas-fir	D	Parson Canal Flats	Defoliator; very scarce. Only 2 larvae collected.
Pikonema alaskensis (Roh.) Yellow-headed spruce sawfly	eS	Canal Flats	Defoliator; increasing but scarce.
Semiothisa sexmaculata (Pack.) Green larch looper	wL	Canal Flats Cranbrook Elko	Defoliator; increasing, maximum of 75 larvae in collection at Gold Creek.
Cryptorhynchus lapathi (L.) Poplar-and-willow borer	W	Canal Flats Dutch Cr.	Woodborer; causing damage and sometimes death of willow spp.
Vespamima sequoiae (Hy. Edw.) Sequoia pitch moth	lP	Kimberley	Bark and wood borer; common near Kimberley. No mortality apparent.
Zeiraphera improbana (Walker) A larch budmoth	wL	Skookumchuck Fernie Elko	Budmoth; increasing, maximum of 19 larvae in collection at Skookumchuck.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

A Pine Needle Cast, *Hypodermella concolor* (Dearn.) Darker

This disease was widespread on lodgepole pine in the southern part of the East Nelson District in 1967. It causes the needles to turn brown and eventually fall off, leaving the tree with only a fraction of its normal complement of needles. Known areas where severe browning occurred were Gold Creek, Sunrise Creek, Hawkins Creek, Bull River, Hosmer, Wardner, and Fort Steele.

Pine Needle Cast, *Elytroderma deformans* (Weir) Darker

Pine needle cast was widespread on lodgepole pine between Wasa Lake and Columbia Lake and often intermixed with *Hypodermella concolor*. Severe browning of foliage was especially noticeable along Whitetail Lake, Skookumchuck Creek, Gold Creek, and the Kootenay River above Canal Flats.

Larch Needle Cast, *Hypodermella laricis* Tub.

There appeared to be a general decline in the distribution of larch needle cast in 1967 although infections persisted in small isolated patches. Three areas of heavy infection were at the upper end of Sunrise Creek, near Elko and near the Estella Mine Road.

Douglas-fir Needle Cast, *Rhabdocline pseudotsugae* Syd.

Douglas-fir needle cast was prevalent from Wasa Lake to Cranbrook and at Spillimacheen and Hosmer. The disease may cause some Christmas trees in these areas to be culled or degraded. Damage shows up as red blotches scattered on the surface of the needles in the spring. Later, in the summer, the infected needles fall off leaving a bare twig with the current year's foliage at the tip.

Stem Diseases

Western Gall Rust, *Peridermium harknessii* J. P. Moore

Gall rust was widespread in the East Nelson District. The incidence of western gall rust is generally low, rising to moderate in a few localities.

Porcupine Damage, Erethizon dorsatum L.

Porcupines caused heavy damage to lodgepole pines in Dewar Creek Valley and light damage sporadically throughout the rest of the St. Mary's River, Bull River, Kootenay River, and Horsethief Creek watersheds.

Exotic Plantations

The exotic plantations in the East Nelson District were examined during the summer of 1967. The trees appear healthy although there is competition with overstory trembling aspen at the Findlay Creek plot and lodgepole pine at the Yahk River plot resulting in reduced or spindly growth (Table 14).

Table 14

Exotic Plantation Examinations, 1967

XP number	Location	Exotic species	Remarks
XP 143	Yahk River	Pinus sylvestris L.	Competition from overstory lodgepole pine causing spindly growth; also some browsing damage present. No insect or disease damage present.
XP 149	Moyie River	Larix decidua Mill.	Plantation not found in 1967.
XP 171	Findlay Cr.	Larix decidua Mill.	No sign of any insects or diseases. Up to 18" of terminal growth. Trees 3-8 feet high. Competition from aspen copse.

Disease Progress Plots

Douglas-fir Dieback, Valsa sp.

Three plots were established in 1958 to determine the annual amount of dieback in Douglas-fir Christmas tree harvesting areas. The plot at Canal Flats was destroyed when almost all of the tagged trees were cut during a thinning operation in the spring of 1967. There was light infection in the plots at Premier Lake and Invermere.

Other Noteworthy Diseases

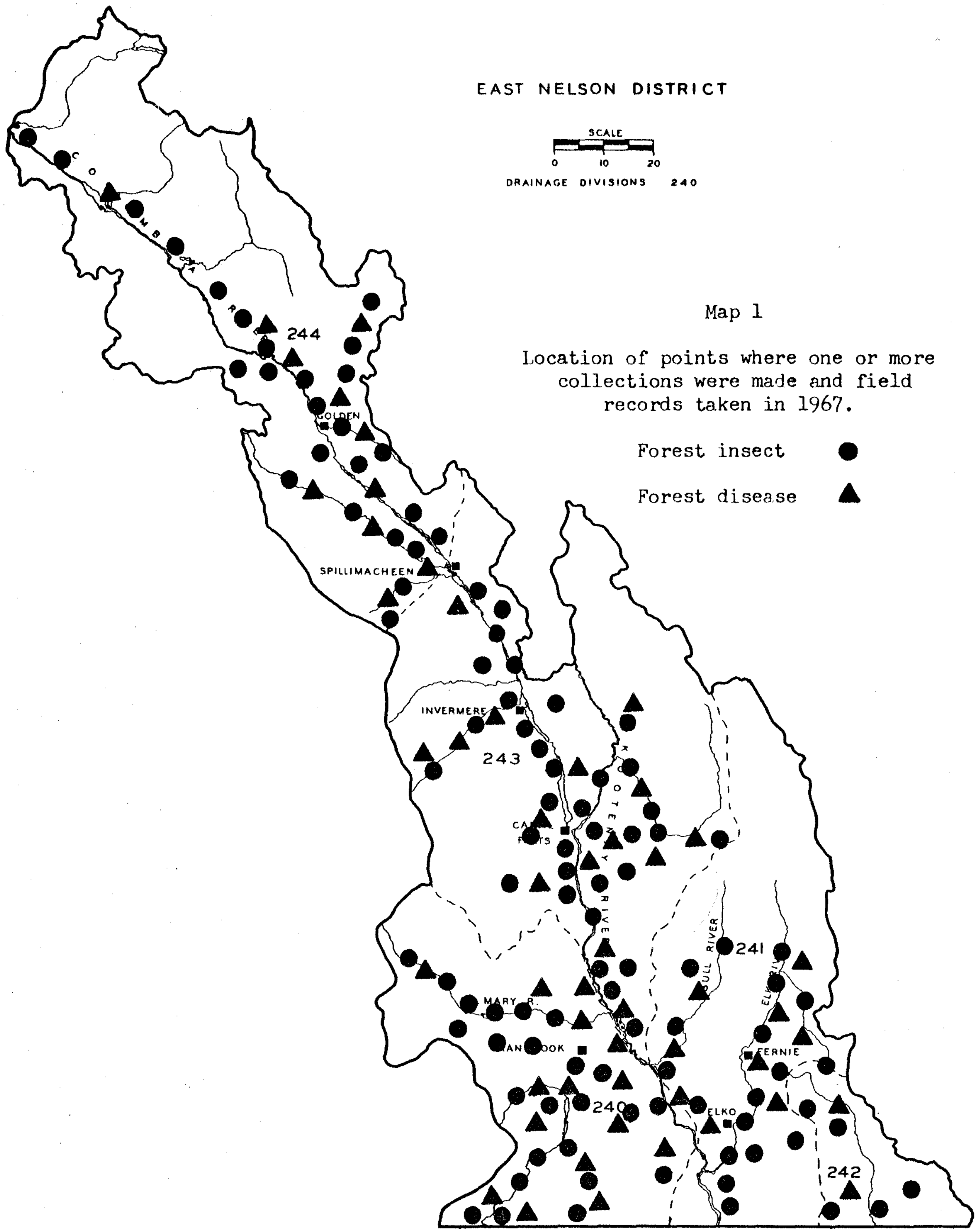
Table 15

Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Arceuthobium americanum Nutt. ex Engelm. Dwarf mistletoe	lP pP	Widespread	Continues to be common in lodgepole pine stands on poorer sites.
Arceuthobium campylopodum f. laricis (Piper) Gill. Dwarf mistletoe	wL	Sunrise Cr. Moyie L. to Kingsgate	Common but sporadic on larch in this area.
Atropellis piniphila (Weir) Lohman and Cash Stem canker	lP	Nicholson Blaeberry R.	Low to moderate numbers of trees infected.
Cronartium ribicola J.C. Fisch. ex Rab. White pine blister rust	whP	Coal Cr.	On whitebark pines in semi-open sub-alpine meadows.
Fume Damage	all species	Kimberley	Trace to light.
Gymnosporangium clavipes (Cke. and Pk.) Foliage and stem rust	cJ, roJ Saskatoon	Widespread	Exceptionally heavy.
Hendersonia pinicola Wehm. Hyperparasite	wL	Cranbrook Fernie Sunrise Cr.	Hyperparasite on *Hypodmella laricis*; increasing.
Isthmiella sp. Needle cast	alF	Fernie Invermere	New record for this district.
Pole Blight	wwP	St. Mary's R.	Six new lesions found in two plots. Two other plots negative.

Table 15 Continued

Organism and disease	Hosts	Locality	Remarks
Stilbospora sp. Needle cast	pP	Bull R. Skookum-chuck	Moderate to high in localized areas.

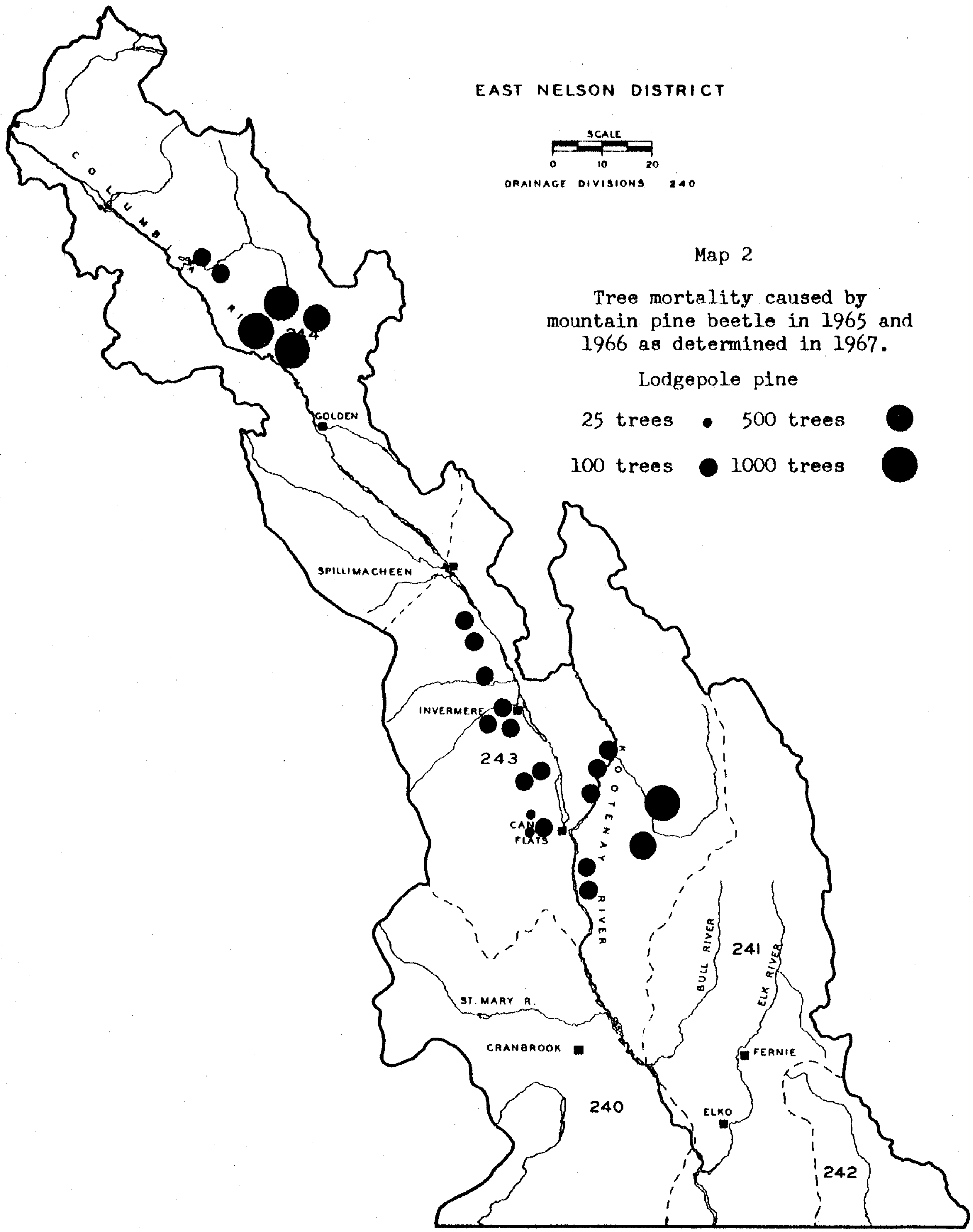


Map 1

Location of points where one or more collections were made and field records taken in 1967.

