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ANNUAL DISTRICT REPORT
FOREST INSECT AND DISEASE SURVEY
BRITISH COLUMBIA, 1977
PART V - NELSON FOREST DISTRICT

by

C. B. Cottrell and R. D. Erickson

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- FILE REPORT -

Appendices may be seen with original file report, in Room 13,
FIDS building.

DEPARTMENT OF ENVIRONMENT

January, 1978

INTRODUCTION

This report outlines the status of forest insect and disease conditions in the Nelson Forest District for 1977, and attempts to forecast pest population trends.

Regular field work in the District began May 16 and ended August 19. Special surveys were as follows: mountain pine beetle cruising with Dr. L. Safranyik for the Western Forest Products Institute mill study, February 16 to 18; early larch casebearer parasite collections, May 3 to 5; mountain pine beetle cruising, collect pheromone traps, etc., September 6 to 16; and larch casebearer overwintering population and larch sawfly cocoon sampling, October 24 to 29. Aerial surveys consisting of 32 flying hours, 20 of which were supplied by the B.C. Forest Service, were done in July and August. Meetings of the East Kootenay Forest Insect and Disease Control Committee were attended three times during the year, while the Kettle Insect and Disease Control Committee was attended twice.

A total of 555 insect and disease collections were submitted to the Pacific Forest Research Centre in 1977. Map A shows collection localities and Map B shows aerial survey flight lines.

Numbers of larval defoliators found in field collections increased; 90% of collections in the West Kootenay and 76% in the East Kootenay contained larvae.

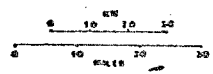
Aerial surveys for mountain pine beetle attack indicated that the 1976 attack increased greatly over that in 1975 in the White River and Flathead valleys but declined in the Golden and Kettle River areas. In 1977, approximately 138,000 red-topped lodgepole and 12,000 western white pine trees were counted. The 1977 attack, especially in the White and Flathead, was very heavy. One small infestation of spruce beetle occurred near Salmo, but populations remained generally low, as were populations of Douglas-fir beetle.

Defoliation caused by larch casebearer increased in intensity and extent. Larch sawfly, larch looper and larch budmoth infestations increased. The 2-year-cycle spruce budworm caused only light defoliation during the "off year" but was found in more areas.

The large forest tent caterpillar infestations in the Golden and Fort Steele areas collapsed. Localized outbreaks of western tent caterpillar continued around Golden and Elko.

Red band disease was common in many lodgepole pine stands, causing heavy foliage loss. The incidence of larch needle cast increased. White pine blister rust, western gall rust and Armillaria root rot continued to cause tree mortality, top-killing and increment loss.

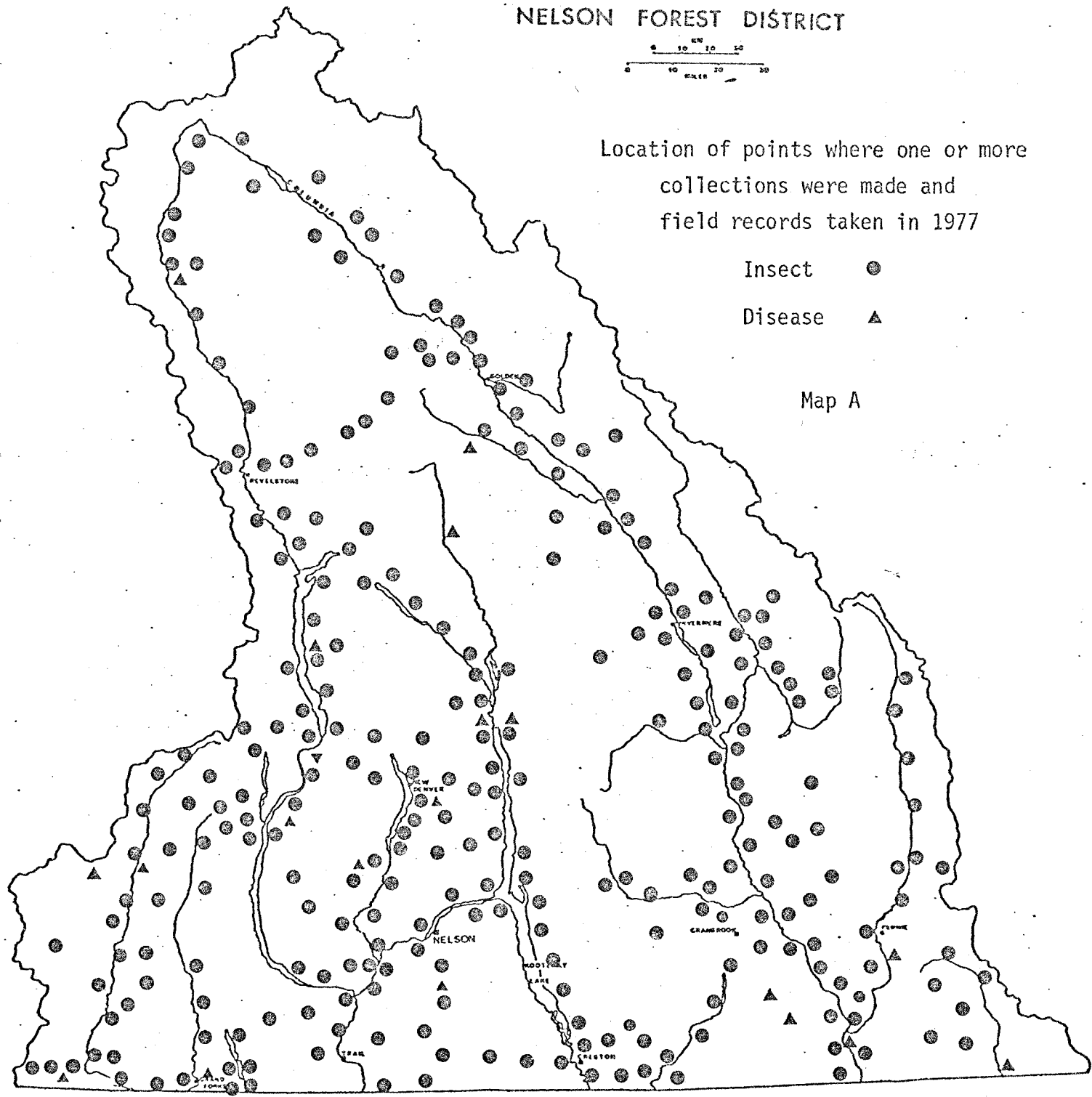
NELSON FOREST DISTRICT



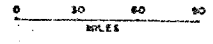
Location of points where one or more collections were made and field records taken in 1977

Insect ●
Disease ▲

Map A

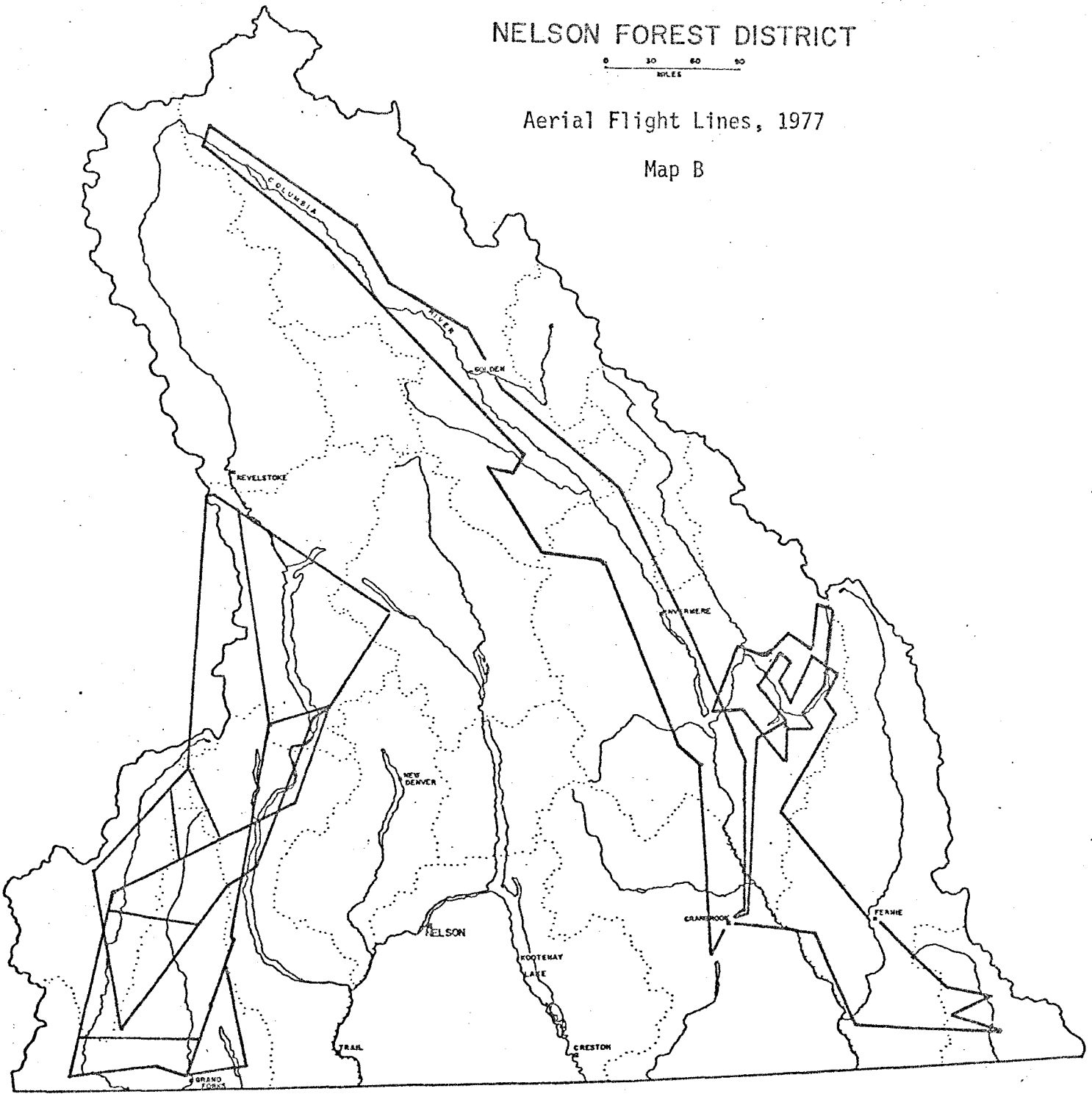


NELSON FOREST DISTRICT



Aerial Flight Lines, 1977

Map B



FOREST INSECT CONDITIONS

Currently Important Insects

Bark Beetles

Mountain pine beetle, *Dendroctonus ponderosae*

The mountain pine beetle continued to kill ever increasing numbers of lodgepole pine trees in the Nelson Forest District. The White River system was the most severely attacked area, where an estimated 117,000 red-topped trees occurred on 9 300 ha (Table 1) compared with an estimated 39,000 red-tops on 4 900 ha in 1976. Green-infested trees attacked in 1977 are known to be numerous in most of the valley but especially near the junction of the north, middle and east forks of the White River.

