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ANNUAL DISTRICT REPORT  
FOREST INSECT AND DISEASE SURVEY  
BRITISH COLUMBIA, 1976  
PART IV, KAMLOOPS FOREST DISTRICT

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by  
R. J. Andrews and J. S. Monts<sup>1/</sup>

PACIFIC FOREST RESEARCH CENTRE  
CANADIAN FORESTRY SERVICE  
VICTORIA, BRITISH COLUMBIA

— FILE REPORT —

DEPARTMENT OF FISHERIES AND ENVIRONMENT  
January, 1977

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## INTRODUCTION

This report outlines forest insect and disease conditions in the Kamloops Forest District for 1976, and attempts to forecast pest population trends.

Regular field work in the District began on May 10 and ended October 2. Special surveys for spruce beetle, mountain pine beetle, western spruce budworm, blackheaded budworm, hemlock looper and a pine sawfly were carried out in September and October. Aerial surveys consisting of 39 flying hours supplied by the British Columbia Forest Service were done in August (Map 2).

Extension service and liaison were increased in 1976 beginning in May with a workshop on aerial recognition of pest damage for B. C. Forest Service fire patrol pilots. A mountain pine beetle workshop was presented in early July at Kelowna to concerned groups including Regional District representatives, Industry personnel and members of the B. C. Forest Service. A forest pest workshop was set up for B. C. Parks youth crews in July at Manning Park, and there were spruce beetle and spruce budworm workshops in Lillooet and Douglas-fir beetle workshops at Kamloops during October. F.I.D.S. rangers for Kamloops participated in meetings to discuss European pine shoot moth survey planning and results with members of the Provincial and Federal Departments of Agriculture and B. C. Forest Service in June and July. The B. C. Forest Service Skimikin Nursery was visited in June and examination of seedlings was made.

A total of 300 beating collections were submitted to the Pacific Forest Research Centre in 1976. Map 1 shows collection localities and drainage divisions. Numbers of larval defoliators in field collections remained at a high level; 97% and 83% of the beating collections contained larvae, in the south and north districts, respectively.

Bark beetles accounted for most of the tree mortality in the Kamloops District in 1976. Spruce beetle was epidemic in the Cayoosh Creek and Bridge River areas. Mountain pine beetle killed an increased acreage of lodgepole pine in the Okanagan and Lillooet areas and caused increased mortality of white pine in Blue River - Adams and Shuswap lakes area. Ponderosa pines killed by mountain pine beetles were more numerous in 1976, and in an increasing number of locations in association with western pine beetle, *Dendroctonus brevicornis*.

Western spruce budworm defoliation of Douglas-fir continued unabated in those areas infested in 1975 and expanded into Merritt and Ashcroft areas in 1976. The Adams Lake infestation also continued and populations expanded in the Shuswap Lake - Sicamous drainages.

While control spraying was carried out over much of the areas infested by Douglas-fir tussock moth in 1975, defoliation by this pest in 1976 still exceeded 4,000 acres.

Heavy defoliation by western hemlock looper, blackheaded budworm and a pine sawfly covered nearly 52,000 acres of western hemlock and lodgepole pine.

European pine shoot moth was prevalent on exotic pines in the Okanagan, where quarantine legislation had been in effect for the past five years.

Insects affecting aspen and poplars were also in epidemic proportions.

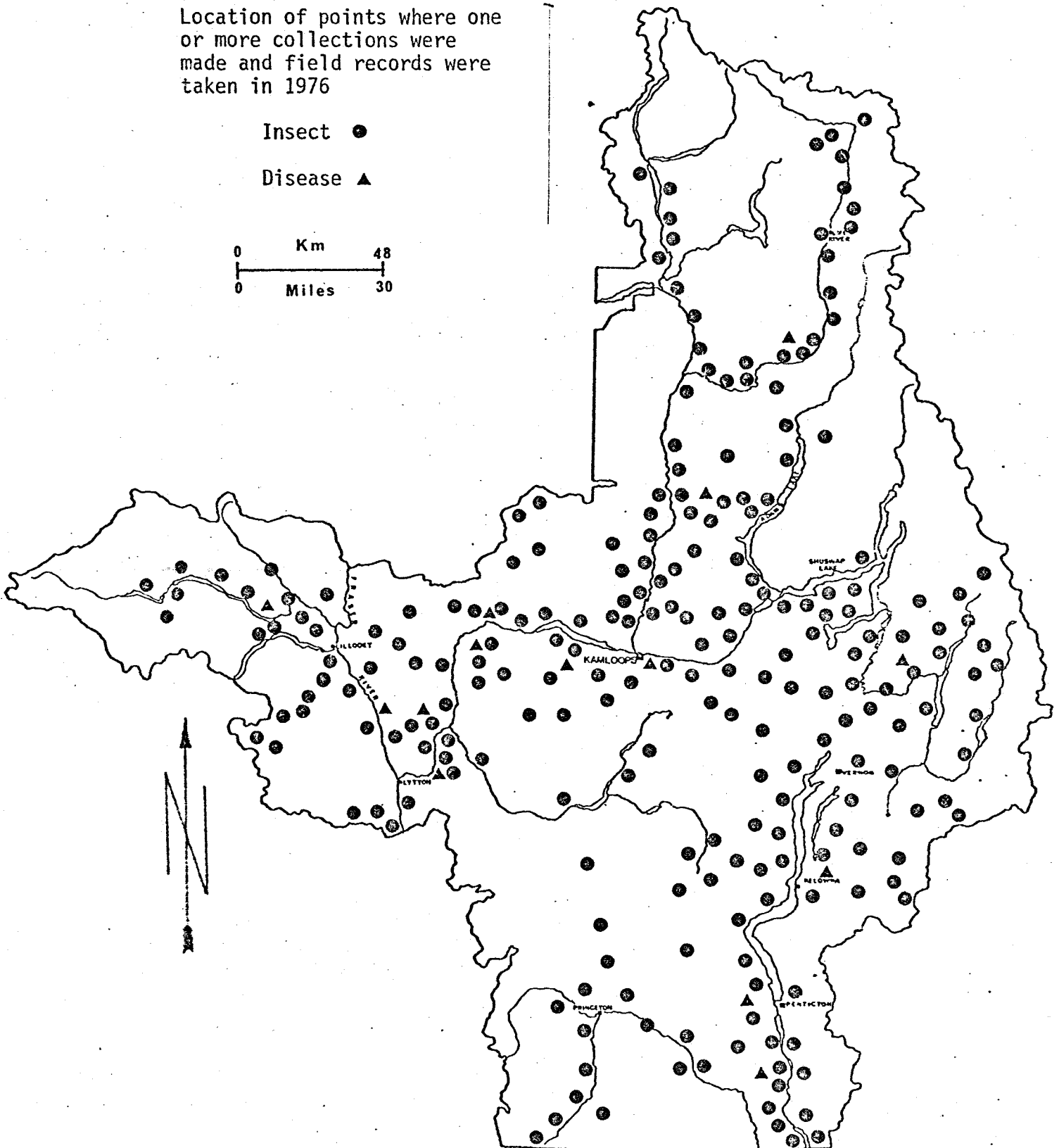
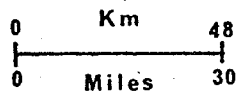
There were few spectacular disease problems noted in 1976 other than perennial incidence of blister rust and mistletoes.

## KAMLOOPS FOREST DISTRICT

Location of points where one  
or more collections were  
made and field records were  
taken in 1976

Insect ●

Disease ▲





Mountain pine beetle, *Dendroctonus ponderosae*

The mountain pine beetle continued as the most widespread and important destroyer of commercial timber in the District. Known infestations have expanded and new areas of damage have been mapped totalling in excess of 39,000 acres, more than doubling the areas of damage in 1975 (Map 3).

Lodgepole pine stands were the hardest hit with some 30,000 acres infested. Infestations ranged throughout the drier regions of the District.

A total of 5,920 acres of infested western white pine was mapped in 1976. Numerous small infestations were located in tributaries of the Fraser River near Lytton and Lillooet. Infestations persisted in the chronic areas of the North Thompson River, Adams and Shuswap lakes.

Increased incidence of scattered, infested ponderosa pine was general throughout the host range in 1976 with heavy infestation of overmature pine near Carpenter Lake. Western pine beetle, *Dendroctonus brevicornis*, was in greater density in this area than for many years, sometimes associated with mountain pine beetle, but in many stems alone.

Table 1 lists and Map 3 locates acreages of mortality by tree species.

Table 1. Locations and acreage of infestations of mountain pine beetle, Kamloops Forest District, 1976