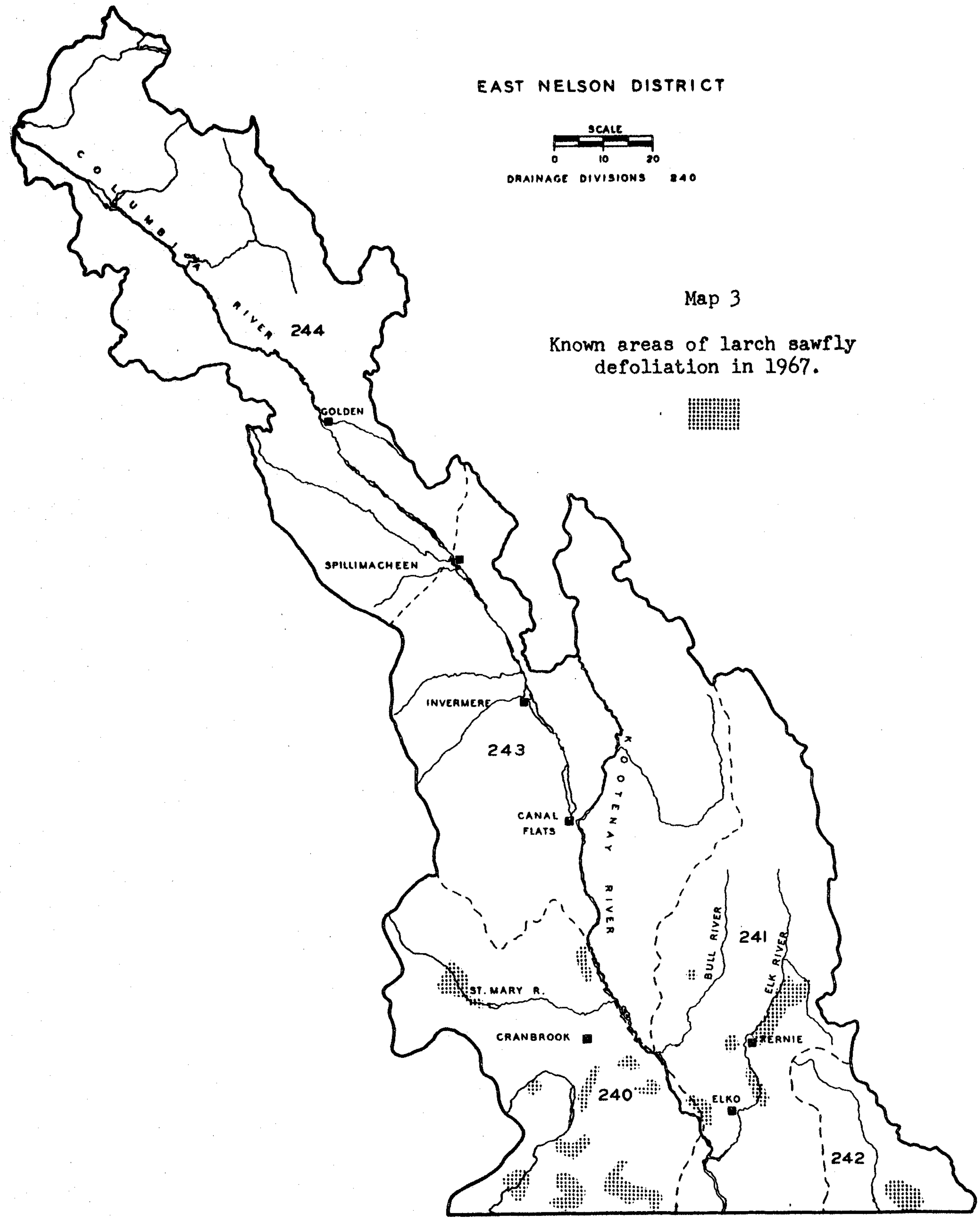
Forest insect ●

Forest disease ▲



Map 2

Tree mortality caused by mountain pine beetle in 1965 and 1966 as determined in 1967.



Map 3

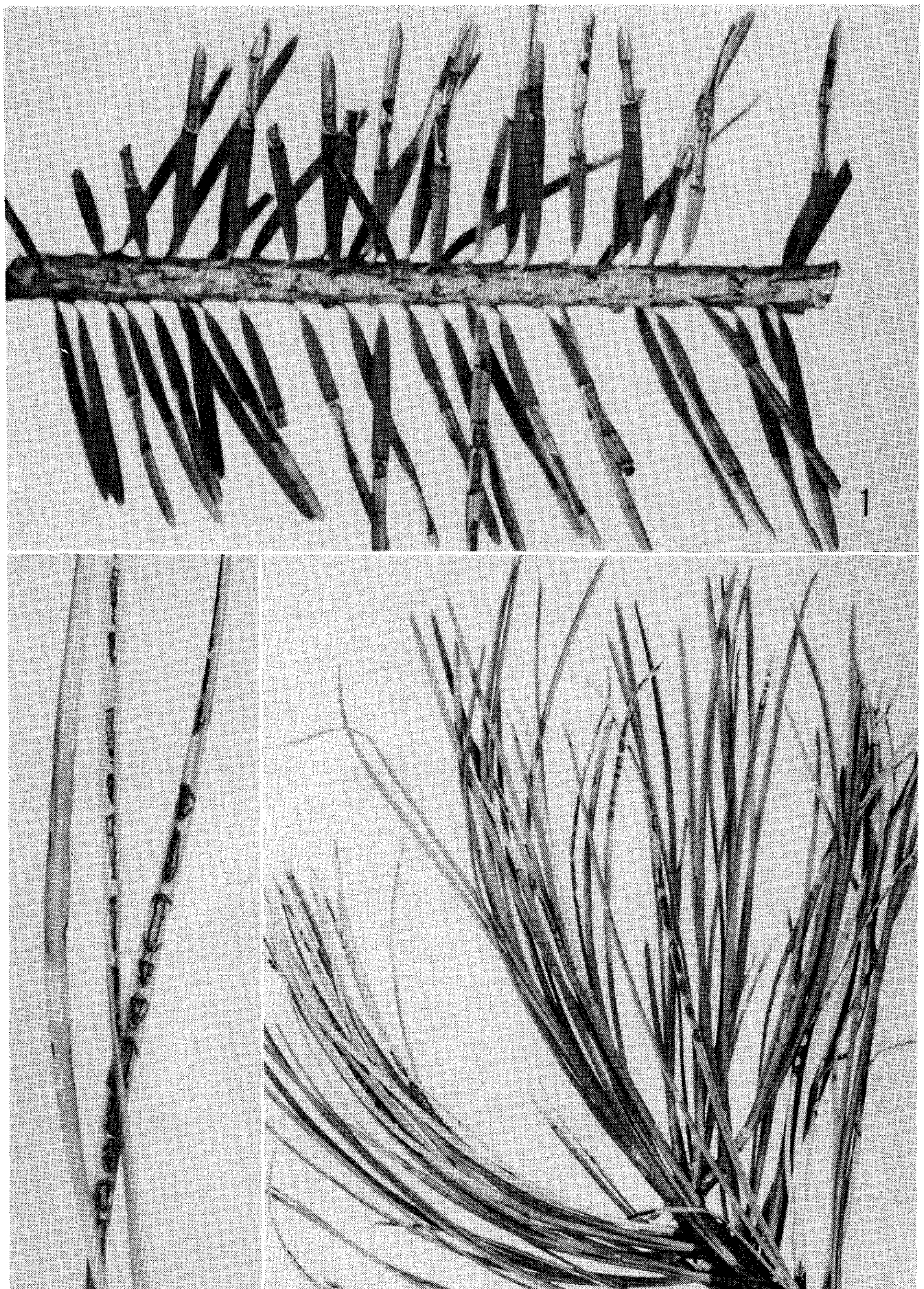
Known areas of larch sawfly defoliation in 1967.

Fig. 1. Feeding damage on Douglas-fir needles caused by *Scythropus* spp. adults at Canal Flats, East Nelson District, September 20, 1967.

J. K. Harvey

Figs. 2, 3. Feeding damage on ponderosa pine needles caused by *Scythropus* spp. adults at Wasa Lake, East Nelson District, September 20, 1967.

J. K. Harvey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FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

PRINCE GEORGE SURVEY DISTRICT

FOREST INSECT AND DISEASE SURVEY

BRITISH COLUMBIA

1967

PRINCE GEORGE SURVEY DISTRICT

J. Grant [1]

The Prince George Forest Insect and Disease Survey District includes the Prince George Forest District and the Prince Rupert Forest District from the Stikine River drainage north to the Yukon-Alaska border.

Ranger personnel assigned to the Prince George District in 1967 were D. G. Lund in North Prince George, D. Beddows in West Prince George, and J. Grant, South Prince George.

Spruce beetle populations remained high in windfalls in the southern part of the District but damage to standing trees was negligible. Unusually warm temperatures during the summer accelerated development to such an extent that the progeny of some beetles which attacked windfall in the spring of 1967 had reached the adult stage by autumn. Two years are usually required for completion of the life cycle.

Mountain pine beetle infestations continued to decline in the Takla Lake region but damage increased in lodgepole pine stands southwest of Quesnel.

Populations of the Douglas-fir beetle remained low.

There was a resurgence of the one-year-cycle spruce budworm in spruce stands of the Upper Liard, Fort Nelson, Muskwa, Prophet, Fontas and Sikanni Chief River valleys. Egg surveys indicated that there will be moderate to heavy defoliation in some of these areas in 1968.

The two-year-cycle spruce budworm remained extremely scarce throughout the District.

The black-headed budworm increased generally in 1967 and light infestations developed near McBride. Understory hemlocks at Goat River and West Twin Creek were defoliated.

Larch sawflies were reduced in numbers in the Fort Nelson region.