In the Flathead River Valley near the Canada-U.S.A. border and at the mouth of Sage Creek, the number of 1976-killed trees (as determined in 1977) increased tenfold compared with 1975, to 4,500 trees on 500 ha. Green-infested trees were very numerous in this area. This sudden large attack may be attributable to beetle flights from nearby huge infestations in Montana, U.S.A.

Red-top counts north of Golden declined in 1977 but this is because of the large areas of beetle-killed timber that have been logged.

Counts of beetle-killed lodgepole pine were also lower in the West Kootenay, mainly due to the rapid detection and logging of small out-breaks. Attacks are expected to remain low in 1978 because of improved control/salvage logging practices. However, in the East Kootenay, attacks are expected to increase again. A period of warm weather in April and May of 1977 allowed the beetles to attack earlier than in the last few years, thus allowing the broods to become well developed for the 1977-1978 over-wintering stage.

Approximately 7,000 red-topped western white pine trees were noted on 1 300 ha, mostly in the Columbia River Valley around McNaughton Lake (Table 1).

Maps 1 to 6 show locations of mountain pine beetle infestations.

Table 1. Number of red-top pine trees and hectares infested as determined from aerial surveys, Nelson Forest District, 1977

Pine species	Location	No. red-tops	No. hectares
lodgepole	<u>West Kootenay</u>		
	Goathide Cr	650	160
	Ptarmigan Cr	280	80
	Arlington L(s)	550	200
	Whitefoot Cr	25	12
	Copperkettle Cr	25	12
	Trapping Cr	30	24
	China Cr	40	16
	Carmi	30	8
	Saunier Cr	35	8
	Wilkinson Cr	47	8
	King Solomon Mtn	600	120
	West of Horse Cr	15	4
	Beaverdell	10	1
	Little Goat Cr	25	20
	Kelly R	30	4
	Boomerang Cr	55	20
	Taurus Cr and north	30	8
	Fourth of July Cr	20	6
	Upper Kettle R	20	6
	Gloucester Cr	5	1
	Burrell Cr	25	6
	Fiva Cr	600	45
Nicholson Cr	50	28	
Rice Cr	5	2	
Christina L	155	93	
Sandner Cr	30	6	
Bitter Cr	25	6	
	Sub Total	3,412	904

cont'd..

Table 1 - cont'd.

Pine species	Location	No. red-tops	No. hectares
lodgepole	<u>East Kootenay</u>		
	Succour Cr	120	20
	Blackwater Ridge	4,900	400
	Beaver Canyon	50	8
	Beavermouth	200	20
	Redgrave	800	60
	Waitabit Cr	500	40
	Donald	600	40
	Blaeberry (W)	50	4
	Blaeberry (E)	75	12
	Moberly Bench	100	16
	Golden (W)	150	40
	Golden (E)	275	40
	Twelve Mile Cr	250	30
	Horse Cr	70	10
	Pagliaro Cr	100	10
	Horsethief Cr	100	20
	Frances Cr	30	6
	Harrogate	100	12
	Mt. Taynton	1,350	160
	Dutch Cr	400	40
	Doctor Cr	800	80
	Palliser R	500	40
	North White R	950	80
	Maijuk Cr	50	4
	Fenwick Cr	350	40
Colin Cr	400	40	
Middle White R	2,000	200	
East White R	500	40	
Grave Cr	300	20	
Whiteswan L	950	80	
White R (E. of Lake)	10,000	1 410	
White R (N. of Lake)	50,000	4 050	

cont'd..

Table 1 - cont'd.

Pine species	Location	No. red-tops	No. hectares	
lodgepole	<u>East Kootenay</u>			
		Rock Cr	5,000	200
		Elk Cr	45,000	2 975
		Blackfoot Cr	665	80
		Thunder Cr	635	120
		Dry Cr	1,000	120
		Lussier R	1,450	120
		Bull R	20	4
		Morrissey Cr	25	4
		Flathead R - Sage Cr	4,500	485
	Sub Total	135,315	11 180	
	Grand Total	138,727	12 084	
western white	<u>West Kootenay</u>			
		Whatshan R	50	12
		Wilson Cr	60	16
		Plant Cr	150	24
		Pingston Cr	200	120
		Trout L	25	4
		Payne Cr	30	12
		Sub Total	515	188
		<u>East Kootenay</u>		
		Sentry Mtn	150	40
		Gold Arm	140	20
		Columbia Reach	1,225	240
		Sullivan Arm	400	80
	Bush Arm	4,000	600	
	Succour Cr	500	120	
	Beavermouth	20	4	
	Sub Total	6,435	1 104	
	Grand Total	6,950	1 292	

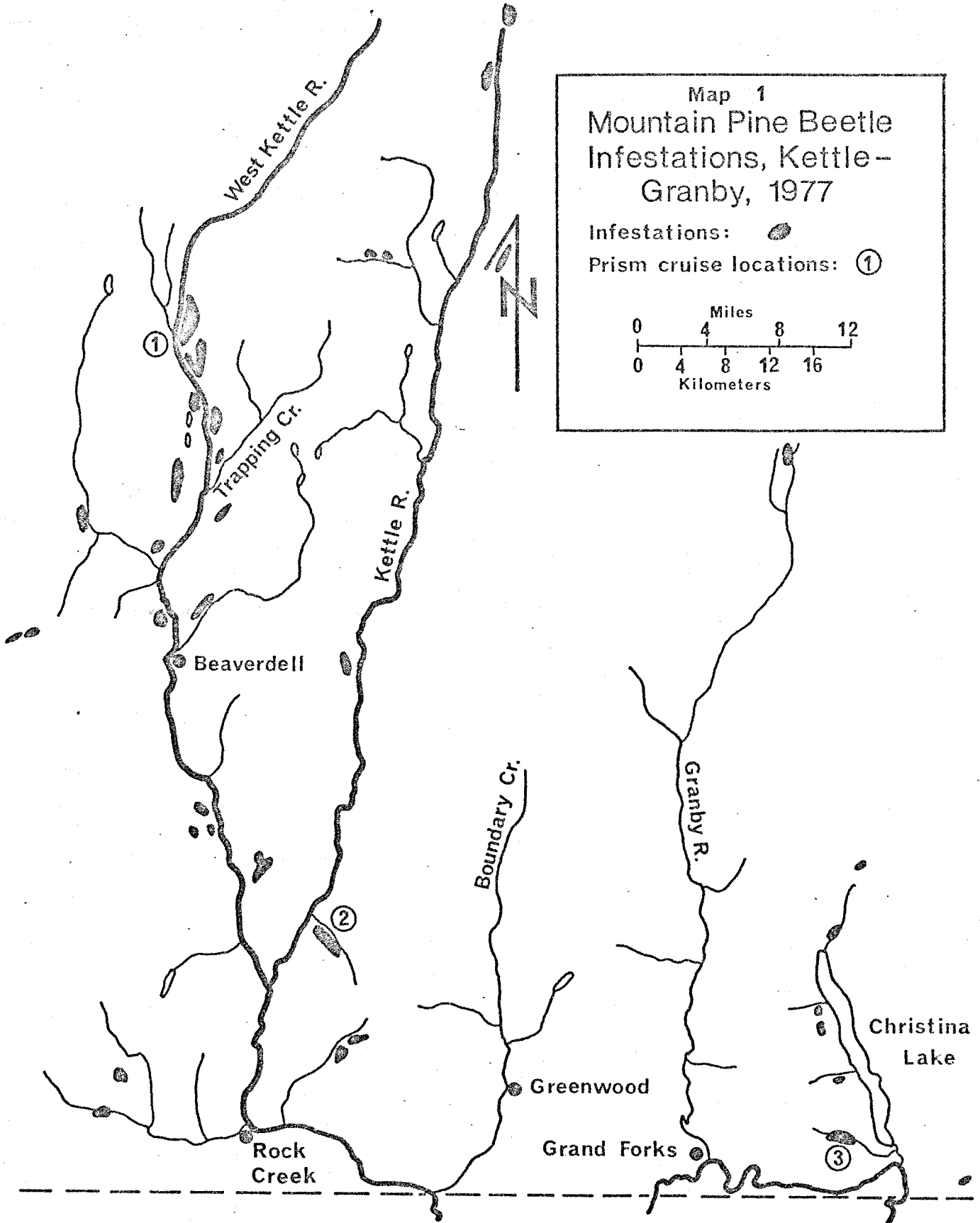
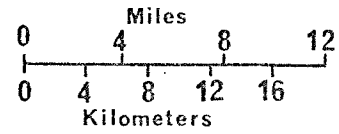
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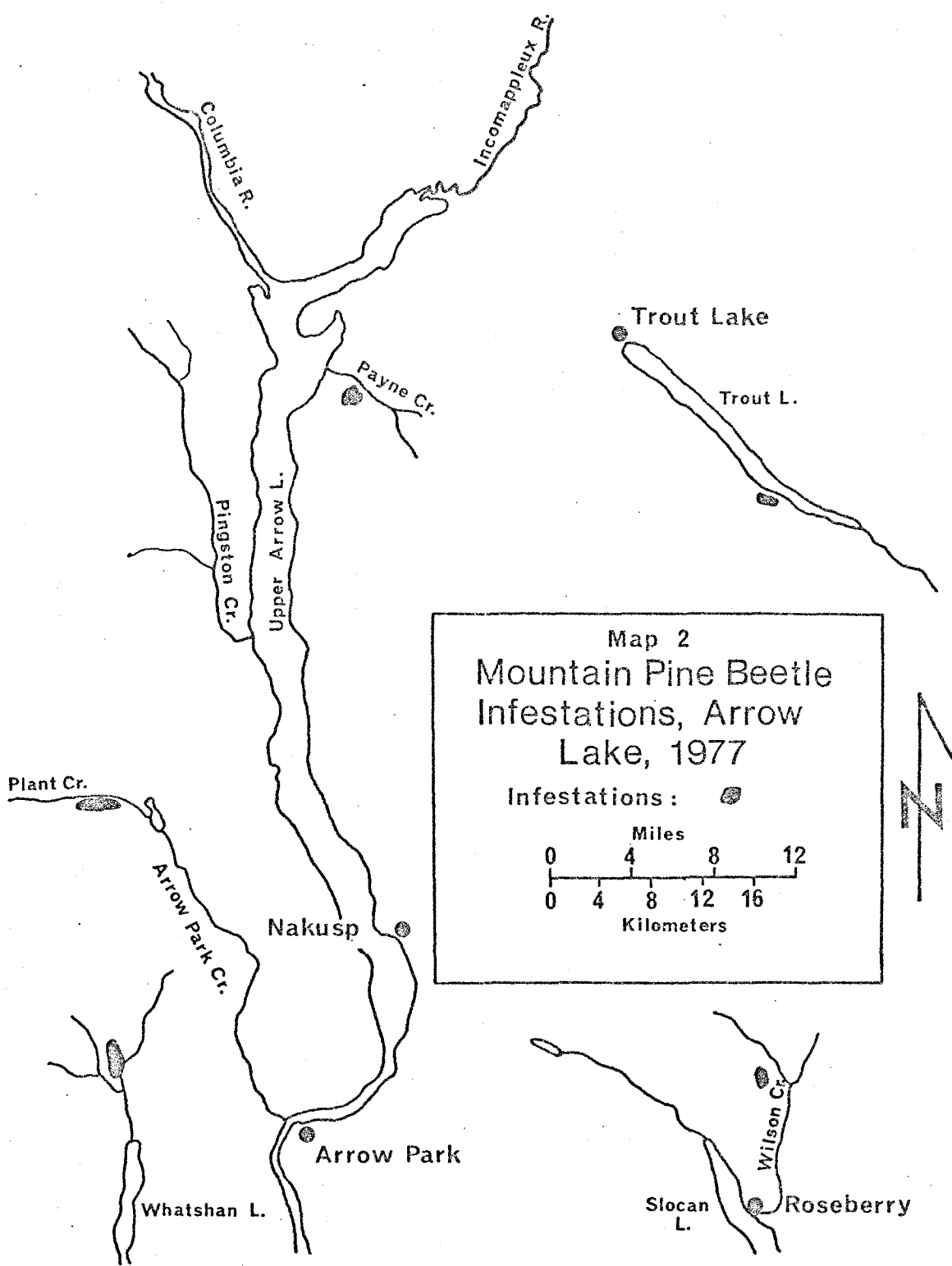
Table 1 - cont'd.