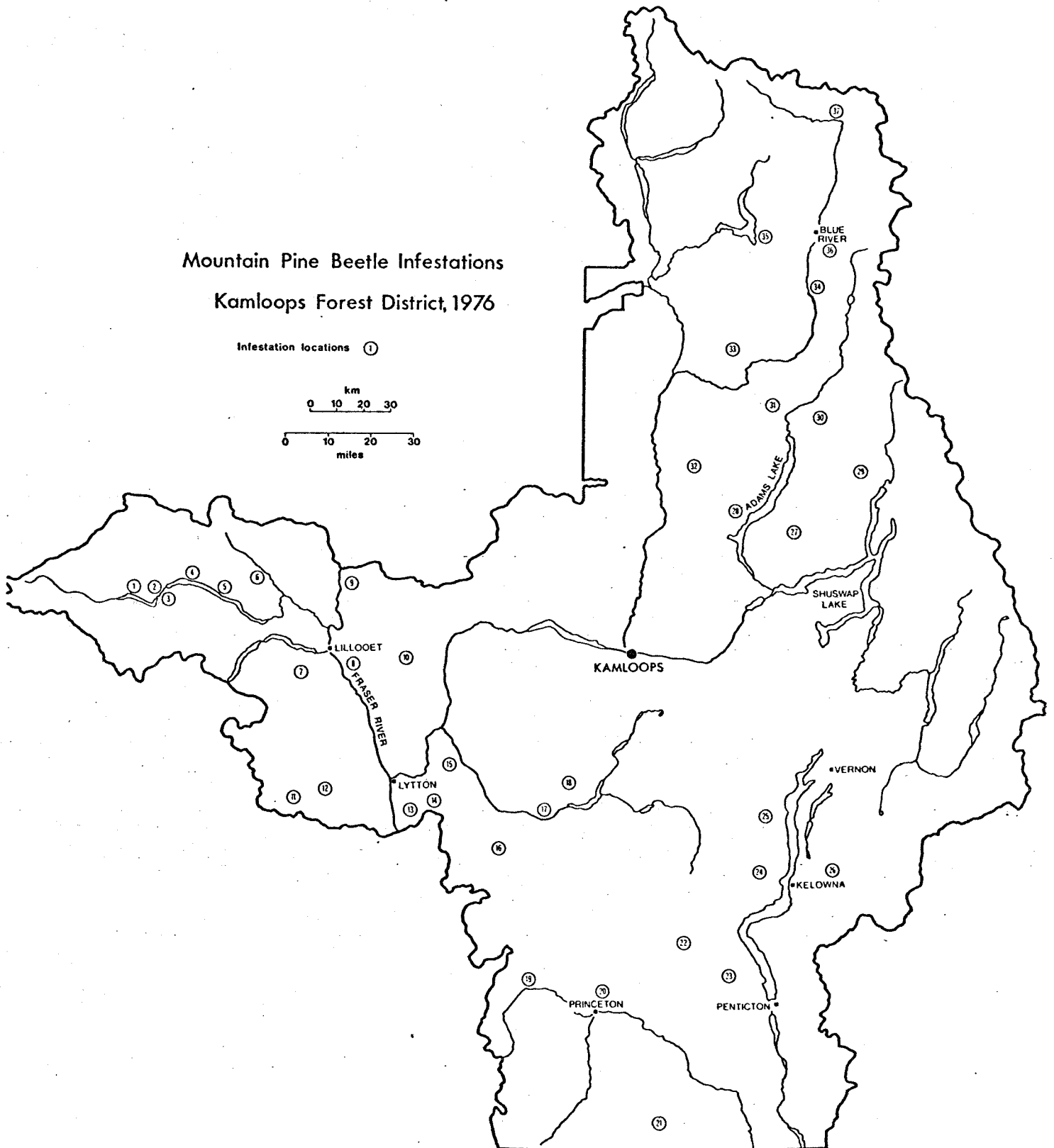
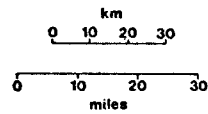
Infestation no.	Tree species	Locality	Estimated acreage
1	lodgepole pine	Downton L	220
2		Gun L	3,280
3		Cadwallader Cr	880
4		Tyaughton L	190
6		Yalakom R	840
7		Cayoosh Cr	1,840
8		Cinquefoil Cr	160
12		Stein R	400
14		Nicoamen Cr	680
15		Skeikut Cr	15
18		Clapperton Cr	5
21		Ashnola R	600
22		Osprey L	25
23		Trout Cr	9,500
24		Lambly Cr	2,440
25		T.F.L.#9 & CP's 2-9	4,700

Table 1 - cont'd.

Infestation no.	Tree species	Locality	Estimated acreage
26		Mission Cr	4,782
TOTAL			30,557
2	ponderosa pine	Gun L	950
4		Tyaughton L	840
5		Marshall Cr	520
9		Pavilion Mtn	120
10		Upper Hat Cr	520
17		Merritt	30
19		Tulameen	60
20		Princeton	10
16		Spius Cr	50
15		Skeikut Cr	15
TOTAL			3,210
7	western white pine	Cayoosh Cr	30
11		Upper Stein R	100
13		Siska	360
14		Nicoamen Cr	80
16		Spius Cr	10
27		Scotch Cr	250
28		Adams L	1,190
29		Hugmamilt L	120
30		Gannett L	625
31		Burton Cr	460
32		N. Barriere L	440
33		Raft R	280
34		Cottonwood Flats	160
35		Murtle L	15
36		Blue R	1,240
37		Upper Thompson R	560
TOTAL			5,920

# Mountain Pine Beetle Infestations Kamloops Forest District, 1976

Infestation locations ①





During September prism cruises were run in five infested areas: Trout Creek; Spius Creek; Marshall Creek; Gun Lake, and Nicoamen Creek. Table 2 shows the percentage of infested stems by attack categories.

Table 2. Status of pine on cruise strips, Kamloops Forest District, 1976

Location	Percentage of stems				
	Healthy	Current	Red	Partial	Gray
Trout Cr	30	8	26	1	35
Spius Cr	70	12	3	0	9
Marshall Cr	32	30	27	0	10
Gun L	47	11	16	7	19
Nicoamen Cr	83	10	5	0.7	0.7

At Marshall Ridge the cruise was run through overmature ponderosa pine. Examination of infested stems showed that both western pine beetle and mountain pine beetle had attacked the stand. Many stems were infested by both species, but in some only one species. It was noted that when both species had attacked, the progeny development coincided with western pine beetle attack period, which is in May, but when mountain pine beetle alone had attacked, progeny development indicated a later attack (July).

The intensity of attack and brood density at all locations cruised indicate a continuing population in 1977.

[Appendix A is a report by Carl W. Chantler, zone technician, covering mountain pine beetle attack areas for the Okanagan P.S.Y.U. and TFL #9, in greater detail.]

Spruce beetle, *Dendroctonus rufipennis*

Several reports of beetle activity were received from B. C. Forest Service and Industry from widespread locations in 1976.

At Lempriere Creek there were scattered, partially attacked trees that had been heavily defoliated by spruce budworm, *Choristoneura biennis*, in 1974 and in 1976. Beetle populations were light but some tree mortality had occurred from repeated attacks over the past four years.

Near the headwaters of Chu Chua and Birk creeks, 250 acres were infested in 1975. In 1976 logging had removed the infested block but there were scattered infested stems near leave blocks. Infested trees are to be removed before beetle flight in May - June, 1977.

East of Kelowna windfelled and/or bulldozed trees bordering Hydraulic Creek harboured a light population of spruce beetle. A few trees contained adults and pupae and several others were newly attacked. The infestation at this location was small and removal of infested material was to be carried out.

Near Lillooet, light to heavy infestations of spruce beetle were found at Camoo Creek, draining into Bridge River, and at Van Horlick and Casper creeks draining into Cayoosh Creek (Map 4). Logging is in progress in each of the areas. Slash accumulation and blowdown had occurred over the past four years and was believed to be a factor in the outbreak. Heavy populations of beetles were prevalent in leave blocks and along the boundaries of logged areas in Van Horlick and Casper creeks, and to a lesser extent at Camoo Creek. Brood assessment disclosed heavy populations of beetles in 2-year attacked trees and also a heavy current attack.

An extensive trap tree program was verbally recommended by Dr. L. Safranyik, stating the following:

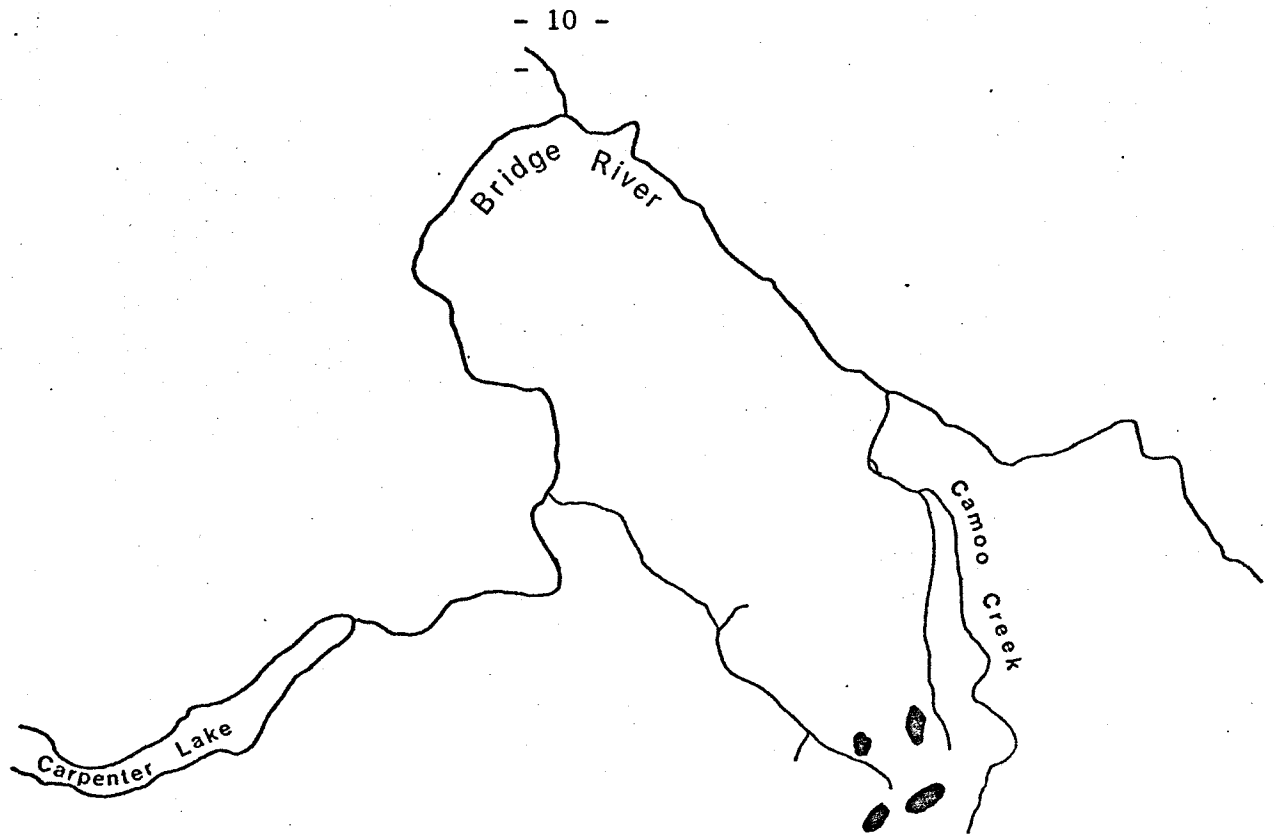
- 1) the best way would be to log the area during the winter;  
failing this,
- 2) an effective positive action would be to consider a trap tree program instituting the following:
  - a. felling of uninfested trees scattered throughout the stand;
    - (i) stumps to be cut as low as possible,
    - (ii) trees felled in shade and should not be bucked or limbed,
    - (iii) one green tree should be felled for every 5-10 infested trees,
    - (iv) trap trees should be removed following the beetle flight and burned or utilized.
  - b. an alternative plan was to fell uninfested trees in small patches of 1-5 acres adjacent to infested areas as long as there are sufficient numbers of trees to absorb the population;
    - (i) three such patches per mile of roadway to be felled at

Van Horlick and Casper creeks,

- (ii) stumps to be cut as low as possible,
- (iii) trees to be felled in shade and neither bucked nor limbed,
- (iv) trap trees to be removed following beetle flight and burned or utilized.