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

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

Host Tree Abbreviations

Abbreviation	Common name	Abbreviation	Common name
alF	alpine fir	tA	trembling aspen
D	Douglas-fir	bCo	black cottonwood
tL	tamarack	bPo	balsam poplar
lP	lodgepole pine	Al	alder species
bS	black spruce	W	willow species
wS	white spruce	B	birch species
wH	western hemlock		
wC	western red cedar		

FOREST INSECT AND DISEASE SURVEY

SOUTH PRINCE GEORGE DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

SOUTH PRINCE GEORGE DISTRICT

1967

J. Grant

Regular field work in the District began May 31 and ended October 5. Special surveys within the District were as follows: spruce beetle plots May 30 to June 6; spruce beetle cruise strips and plots September 25 to October 4. Aerial surveys of most of the more recently infested spruce beetle areas were made in August. In addition, assistance was given in a wood-borer control project and damage survey at Mackenzie, West Prince George District, in the periods March 14-15, May 19-20 and September 19-21. The period July 22-27 was spent assisting in a survey of spruce budworm damage in the North Prince George District.

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

Although spruce beetle populations were high in windthrown trees in many parts of the District, no standing trees were known to have been killed in 1967. Mountain pine beetle damage was restricted to the southern part of the Quesnel District, and to a small area near Valemount.

With the exception of the black-headed budworm which caused minor defoliation, most defoliating insects were well below infestation levels.

Table 1

Collections by Hosts,

South Prince George District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Cedar, western red	5	1	Alder, mountain	0	1
Douglas-fir	32	1	Aspen, trembling	10	2
Fir, alpine	83	6	Birch, western white	3	0
Hemlock, western	32	0	Cottonwood, black	1	2
Pine, lodgepole	26	45	Willow species	5	0
Pine, Scots	0	1			
Spruce, black	14	0			
Spruce, white	88	1			
Totals	280	55	Totals	19	5
			Miscellaneous hosts	5	1
			No host	1	0
			GRAND TOTALS	305	61

Table 2

Currently Important Insect and Disease 1/ Problems by Drainage Divisions, South Prince George District, 1967

Insect and disease problems	Principal hosts 2/	Importance by drainage divisions 3/		
		260	261	262
Bark Beetles				
Spruce beetle	wS	1	3	3
Mountain pine beetle	lP	3	3	2
Douglas-fir beetle	D	2	1	2
Western balsam bark beetle	alF	1	2	4
Defoliators				
Black-headed budworm	wH, wS, alF	1	1	3
Two-year-cycle spruce budworm	alF, wS	1	1	1
Foliage Diseases				
A pine needle cast	lP	4	1	1

Includes only weather-induced foliage diseases subject to notable annual fluctuation.

2/ Refer to host code in main district introduction.

3/ High populations 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

Spruce Beetle, Dendroctonus obesus (Mann.)

Although populations of the spruce beetle remained high in windfall in parts of the District, no white spruce were known to have been killed in 1967.

Overwintering mortality of spruce beetles in logs cut at four localities in the spring of 1966 was generally light, ranging from 3% at Wells to 22% at Aleza Lake (Table 3).

Table 3

Spruce Beetle Mortality in Logs Cut in Spring, 1966 and Examined in Spring, 1967, South Prince George District

Locality	No. of samples	Av. no. per sq. ft.				% mortality
		Adults		Larvae		
		Living	Dead	Living	Dead	
Aleza Lake	6	0.2	0	18.0	5.2	22
Pitoney Lake	4	0	0	29.0	2.5	8
Naver Road	4	0	0	47.5	3.0	6
Wells	4	0.2	0	25.2	0.7	3

Scattered tree mortality resulting from partial or "strip" attacks during the peak years of the outbreak continued. Dying and dead trees were most common in the Monkman, Willow, Naver and Big Valley sustained yield units.

The only fresh Dendroctonus attacks on standing trees observed in 1967 were in the Pass Lake area near McGregor. A few seed-block trees with root collars injured during scarification had attracted sporadic attacks; most of the beetles had been pitched out.

Aerial surveys were conducted in August; no evidence of current spruce beetle activity was observed.

Five permanent strips, one mile long and one chain wide, were cruised in September to detect freshly attacked trees and determine the prevalence of windfall and the level of beetle infestation of wind-thrown trees. No freshly infested trees were found; however, two trees near Wingdam had died as a result of partial attacks in the period 1962-1964.

Incidence of windfall was variable, with the pattern of distribution much the same as in 1966. There were no fresh windthrown trees at Barney Creek and Wingdam, and an average of 2.5 per acre at Pitoney Lake. Square-foot bark samples were removed from the lower, mid and upper bole of each recently windthrown tree and examined for spruce beetle broods. Most of the samples were infested (Table 4).

Table 4

Average Number of Fresh Windfall per Acre and Percentage of Bark Samples Infested by Spruce Beetles at Five Localities, South Prince George District

Locality	Av. no. fresh windfall per acre		% samples infested with spruce beetle	
	1966	1967	1966	1967
Barney Creek	0	0	-	-
Aleza Lake	0.3	0.4	89	100
Pitoney Lake	2.6	2.5	32	64
Naver Access Rd.	0.6	0.6	80	80
Wingdam	0.5	0	44	-

Life history plots were continued in 1967. Four-foot bolts were cut from freshly-felled trees in May and early in June at three localities; six bolts were placed in shaded sites and six in the open. In September, the number of larvae, pupae and adults in square-foot bark samples from each bolt were counted to determine the stage of development reached by broods established in 1967. Although the unusually warm summer had apparently accelerated development at the two low-elevation plots, the majority of broods were still in the larval stage as shown below:

Location	Elevation	Av. no. per sq. ft.		
		Larvae	Pupae	Adults
Aleza Lake	2,100	29	3.2	9.0
Pitoney Lake	3,200	39	0.4	3.1
Wells	4,100	90	0	0

As beetles that reach the adult stage late in the season are believed to be more susceptible to low winter temperatures than larvae and older adults, the acceleration of the life cycle in 1967 may not have much effect on the size of the 1968 beetle flight. The outlook for 1968 is for a continuing hazard in areas where high beetle populations are present in windfall and logging slash.

Mountain Pine Beetle, *Dendroctonus ponderosae* Hopk.

Infestations of mountain pine beetle persisted in lodgepole pine stands in the southern part of the Quesnel district on both sides of the Fraser River, and to a lesser extent, in the Valemount area. The greatest increase in tree mortality since 1966 occurred near Tingley Creek, west of the Fraser River, and east of the Fraser near Eveline Lake. A large part of the infestation near Cuisson Lake was logged in 1966 and 1967. Table 5 shows, by locality, the number of trees and estimated volume killed by mountain pine beetles in 1965 and 1966, as determined by aerial surveys in 1967. Volumes are based on measurement of beetle-killed trees at Cuisson Lake and Narcosli Creek.

Table 5

Number and Volume of Lodgepole Pine Killed by Mountain Pine Beetles in 1965 and 1966 in South Prince George District, as Determined by Aerial Surveys in 1967

Locality	No. of trees	Volume (cu. ft.)
Cuisson Lake	475	14,250
Tingley Creek	985	29,550
Upper Narcosli Creek	600	18,000
Eveline Lake	120	3,600
Canoe River	50	1,500
Swift Creek	25	750
Totals	2,255	67,650

Douglas-fir Beetle, *Dendroctonus pseudotsugae* Hopk.

Surveys in 1967 revealed no major tree mortality caused by Douglas-fir beetles. The only noteworthy infestation was in the Canoe River Valley near Hugh Allan Creek; 126 trees attacked in 1967 were already fading by mid-August. Scattered mature Douglas-firs had been killed north of Giscome Canyon on the Fraser River.

There was a sharp decline in tree mortality in Castle Creek Valley near McBride where 400 red-tops were counted in 1966.

Western Balsam Bark Beetle, *Dryocoetes confusus* Swaine

Scattered, recently-killed alpine fir were noted over extensive areas covered by aerial surveys in 1967. This mortality, believed to have been caused by the western bark beetle associated with a fungus *Ceratocystis dryocoetidis* Kendrick and Molnar, was most prevalent in the eastern part of the District. Heaviest concentrations of dead trees were along the Fraser River Valley between McKale and Laselle creeks, and in the valleys of Slim and Kenneth creeks.

Defoliators

Black-headed budworm, *Acleris variana* (Fern.)

Black-headed budworm populations increased throughout the District in 1967. Localized light infestations developed in mature hemlock stands at West Twin Creek and Goat River near McBride, and in the Torpy and McGregor River valleys east of Upper Fraser in mixed stands of white spruce, alpine fir and western hemlock.

Although no defoliation was visible from the air, understory hemlocks were noticeably defoliated near the lower margins of mature hemlock stands on the valley sides at West Twin Creek and Goat River. The elevation at both localities was between 2,800 and 3,000 feet.

A mass collection of 213 pupae taken at West Twin Creek on August 8 produced only 11 hymenopterous parasites; 61% of the pupae produced moths.

The increase in black-headed budworm populations, demonstrated by occurrence in random beating collections in the period 1965 to 1967, is shown in Table 6.

Table 6

Summary of Black-headed Budworm Collections,
South Prince George District

Host	No. of samples taken during larval period			% samples containing larvae			Av. no. larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
wS	65	71	74	23	41	61	2.9	4.0	10.9
alF	46	61	55	24	38	65	1.5	2.5	10.4
wH	9	13	28	33	69	75	1.3	2.8	28.2
D	19	24	17	0	4	12	-	1.0	1.0

Above-average populations may persist in the eastern part of the District in 1968.

Two-year-cycle Spruce Budworm, *Choristoneura fumiferana* (Clem.)

Populations of the two-year-cycle budworm remained low throughout the District. Few larvae were collected and no damage was observed.

Four permanent plots in stands where infestations had occurred within the last decade were sampled in June. Branches were clipped from the mid-crowns of 10 alpine fir trees at each plot, and the foliage examined for larvae and defoliation. A comparison of results of plot examinations in the non-flight years 1963, 1965 and 1967 shows a continuing trend towards lower populations except at Barkerville where there was a slight increase in 1967 (Table 7).

Table 7

Number of Two-year-cycle Spruce Budworm Larvae per Square Foot of Alpine Fir Foliage at Five Plots, South Prince George District

Location	No. larvae per sq. ft.		
	1963	1965	1967
George Mountain	6.2	1.2	0
Strathnaver	1.6	0.2	0
Hay Lake	0.7	0.5	0.1
Genevieve Lake	2.7	0.4	0
Barkerville	7.9	0.1	0.2

Mortality plots, each consisting of 100 understory trees, were examined at George Mountain, Strathnaver, and Hay and Genevieve lakes. As several years have elapsed since heavy defoliation occurred at these localities, most of the trees were increasing in vigour; the most serious effect of budworm damage appeared to be multiple leader growth.

Other Noteworthy Insects

Western Hemlock Looper, *Lambdina fiscellaria lugubrosa* (Hulst)

Populations of the western hemlock looper remained low in 1967. Although there was a decrease in the percentage of positive collections from western hemlock, larvae were taken more frequently from other coniferous hosts than in 1966 (Table 8).

Table 8

Summary of Western Hemlock Looper Collections
South Prince George District

Host	No. of samples taken during larval period			% samples containing larvae			Av. no. larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
wS	84	75	63	5	5	22	1.0	1.2	1.3
alF	62	59	58	15	8	14	1.4	1.8	1.4
wH	18	13	28	28	23	7	3.0	1.0	1.5
D	27	23	25	0	0	28	-	-	1.1

Aspen Leaf Miner, *Phyllocnistis populiella* Chamb.

Aspen leaf miners remained scarce in 1967 except in the McBride district where extensive stands of trembling aspen were infested. Four plots in the Prince George area were sampled by examining the leaves from 1-foot branches cut from each of 10 trees. Table 9 shows the percentage of leaf surfaces mined and the number of adult miners produced per 100 leaf surfaces. Although there was an increase at all plots, miner populations were still too low for the samples to yield reliable data on causes of mortality in the cocoon stage.