Pine species	Location	No. red-tops	No. hectares
ponderosa pine	<u>West Kootenay</u>		
	Westbridge	45	10
	Kettle Valley Rec. Area	<u>20</u>	<u>8</u>
	Sub Total	65	18
	Grand Total	65	18


Map 1
Mountain Pine Beetle
Infestations, Kettle-
Granby, 1977

Infestations: ●
Prism cruise locations: ①



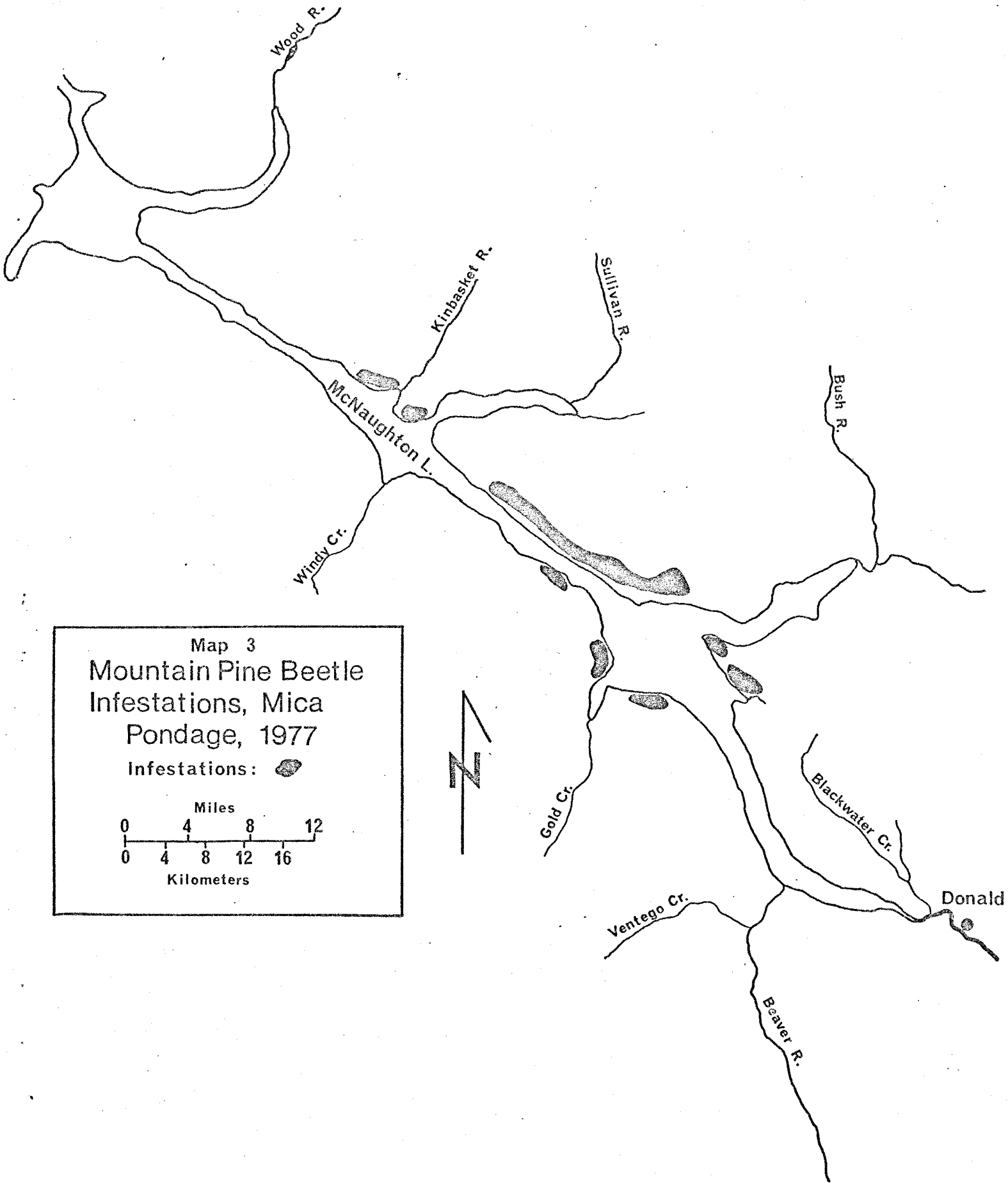



Map 2
 Mountain Pine Beetle
 Infestations, Arrow
 Lake, 1977

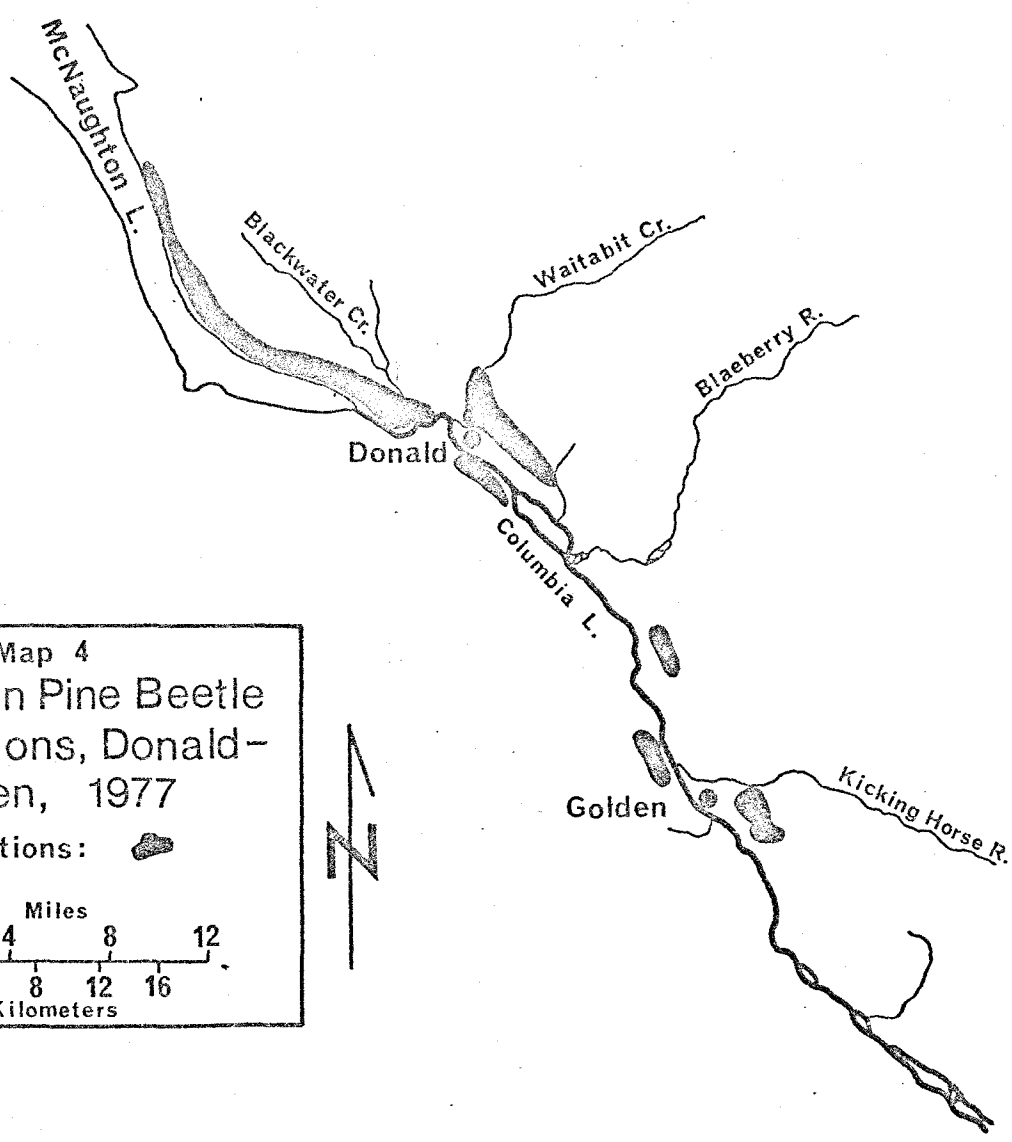
Infestations: 