Following this program the results of the trapping should be monitored and evaluated.

[Appendix B is a report that covers the outbreak and was submitted in December 1976.]

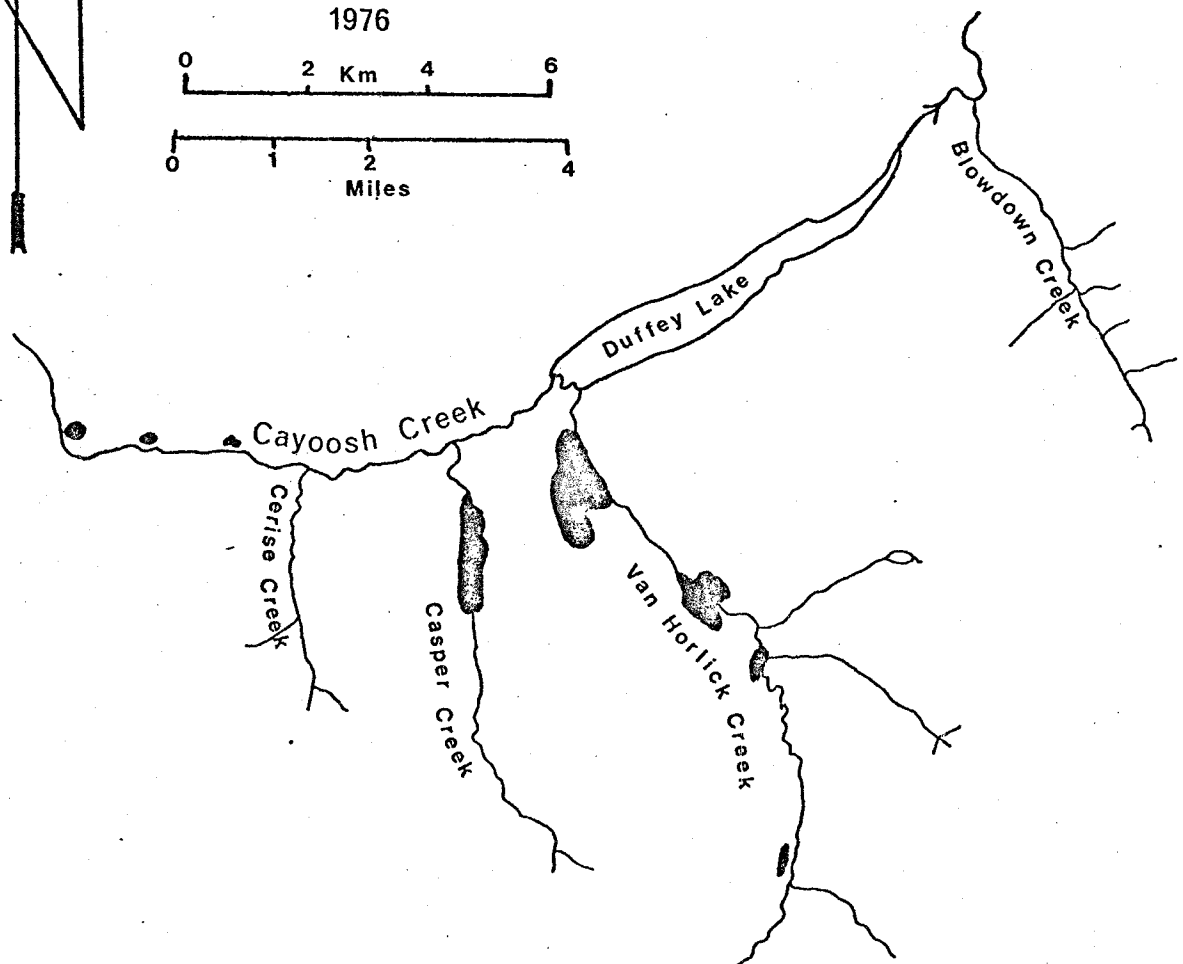
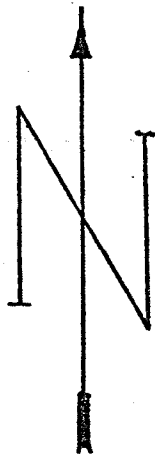
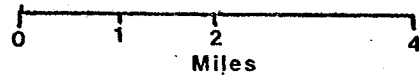


Map 4

Spruce Beetle Infestations

Kamloops Forest District

1976



Douglas-fir beetle, *Dendroctonus pseudotsugae*

Douglas-fir tree mortality caused by Douglas-fir beetle was light throughout the type range in the District in 1976. However a potential threat to Douglas-fir in Douglas-fir tussock moth defoliated stands was investigated.

In areas defoliated by the Douglas-fir tussock moth in 1974 and 1975, mortality of Douglas-fir attributed to defoliation ranged from 3 to 34%. In addition, 1975 attacks by Douglas-fir beetle on severely defoliated trees killed 9 to 19% of the trees in two stands. Attacks by bark beetles in 1976 were evident in seven of the eight areas, increasing expected mortality by 6 to 24%.

[Appendix C is a summary of tree conditions on cruise strips in Douglas-fir tussock moth defoliated stands in Kamloops Forest District by D. Collis.]

Balsam bark beetle, *Dryocoetes-Ceratocystis* complex

Aerial surveys disclosed three areas of heavy damage to alpine fir by the beetle-disease complex in the Kamloops Forest District.

Near Bonaparte Lake, 2,600 acres were attacked. This is part of a timber type showing scattered attack from Jamieson Creek north to Mann Creek.

North of Sicamous beetle-damaged alpine fir trees were seen on each side of the valley. South of Yard Creek there were 1,800 acres of attacked trees, and on the western side near Legerwood Creek, 680 acres.

Other areas of scattered attack were between Kloo Creek and McCulloch Lake east of Kelowna, and south of Bouleau Lake west of Vernon.

Western spruce budworm, *Choristoneura occidentalis*

Defoliation by western spruce budworm expanded in the Kamloops Forest District in 1976 (Map 3). The budworm has been active in some Douglas-fir stands in the Lillooet District for the ninth consecutive year, and has persisted near Lytton and Adams Lake since 1974. New areas of infestation are in the upper Shuswap Lake, Scotch Creek, Sicamous - Seymour River areas in the northern portion of the District and in the Ashcroft and Nicola River portion in the southwest. Traces of defoliation were recorded near Merritt, Princeton, Okanagan Falls and Westwold areas.

Aerial surveys in August revealed 106,000 acres of Douglas-fir defoliation in the southwestern portion of the District, 100,000 acres in the Clinton - Ashcroft - Big Bar area, 42,000 acres around Adams Lake and 51,000 acres in the Shuswap Lake - Sicamous area.

Severe defoliation, causing from 2 to 12 feet of top-stripping, occurred at Mission Pass, Whitecap and Kwoiek creeks in the Fraser River area and at Scotch Creek, along Anstey Arm and near Mara Lake in the Shuswap drainage. Moderate defoliation was prevalent in the Anderson, Seton, Carpenter, Gun and Downton lakes area, along Cayoosh Creek and tributaries of the Fraser River from Pavilion to Lytton, near Sicamous along Seymour River north of Shuswap Lake, and along Adams Lake and River.

Larval feeding, from 2,000 to 3,000 feet elevation, was completed by the end of July but some feeding at higher elevations continued into early August. Returns from the Insect Pathology Research Institute indicated no disease or virus in larval populations.

Egg populations were assessed in August and September to determine the potential populations for 1977. Predictions of 1977 damage are based on the premise that 50 to 150 egg masses per 100 ft<sup>2</sup> of foliage could result in moderate defoliation, and more than 150 in heavy defoliation. Table 3 shows the results of the egg survey and defoliation estimates for 1974 to 1976.

Baited traps were used for the fourth year as a means of assessing the adult budworm population. The traps, containing a sex attractant at the rate of 10 mg of Soolure, were set out at 14 locations in the District just prior to moth emergence in July, and retrieved after the moth flight in August (Table 4).

Table 3. Comparison of density of western spruce budworm egg masses, average numbers of larvae from 1974 to 1976, and predicted defoliation for 1977, Kamloops Forest District

Location	Avg no. egg masses per 100 ft <sup>2</sup> of foliage			Avg no. larvae in 3-tree beating samples			Predicted defoliation for 1977 (Light, Medium or Heavy)
	1974	1975	1976	1974	1975	1976	
Gun L	88	70	268	84	-	-	H
Marshall Cr	205	133	902	175	-	-	H
Mission Pass	220	479	714	163	115	390	H
Fountain Valley	193	172	989	299	195	235	H
Cayoosh Cr	83	92	321	-	-	70	H
Botanie Cr	-	273	362	205	460	260	H
Kwoiek Cr	234	164	228	225	228	257	H
Adams L	-	125	25	-	-	100	L
Robert Cr (Burton Cr)	-	92	179	103	-	75	H
Cinquefoil Cr	-	-	684	165	275	270	H
Oregon Jack Cr	-	-	990	10	2	26	H
McLean L	-	-	51	7	-	19	M
Izman Cr	-	-	733	7	-	90	H
Soap L	-	-	637	-	-	-	H
Sicamous	-	-	673	-	-	60	H
Scotch Cr (west fork)	-	-	112	-	-	60	M
" " (east fork)	-	-	69	-	-	60	M
Mara Ridge	-	-	164	-	-	60	H
August L	-	-	129	-	1	25	M
Spius Cr	-	-	183	-	-	26	H
Merritt	-	-	192	-	-	60	H

Table 4. Numbers of spruce budworm larvae in beating samples and male moths caught in traps, Kamloops Forest District, 1976