Table 9

Percentage Aspen Leaf Surfaces Mined and Numbers of Leaf Miner
Adults Produced per 100 Leaf Surfaces, South Prince George District

Locality	% leaf surfaces with mines			No. adults produced per 100 leaf surfaces		
	1965	1966	1967	1965	1966	1967
Cale Creek	1.9	0.7	3.4	0.1	0	0.6
Stone Creek	1.2	0.3	0.8	0.2	0	0.1
Woodpecker	6.4	1.6	10.6	0.1	0.5	1.2
Hison	1.3	1.2	4.5	0.1	0.1	1.0

A Leaf Blotch Miner, Lyonetia sp.

An infestation of blotch miners caused severe browning of white birch stands for 12 miles along the Fraser River from Tête Jaune to Red Pass. Foliage of willows, alders and mountain ash was lightly infested.

Table 10

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Cryptorhynchus lapathi L. Poplar-and-willow borer	bCo, W	Tête Jaune	Stem borer. Infestation increasing.
Nymphalis antiopa L. Mourning cloak butterfly	tA, W	Prince George Quesnel	Defoliator, Increase in 1967.
Phyllophaga sp. White grubs	wS	Redrock Nursery	Root feeder. No damage in 1967.
Pissodes engelmanni Hopk. Engelmann spruce weevil	wS, lP, bS	General	Leader borer. Infesting lP at Hixon, bS at Nazko.
Pristiphora erichsonii (Htg.) Larch sawfly	Siberian larch	Prince George	Defoliator. Light damage on ornamentals.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

A Needle Cast, Hypodermella concolor (Dearn.) Darker

Lodgepole pines on the plateau between the Fraser River and Nazko in the Quesnel district were infected with this needle cast fungus. Immature trees between Canyon Lake and Udy Creek were most heavily damaged; over 90% of the 1966 needles on some saplings had been killed. Mature stands were not so seriously damaged.

Stem Diseases

Stem Cankers of Lodgepole Pine, *Atropellis piniphila* (Weir) Lohm. and Cash and *Peridermium stalactiforme* Arth. and Kern

A survey was conducted in 1967 to determine the distribution of these fungi which cause lesions on the stems of lodgepole pine. Fifty trees in each of 20 plots were examined and the number of stems infected by each organism and the number of lesions per tree were recorded. Ground cover was examined for the presence of Indian paint brush, *Castilleja* spp., alternate hosts of *Peridermium stalactiforme*.

Atropellis was found on 13 plots; the heaviest infection was at Milburn Mountain west of Quesnel, where 30% of the trees had cankers. *Peridermium* was present on nine plots (Table 11).

Table 11

Lodgepole Pine Stem Canker Survey,
South Prince George District, 1967

Locality	% stems infected by		Indian paint brush present
	Atropellis piniphila	*Peridermium stalactiforme*	
Ferndale	2	4	x
Foreman	20	0	x
Shelley	18	6	x
Prince George	0	2	
Purden Lake	6	0	
Thursday Creek	2	0	
Stoner	0	0	
Woodpecker	20	6	x
Hixon	0	14	x
Wingdam	2	0	
Wells	0	0	x
Barkerville	6	6	x
Penny	0	0	
Milburn Mtn.	30	8	x
Puntchezakut L., 3 Mi. E.	4	0	x
Puntchezakut L., 4 Mi. W.	6	0	
Puntchezakut L., 10 Mi. W.	0	16	x
Nazko	0	12	
McLeese L.	8	0	
Jackman	12	0	

Exotic Plantations

Two exotic plantations were examined; one was a Scots pine plantation at Aleza Lake and the other mixed conifers at Prince George Experimental Farm (Table 12).

Table 12

Exotic Plantation Examinations, 1967

XP No.	Location	Exotic species	Remarks
40	Aleza Lake	Pinus sylvestris	7 of 50 trees examined had branches pulled from stem, apparently by subsidence of snow when branches frozen in crust. 2 trees infested with pitch nodule maker, Petrova sp.
117	Prince George	mixed conifers	50 Pinus sylvestris examined; 3 dead, 3 missing, presumably cut down. Remainder growing slowly; poor site. A few colonies of larch sawfly on Larix sibirica.

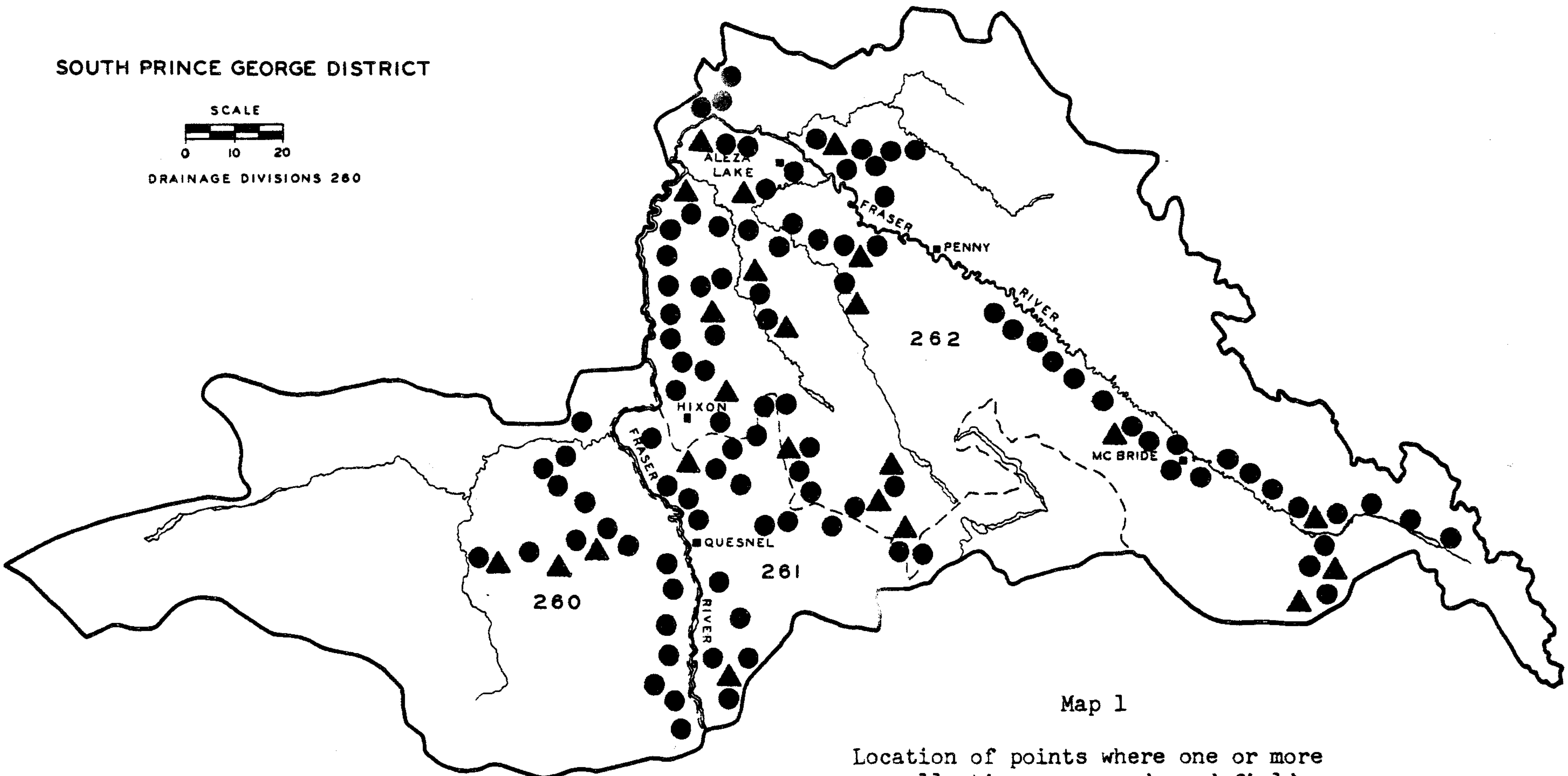
Table 13

Other Diseases of Current Minor Significance

Organism and disease	Hosts	Locality	Remarks
Ciborinia whetzelii (Seaver) Seaver Ink spot on aspen	tA	Strathnaver	Scattered patches of heavy infection.
Didymascella thujina (Durand) Cedar leaf blight	wC	Lamming Mills	Common on regeneration.
Hypodermella abietis-concoloris (Mayr) Dearn. Alpine fir needle cast	alF	Barkerville	Very light infection.

Table 13 Continued

Organism and disease	Hosts	Locality	Remarks
Isthmiella n. sp. Alpine fir needle cast	alF	Dore R., Upper Fraser Barkerville	Individual trees heavily infected; kills previous year's needles.
Lophodermium macrosporum (Hart.) Rehm Spruce needle cast	eS	Dore R.	Severe needle loss on some trees.
Venturia populina (Vuill.) Fabric. Poplar leaf and shoot blight	bCo	Cinema, Stoner	Kills leaves and young shoots.
An unidentified foliage disease	tA	Widespread, Prince Geo., and Hixon districts.	Causes browning of entire stands, premature loss of leaves.



Map 1

Location of points where one or more collections were made and field records taken in 1967.

Forest insect ●

Forest disease ▲

FOREST INSECT AND DISEASE SURVEY

WEST PRINCE GEORGE DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

WEST PRINCE GEORGE DISTRICT

1967

D. Beddows 1/

INTRODUCTION

Regular field work in the District began on May 29 and ended on October 5. Two and a half weeks were spent on special surveys. Two days in August were used for an aerial survey to map spruce beetle and mountain pine beetle infestations and alpine fir mortality. One week in June and another in September was spent on a spruce beetle survey in West and South Prince George districts. Two days in September were used to assist in a wood borer study at Alexandra Forest Products, Mackenzie.

Table 1 shows the forest insect and tree disease collections by host; Map 1 shows the distribution of collections and field records taken. The principal problems in each Forest Insect and Disease Survey Drainage Division are shown in Table 2. These Drainage Divisions are illustrated on Map 1.

Table 1

Collections by Hosts

West Prince George,District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Douglas-fir	8	0	Black cottonwood	0	2
Fir, alpine	75	8	Trembling aspen	6	2
Pine, lodgepole	52	46	Willow	1	0
Spruce, black	24	3			
Spruce, white	126	4			
Larch, eastern	3	0			
Totals	288	61	Totals	7	4
			No hosts	13	0
			GRAND TOTALS	308	65

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

Table 2

Currently Important Insect and Disease 1/
Problems by Drainage Divisions, West Prince George District, 1967

Insect and disease problems	Principal hosts 2/	Importance by drainage divisions 3/					
		280	281	282	283	284	285
Bark Beetles							
Spruce beetle	wS	1	1	2	1	0	0
Mountain pine beetle	lP	1	1	2	1	0	0
Western balsam bark beetle	alF	1	0	3	3	0	0
Wood Borers							
Cerambycidae	wS, lP, alF	3	0	3	3	0	0
Foliage Diseases							
A foliage disease on aspen	tA	4	4	4	4	0	0

Includes only weather-induced and foliage diseases subject to notable annual fluctuation.

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

Spruce Beetle, Dendroctonus obesus (Mann.)

The spruce beetle population remained at a high level in windfall throughout the West Prince George District in 1967, although no recent attacks on standing trees were noted. Overwintering beetle mortality counts were made in June at Tudyah, McLeod and Kerry lakes. Square-foot bark samples were taken from log bolts cut in the spring of 1966 and the number of dead and living spruce beetle larvae and adults recorded. The findings are as follows:

Location	Av. no. per sq. ft.			
	Adults		Larvae	
	Living	Dead	Living	Dead
Tudyah Lake	0.2	0	10.2	1.0
McLeod Lake	0.4	0	28.6	3.2
Kerry Lake	0	0	12.0	1.2

No recent beetle-killed trees were sighted during the aerial survey.