Miles
 0 4 8 12

Kilometers
 0 4 8 12 16



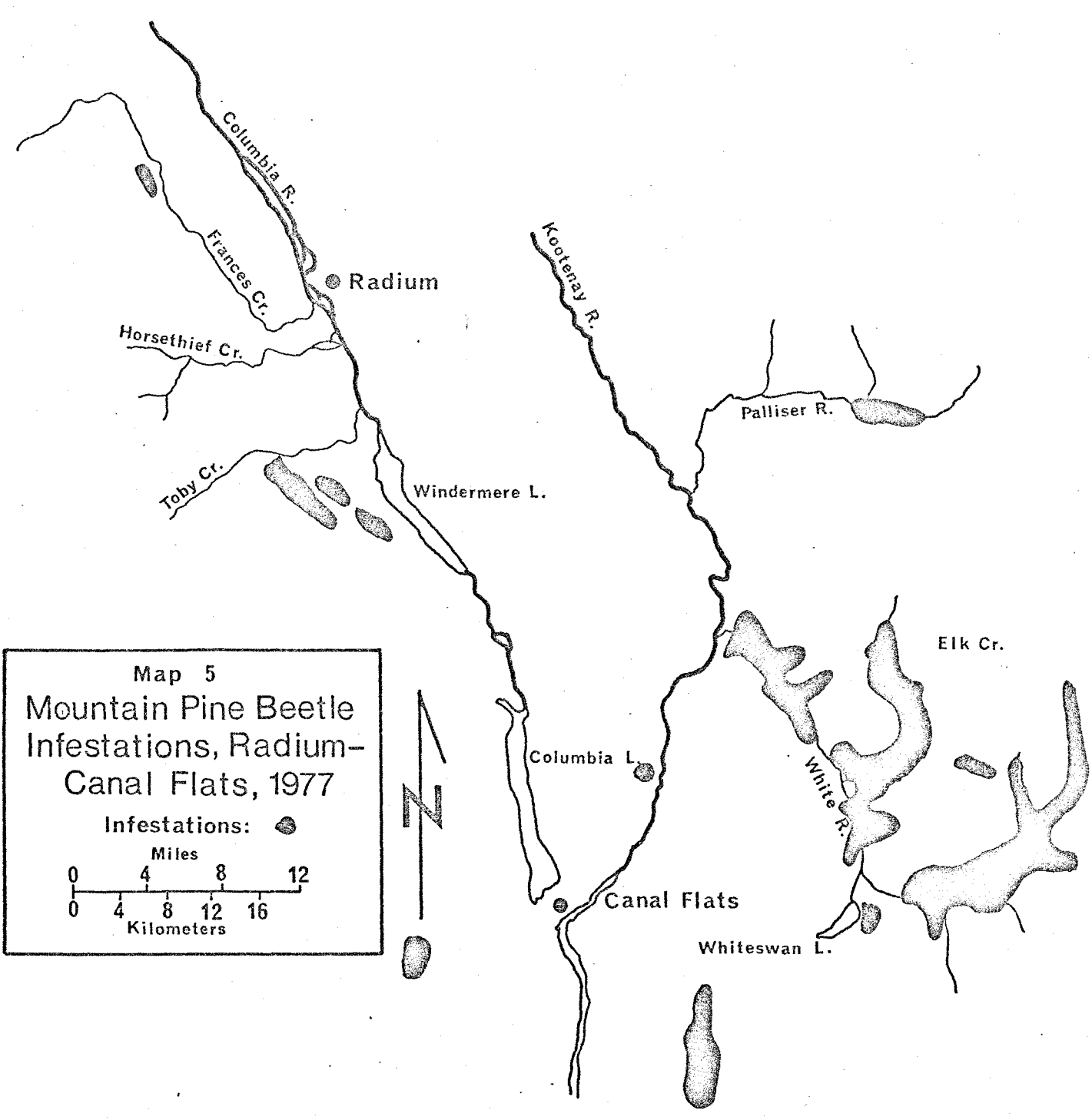
Map 3
 Mountain Pine Beetle
 Infestations, Mica
 Pondage, 1977
 Infestations: 
 Miles
 0 4 8 12
 Kilometers
 0 4 8 12 16



Map 4
Mountain Pine Beetle
Infestations, Donald-
Golden, 1977
Infestations: 
Miles 0 4 8 12
Kilometers 0 4 8 12 16



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Map 5
Mountain Pine Beetle
Infestations, Radium-
Canal Flats, 1977

Infestations: ●

Miles
0 4 8 12

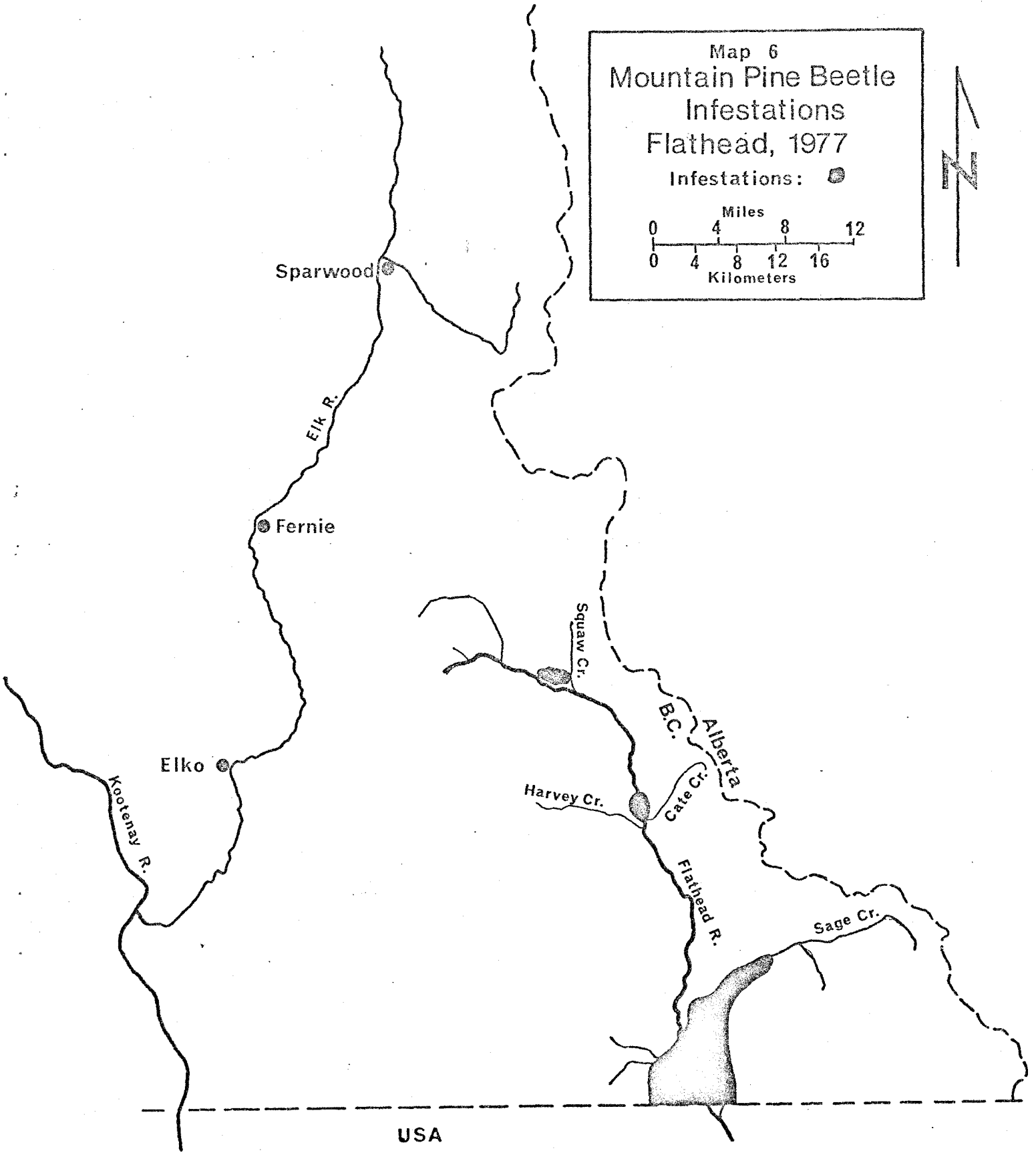
Kilometers
0 4 8 12 16

Map 6
Mountain Pine Beetle
Infestations
Flathead, 1977

Infestations: ●

Miles
0 4 8 12

Kilometers
0 4 8 12 16



USA

Spruce beetle, *Dendroctonus rufipennis*

Approximately 40 Engelmann spruce trees were attacked in the spring of 1977 at Swift Creek near Salmo. The trees were logged by mid-summer. Along the North White River the occasional wind-felled spruce on road right-of-ways contained moderate populations.

Douglas-fir beetle, *Dendroctonus pseudotsugae*

Only a few red-topped Douglas-fir trees were noted in 1977. About 50 trees were attacked in the Lussier River Valley, 25 along Johnston Creek and 10 at Deer Creek.