Location	Avg no. larvae in beating samples	Avg no. male moths per trap
Kwoiek Cr	257	18
Cayoosh Cr	70	29
Mission Pass	390	31
Botanie Cr	260	28
Burton Cr	75	22
Sicamous	60	11
Mara Ridge	60	18
Spilus Cr	26	61
Tulameen R	90	94
Bromley Park	25	93
Shuttleworth Cr	70	74
Turnbull Rd. (Kelowna)	35	95
Pavilion L	34	32
Lac Le Jeune	7	81

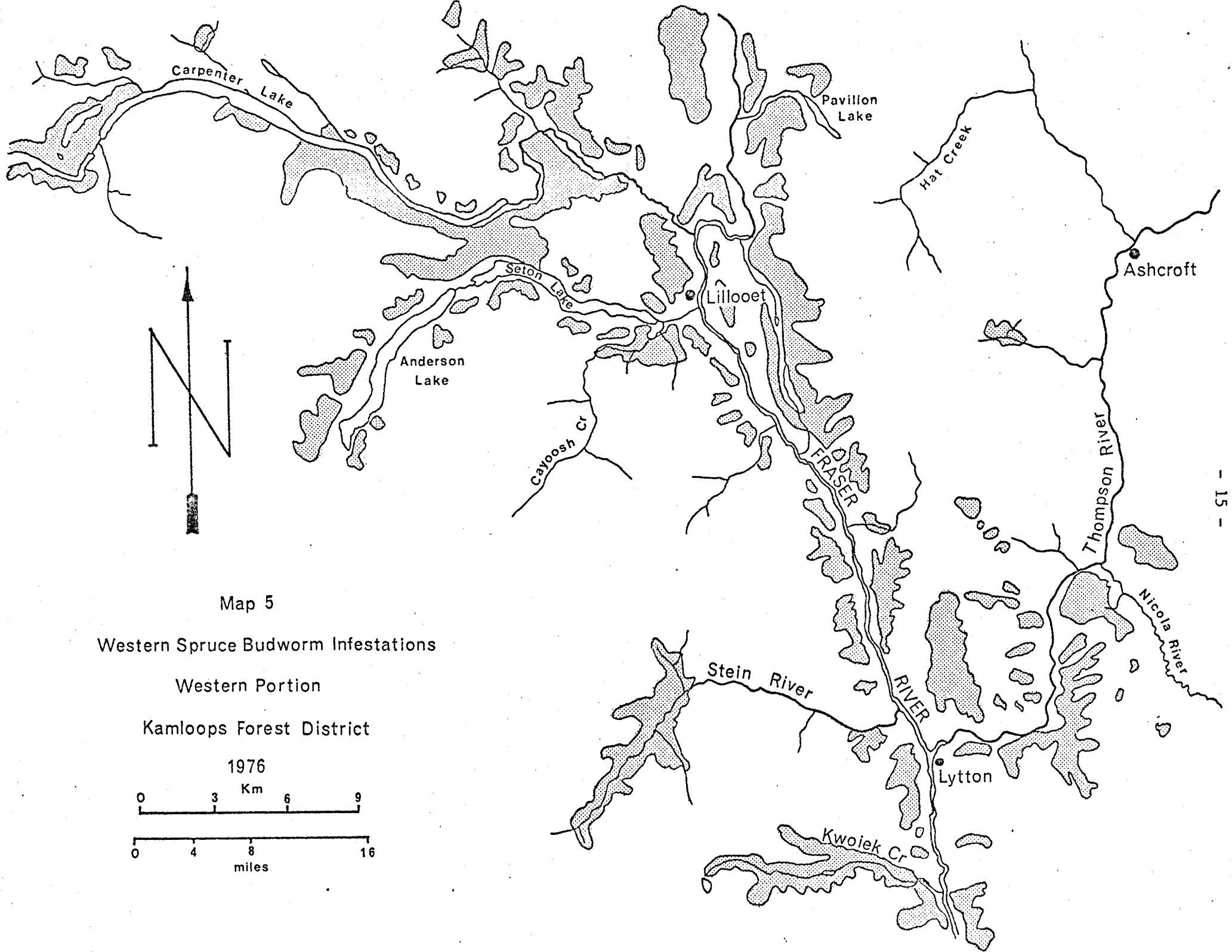
Appraisal plots, established in 1973 at Kwoiek Creek and Mission Pass, to study the effects of defoliation over a period of years, were examined in August. At Mission Pass, where trees have sustained foliage loss of varying degrees for nine consecutive years, 44% of the Douglas-fir examined had from 1 to 40 feet of top-stripping. Four of the plot trees had been blown down and were heavily infested by Douglas-fir beetle. Damage was more severe at Kwoiek Creek where, after five successive years of severe defoliation, 88% of the trees had from 2-40 feet of top-stripping. Three trees in the plot had been killed by Douglas-fir beetle.

The possibility of trees weakened by successive years of budworm defoliation and being susceptible to Douglas-fir beetle attack was investigated by running cruise strips through these damaged stands. Locations of cruise strips were in the Vancouver and Kamloops Forest Districts. Appendix D covers the survey.

Increment core samples were taken from Douglas-fir trees within budworm defoliated stands near Adams Lake to determine if, through increment loss, moderate to severe defoliation had occurred in the past. Analysis showed no marked loss of increment in these stands in the past 50-75 years.

Egg population data and flight trap information from 14 locations indicate a continuation of large populations and heavy defoliation in 1977. Further expansion of defoliation is expected in the Merritt - Princeton, Ashcroft, and in the Sicamous areas.





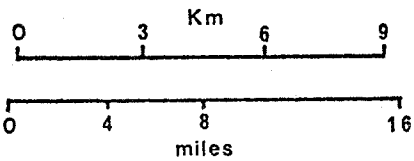
Map 5

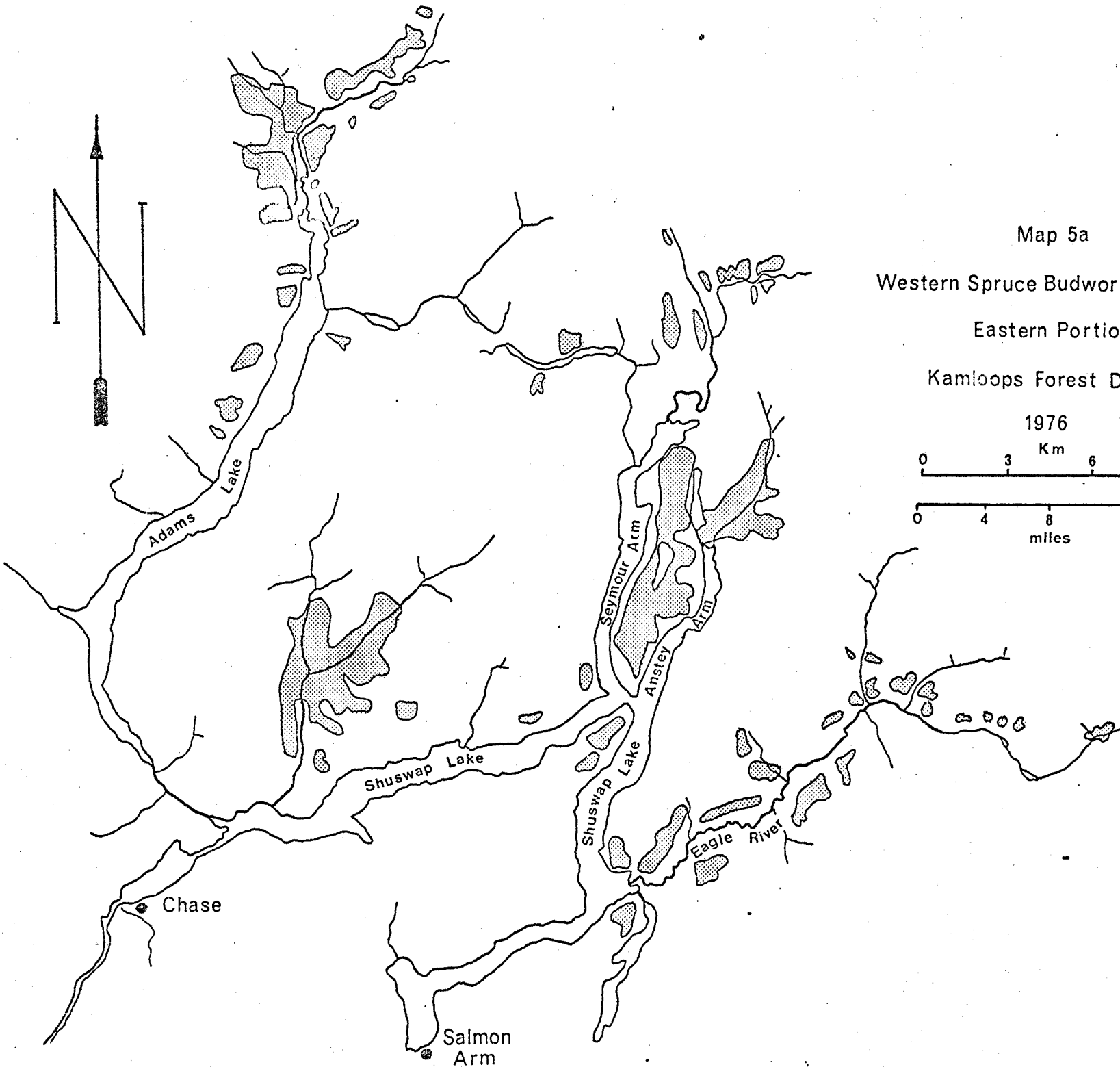
Western Spruce Budworm Infestations

Western Portion

Kamloops Forest District

1976





Map 5a

Western Spruce Budworm Infestations

Eastern Portion

Kamloops Forest District

1976

0 3 6 9  
Km

0 4 8 16  
miles

Two-year-cycle spruce budworm, *Choristoneura biennis*

A severe infestation at Lempriere Creek caused heavy defoliation of Engelmann spruce and to a lesser extent alpine fir (Map 6). Top-stripping occurred on both overmature and pole-sized trees.

Light to moderate defoliation was reported in this area during 1974, although most of the damage was on alpine fir.