The permanent cruise strip at McLeod Lake consisting of a one-mile-long by one-chain-wide strip was examined for newly attacked trees and windfall in September. No recently attacked trees were found; there were three windthrown trees of which two were infested.

Although no standing trees were attacked, this beetle in windfall continued to present a hazard.

Mountain Pine Beetle, Dendroctonus ponderosae Hopk.

The amount of mountain pine beetle damage recorded on aerial surveys decreased drastically in comparison with 1966 (Table 3). The only infested area was at Dominion Point on Takla Lake where 600 lodgepole pine trees had been killed in recent years.

Table 3

Numbers of Lodgepole Pine Trees Killed by Mountain Pine Beetle, 1963-64, 1964-65 and 1965-66, as Determined by Aerial Surveys, West Prince George District, 1965, 1966 and 1967

Locality	Est. no. trees killed		
	1963-64	1964-65	1965-66
Kuzkwa R.	12,200	220	0
Tarnezell L.	75	0	0
Trembleur L.	200	0	0
Tochcha L.	115	0	0
Takla L.	18,300	6,000	600
Natowite L.	600	220	0
Inzana L.	-	250	0
Totals	31,490	6,690	600

The mountain pine beetle population is expected to remain low in 1968.

Western Balsam Bark Beetle, Dryocoetes confusus Swaine

An aerial survey in September 1967 indicated that this beetle continued to cause widespread light to heavy mortality of alpine fir in inaccessible areas between 3,000 to 5,000 feet elevation.

Severe infestations were observed southwest of Takla Lake, at Burden Lake and at Scovill Creek. There were light infestations west of Stuart Lake, at Tezzeron Lake, Airline Lake, Averil Mountain, Misch-insinlika Creek, Trembleur Lake, Sakeniche River, Tchentlo Lake, Dina Lake, Weston Lake and Tsedeka Creek.

No predictions can be made on this beetle's status in 1968.

Wood borers

Cerambycidae

Woodborers of the family Cerambycidae were present in varying numbers in windfall and decked logs throughout the District. Large piles of decked and bundled white spruce logs at Mackenzie were sprayed with Benzene hexachloride under the direction of H. A. Richmond, Consulting Forest Entomologist, in an attempt to cut down wood-borer attack. Spray was applied May 20-22 and July 15.

A special report on this project will be available for distribution in 1968.

A study using window flight traps was conducted at Northwood Pulp Mill, Prince George, to determine the flight period and abundance of wood borers in the vicinity of log decks and the effectiveness of two sizes of flight traps in catching adult wood borers. The large trap consisted of a 2 by 2 foot pane of glass within a wooden frame hung vertically in a metal trough containing water and ethylene glycol. The small trap consisted of a 12 by 12 inch pane of glass and a correspondingly smaller metal trough.

A small and large trap were set side by side at two locations on the log decks. They were visited once a week from June 9 to September 8 for transferral of trapped insects to vials of 90% alcohol. Table 4 shows the species of insects caught and their numbers compared by trap size.

Table 4

Number and Species of Insects Caught in Large and Small Flight Traps and their Flight Periods, Northwood Pulp Mill, Prince George, West Prince George District, 1967

Insect	Flight period	No. caught in large trap	No. caught in small trap
Acmaeops pratensis Leich.	Jul 8 - Jul 14	6	0
Acmaeops proteus Kby.	Jun 9 - Aug 11	13	6
Anoplodera sexmaculata (L.)	Jul 28	1	0
Asemum atrum Esch.	Jun 9 - Jun 16	3	2
Chrysobothris sp.	Jul 14 - Aug 18	6	0
Criocephalus productus Kby.	Jul 14 - Aug 28	8	0
Dicerca sp.	Jun 16	2	0
Melanophila sp.	Jul 8 - Sep 8	28	4
Monochamus oregonensis Lec.	Jul 30	1	0
Neocanthocinus pusillus Kby.	Jul 21	1	0
Neoclytus muricatulus Kby.	Jun 20 - Jul 14	4	1
Pachyta liturata Kby.	Jul 21 - Aug 18	7	0
Phymatodes dimidiatus Kby.	Jul 8	2	0
Pogonocherus sp.	Jul 28	1	0
Rhagium lineatum Oliv.	Jun 9 - Jun 16	3	2
Serropalpus sp.	Jun 30 - Sep 8	40	8
Spondylis upiformis Mann.	Jun 29	6	1
Tetropium cinnamopterum Kby.	Jul 8 - Aug 44	9	0
Tetropium sp. prob. parvulum	Jun 16 - Jul 8	2	0
Trypodendron sp.	Jun 9 - Sep 8	23	20

Table 4 Continued

Insect	Flight period	No. caught in large trap	No. caught in small trap
Urocerus sp.	Jul 21 - Aug 4	1	2
Utobium elegans (Horn)	Jun 9	0	1
Xeris spectrum (Linn.)	Jul 14	1	0
Xylita livida Sahlb.	Jun 9 - Aug 11	45	34
Xylotrechus undulatus (Say)	Jun 9 - Sep 1	14	2
Totals		227	83

The large traps averaged 8.1 insects a week compared with 2.9 insects a week in the small traps.

The study is to be continued in 1968.

Other Noteworthy Insects

Cooley Spruce Gall Aphid, *Adelges cooleyi* (Gill.)

Spruce gall aphid was common on white spruce and Douglas-fir throughout the southern portion of the West Prince George District. Notable populations were present in the Vanderhoof Ranger District along the Blackwater and Chilco roads and along Highway 16 in the Fort Fraser Ranger District. It is expected that the population of this gall aphid will remain much the same in 1968.

Two-year-cycle Spruce Budworm, *Choristoneura fumiferana* (Clem.)

Spruce budworm populations decreased at all four budworm study plots in the District. The plots were examined in June for larvae and infested tips. One 18-inch branch sample was taken from the mid-crown of each of 10 sample trees at each plot and the branch area measured. Buds were classified as infested, not infested and killed, and the larvae were counted on each branch sample. Adventitious buds were noted if present. Table 5 shows the comparative number of larvae per square foot and percentage of tips infested at each of the four plots for the last three non-flight years.

Table 5

Number of Spruce Budworm Larvae per Square Foot of Foliage and % Tips Killed, West Prince George District

Locality	No. larvae per sq. ft.			% tips killed		
	1963	1965	1967	1963	1965	1967
Davie Lake	0.4	0.3	0.0	6.0	0.1	0.0
Tudyah Lake	2.7	0.2	0.0	17.0	0.1	0.0
Pine Pass	6.1	2.1	0.0	38.0	9.0	0.0
Big Creek	2.5	6.6	0.1	24.0	12.0	0.0

There was no noticeable defoliation at any of the plots, Generally, the understory sample trees on the plots were in poor condition due to past budworm feeding and suppression. The greatest amount of damage appeared to have been caused by winter browsing by moose.

Spruce budworm decreased in frequency of occurrence and abundance from 1965 in random collections. The incidence of larvae in three-tree beating collections from white spruce and alpine fir during the larval period June 8 to July 10 for the non-flight years 1963, 1965 and 1967 is as follows:

Host	No. collections during larval period			% containing larvae			Av. no. of larvae per positive sample		
	1963	1965	1967	1963	1965	1967	1963	1965	1967
White spruce	20	40	43	25	5	5	11.6	2.0	0.1
Alpine fir	16	13	28	66	1	0	6.5	1.0	0.0

Douglas-fir Beetle, Dendroctonus pseudotsugae Hopk.

The Douglas-fir beetle population was virtually non-existent. No new beetle-killed Douglas-fir trees were seen during aerial surveys.

Aspen Leaf Miner, Phyllocnistis populiella Cham.

The aspen leaf miner population, based on samples taken at five leaf miner plots, increased in 1967 over much of the District. One 12-inch branch sample was taken from each of the 10 tagged sample trees at each plot and the leaves examined to determine the percentage of leaf surfaces mined and number of adults produced (tables 6 and 7).

Table 6

Percentage of Aspen Leaf Surfaces Mined and Numbers of Aspen Leaf Miner Adults Produced per 100 Leaf Surfaces, West Prince George District

Locality	% leaf surfaces with mines			No. of adults produced per 100 leaf surfaces		
	1965	1966	1967	1965	1966	1967
Hart Hwy. Mi. 79	2.0	0.4	6.7	0.3	0.0	0.8
Hart Hwy. Mi. 103	2.0	0.4	4.4	0.0	0.3	0.1
Shelley	3.0	4	17.4	0.2	0.1	13.2
Vanderhoof	0	0	0.9	0.0	0.0	0.1
Endako	7	13	3.3	2.2	5.0	0.6

Table 7

Mortality of Aspen Leaf Miner in Cocoons, Based on Cocoon Samples 1/ at Five Plots, West Prince George District

Locality	Percentage mortality					
	Parasitism			Other causes		
	1965	1966	1967	1965	1966	1967
Hart Hwy. Mi. 79	20	25	19	20	0	60
Hart Hwy. Mi. 103	0	0	43	75	0	43
Shelley	33	20	12	0	20	3
Vanderhoof	-	0	20	-	0	48
Endako	16	16	22	24	12	43

1/ Based on less than 100 cocoons.

Heavy infestations occurred along the Vanderhoof-Fort St. James Road, along Highway 16 from Vanderhoof to Engen and at various locations along the Hart Highway. None of the established plots was within the boundaries of these infestations. The rise in population is expected to continue in 1968.

Yellow-headed Spruce Sawfly, Pikonema alaskensis Roh.

This species occurred generally throughout the West Prince George District on white spruce. The following data show a continuing decline in the population since 1965.

No. collections during larval period			% collections containing larvae			Av. no. larvae per positive collection		
1965	1966	1967	1965	1966	1967	1965	1966	1967
128	53	68	36	13	24	1.8	1.4	0.4

Green-headed Spruce Sawfly, *Pikonema dimmockii* (Cress.)

Although more abundant on white spruce, this defoliator occurs on black spruce as well. Low populations persisted throughout the District. The following data show that the average number of larvae per collection was lower in 1967 than in 1966 and 1965.

No. collections during larval period			% collections containing larvae			Av. no. larvae per positive collection		
1965	1966	1967	1965	1966	1967	1965	1966	1967
128	60	87	34	35	30	1.6	1.4	0.5

Table 8

Other Insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Acleris variana (Fern.) Black-headed budworm	wS, alF D, bS	Widespread	Defoliator, average 2.0 larvae per positive sample.
Caripeta divisata Wlk. Grey forest looper	wS, alF, bS	Widespread	Defoliator, light population.
Eupithecia luteata bifasciata Dyar A looper	D, bS alF, wS	Widespread	Defoliator, an average of 1.6 larvae per positive collection.
Trypodendron sp. Ambrosia beetle	wS	Mackenzie	Wood borer, light attack in log decks at Mackenzie.

Table 8 Continued

Insect	Hosts	Locality	Remarks
Zeiraphera fortunana Kft. A budmoth	bS, alF, D, wS	Widespread	Defoliator, an average of 2.4 larvae from 23 positive collections.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Foliage Diseases

Browning Disease on Aspen

A disease causing aspen leaves to wither was first noticed in early June along Highway 16 in the Vanderhoof Ranger District. Later in the season stands along the Hart Highway from Prince George north to Pine Pass, along the Blackwater Road, and along the Vanderhoof-Fort Saint James Road were heavily infected. Samples of diseased foliage are being identified.

Stem Diseases

Disease - Western Balsam Bark Beetle Complex on Alpine Fir

The current status of the western balsam bark beetle is discussed in the insect portion of this report. Investigations are being conducted to determine to what extent the disease organism, _Ceratocystis dryocoetidis_ Kendrick and Molnar, contributes to the overall alpine fir mortality. Research into the problem is being carried on by the Department of Forestry and Rural Development at the Regional Laboratory at Victoria.