Dryocoetes-Ceratocystis complex

The western balsam bark beetle, *Dryocoetes confusus*, in association with the fungus, *Ceratocystis dryocoetidis*, continued to take an annual toll of high elevation alpine fir trees but fewer than in previous years. However, the number of red-topped trees shown in Table 2 is considered to be conservative since not all high elevation stands are surveyed on an annual basis.

Table 2. Location and numbers of alpine fir trees killed by *Dryocoetes-Ceratocystis* complex, Nelson Forest District, 1977 aerial survey

Location	No. of trees
Mt. Mackie	100
Silverton Cr	1,200
Pingston Cr	1,500
Coursier L	500
Spillimacheen R	2,000
Bugaboo Cr	500
Blackfoot Cr	100
Horsethief Cr	500
St. Marys R	1,000
Upper Bull R	100
Olivia Cr	100
Akoo Cr	100
Narboe Cr	100
	<u>7,800</u>

Pine engraver, prob. *Ips pini*

Engraver beetles attacked about 50 scattered pockets of 2 to 20 standing lodgepole and ponderosa pine trees in the Grasmere area south of Elko. The area is comprised of one large Indian Reserve and moderately-treed range land. In the past few years considerable land clearing has taken place so a large population of beetles probably built up in the resulting slash. Adult beetles were present in standing trees in September but not in October, indicating that they may be overwintering in the duff. As *Ips* infestations seldom last more than one year in standing trees, no extensive outbreak is forecast for 1978.

Defoliators

Larch casebearer, *Coleophora laricella*

Defoliation of western larch by larch casebearer was slightly greater in 1977 than in 1976 and increased noticeably in the eastern portion of the District. Moderate to heavy defoliation occurred in the Kootenay River from Blewett to Castlegar, from Fruitvale to Ross, west of Salmo, along the Pend-d'Oreille River, along Summit Creek to Creston, Crawford Bay and from Arrow Creek to Rykerts. Lighter defoliation occurred from Crescent Valley to New Denver in the Slocan Valley and from Wardner to Elko.

Defoliation at five permanent sample points is shown in Table 3.

Table 3. Western larch defoliation by larch casebearer at five permanent plots, Nelson Forest District, 1977

Plot location	Elevation	Defoliation ^{1/}
Fruitvale	2300'	moderate
Salmo	2200'	light
Rykerts	2200'	moderate
East Arrow Cr	2400'	light
Yahk	2800'	light

^{1/} light - 0-25% discolored
moderate - 26-50% "
heavy - 51-75% "
severe - over 75% "

Only one parasite release was carried out in 1977, at Rossland on plot #7. There were 16 male and 36 female *Agathis pumila* adults received from G.D. Williamson in good order, and released on July 26, 1977.

Larch casebearer larvae and pupae were collected at the five permanent plots on May 2 and May 21, 1977, and reared for parasite emergence (Table 4). The sampling system used was to prune and bag 4-18" (45 cm) branch tips from the mid-crown of each of 4 trees at each plot. This same sampling system was used for the overwintering larvae counts.

In October, 1977, larch casebearer overwintering larvae were collected on branch samples at five permanent plots to determine the number of overwintering larvae (Table 5).

Table 4. Larch casebearer parasites recovered through rearing.

Sample location and date	No. of adults (per cent)		No. of pupae
	<i>Agathis pumila</i>	<i>Chrysocharis laricinellae</i>	
Fruitvale, May 2	56 (28%)	5 (2.5%)	200
" , " 22	0	6 (3.0%)	200
Salmo, May 2	1 (0.5%)	4 (1.9%)	213
" , " 22	0	11 (5.5%)	200
East Arrow Cr, May 2	4 (2.0%)	1 (0.5%)	203
" " " , " 22	16 (7.5%)	8 (4.0%)	200
Yahk, May 2	0	0	200
" " 22	0	5 (2.5%)	200
Rykerts, May 2	0	0	200 ?
" " 22	0	0	200

Table 5. Overwintering larval populations at five plots, Nelson Forest District, 1974-77.

Location	Avg no. larvae per 18" branch			
	1974	1975	1976	1977
Fruitvale	10 (8) ^{2/}	2 (2)	18 (9)	48 (11)
Salmo	6 (6)	14 (16)	47 (21)	81 (49)
Rykerts	33 (28)	63 (68)	157 (64)	110 (61)
East Arrow Cr	37 (51)	105 (57)	91 (31)	42 (30)
Yahk	5 (5)	3 (4)	17 (9)	19 (14)

^{2/} Figures in brackets are numbers of casebearers per 100 fascicles.

The defoliation in 1978 should be moderate in most areas where moderate to severe defoliation occurred in 1977, and increase to moderate in the 1977 light areas.

Larch budmoth, *Zeiraphera improbana*

In 1965-1966 and 1973 there were large infestations of larch budmoth in the western portion of the Nelson Forest District. In 1977, there was a total of 2 020 ha of defoliation of western larch by the larch budmoth in the following locations: Granby River, 1 450 ha; Kelly River, 420 ha; St. Annes Creek, 100 ha, and Thone Creek, 50 ha (Map 7). All the infestations were 1 200 m to 1 500 m elevation. The larvae of larch budmoth were in the 3rd and 4th instar about June 5 in the Kettle River area. The defoliation of western larch by larch budmoth was noticeable on July 7.

Larch looper, *Semiothisa* sp.

For the first known time in British Columbia, *Semiothisa sexmaculata* (species not positively identified) caused widespread defoliation of western larch in the western part of the Nelson Forest District between Kootenay Lake and Arrow Lake (Map 8, Table 6).

Defoliation first appeared on August 12, 1977 in bands from 900 m to 1 200 m elevation on north- east- and west-facing slopes. Both pure and mixed larch stands were infested, however, defoliation in pure stands appeared most severe. By the first week of September defoliation, which appeared first as a light straw color, turned a bright red. Also at this time the larvae had pupated in the duff below the infested trees. The average number of pupae per 1 000 cm² of duff from three locations (two points on Blueberry Creek, one on Cayuse Creek) was 0.7. In the same samples there was an average of 1.5 diptera puparia per 1 000 cm² of duff. It is not known at this time if the diptera puparia are parasites of the *Semiothisa* sp.


Table 6. Areas of defoliation of western larch by *Semiothisa* sp., Nelson Forest District, 1977. (See Map No. 8).

Location	Defoliation (hectares)		
	Light	Moderate	Severe
Slocan Valley	960	160	470
Arrow Lakes	965	240	420
West Arm, Kootenay Lake	100	225	210
Kootenay River (includes Blueberry Creek)	80	145	615
Sub Totals	2 105	770	1 715

Total defoliation: 4 590 ha

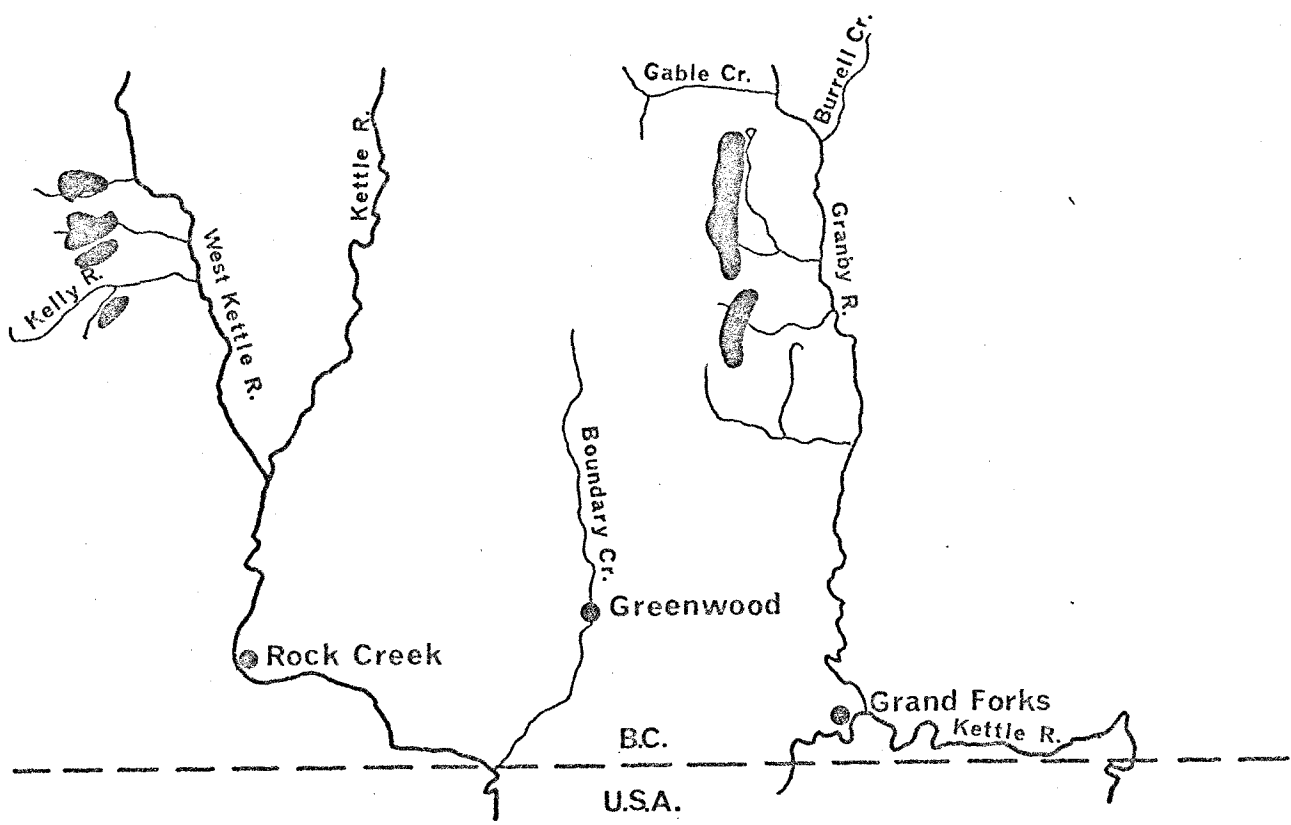
This larch looper was collected in beating samples on western larch, Douglas-fir and western hemlock. The average number of larvae per positive sample was 8 on western larch, 2 on Douglas-fir and 3 on western hemlock. These early beating samples did not necessarily coincide with resulting defoliation.