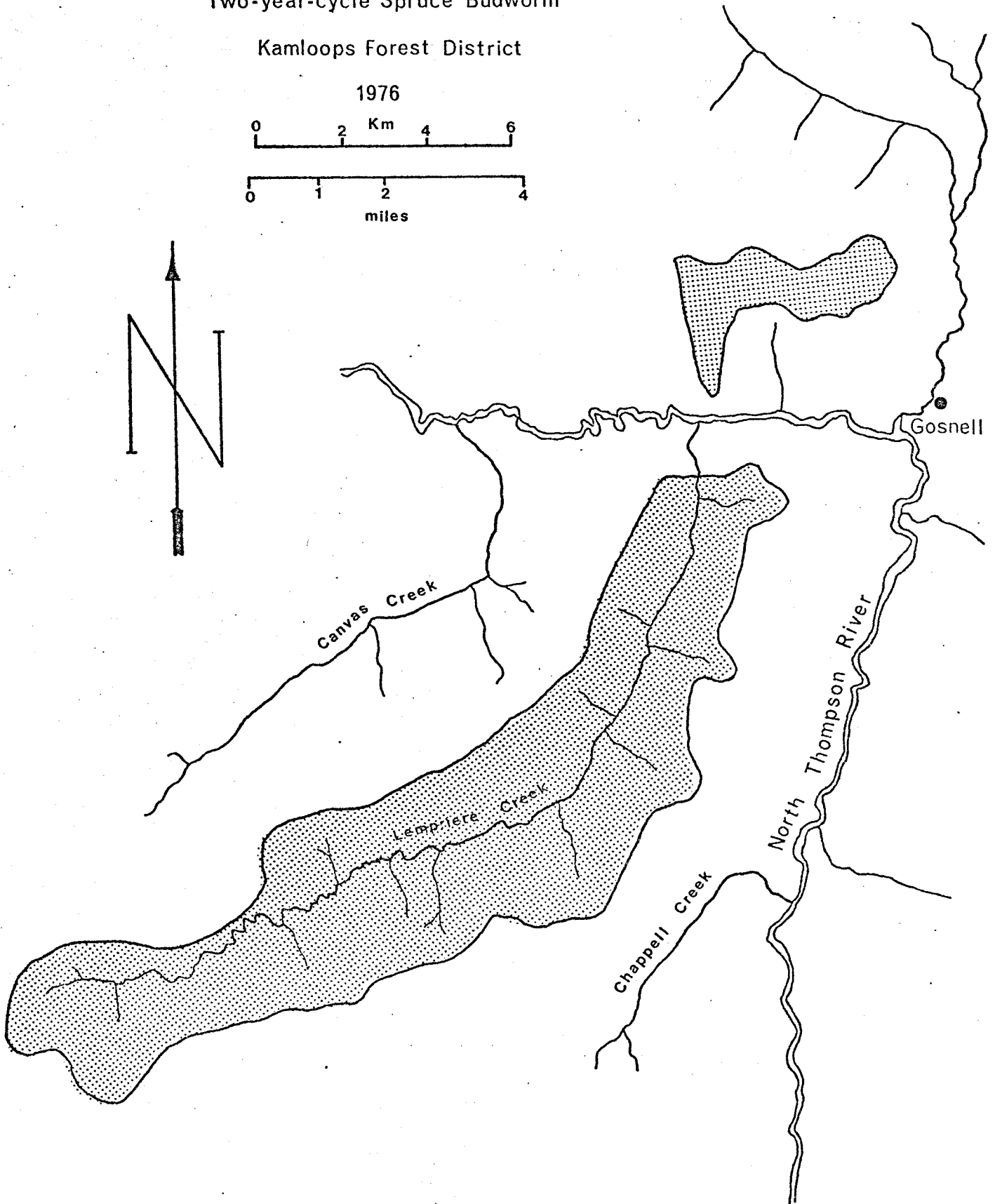
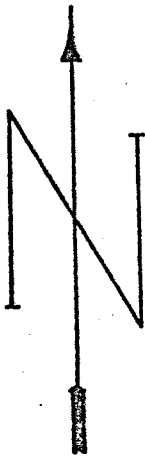
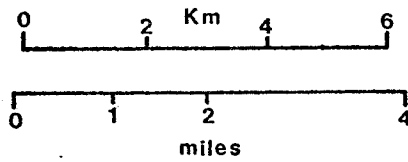
Egg sampling in 1976 indicated a continuing heavy population, therefore, moderate to heavy defoliation may be expected in 1978, the year that most of the 2-year-cycle larvae mature and develop to the adult stage.

Map 6

Two-year-cycle Spruce Budworm

Kamloops Forest District

1976



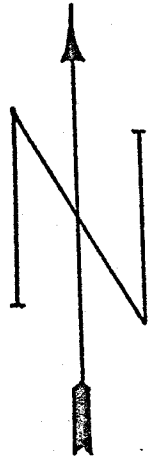
Douglas-fir tussock moth, *Orgyia pseudotsugata*

More than 20,000 acres of Douglas-fir trees were sprayed in 1976 for control of Douglas-fir tussock moth. However, severe defoliation did occur on 4,400 acres beyond the spray boundaries or in leave blocks (Map 7).

Areas of defoliation in 1976 were: along the North Thompson River from above Westsyde to Dairy Creek, on the Kamloops Indian Reserve and north along the ridges to Strawberry Hill and Heffley Creek, and along Palmer Forsythe Road. Large patches of trees near Indian Garden Ranch south of Savona were also stripped of foliage.

A virus disease was evident in the population during the latter stages of larval development and reduced the adult population significantly.

Egg sampling in heavily populated areas disclosed a complete collapse of infestation.

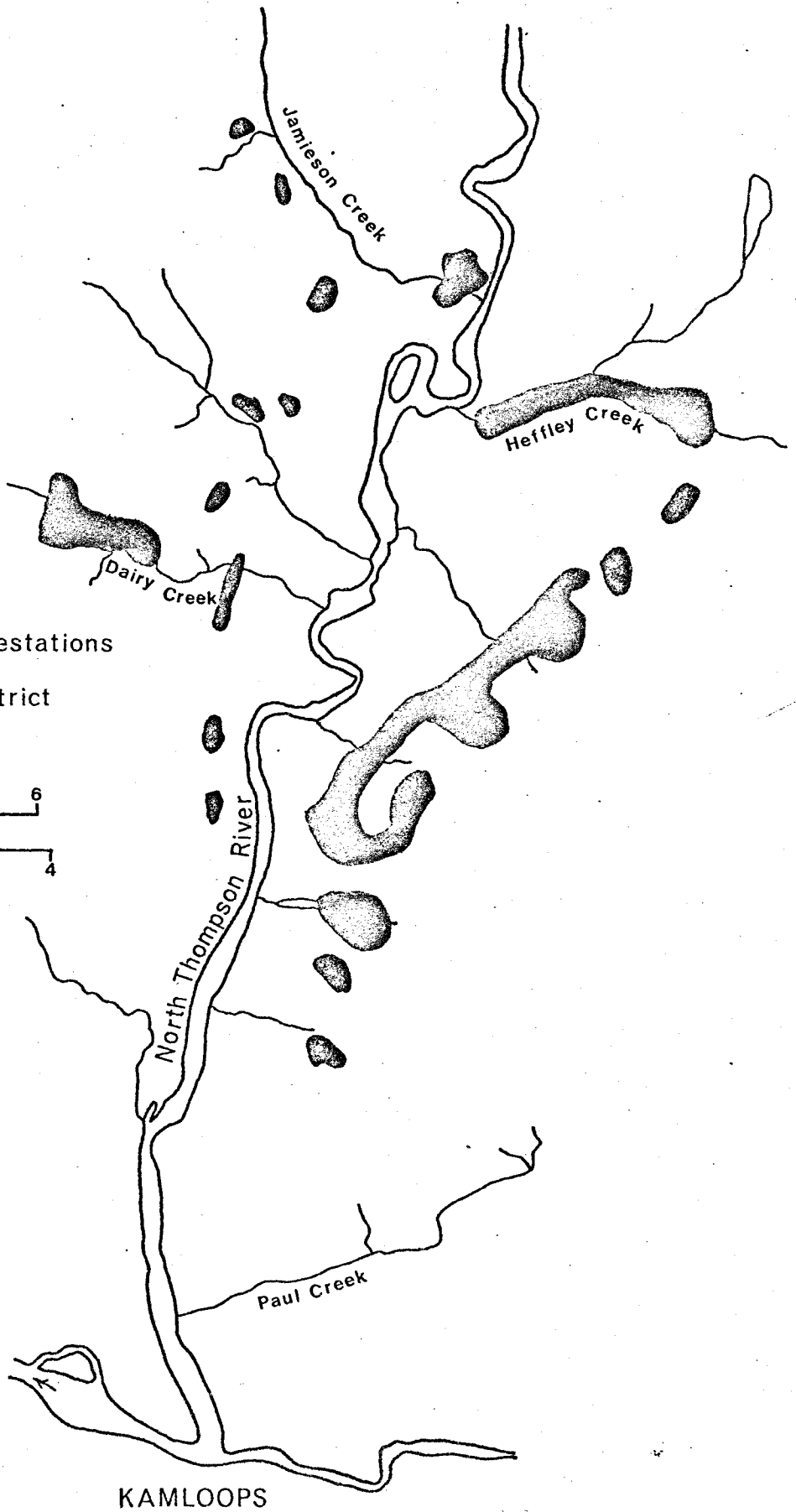
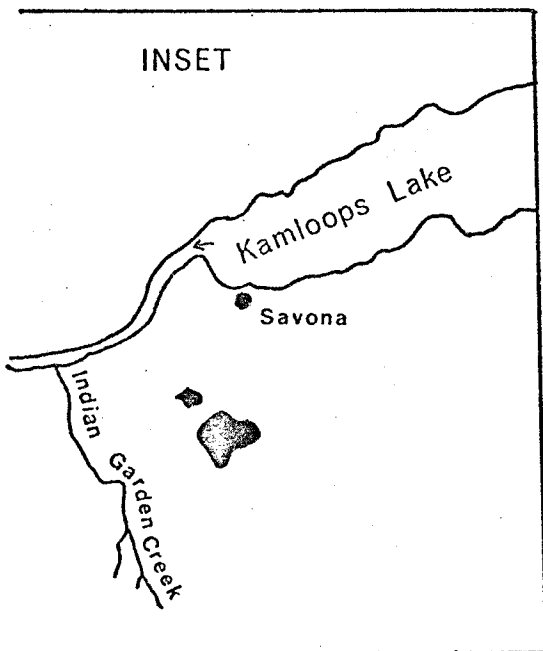
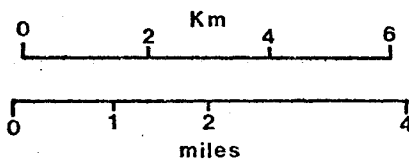


Map 7

Douglas-fir Tussock Moth Infestations

Kamloops Forest District

1976

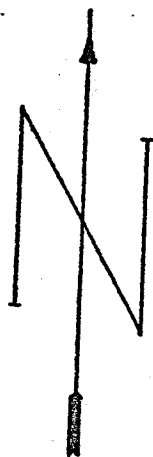


JM

Western blackheaded budworm, *Accleris gloverana*

During aerial surveys in August, moderate defoliation of western hemlock was observed on more than 6 400 ha (16,000 acres) in three areas near Blue River (Map 8). A ground survey of defoliated trees on August 18, after feeding had ceased, revealed that the blackheaded budworm appeared to be the major defoliator, although numerous cocoons of the hemlock sawfly, *Neodiprion* sp., and moulted larval skins of saddleback looper, *Ectropis crepuscularia*, and filament bearer looper, *Nematocampa filamentaria*, were also present.