Mistletoe Disease

Lodgepole Pine Dwarf Mistletoe, _Arceuthobium americanum_ Nutt. ex Engelm.

Light to heavy infections of this parasite on young and mature lodgepole pine occurred over much of this host's range. A collection made at Germansen Landing in the Fort St. James Ranger District constituted a new locality record. At Fort Fraser the infection was generally severe in trees under 6 inches dbh. The stand was exclusively young lodgepole pine.

Other Noteworthy Diseases

Canker Damage to Lodgepole Pine

Distribution records were required for two diseases which cause cankers on lodgepole pine, *Atropellis piniphila* (Weir) Lohman and Cash, and *Peridermium stalactiforme* Arth. and Kern. Nineteen stands of lodgepole-pine, at least 5 miles apart, were examined. Fifty trees in a straight line were examined. The presence of Indian paintbrush, an alternate host of *Peridermium stalactiforme* Arth. and Kern, was recorded (Table 9).

Table 9

Location and Results of *Atropellis piniphila* and *Peridermium stalactiforme* Survey, West Prince George District, 1967

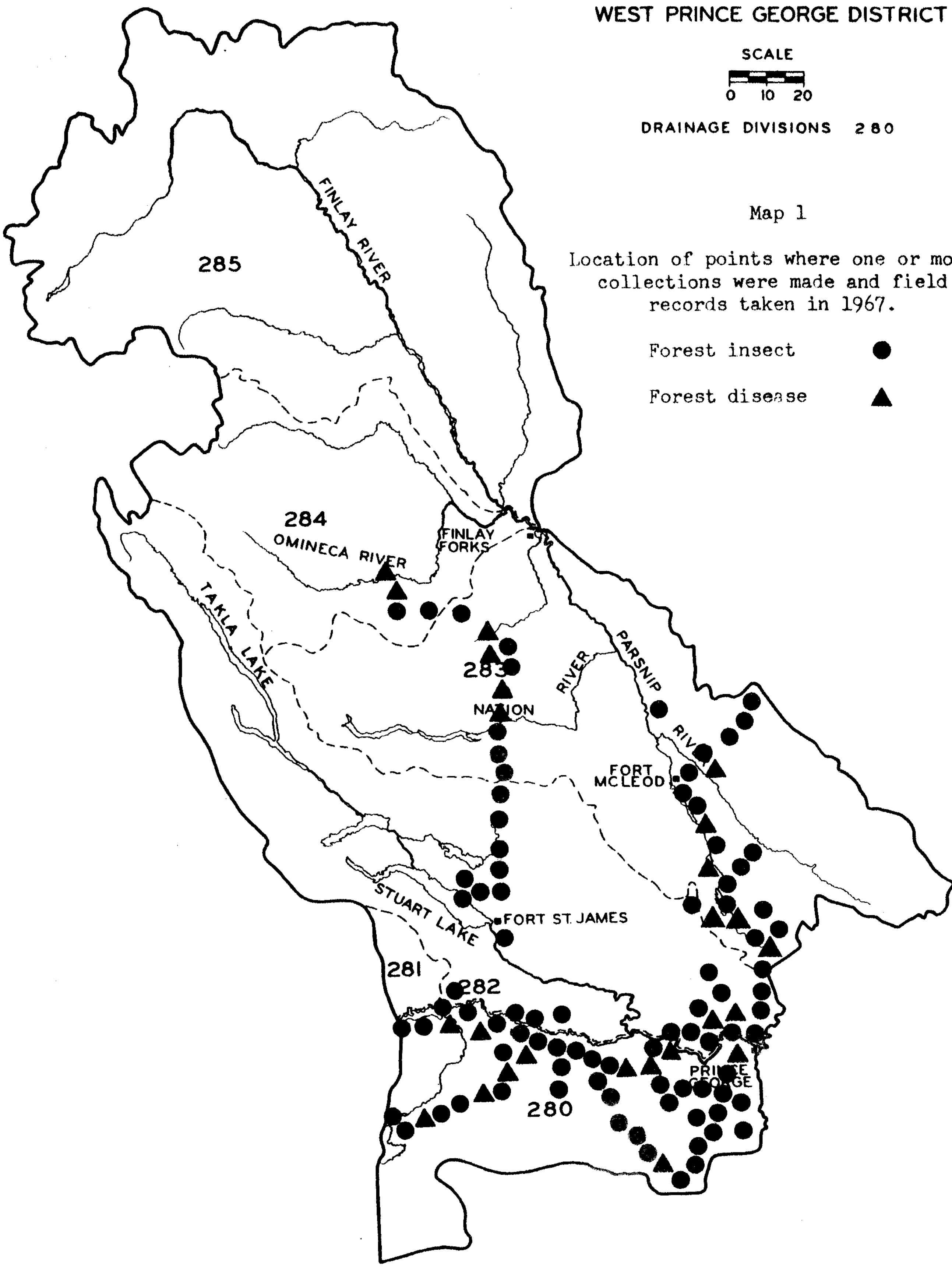
Location	% stems infected by		Indian paintbrush present 1/
	Peridermium	*Atropellis*	
Manson River	8	0	n
Omineca River	2	0	n
Germansen Ldg.	8	0	y
Upper Gaffney Cr.	4	0	n
10 Mi. South Upper Gaffney Cr.	2	0	n
Sylvester Cr.	0	0	n
Mi. 38 Hart Hwy.	2	0	n
Ft. Fraser	4	0	y
Mile 46 Hart Hwy.	8	0	n
Mi. 3.7 Telegraph Rd.	8	0	n
S. of McLeod Lk.	0	0	y
E. of McLeod Lk.	0	10	n
Mi. 17 Kenny Dam Rd.	0	14	y
Mi. 24 Kenny Dam Rd.	14	8	n
Mi. 35 Kenny Dam Rd.	0	2	n
Mi. 42 Kenny Dam Rd	0	6	y
Cluculz Lake	8	12	y
Bednesti Lake	0	4	y
Parsnip R. Bridge	2	10	n

1/ n - no
6 - yes

Table 10

Other Diseases of Current Minor Significance

Organism and Disease	Host	Locality	Remarks
<u>Bifusella crepidiformis</u> Darker Needle cast	bS	Germansen Landing	Common in immediate area. Light infection.
<u>Chrysomyxa</u> <u>arctostaphyli</u> Diet. A spruce broom rust	wS, bS	Widespread	Most severe in black spruce stands.
<u>Hypodermella</u> <u>concolor</u> (Dearn.) Darker Needle cast	lP	Hoodoo Lake	Very light infection. One of the most virulent needle cast fungi on lodgepole pine.
<u>Lirula</u> <u>abietis-concoloris</u> (Mayr ex. Dearn.) Darker Needle cast	alF	Link Creek	Light infection. Rocky Mountains.
<u>Phacidium</u> <u>abietis</u> (Dearn.) Reid and Cain Snow blight	alF	Pine Pass	Light infection.



Map 1

Location of points where one or more collections were made and field records taken in 1967.

FOREST INSECT AND DISEASE SURVEY

NORTH PRINCE GEORGE DISTRICT

1967

FOREST INSECT AND DISEASE SURVEY

NORTH PRINCE GEORGE DISTRICT

1967

D. G. Lund [1/]

INTRODUCTION

Regular field work in the District commenced on June 7 and terminated September 8. Special aerial and ground surveys for spruce budworm damage were made in the Liard and Fort Nelson River drainages from July 24 to 31. A total of 5 hours and 20 minutes flying time was utilized in this survey. Numbers of larval defoliators found in field collections increased in 1967; 54% of beating collections contained larvae in 1967 compared with 41% in 1966.

Spruce budworm was the only major problem of the District in 1967. Larch sawfly persisted but areas where noteworthy defoliation occurred diminished. Aspen leaf miner continued to increase along the Yukon border. A spruce needle cast, *Bifusella crepidiformis* Darker, was collected for the first time in the Province and reached epidemic levels near Atlin.

Insect and disease collections made in the District are shown by host in Table 1; collection localities and drainage divisions are shown on maps 1 and 2. The specific problems in each of the drainage divisions surveyed are tabulated in Table 2.

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

Table 1

Collections by Hosts,

North Prince George District, 1967

Coniferous hosts	Forest insects	Forest diseases	Broad-leaved hosts	Forest insects	Forest diseases
Fir, alpine	19	6	Aspen, trembling	22	7
Juniper, common	2	1	Birch species	8	1
Larch, eastern	41	0	Cottonwood, black	4	0
Pine, lodgepole	44	43	Poplar, balsam	2	0
Spruce, black	26	4	Willow species	18	1
Spruce, white	135	22			
Totals	267	76	Totals	54	9
			Miscellaneous hosts	15	6
			No host	1	0
			GRAND TOTALS	337	91

Table 2

Currently Important Insect and Disease 1/ Problems by Drainage Divisions, North Prince George District, 1967

Insect and disease problems	Principal hosts 2/	Importance by drainage divisions 3/							
		300	301	302	303	304	305	306	307
Defoliators									
One-year-cycle spruce budworm	wS, alF, tL, bS,	0	1	5	4	2	0	0	0
Larch sawfly	tL	2	2	2	0	0	0	0	0
Leaf Miners									
Aspen leaf miner	tA	1	1	1	0	4	3	0	2
Weather Damage									
Frost damage	alF, lP, bCo	1	1	4	0	1	1	0	0
Foliage Diseases									
A spruce needle cast, *Bifusella crepidiformis* Darker	wS	0	0	1	0	0	4	0	0
A spruce needle rust, *Chrysomyxa ledicola* Lagerh.	wS	3	4	1	0	1	1	0	0
An alpine fir needle rust, *Peridermium holwayi* Syd.	alF	3	0	0	0	2	0	0	0
A spruce needle rust, *Chrysomyxa weirii* Jacks	wS	1	1	1	0	1	1	0	0
Ink spot on aspen, *Ciborinia whetzelii* (Seaver) Seaver	tA	1	1	3	0	0	0	0	0

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

2/ Refer to host code in the Prince George 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 of insects and/or potential problem - 3.
Static or falling population and/or moderate numbers of insects and/or no problem at present - 2.
Endemic population and/or no significant damage - 1.
Not sampled and/or not found and/or no host - 0.

FOREST INSECT CONDITIONS

Currently Important Insects

Defoliators

One-year-cycle Spruce Budworm, *Choristoneura fumiferana* (Clem.)

The infestation of spruce budworm increased in parts of the North Prince George District in 1967. Heaviest defoliation occurred south and east of Fort Nelson, along valleys of the Fort Nelson River drainage system and along the Liard River from Mile 540 Alaska Highway to Liard Hotsprings. White spruce was the preferred host but alpine fir and larch were fed upon where larval populations were heaviest. A comparison of beating samples from white spruce in 1966 and 1967 shows a sharp increase over the 1966 level (Table 3).

Table 3

Summary of Spruce Budworm Collections by Drainage Divisions, North Prince George District

Drainage divisions	No. of samples taken during larval period			% samples containing larvae			Av. no. larvae per positive sample		
	1965	1966	1967	1965	1966	1967	1965	1966	1967
300	0	0	0	-	-	-	-	-	-
301	2	2	5	0	0	0	-	-	-
302	33	19	41	42	47	84	43	13	60
304	8	16	2	0	0	50	0	-	1
Totals	43	37	48	33	27	57	43	13	54

Aerial surveys were made on July 26, after larval feeding had been completed in all areas. There was moderate to severe defoliation of current year's foliage in spruce stands along the Fontas, Sikanni Chief, Muskwa, Prophet and the upper parts of the Fort Nelson and Liard rivers (Map 3). No damage was visible along the lower valleys of the Liard and Fort Nelson rivers where damage was last evident in 1965.