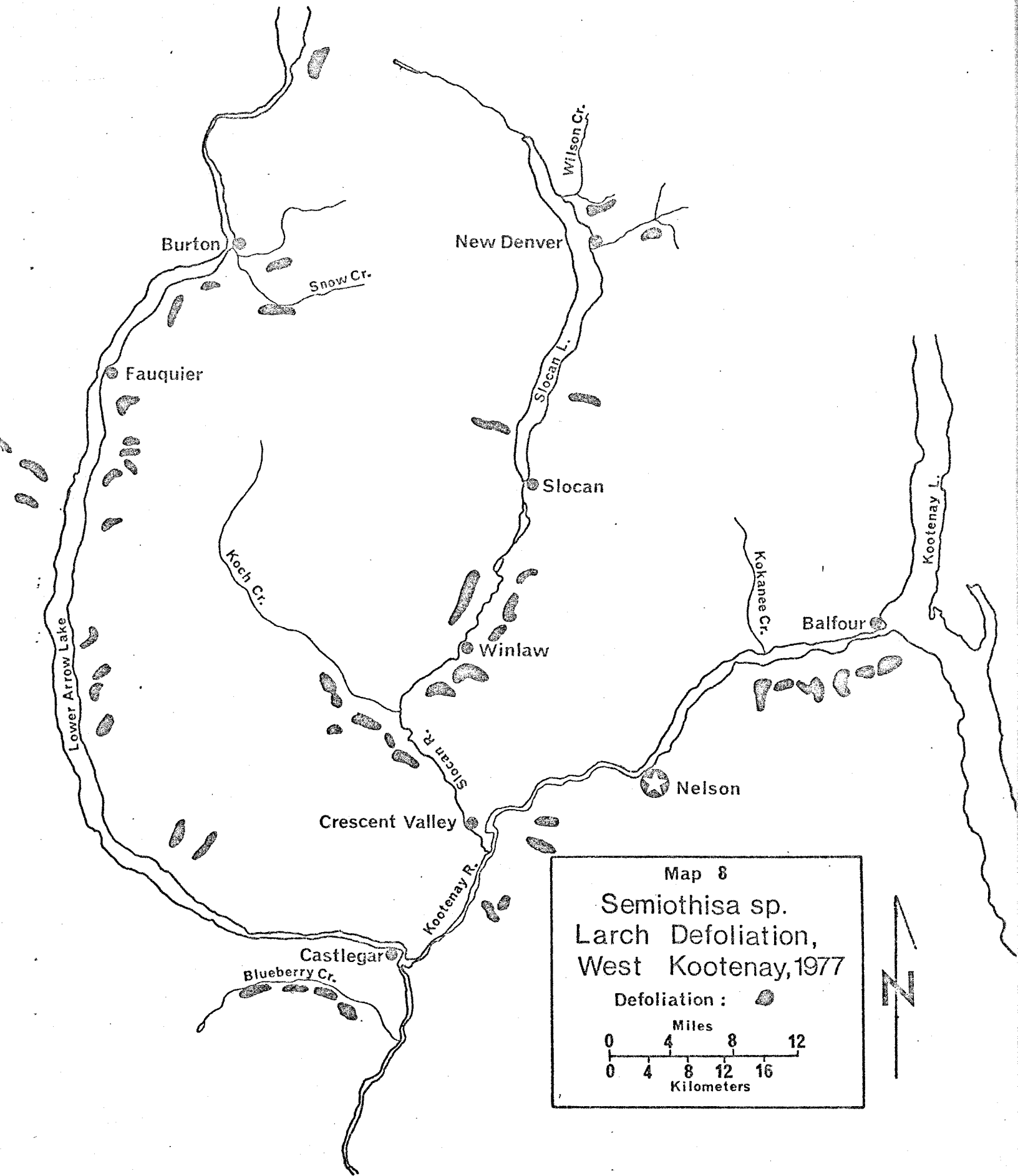
Map 7
Larch Budmoth
Defoliation, Kettle-
Granby, 1977

Defoliation: 

Miles
0 4 8 12

Kilometers
0 4 8 12 16





Larch sawfly, *Pristiphora erichsonii*

Larch sawfly populations increased for the second year in the vicinity of Sparwood, causing moderate to severe defoliation of western larch trees. On the hillsides at 1 200 to 1 400 m elevation on the west side of the Elk River, north of Sparwood, larch trees on 200 ha were from 75 to 90% defoliated, while 600 ha were moderately defoliated (30 to 50%) in the valley bottom. Light damage occurred for about 1 km south of Sparwood and larvae could be found from there to Hosmer. Light populations of larvae were noted at Dutch Creek and near Rossland.

Previous major sawfly outbreaks have appeared first in the Sparwood - Fernie area and then later westward throughout most of the range of western larch.

In October, 1977, sampling in the duff beneath attacked trees, indicated a fairly large number of healthy overwintering larvae in the cocoon stage. In each of the three defoliation categories, 10 - 1 000 cm² duff samples were examined for cocoons; the results were as follows: severe averaged 63 cocoons of which 89% appeared healthy; moderate, 16 cocoons, 82% healthy, and light, 5 cocoons, 80% healthy (Tables 7 and 8). Unless predation by rodents during the winter of 1977-78 is especially high (which seems unlikely at this time), the infestation is expected to increase in size and intensity in 1978.

In 1977, 10,000 larch sawfly cocoons were collected from The Bog near Winnipeg by the Northern Forest Research Centre. These cocoons are hoped to contain the exotic parasite, *Olesicampe benefactor*, which was successful in controlling larch sawfly outbreaks in Manitoba. Parasites from the cocoons will be reared to the adult stage at the Pacific Forest Research Centre during the ~~winter~~ and released in the Sparwood area when the larch sawfly larvae first appear.

early summer

Table 7. No. of larch sawfly cocoons per 1 000 cm² of duff in three defoliation categories at Sparwood, October 27, 1977.

Defoliation classification	Tree no.	Sound cocoons ^{1/}	Unsound cocoons ^{1/}
Severe	1	19	6
	2	33	10
	3	158	5
	4	10	0
	5	62	8
	6	70	7
	7	25	5
	8	58	16
	9	20	7
	10	<u>106</u>	<u>1</u>
		Total	561
	%	89	11
Moderate	1	2	2
	2	6	5
	3	22	7
	4	17	4
	5	25	1
	6	7	0
	7	2	0
	8	7	0
	9	13	1
	10	<u>31</u>	<u>8</u>
		Total	132
	%	82	18
Light	1	1	1
	2	6	1
	3	14	4
	4	6	0
	5	7	1
	6	2	0
	7	0	0
	8	0	0
	9	1	2
	10	<u>2</u>	<u>1</u>
		Total	39
	%	80	20

^{1/}All cocoons to be reared in February, 1978, for parasites.

Table 8. No. of western larch branch tips curled by larch sawfly in three defoliation categories at Sparwood, October 27, 1977.

Defoliation category	Tree 1 ^{1/}			Tree 2 ^{1/}			Tree 3 ^{2/}		
	Branch no.	No. tips	No. tips curled	Branch No.	No. tips	No. tips curled	Branch No.	No. tips	No. tips curled
Severe	1	20	1	1	20	4	1	20	1
	2	20	1	2	20	5	2	20	1
	3	20	1	3	20	0	3	20	0
	4	20	4	4	20	2	4	20	2
	5	20	1	5	20	0	5	20	1
	6	20	3	6	20	3	6	20	0
	7	20	7	7	20	3	7	20	4
	8	20	6	8	20	1	8	20	5
	9	20	10	9	20	0	9	20	2
	10	20	4	10	20	3	10	20	3
	Total	200	38	Total	200	21	Total	200	19
	%		19	%		10.5	%		9.5
Moderate	1	20	4	1	20	1	1	20	6
	2	20	2	2	20	6	2	20	2
	3	20	1	3	20	4	3	20	3
	4	20	2	4	20	1	4	20	6
	5	20	0	5	20	0	5	20	3
	6	20	4	6	20	5	6	20	2
	7	20	3	7	20	0	7	20	2
	8	20	0	8	20	1	8	20	3
	9	20	1	9	20	2	9	20	2
	10	20	2	10	20	3	10	20	4
	Total	200	19	Total	200	23	Total	200	33
	%		9.5	%		11.5	%		16.5
Light	1	5	0	1	6	0	1	3	0
	2	6	0	2	12	0	2	11	0
	3	5	1	3	6	0	3	6	0
	4	5	0	4	4	0	4	7	0
	5	7	0	5	11	0	5	10	1
	6	6	2	6	15	0	6	5	0
	7	6	0	7	16	1	7	11	0
	8	7	1	8	12	0	8	6	0
	9	4	0	9	9	1	9	8	0
	10	5	1	10	6	0	10	8	1
	Total	56	5	Total	97	2	Total	75	2
	%		8.9	%		2.1	%		2.7

^{1/} Tips counted on large trees with binoculars.