On September 27, observation of numerous budworm eggs in the defoliated stands further substantiated the conclusion that this was the major pest. Two 18-inch branches were collected from each of 10 trees to determine the overwintering egg population. Numbers of eggs per branch ranged from 5 to 258 and averaged 75, indicating a high population, leading to a prediction of heavy defoliation by blackheaded budworm in these stands in 1977.



Map 8

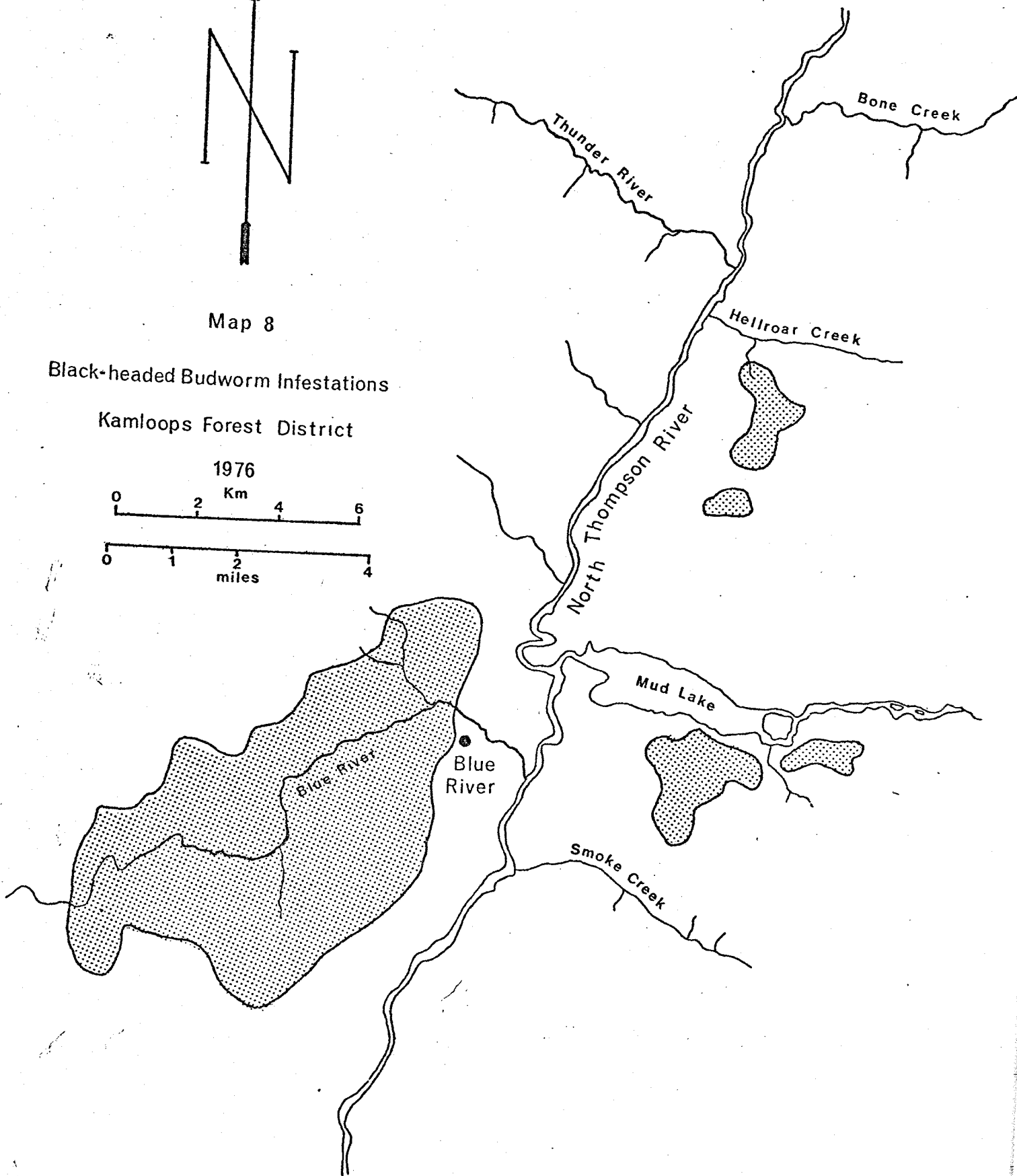
Black-headed Budworm Infestations

Kamloops Forest District

1976

0 2 4 6 Km

0 1 2 4 miles



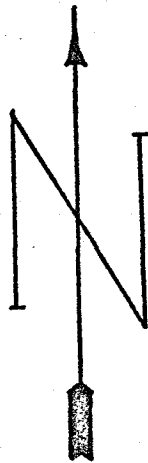


Western hemlock looper, *Lambdina fiscellaria lugubrosa*

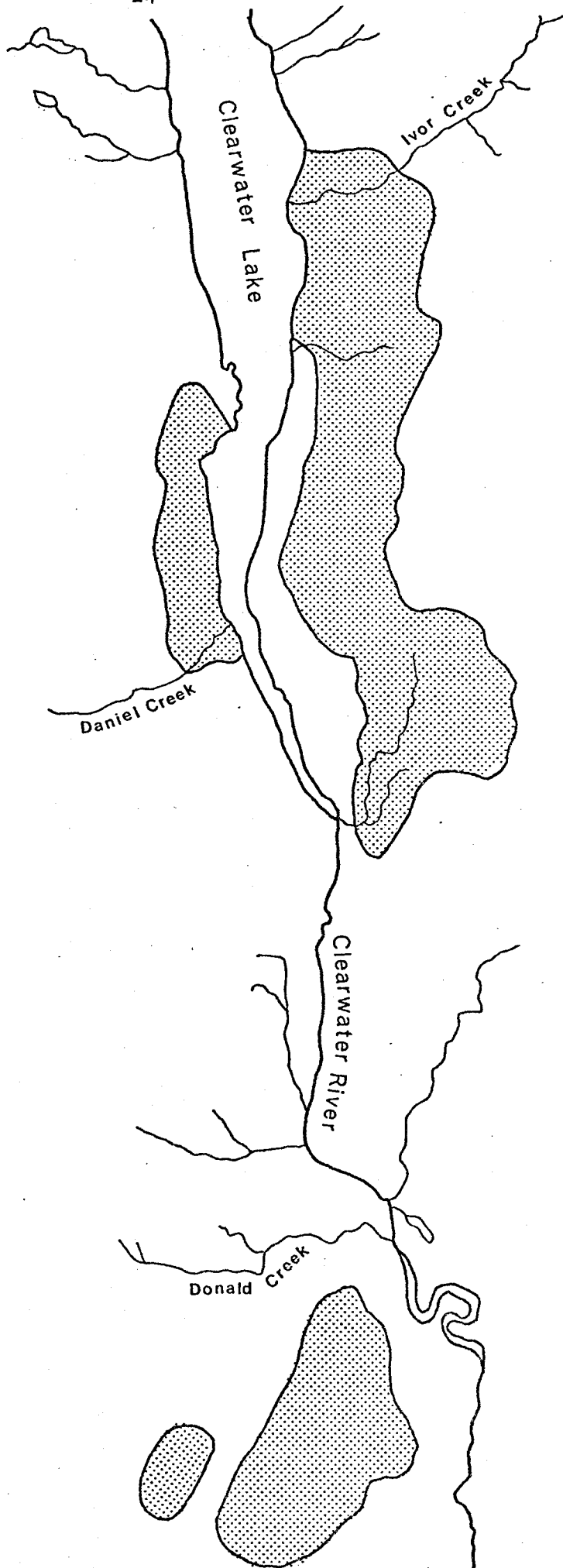
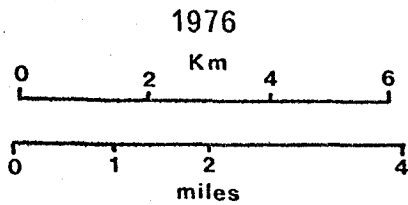
During aerial surveys in mid-August, heavy defoliation of western hemlock was observed near Clearwater River south of Donald Creek, and from the south end of Clearwater Lake to Azure Lake (Maps 9, 9a). The extent of the infestation is about 10 500 ha (26,000 acres). Through cooperation of the B. C. Forest Service, the area was visited early in September by helicopter. Ground observations were made at three locations within the infestations. Numerous western hemlock looper moths were in flight. No eggs were seen, however, pupae were numerous on the tree stems. Many standing western hemlock, Engelmann spruce and western red cedar trees were examined at the lower bole and 10 to 20 pupae per square foot were found in bark crevices. Two felled western hemlock stems were examined at mid crown and 25 to 40 pupae per square foot were found in bark crevices.