Two methods were used in ground surveys to measure budworm damage on white spruce. Estimates of defoliation of current year's growth were obtained at 12 localities by examining 10 overstory plot trees with binoculars. Damage was heavier at Parker Creek (Mile 247) and along the Liard River than in 1966 (Table 4).

Table 4

Estimated Percentage Defoliation of Current Year's Growth of White Spruce by One-year-cycle Spruce Budworm, North Prince George District

Location	% defoliation of current year's growth		
	1965	1966	1967
Mile 247 A.H.	90	74	85
270	30	4	tr
5 Sikanni Rd.	—	-	59
321 A.H.	80	22	10
335	95	22	5
342	70	13	10
494	95	12	tr
506	90	4	18
514	95	tr	5
Smith River Falls	-	-	34
Mile 528 A.H.	75	3	12
538	95	25	85

Information on accumulated defoliation was obtained by counting the needles for each year on 10 twigs from two branches cut from the upper crown of one overstory tree at each of the 12 plots (Table 5). Foliage loss appeared to be reaching a critical level at miles 247 and 538 Alaska Highway and at Smith River Falls.

Table 5

Percentage Total Defoliation of White Spruce by Spruce Budworm as Determined from Needle Counts on Two Sample Branches at Each Plot, North Prince George District

Location	% total defoliation of upper crown		
	1965	1966	1967
Mile 247 A.H.	34	46	82
270	16	16	24
5 Sikanni Rd.	-	-	51
321 A.H.	24	30	39
335	30	26	38
342	26	47	34
494	25	46	33
506	55	50	37
514	57	63	20
Smith River Falls	-	-	71
Mile 528 A.H.	43	20	44
538	49	53	78

Egg sampling was carried out at 12 permanent sampling stations along the Alaska Highway between miles 247 and 538. Two complete branches were taken from the south side of the upper crown of one overstory tree on the periphery of each plot. The branch area was computed, total defoliation determined, pupae counted for successful emergence and egg masses counted to obtain estimates of the 1968 population. Pupae were too scarce in most localities to yield reliable data on parasitism; where one or more pupae were found per square foot of foliage, parasitism ranged from 18% at Mile 335 to 80% at Mile 538 Alaska Highway.

Moderate to high egg populations were found at nine of the 12 sample points (Table 6). Medium to heavy defoliation may be expected in these localities in 1968.

Table 6

Defoliation, Adult Emergence, and Number of Egg Masses per 100 Square Feet of White Spruce Foliage, North Prince George District

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	1966	1967	1966	1967
Mile 247 A.H.	74	95	480	303	1,426	2,396
270	4	tr	0	25	40	99
5 Sikanni Rd.	-	80	-	425	-	1,058
321 A.H.	22	tr	25	0	25	0
335	22	5	0	132	10	131
342	13	tr	15	59	46	98
494	12	tr	0	20	0	0
506	4	tr	0	0	0	141
514	tr 1/	tr	0	0	43	28
Smith River Falls	-	50	-	0	-	116
Mile 528 A.H.	tr	tr	0	44	26	304
538	25	90	29	81	246	677

1/ trace

Larch Sawfly, Pristiphora erichsonii (Htg.)

Although the number of areas affected diminished, larval populations of larch sawfly increased in some stands of eastern larch in the North Prince George District as shown in the following summary of collections:

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive collection		
1965	1966	1967	1965	1966	1967	1965	1966	1967
29	29	25	59	61	56	12	14	50

The highest larval collection was 247 larvae taken in a quantitative beating sample at Mile 363 Alaska Highway. Many of these had parasitic Diptera eggs on them which may reduce populations significantly in 1968.

Defoliation in the Fort Nelson, Hudson Hope areas and along the Hart Highway northeast of Chetwynd was light and in some stands not visible.

Sequential sampling, a method used for determining larch sawfly population densities, was carried out in these areas and only one plot at Mile 30 Monkman Pass Road fell into the moderate band; all others were light.

Leaf Miners

Aspen Leaf Miner, *Phyllocnistis populiella* Cham.

Infestations remained heavy in stands of aspen along the Yukon border from Hyland River, extending south of Dease Lake, and as far west as Atlin Lake. All other regions were lightly infested. In August, two permanent plots at Hyland River and at Mile 45 Cassiar Road were heavily infested. The two plots at Prochniac Creek and Smith River were lightly infested and had insufficient cocoons to yield adequate data (Table 7).

Table 7

Comparison of Aspen Leaf Surfaces Mined and Number of Adult Aspen Leaf Miners Produced per 100 Leaf Surfaces, North Prince George District

Location	Percentage of leaf surfaces with mines			No. of adults per 100 leaf surfaces		
	1965	1966	1967	1965	1966	1967
Prochniac Cr.	0.0	0.0	3.6	0.0	0.0	0.0
Smith River	7.9	0.0	4.4	0.9	0.0	0.0
Hyland River	7.9	31.0	90.0	4.3	26.3	57.6
Mile 45 Cassiar Rd.	0.9	-	56.4	-	-	31.4

Parasitism increased at the Hyland River plot. In the 100 cocoon sample, 28% were parasitized, 13% dead, 1% otherwise destroyed and 58% emerged successfully. At the Cassiar plot, 17% were parasitized, 13% dead, 2% otherwise destroyed and 68% emerged successfully.

Other Noteworthy Insects

Bark Beetles

Spruce Beetle, *Dendroctonus obesus* (Mann.)

There was little or no spruce beetle activity in accessible stands of white spruce in the District in 1967. Aerial surveys showed some damage along the Liard River where trees had been weakened by spruce budworm feeding.

Western Balsam Bark Beetle, *Dryocoetes confusus* Swaine

There was further reduction in the infestation in alpine fir in the Pine Pass area.

Defoliators

Black-headed Budworm, *Acleris variana* (Fern.)

The average number of larvae per positive sample increased from 1.9 in 1966 to 3.0 in the current year as shown in the following summary of collections on white spruce:

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive collection		
1965	1966	1967	1965	1966	1967	1965	1966	1967
75	65	74	44	55	41	3.2	1.9	3.0

A Spruce Foliage Worm, *Dioryctria reniculella* Grt.

A defoliator of white spruce, this insect was most plentiful in stands of timber that were infested by spruce budworm. A noteworthy rise in population is illustrated in the following summary:

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive collection		
1965	1966	1967	1965	1966	1967	1965	1966	1967
60	54	42	1.7	7.4	10	1	2.2	11

Twenty-seven larvae were collected in a quantitative beating sample at Mile 538 Alaska Highway.

Green Larch Looper, Semiothisa sexmaculata (Pack.)

There was a substantial increase in larval populations of this geometrid in larch stands along the Hart Highway and in the Monkman Pass area, as shown in the following tabulation:

Number of samples taken during larval period			% samples containing larvae			Average number of larvae per positive collection		
1965	1966	1967	1965	1966	1967	1965	1966	1967
12	16	17	0	18	47	-	6	26

Table 8

Other insects of Current Minor Significance

Insect	Hosts	Locality	Remarks
Anoplonyx luteipes (Cress.) A native larch sawfly	tL	Hart Highway, Monkman Pass	Defoliator; increase in populations.
Campaea perlata Gn. A looper	tL, wS	Chetwynd	Defoliator; fairly common.
Diachus sp. A metallic leaf beetle	W	Kledo Cr.	A skeletonizer; moderate population.

Table 8 Continued

Insect	Hosts	Locality	Remarks
Disonycha alternata (Ill.) A leaf beetle	W	Raspberry Cr.	Defoliator; moderate to severe damage.
Hydriomena furcata Thun. A looper	W	M. 229, A.H.	Defoliator; light infestation.
Nematus sp. A sawfly	W, tA	Widespread	Common defoliator. Found throughout the District.
Operophtera bruceata (Hulst) Bruce spanworm	tA, W	Ft. St. John	Common defoliator. Highest population in the Peace R. region.
Petrova albicapitana (Busck) Pitch nodule moth	lP	General	Feeds in pitch nodules on stem and branch.
Pikonema alaskensis (Roh.) Yellow-headed spruce sawfly	wS	Widespread	Common defoliator. Greatest number of larvae collected at Mile 600 A.H.
Pikonema dimmockii (Cress.) Green-headed spruce sawfly	wS	Widespread	Common defoliator. Found throughout the District.
1967 Pissodes terminalis Hopp. Pine terminal weevil	lP	East Pine	A terminal weevil. Pupae and damage found only at East Pine.
Zeiraphera fortunana Kft. Yellow spruce budworm	wS	General	Defoliator; moderate numbers of larvae.
Zeiraphera improbana (Wlk.) A larch budmoth	tL	General	Defoliator; a decrease in population.

FOREST DISEASE CONDITIONS

Currently Important Diseases

Weather Damage

Lodgepole pine, alpine fir and black cottonwood trees were severely damaged by frost at high exposed altitudes in the Sentinel Mountain Range northeast of Fort Nelson.

Foliage Diseases

A Needle Cast on White Spruce, *Bifusella crepidiformis* Darker

White spruce in the Atlin region was moderately infected with this needle cast. Needles four years old and older had turned red and were beginning to drop. The most severe infection was at Discovery on the Surprise Lake Road. Lighter infections occurred along the Smith River Falls Road and the Liard River.

A Spruce Needle Rust, *Chrysomyxa ledicola* Lagerh.

A common disease in the District; white spruce was heavily infected along the Beaton River Road and moderately infected along the Hart Highway northeast of Chetwynd. Light infections occurred in other areas.

Alpine Fir Needle Rust, *Peridermium holwayi* Syd.

There was moderate infection of alpine fir by this disease in the Monkman Pass area and along the Dease Lake Road.

A Spruce Needle Rust, *Chrysomyxa weirii* Jacks

Light infection of needles of black and white spruce occurred at Mile 247 Alaska Highway and at Muncho Lake.

Ink Spot on Aspen, *Ciborinia whetzelii* (Seaver) Seaver

Infection of aspen trees in the Upper Halfway River and along the Alaska Highway south of Wonowon was light but at Mile 420 Alaska Highway the infection was moderate and had turned foliage brown on about 40 acres of immature trees.

Stem Diseases

Lodgepole Pine Stem Canker, *Atropellis piniphila* (Weir) Lohman & Cash

Twenty stands of lodgepole pine were examined in the District but the disease was not found.