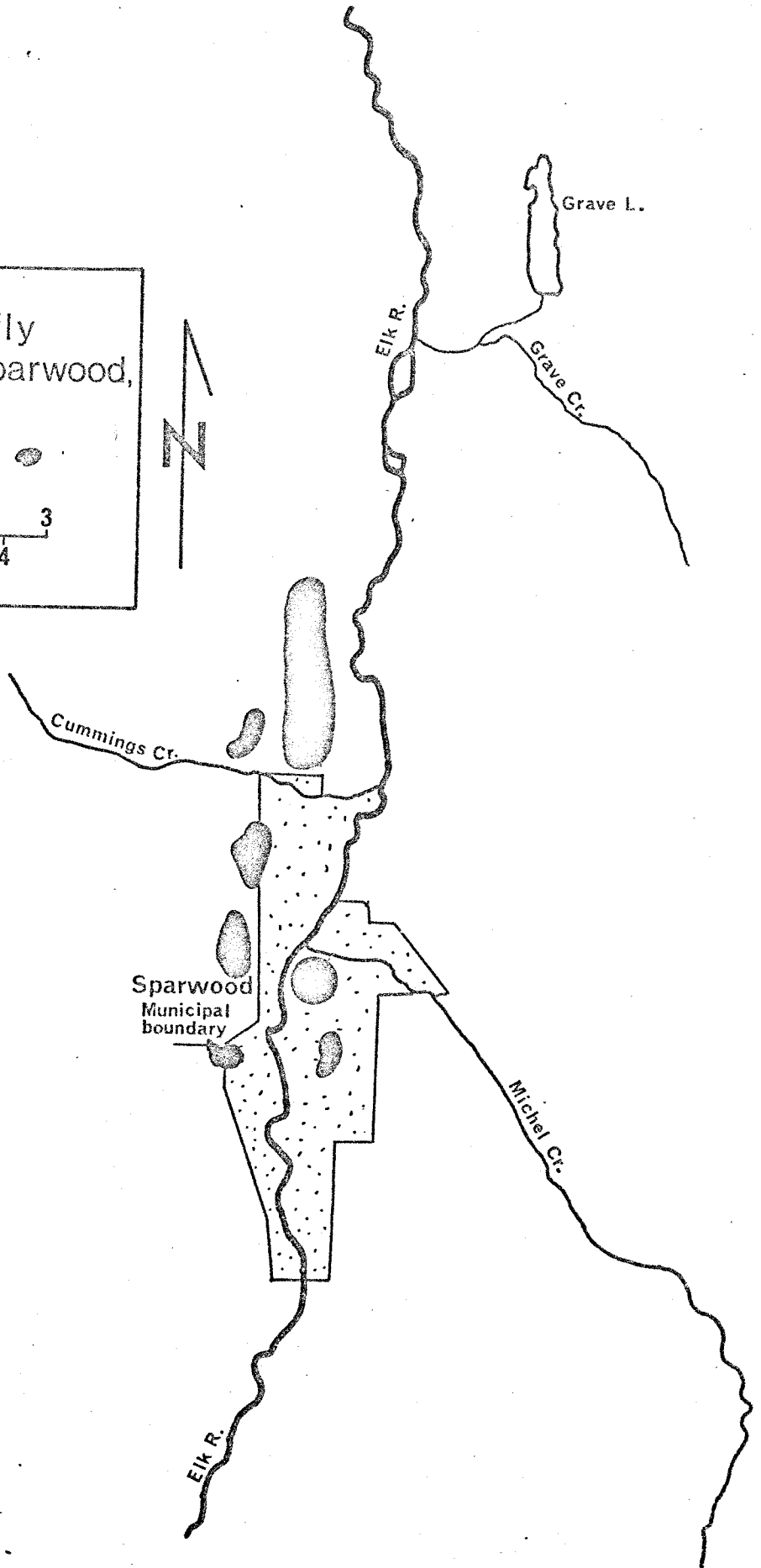
^{2/} Tips counted on five branches from each side of small trees (i.e. 4 m or less).

Map 9
Larch Sawfly
Infestations, Sparwood,
1977

Infestations: ●

Miles
0 1 2 3

Kilometers
0 1 2 3 4



Western spruce budworm, *Choristoneura occidentalis*

One-year-cycle spruce budworm caused moderate defoliation of 25 ha of Douglas-fir trees at Clanwilliam Lake. (A granulosis virus (?) was identified in samples sent to I.P.R.I.). Light defoliation occurred in the Kettle Valley and along the west side of Slocan Lake. The number of larvae in beating samples increased throughout the District. The number of moths caught in pheromone traps was small but the traps were placed well outside of any known infestation areas (see Appendices I-VI).

Spruce budworm, *Choristoneura biennis*

Two-year-cycle spruce budworm (normal cycle), caused light defoliation of approximately 1 000 ha of Engelmann spruce and alpine fir along the North White River and 200 ha in the East White River Valley. Larvae were fairly numerous and moderate defoliation is expected in 1978. (Appendix VII).

Two-year-cycle spruce budworm (off cycle) larvae lightly to moderately defoliated Engelmann spruce and alpine fir over 500 ha in McMurdo Creek Valley. This infestation has declined in extent and defoliation intensity from 1975. Two other infestations are also believed to be of the off-cycle variety, in Glenogle Creek in an area of undetermined size, and about 160 ha at the headwaters of Silverton Creek.

Western blackheaded budworm, *Acleris gloverana*

Feeding by blackheaded budworm larvae resulted in very light defoliation of Engelmann spruce on 250 ha in Matthew Creek Valley. Elsewhere in the District populations remained at low levels.

Satin moth, *Stilpnotia salicis*

Black cottonwood and trembling aspen trees were heavily defoliated (avg 80%) on 140 ha on Red Mountain near Rossland. There was no apparent tree mortality.

European pine shoot moth, *Rhyacionia buoliana*

Pine shoot moth continued to infest mugho pine at the Hugh Keenleyside Dam Viewpoint at Robson. There was only one damaged tip noted on Austrian pine. A new infestation was noted on the grounds of the I.C.B.C. office in Trail. These trees were recently planted and were already infested when imported from Vancouver. Clipping of infested tips and chemical spraying was carried out at both sites. Baited pheromone traps did not catch any adults in the area (Appendix VIII).

I.C.B.C. offices in the East Kootenay did not import any pine trees, nor were any adults caught in pheromone traps in the Creston area where a small outbreak occurred several years ago.

Birch skeletonizer, *Bucculatrix canadensisella*

Birch skeletonizer caused severe browning of western white birch trees on extensive areas from Kaslo to Trout Lake, from Radium to Donald in the Columbia Valley, in the Kicking Horse and Beaver River areas, and in the Toby and Horsethief Creek valleys.

Other Noteworthy Insects

Tent caterpillars, *Malacosoma* spp.

The large infestations of forest tent caterpillars, *M. disstria*, near Fort Steele and on Moberly Bench collapsed. However, infestations of the western tent caterpillar, *M. californicum pluviale*, persisted in small areas on trembling aspen and willow in the vicinity of Golden and Elko.

Yellowheaded spruce sawfly, *Pikonema alaskensis*

Individual ornamental spruce trees were moderately defoliated at Hugh Keenleyside Dam and at Wasa Lake.

Spruce weevil, *Pissodes strobi*

West of Slocan on Little Slocan River, 50% of immature Engelmann spruce were infested on several acres.

Pacific willow leaf beetle, *Pyrrohalta carbo*

Leaf beetles defoliated willows in the Columbia River Valley from Downie Creek to Shelter Bay and on the east side of Upper Arrow Lake from Fauquier to Nakusp and south to New Denver in the Slocan Valley.

A leaf beetle, *Dichelonyx* sp.

Leaf beetle populations in Douglas-fir Christmas tree areas in the Windermere Valley decreased in 1977 and caused only slight damage. Several hectares of western white birch and understory plants (Thimbleberry, Vetch, etc.) were moderately defoliated west of Brisco.

Cone and Seed Insects

Cone and seed insects were scarce as were most conifer cones. The only two tree species which bore a small number of cones were western larch and lodgepole pine.

Douglas-fir needle midges, *Contarinia* spp.

Cooley spruce gall aphid, *Adelges cooleyi*

Needle midge and aphid infestations decreased significantly as compared with the severe attacks in Douglas-fir Christmas tree cutting areas in the Windermere Valley in 1976. Needles were examined from one branch tip from each of 10 trees in five areas. The percentage of needles infested by needle midges, with 1976 figures in brackets, were as follows: Brisco, 1 (5); Edgewater, 2 (10); Radium, 6 (45); Invermere, 6 (28); and Canal Flats, 2 (3).

Per cent needles infested by Cooley spruce gall aphid, with 1976

figures in brackets, were as follows: Brisco, 2 (19); Edgewater, 3 (27); Radium, 5 (12); Invermere, 4 (14), and Canal Flats, 14 (35).

The number and percentage of needles infested by needle midges and aphids are shown in Tables 9 and 10.

Table 9. Number of Douglas-fir needles infested by needle midges and aphids, Nelson Forest District, 1977.

Location	Contarinia	Adelges	Healthy	Total
Brisco	7	19	1,195	1,221
Edgewater	24	49	1,406	1,479
Radium	81	62	1,174	1,317
Invermere	66	42	1,056	1,164
Canal Flats	14	133	777	924

Table 10. Per cent Douglas-fir needles infested by needle midges and aphids, Nelson Forest District, 1977.

Location	% needles infested		
	Contarinia	Adelges	Healthy
Brisco	0.6	1.6	97.8
Edgewater	1.6	3.3	95.1
Radium	6.2	4.7	89.1
Invermere	5.7	3.6	90.7
Canal Flats	1.5	14.4	84.1

Douglas-fir tussock moth, *Orgyia pseudotsugata*

Rusty tussock moth, *Orgyia antiqua badia*

Pheromone traps were set out in July to attract male tussock moths at the following six locations. The number of Douglas-fir tussock moths in five traps at each location, with the number of rusty tussock moths in brackets, averaged as follows: Cascade, 6 (7); Radium, 0 (0); Dutch Creek, 0 (2); Wasa Lake, 0 (0); Grasmere, 1 (0), and Kingsgate, 1 (25). (Appendices IX-XIV).

Green-striped forest looper, *Melanolophia imitata*

Increased numbers of larvae were collected in three-tree beating samples but the population remained low.

Western hemlock looper, *Lambdina fiscellaria lugubrosa*

Very few larvae were collected throughout the District

Western false hemlock looper, *Nepytia freemani*

Very few larvae were collected; the largest collection from Douglas-fir around Windermere Lake contained five larvae.

Conifer sawflies, *Neodiprion* spp.

Larvae were commonly found but generally in small numbers; the largest collection on western hemlock contained 80 larvae in the Akolkolex River Valley.

Fall webworm, *Hyphantria cunea*

Numerous webs occurred on chokecherry in the Castlegar area and from Fauquier to Nakusp.

Uglynest caterpillar, *Archips cerasivoranus*

Common on chokecherry in the upper Columbia River Valley.