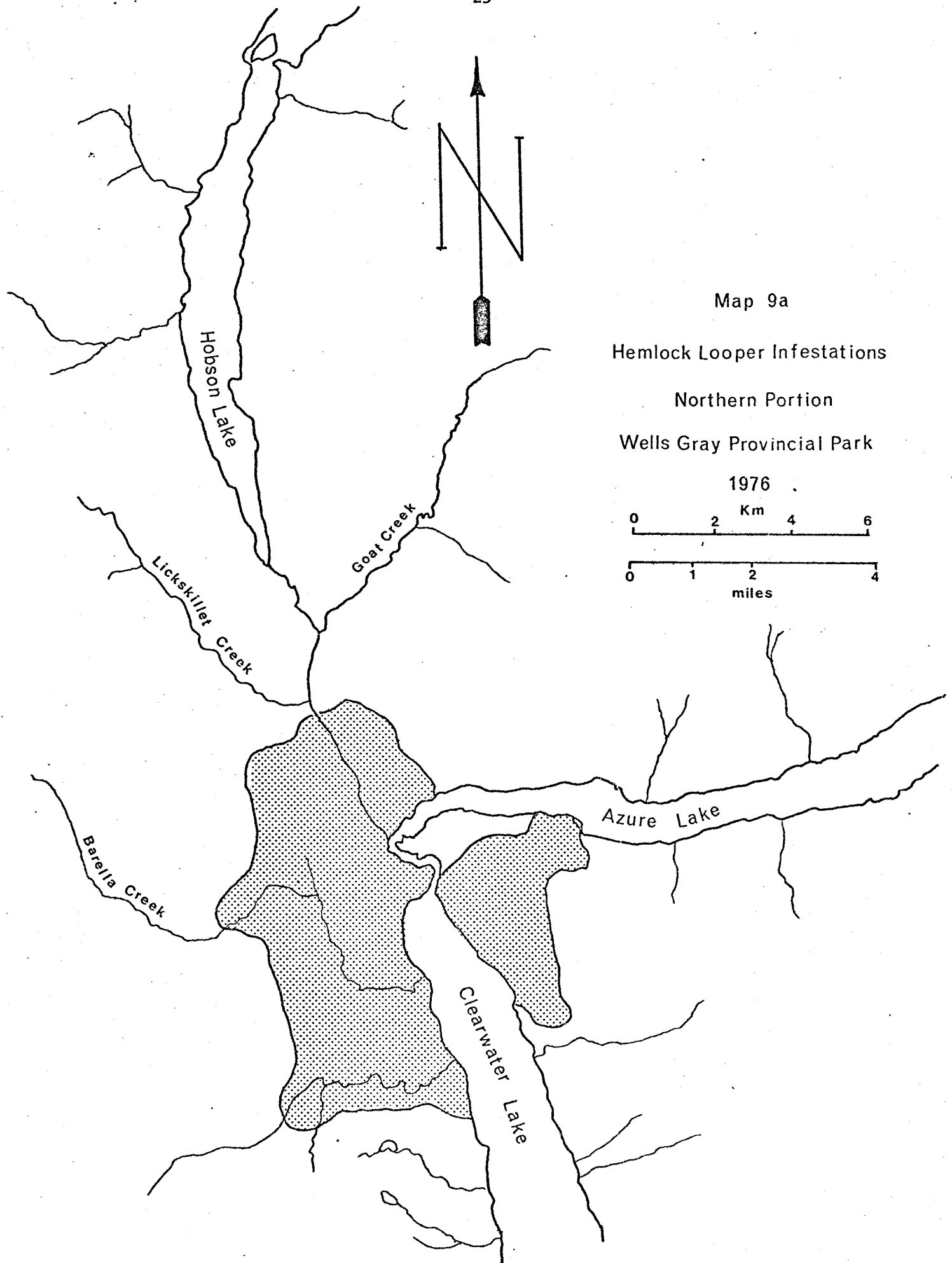
The infestations along Clearwater Lake were more active than the one south of Donald Creek. The area south of Donald Creek had obviously been infested for 2 or perhaps 3 years, and considerable tree mortality has resulted on 1 200 ha (3,000 acres). Defoliation ranged from 50 to 80% of the total foliage on most western hemlock trees but the number of pupae in bark crevices was much lighter in this area.

No egg sampling was done because of poor access, however, number of pupae found indicates a continuing heavy looper population in 1977 along Clearwater Lake, and further mortality of western hemlock trees may be expected in the area south of Clearwater Lake.



Map 9  
Hemlock Looper Infestations  
Southern Portion  
Wells Gray Provincial Park





A lodgepole pine sawfly, *Neodiprion* sp.

Sawfly larvae severely defoliated the old growth foliage of lodgepole pine stands along the North Thompson River from Vavenby to Cottonwood Flats (Map 10). The infestation covered 14 175 ha (35,000 acres) from the valley bottom to 3,000 feet elevation. The heaviest defoliation was on 10 125 ha (25,000 acres) between Mad River Valley and Wire Cache. Foliage on the 1976 growth was generally unaffected.

In mid-August 205 cocoons were collected to send to P.F.R.C. in Victoria, for rearing to determine parasitism. The average number of cocoons per square foot of duff ranged from 30 to 50. Only 20 adults emerged from the cocoons. Three to five cocoons dissected in December were parasitized.

In September, sampling disclosed a heavy egg population. Two branches, 3 feet long, were cut from the upper 1/3 of the crown from 10 trees and the number of foliated tips, egg clusters, and the eggs per cluster counted. The following table shows the results of the survey.

Table 5. Egg sampling results of sawfly defoliated lodgepole pines, Kamloops Forest District, 1976

Tree no.	No. of tips	Percentage tips infested	Avg no. of clusters/tip	Avg no. eggs/inch of foliage
1	20	20	1.7	3.1
2	8	87	7.1	16.4
3	9	66	8.3	18.0
4	16	56	4.4	9.4
5	11	81	8.2	17.3
6	10	70	6.1	12.1
7	11	72	7.4	17.7
8	13	92	10.7	20.2
9	5	20	1.0	4.4
10	12	66	9.0	29.4

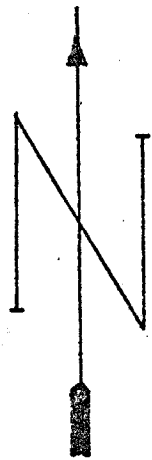
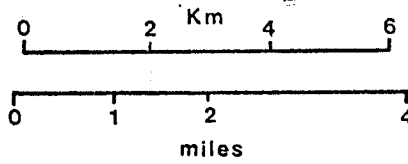
Little is known about the relationship between larval feeding and damage to the host. In the past, defoliation occurred for 2 years before the population collapsed. The existing egg population indicates a large population will prevail into 1977, however parasitism is heavy and virus may further deplete the population. Long term host damage is expected to be restricted to increment loss only.

Map 10

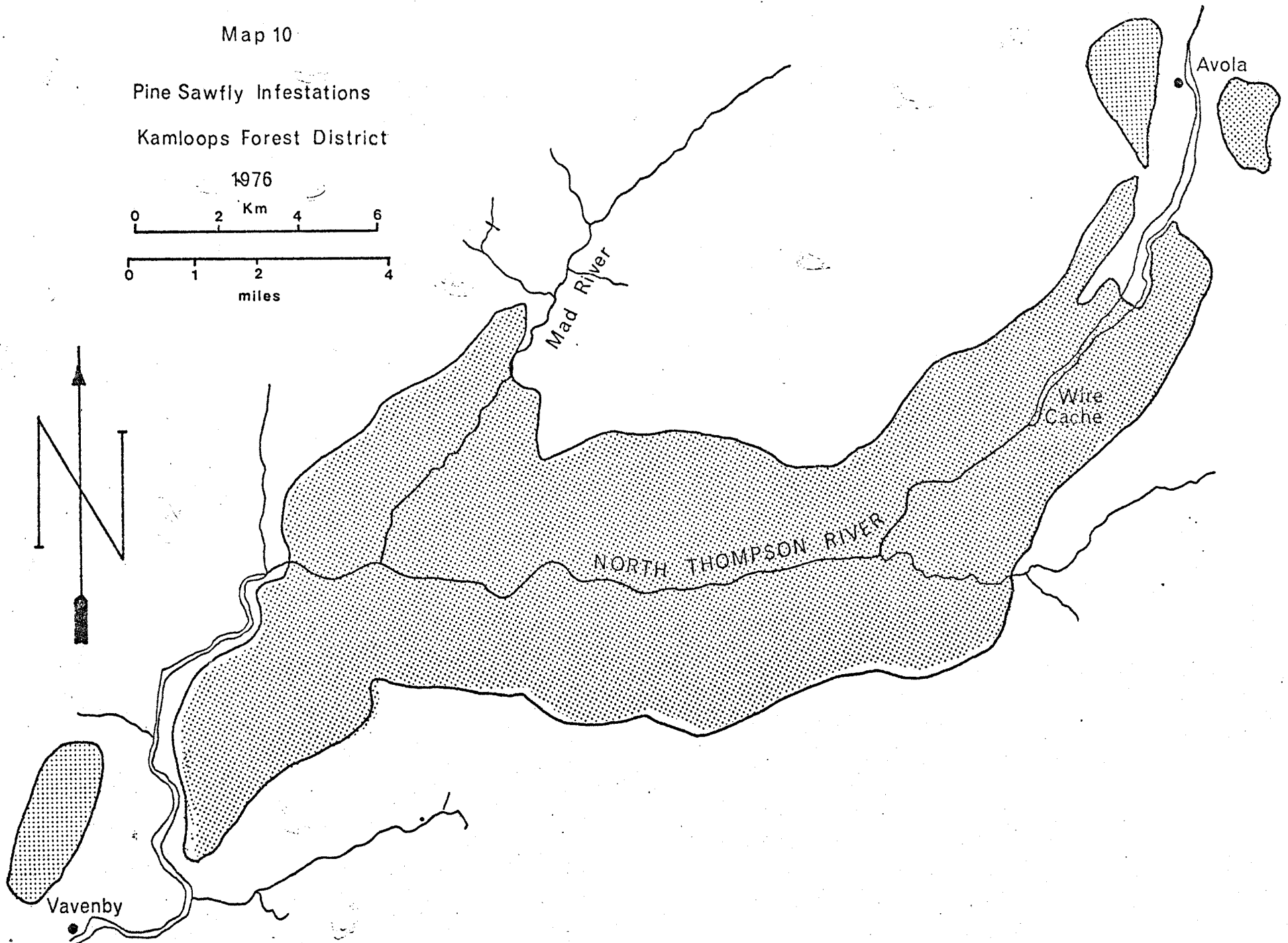
Pine Sawfly Infestations

Kamloops Forest District

1976



- 27 -



European pine shoot moth, *Rhyacionia buoliana*

Exotic pine plantations were examined at four locations in May: Westbank, 500 Scots pine; Mission Creek, 125; Larkin, 100 and Glenmore Road, 43. In each instance no damaged shoots were observed. However, when pheromone traps were set out at Okanagan Regional College at Kelowna, a light to moderate population of European pine shoot moth was found.