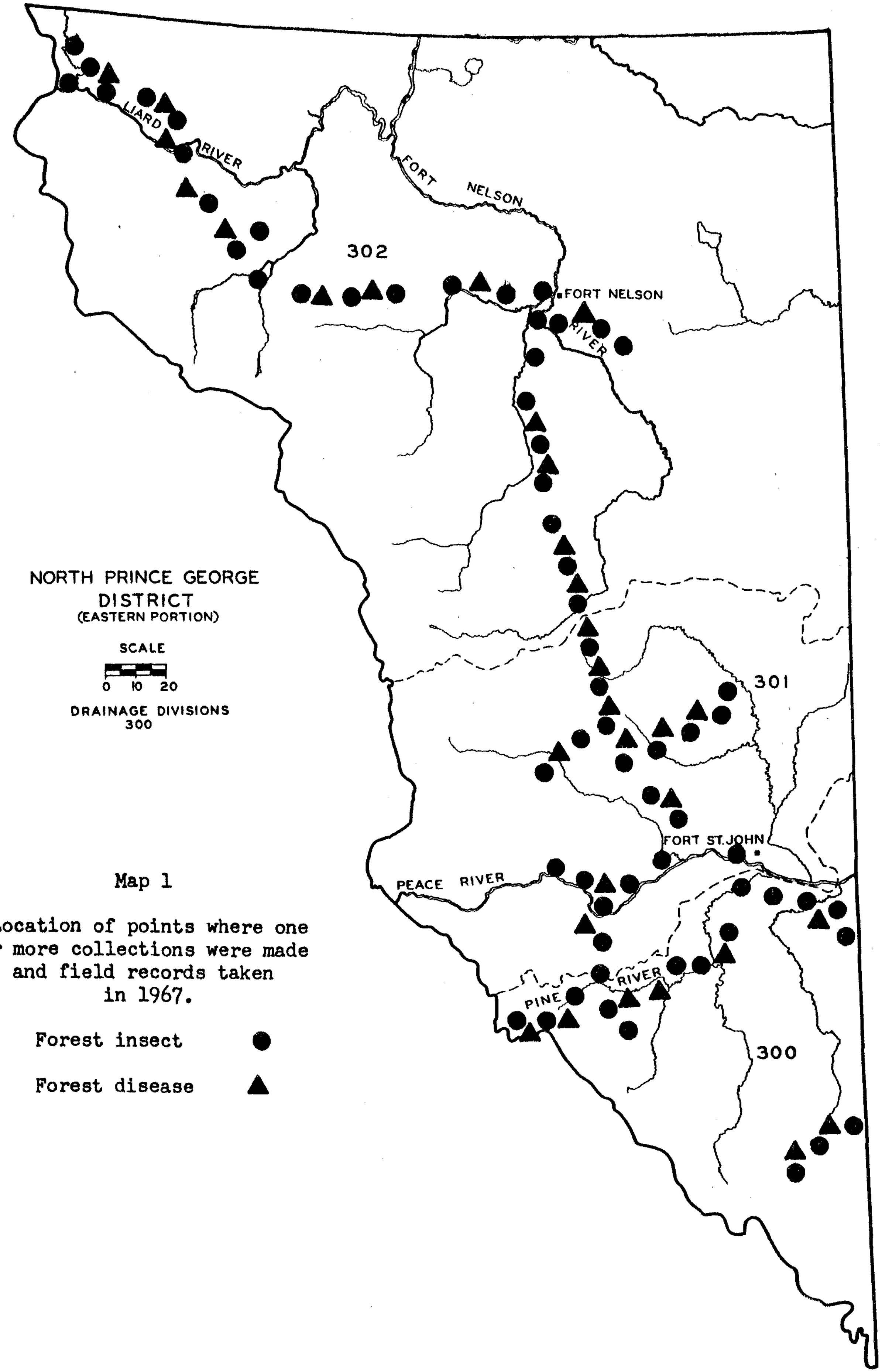
Lodgepole Pine Stem Blister Rust, *Peridermium stalactiforme* Arth. & Kern.

A search for this disease was made in the same 20 stands with negative results.

Table 9

Other Diseases of Current Minor Significance

Disease	Host	Locality	Remarks
Chrysomyxa arctostaphyli Diet. . Crown rust on black spruce	bS	Widespread	Common disease. Causes abnormal growth of branches and twigs.
Chrysomyxa pirolata Wint. A cone rust	bS, wS	Mi. 321.5 A.H.	Usually sporulates in mature cones but in this case it sporulated in immature cones.
Hypodermella ampla (Davis) Dearn. A needle cast on lodgepole pine	lP	Surprise L.	Light infection.
Hypodermella n. sp.	wS	Mi. 65 Dease L. Rd.	A new species infecting foliage of understory trees.
Lophodermium macrosporum (Hart) Rehm A needle rust	wS	Surprise L., Mi. 15 Cassiar Rd.	Light to moderate infection.
Melampsorella caryophyllacearum Schroet. Broom rust on alpine fir	alF	Peace River region	General in major stands of alpine fir.
Peridermium harknessii J. P. Moore Native blister rust	lP	Widespread	A light to moderate infection throughout the District.

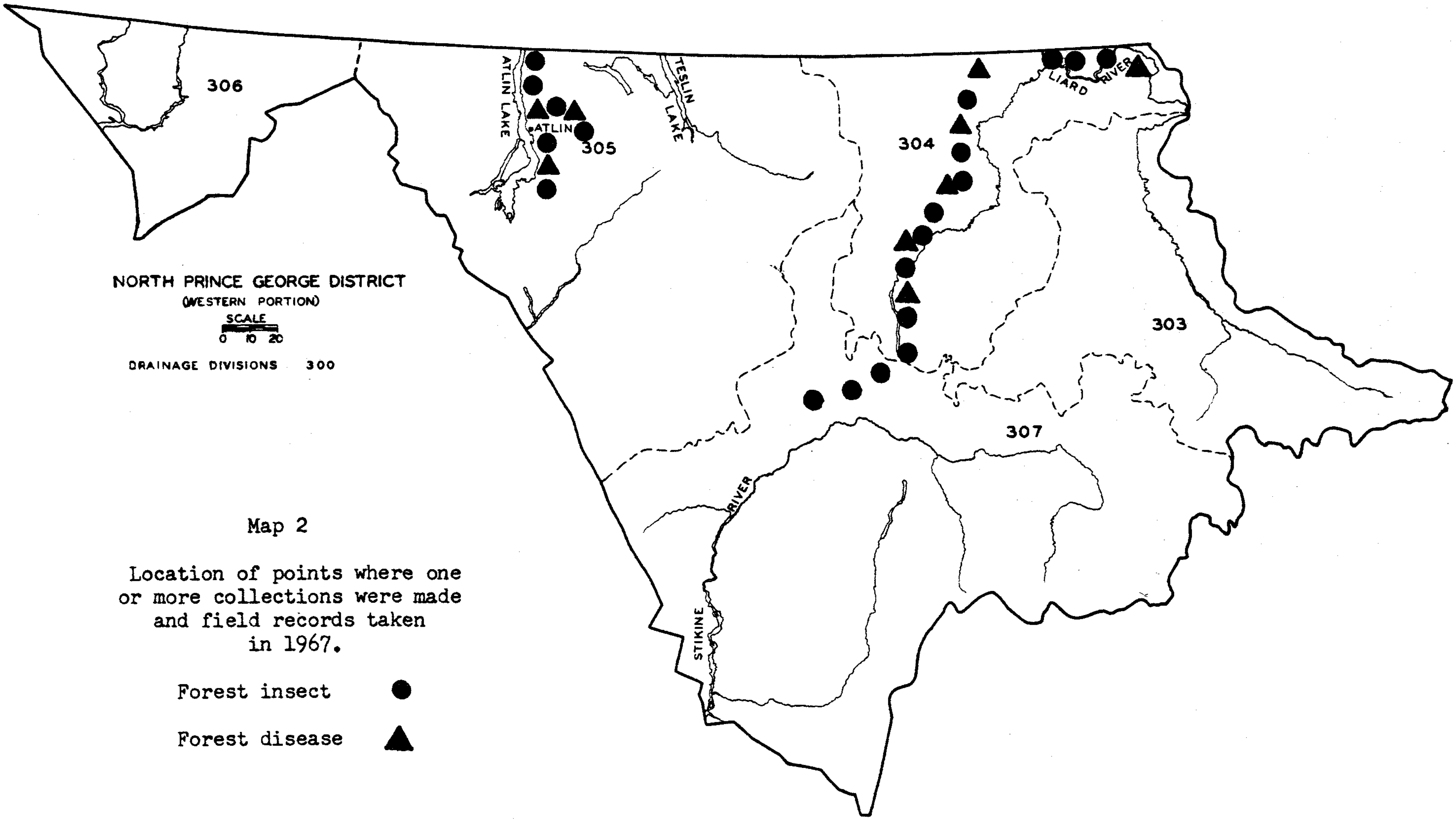


Map 1

Location of points where one or more collections were made and field records taken in 1967.

Forest insect ●

Forest disease ▲

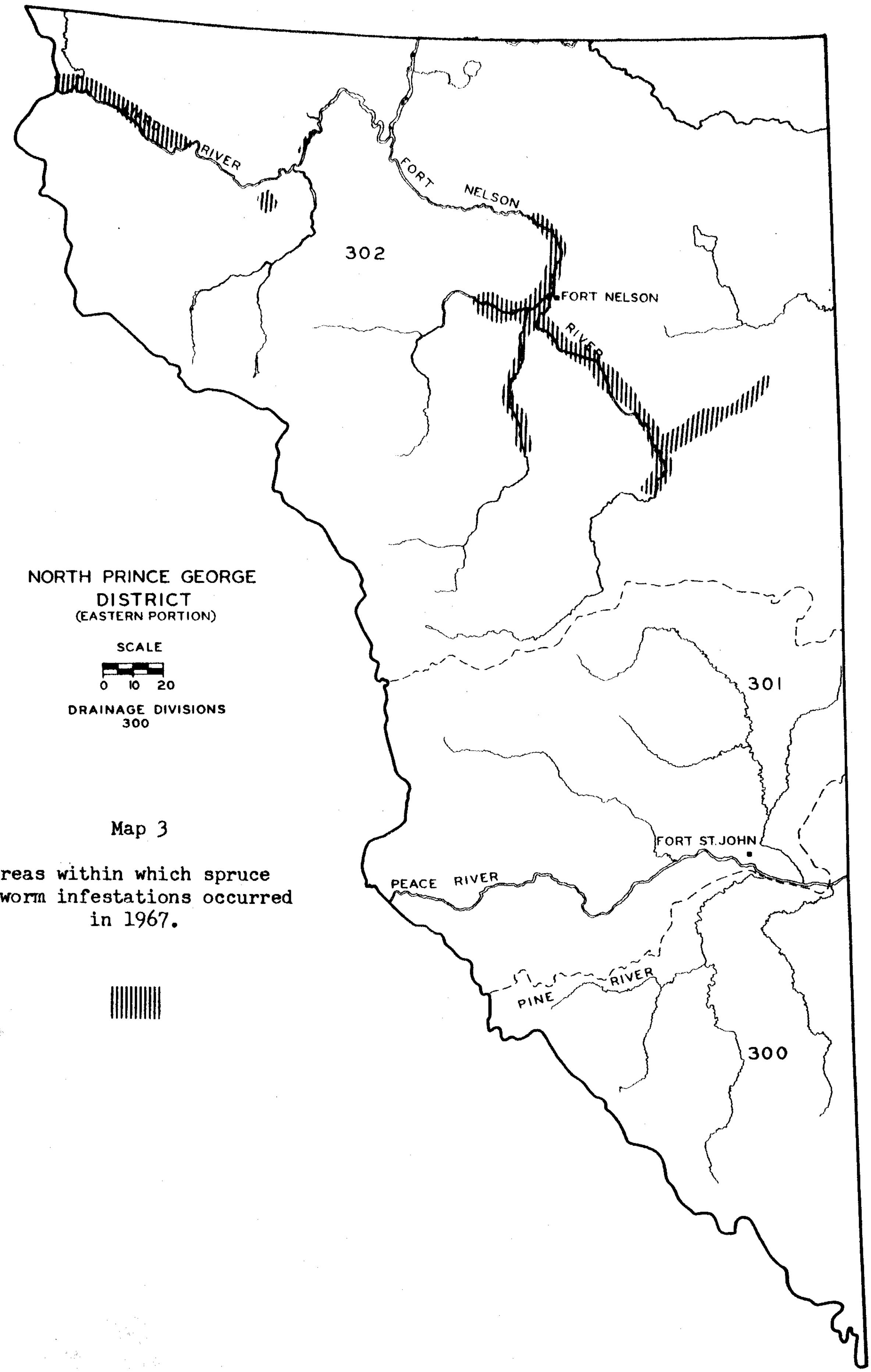


Map 2

Location of points where one or more collections were made and field records taken in 1967.

Forest insect ●

Forest disease ▲



Map 3

Areas within which spruce budworm infestations occurred in 1967.