Apple and thorn skeletonizer, *Anthophila pariana*

The leaves of orchard and residential apple trees were severely browned by this skeletonizer from Castlegar to South Slokan and in the vicinity of Creston. Some native hawthorn and Saskatoon bushes were also affected.

Gypsy moth, *Porthetria dispar*

No gypsy moth adults were caught in pheromone traps. Two traps each were set in July in the following parks: Kikomun, Norbury Lake, Wasa, Nancy Greene Lake, Beaver Creek, near Trail, and at Rossland. The traps were collected in mid-September (Appendix XV).

A sphinx moth, *Celerio* sp.

Common on fireweed northwest of Revelstoke.

FOREST DISEASE CONDITIONS

Red band disease, *Scirrhia pini*

A foliage disease of pines, which appears in abundance after several wet summers, caused widespread discoloration of lodgepole and western white pine. Areas of infection were as follows: Conkle Lake, Granby River from Grand Forks to Burrell Creek, Salmo to Nelway, the headwaters of Enterprise Creek and along the Slocan Valley from South Slocan to Nakusp. In the East Kootenay, the disease was most prevalent in tributary valleys of the upper Kootenay River such as the White and Bull rivers and Ram and Lodgepole creeks, and Harvey Creek in the Flathead River Valley.

Larch needle cast, *Hypodermella laricis*

About 400 ha of mature western larch trees north of Sparwood were moderately affected by the larch needle cast disease resulting in premature browning of the foliage. In the western part of the District small pockets, from 5 ha to 40 ha, were discolored over a wide area, as follows: in the Beaverdell area; along Nicholson, Grouse and State creeks; the Kettle River; Little Slocan River to Little Slocan Lake; Arrow Park Creek, and from Halfway River to Galena Bay.

Armillaria root rot, *Armillaria mellea*

Increased mortality of Douglas-fir trees occurred in the Columbia Valley. Groups of 3 to 25 dead and dying trees were particularly common near Fairmont, Windermere, Invermere and Radium. At Deer Creek on Lower Arrow Lake several groups of root rot weakened trees were attacked by Douglas-fir beetles and killed.

Black stain root disease, *Verticicladiella wagnerii*

This root disease was first collected in British Columbia in 1976, although it had been known in the United States for several years. In 1976, lodgepole pine mortality was noted near Matthews and Arlington lakes, and at Jolly, Ptarmigan and Hellroarer creeks. Douglas-fir trees were killed in the Kettle River Recreational area.

In 1977, additional infection sites in lodgepole pine stands were located at Nancy Greene, Christina, Conkle and Joe Dandy lakes and at Nicholson, Goatskin and Dale creeks, and near Greenwood, indicating the disease is probably quite widespread.

White pine blister rust, *Cronartium ribicola*

White pine blister rust continued to kill or top-kill mature western white pine trees throughout its range. The largest concentrations observed in 1977 were along the Columbia River at McNaughton Lake, Downie Creek and upper Arrow Lake. Other large infection sites were noted at Trout Lake, along the Lardeau River to Meadow Creek, Kaslo River, and in the Slocan Valley.

Globose gall rust, *Endocronartium harknessii*

A continuing problem in extensive areas of lodgepole pine, resulting in seedling mortality and branch flagging on larger trees. Although common throughout the southern half of the Nelson Forest District, the most severely infected areas are from Canal Flats to Skookumchuck, from Cranbrook to Yahk, and at Shoreacres near South Slocan.

Needle rusts of alpine fir, *Pucciniastrum* spp.

Fir needle rust, *P. epilobii*, was common in most high elevation stands in tributary valleys in the Kootenay River system and was particularly severe in Matthew and Lamb creeks. In tributary valleys of the Columbia River such as Horsethief, Farnham and Bugaboo creeks, infections were common but generally light to moderate in intensity.

Blueberry rust, *P. geoppertianum*, was very heavy on 40 ha of alpine fir in the headwaters of Slewiskin Creek.

Conifer-cottonwood rust, *Melampsora occidentalis*

This needle rust was common on Douglas-fir trees around Kootenay, Slocan and the Arrow lakes. Near Lardeau, New Denver and Fauquier, 80% of regeneration Douglas-fir was 100% defoliated. Deformation of many seedlings and possibly mortality may occur.

Kinky disease

No Kinky disease was found in over 1,000 lodgepole pine seedlings planted in each of two locations, Wuho and Lumberton creeks.

Bud necrosis, *Dichomera gemmicola*

Bud necrosis occurred on 25% of immature Douglas-fir trees in localized areas at Argenta and Davis Creek. About 5% of the buds were killed, which will result in some deformation of the trees infected.

Drought damage

Extensive areas of understory western yew were severely damaged and some mortality is expected in the Bull River and Crawford Creek valleys. A 6-week period, from April 1 to May 15, of unusually dry weather coupled with record-breaking high temperatures, is thought to be the cause of the damage. The condition of the yew trees created a high fire hazard.

Numerous scattered areas of lodgepole pine seedling mortality occurred in exposed plantation sites, notably in the Driftwood Creek Valley, west of Spillimacheen and in Lodgepole Creek, southeast of Elko.

Winter damage

All ages of lodgepole pine trees in the Hawkins Creek Valley were moderately damaged. Some severe damage in the valley bottom may result in scattered mortality of regeneration-sized pine.

Sunscald damage

Regeneration western red cedar on about 40 ha in a recently logged area on Mt. Kirkup near Rossland suffered foliage damage due to sunscald.

Fume damage

A concentration of sulphur dioxide fumes occurred near Trail on May 31, 1977, which resulted in damage to ornamental spruce and pine trees. The damage was most severe at Glenmerry, where even the foliage of Colorado blue spruce, normally a resistant species, turned a bright red.

Salt damage

Coniferous seedlings along the Trans-Canada Highway from the western boundary of Glacier National Park to Glacier, 21 km, were damaged by road salt. Some western red cedar were killed while western hemlock, lodgepole pine and Douglas-fir were affected in descending order of damage. This might be considered as roadside weed control except that later, when deciduous growth such as black cottonwood leafed-out, they were not affected. Mature Douglas-fir trees on Highway #1 east of Golden continue to be killed.

Physiological disorder

Western hemlock regeneration mortality occurred in 1976 or 1977 along the Duncan River from Hume to Fitch creeks. Many trees, from 1 m to 3 m in height, growing under mature hemlock stands, were killed for no apparent reason.

Discoloration of maple trees

The leaves of Manitoba maple were severely browned on boulevards in Grand Forks. Entire sections of the crown were affected. The discoloration extended from the leaf margin inward. No cause for the damage was found.

Porcupine damage

Immature western larch in an area over 100 km² in the Bloom and Caven Creek valleys have been severely attacked by porcupines. The debarking of larch trees, 5 m to 15 m in height, and to a lesser extent immature lodgepole pine, has resulted in top-kill, multiple leader growth and mortality to tens of thousands of trees. Damage has occurred over a period of years but was greatly accelerated in the spring of 1977.

Similarly, larch trees at the headwaters of Blueberry and Cayuse creeks were damaged.

Mite damage, *Trisetacus* sp.

A collection of yellow cedar cones at Dog Creek in the West Kootenay was made to determine the amount of cone necrosis caused by the mite, *Trisetacus* sp. The collection showed only 8% of the cones with symptoms caused by the mite.

Points re Continuation of Biological Control

Programme against Larch Casebearer

in British Columbia, 1978

1977 (Results)

1. Release of parasites from CIBC collected casebearers in 1977:

16 male

Agathis pumila released 26 July 1977,

36 female Plot #7 Rossland.

Obviously parasitism of the european collected material was exceedingly low in 1977!

2. No assessment has yet been attempted on the 15 plots established in 1974, for follow-up investigations on the effectiveness of the release programme.
3. Before establishment of the release plots, five others were set out in 1966 by FIDS to annually monitor native parasites of larch casebearer. Agathis pumila was established on two of these (Fruitvale and East Arrow Creek) in 1969 for multiplication, and later collection and release. So far no Agathis have been collected from this source for re-distribution.
4. Chrysocharis laricinellae was at one time proposed for release in B. C. The first releases in western N. A. were made in 1972 in Washington and Idaho, U. S. A. None was released in B. C. at any time. This species was first reared from larch casebearer in B. C. in 1973.

The recent upsurge in southern B. C. of Chrysocharis as indicated in the following table presumably is attributable to spread of Chrysocharis from U. S. releases. [There is a possibility of course that Chrysocharis may have been introduced during the earlier accidental introductions of larch casebearer].

Exotic Parasite Recovery from Five Plots in 1977

Locality	Coll'n date	% parasitism by		Other species
		<u>Agathis</u>	<u>Chrysocharis</u>	
Fruitvale	2 May	28	2.5	-
	22 May	0	3.0	-
Salmo	2 May	0.5	1.9	-
	22 May	0	5.5	-
East Arrow Cr	2 May	2.0	0.5	-
	22 May	7.5	4.0	-
Yahk	2 May	0	0	-
	22 May	0	2.5	-
Rykerts	2 May	0	0	-
	22 May	0	0	-

Earlier it had been decided, after word from Raske, and after consultation with Quednau, that we should not release Chrysocharis laricinellae in B. C. since it can at times be a devastating hyperparasite of Agathis. So be it the preceding table indicates that Chrysocharis already (1977) is well established. Obviously the species has spread very rapidly; further consideration of a Chrysocharis release programme presently seems unwarranted.

1978 (Proposal)

- a. In 1978 adult Agathis should be reared from larch casebearers (at Fruitvale^{*} and East Arrow Creek, collected early in May 1978 for rearing to the adult stage and released in one or more of the 15 parasite release plots. They should be collected early in the spring before there is significant hyperparasitism of Agathis by Chrysocharis.
- b. Agathis pumila is still considered to be the first or second most important exotic parasite of larch casebearer, therefore we recommend that CIBC again be requested to collect material from Europe solely for Agathis pumila for eventual use in southern B. C.

We will accept and release Diadegma, however it is so scarce in collections from Europe, we feel that it is not basically a very useful species, therefore do not ask CIBC to collect it deliberately.

D. A. R.
30 January 1978.

* Fruitvale trees won't stand much
more pruning.