Fifty Scots pine were examined and 27 of these were infested. Numbers of tips infested ranged from 2 - 20 per tree. Four of 14 Mugho pines contained 4 to 10 infested shoots. Progeny at the end of May were ultimate instar larvae and pupae.

With this initial discovery of infestation, notification was given to the Federal and Provincial Departments of Agriculture at Penticton (Plant Protection Branch). A cooperative survey was initiated to survey more thoroughly all towns and cities in the Okanagan Valley and Kamloops to determine shoot moth incidence on exotic pines and the effectiveness of the certification program in Kelowna and neighbouring cities of the Okanagan Valley, and Kamloops. All detected infested shoots were to be removed and burned. [Some infested trees were destroyed.]

All nurseries, municipal park supervisors and contract landscapers were contacted for lists of pines planted in their respective zones in the past 3 years. All residences near infested locations were examined for native and exotic pines, using known locations as foci, covering most of the cities.

Forty-nine locations contained infested pines; 41 in Kelowna and 8 in Vernon. Table 6 shows the results of this survey.

Table 6. Location and numbers of European pine shoot moth infested pines, Kamloops Forest District, 1976

Location	Infested pines
<u>Kelowna</u>	
Okanagan Regional College	27 Scots pine
" " Library Hdqs.	8 " "
Kelowna Recreational Centre	29 " "
Homeco	2 " "
Pollution Centre	10 " "
Big White Motel	5 " " , 2 Mugho
Kelowna Nurseries	1 " " , 3 "
Central Trailer Park	8 ? pines
33 Kelowna residences	27 Scots pine, 15 Mugho, 4 ponderosa
<u>Vernon</u>	
Jordan (Justice) Park	43 Mugho
7 Vernon residences	16 " , 4 lodge-pole

A spray program was organized by the Departments of Agriculture using Dimethoate to control known infestations. All institutions, such as Okanagan Regional College and municipal governments were given responsibility for spraying their own infested trees, while pine on small private lots and some small plantings on commercial establishments were sprayed by B.C. Agricultural personnel. British Columbia Department of Agriculture advised when to spray, type of spray and dosage used. Three applications were made at 2-week intervals.

Pheromone traps baited with trans-9-dodecenyl acetate - 5% by weight were set out to further monitor moth populations in Kelowna, Vernon, Westbank, Westwold and Penticton. Table 7 shows the locations and the results obtained.

Table 7. Locations and number of pheromone baited traps set out and number of male moths caught, Kamloops Forest District, 1976

Location	No. of traps	No. of male moths
<u>Dept. of Environment - FIDS</u>		
Kamloops	10	0
Vernon	5	1
Larkin	5	0
Winfield	5	0
Kelowna	10	0
Westbank	5	0
<u>Dept. of Agriculture Plant Protection (Federal)</u>		
Nurseries (Oliver, Westbank)	17	0
" (Kelowna, Vernon)	0	0
City of Kelowna (residences)	22	11
City of Penticton (Cherry Lane)	1	0
Total	80	12

Results of the trapping program indicated need for an extensive survey in 1977. A committee comprised of representatives from the Provincial and Federal Departments of Agriculture, B.C. Forest Service and Canadian Forestry Service met and drew tentative plans for this survey.

[Minutes from the meeting and recommendations for the upcoming survey may be found in Appendix E.

A brief history of the European pine shoot moth in British Columbia is found in Appendix F.]

Rusty tussock moth, *Orgyia antiqua badia*

Infestations of rusty tussock moth were found in lodgepole pine stands in the Monte Hills - Douglas Plateau area near Dardanelles and Todd lakes (T.F.L. 16) in 1975. In February of 1976 numerous overwintering egg masses were observed in the upper crowns of 80-100 year old lodgepole pines; fewer, but significant numbers, were found on Engelmann spruce and understory alpine fir and mountain alder. The infestation appeared to be restricted to lodgepole pine stands between 1100 and 1500 metres (3,600 to 5,000 feet) elevation, and was estimated to cover 2 400 to 3 200 ha (6,000 to 8,000 acres), of which 400 ha (1,000 acres) sustained light to moderate defoliation in 1975.

In May of 1976, egg mass collections sent to C.C.R.I., disclosed a high incidence of virus infection.

Three examinations were made during the summer months, and by September few larvae were evident. Defoliation in June was light but no further damage was observed. In late September egg sampling was attempted but no egg masses were found on several felled trees.

Scale insects, *Phenacaspis pinifoliae* and *Nuculaspis californica*

Scale insects continued to infest all ages of ponderosa pine trees in the Kelowna, Summerland, Penticton and Okanagan Falls areas. Black pine leaf scale was predominant near East Kelowna and Okanagan Falls, while at Penticton and Summerland, white pine leaf scale was predominant. Some tree mortality occurred in pole-sized groups near Kelowna and east of Penticton near the Carmi Road.

Increased rainfall, increasing the tree vigor during the 1976 growing season, is expected to reduce the population in 1977.



### Other Noteworthy Insects

#### Satin moth, *Stilpnotia salicis*

Light to moderate defoliation of trembling aspen and black cottonwood by the satin moth was observed from Knutsford south to Merritt and south along the Merritt - Princeton highway for 12 miles. Other areas of spotty, light defoliation of trembling aspen and silver poplar were observed near Tranquille and along the south Thompson River from Dallas to Monte Creek.

In most instances, from 1 to 10 trees in 50-100 tree clones were from 50 to 80% defoliated. Moths were numerous in the Kamloops - Monte Creek area in August, and increased defoliation is expected in 1977.

#### Forest tent caterpillar, *Malacosoma disstria*

In August, 300-500 acres of defoliated trembling aspen were observed during aerial surveys. Northeast of Halymore Lake near Little Fort, trees were moderately defoliated by the forest tent caterpillar.

History of outbreaks of this insect indicate continuing and probably expanded infestations in 1977.

#### Western false hemlock looper, *Nepytia freemani*

Western false hemlock looper populations continued to decline in 1976. Numbers of larvae in collections ranged from 1 - 50. Near Bromley Park, southeast of Princeton, 50 larvae per collection may have contributed to light defoliation of Douglas-fir; from 30 - 60 spruce budworm, *Choristoneura occidentalis*, were also found in collections at this location.

Black army cutworm, *Actebia fennica*

Populations of black army cutworm declined to low levels in 1976. Only traces of damage to fireweed were observed near Salmon Arm, Scotch Creek, Blue River and Wiley Creek, where potential populations in 1975 were cause for concern.

Pheromone traps (baited with 95 micrograms of 7 Dodecen-1-01 acetate) at two locations near Scotch Creek and at Wiley Creek and Blue River, averaged from 0 to 4 moths per trap. Low populations are expected in 1977.

Douglas-fir needle midges, *Contarinia* spp.

Needle midges were monitored at eight locations from Penticton to Barriere in 1976. In all areas, less than 1% of needles of the current year's growth were infested.

Populations of Cooley spruce gall aphid, *Adelges cooleyi*, were also light.

Larch casebearer, *Coleophora laricella*

Low populations resulted in light browning of western larch trees east of Okanagan Falls along Shuttleworth Creek. Maximum number of pupae per 100 fascicles was 17.

A new record of occurrence for the larch casebearer was collected east of Cherryville near Heckman Creek. Three pupae were collected from the lower crown of a 10-inch diameter larch tree. This extends the known range of the casebearer west of the Monashee Mountains and north of Penticton.

Larch budmoth, *Zeiraphera improbana*

Low to moderate populations of budmoth larvae caused light defoliation of overmature western larch trees along Shuttleworth Creek, east of Okanagan Falls. Elsewhere populations remained low.

Alder flea beetle, *Altica ambiens*

Light to moderate browning of black cottonwood foliage was observed in the Salmon Arm - Shuswap Lake area and along Mara Lake.

## FOREST DISEASE CONDITIONS

### Dwarf mistletoe on lodgepole pine, *Arceuthobium americanum*

Infection by dwarf mistletoe on lodgepole pine was common throughout the host range in Kamloops Forest District. Volume loss through decreased increment is high and tree mortality occurs as a result of reduced vigor of the host. Infection is spread through aerial seeding from the parasitic plants on mature trees to regeneration growth. After logging, unless clear-cutting has been the policy, infection continues from residual trees left standing singly or in groups.

Near Big White Mountain a 100+ acre area was logged in the 1950's. The area, on a southwest 10-20 percent slope, was not slash-burned. Residual lodgepole pine trees, up to 70 feet high, were left singly and in groups of from 2-10 per acre. Mistletoe infection on these residuals ranged from 1-2 aerial plants per tree to 10. Natural regeneration beneath these ranged up to 450 stems per acre, in a 2-storied growth of up to 5 feet and up to 25 feet in height. Four groups of 25 regeneration trees were examined in a radius of 20 feet from residual infected pines. Seventeen percent of the trees from 10-20 feet in height were found to harbour aerial plants of dwarf mistletoe; no infection was found on regeneration under five feet.

Clear-cutting appears to be the best way to control dwarf mistletoe in lodgepole pine. Unless all infected trees are cut or poisoned at the time of logging, the sanitation value of the operation is lost. Residual trees left in relatively clear-cut areas should be examined and if infected, cut out within five years following successful regeneration.

### Pine needle cast, *Elytroderma deformans*

Heavy browning of ponderosa pines was evident over most lower elevation areas in the Okanagan Valley, Nicola Valley and Thompson River Valley.

### Shoot tip blight of ponderosa pine, *Diplodia pinea*

The first recorded incidence of this disease on container-grown pine seedlings was found at the B.C. Forest Service Nursery at Vernon.

A tip wilt, *Sirococcus strobilinus*

Light infection by this tip wilt was found on container-grown lodgepole pine seedlings at Skimikin Nursery in 1976. A fungicidal spray was used for control.

Salt damage

With the increased use of salt for de-icing highways, damage to conifers bordering the road has become more apparent. Dehydration of foliage, caused from salt-saturated runoff, and mists from passing vehicles, results in foliage browning and tip dieback.