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ANNUAL DISTRICT REPORT
FOREST INSECT AND DISEASE SURVEY
BRITISH COLUMBIA, 1978
PART V - NELSON FOREST DISTRICT

by

R.D. Erickson and C.S. Wood^{1/}

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VICTORIA, BRITISH COLUMBIA

- FILE REPORT -

DEPARTMENT OF ENVIRONMENT
January, 1979

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NELSON FILE REPORT

1978

R.D. Erickson and C.S. Wood

Introduction

This report outlines the status of forest insect and disease conditions in the Nelson Forest Region for 1978, and attempts to forecast pest population trends.

Regular field work in the District began May 15 and ended August 25. Special surveys were as follows: Mountain pine beetle survey with R.L. Fiddick, C.F.S. and M. Finnis, B.C.F.S. in Akamina-Kishinena creeks April 24-27; early larch casebearer parasite collection, April 24-27; special mountain pine beetle meeting and review at Akamina-Kishinena creeks with Young, Owen, Brash and Cuthbert from B.C.F.S. and Massie from C.F.S., July 18-19; mountain pine beetle cruising and population assessment and larch sawfly cocoon sampling, Sept. 18-25; fall larch casebearer population assessment and talk to Forestry class at Selkirk College, Oct. 23-26. Aerial surveys consisting of 23.3 flying hours, 4 of which were supplied by the B.C. Forest Service, were done in August. Meetings of the Kettle Forest Insect and Disease Control Committee and the East Kootenay Forest Insect and Disease Control Committee were each held and attended twice.

A total of 609 insect and disease collections were submitted to the Pacific Forest Research Centre in 1978. Map A shows collection locations and Map B shows aerial survey flight lines.

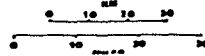
Numbers of larvae defoliators found in field collections increased; 89% of collections in the West Kootenay and 85% in the East Kootenay contained larvae.

Aerial and ground surveys for mountain pine beetle showed general increases in all areas of the region, and very large increases in the Flathead River Drainage and White River-Kootenay River area. Heaviest current attack occurred in the Flathead at Kettle Creek and White River with 39% and 27% of the lodgepole pine stems per ha currently infested. Spruce beetle was found killing green Engelmann spruce trees at two new locations, one west of Beaverdell and the other at the top end of the main Kettle River at Trap Creek. Populations of Douglas-fir beetle remained generally low in 1978.

Defoliation of western larch by larch casebearer continued at the same intensity as 1977 but increased in extent in the eastern portion of the region. The larch looper infestations collapsed in 1978. Both 1-year-cycle and 2-year-cycle spruce budworm caused generally light defoliation with pockets of severe in 8 scattered areas. The larch sawfly infestation at Sparwood expanded down the valley to Fernie. A parasite release was made at Sparwood. Larch budmoth collapsed in the areas infested in 1977 and expanded in new areas.

Red band disease of pine was less widespread in 1978 than 1977 but still caused pockets of needle discoloration and drop. Throughout the range of ponderosa pine in the East Kootenay a needle blight caused extensive discoloration and needle drop. Larch needle cast caused reddening of western larch in both the east and west Kootenay. At times it was associated with a needle rust of western larch. Foliage diseases on poplar were common throughout the region with pockets of severely discolored stands. White pine blister rust, western gall rust and root rots continue to cause top killing, growth loss and tree mortality.

NELSON FOREST DISTRICT

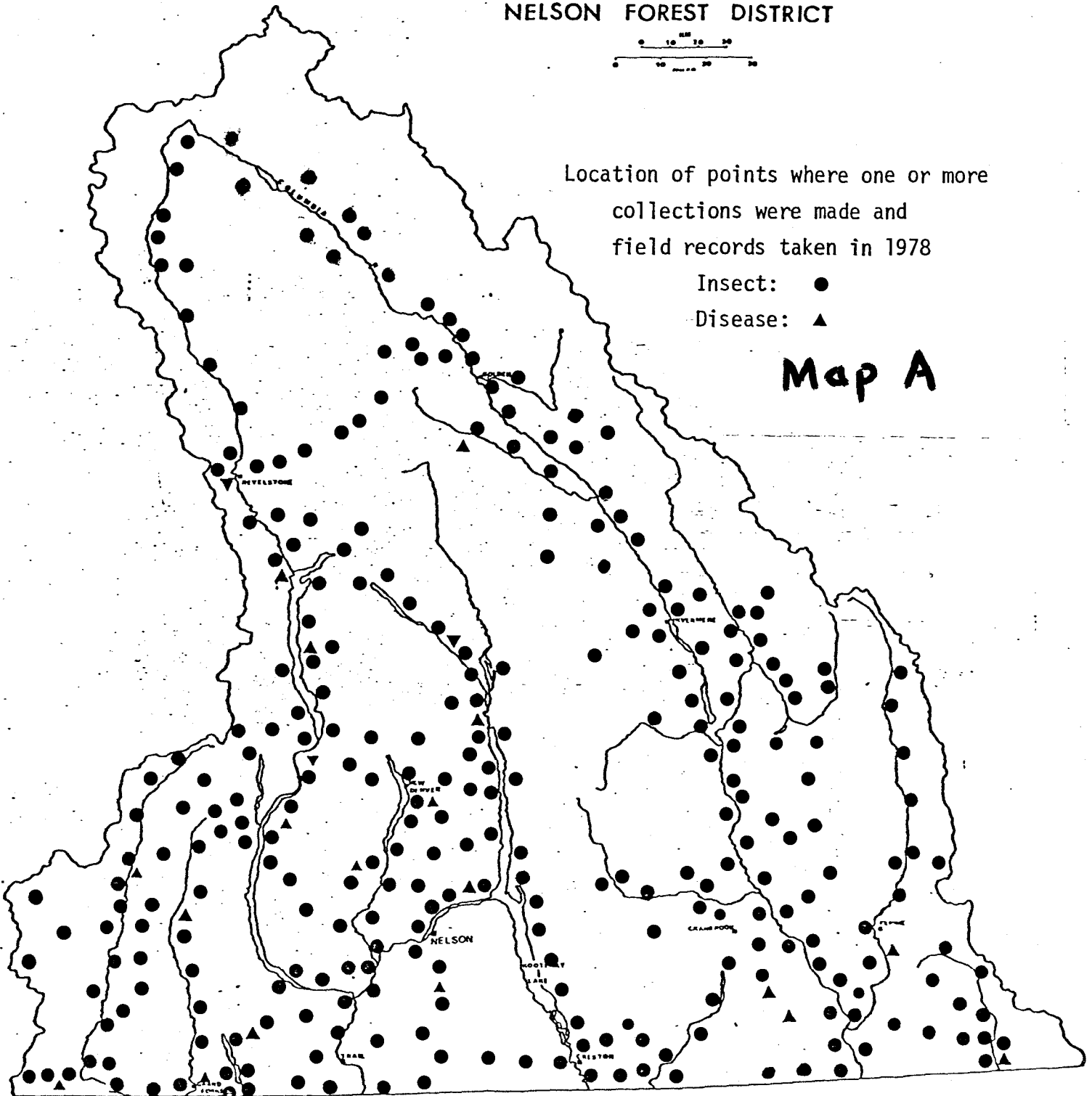


Location of points where one or more
collections were made and
field records taken in 1978

Insect: ●

Disease: ▲

Map A

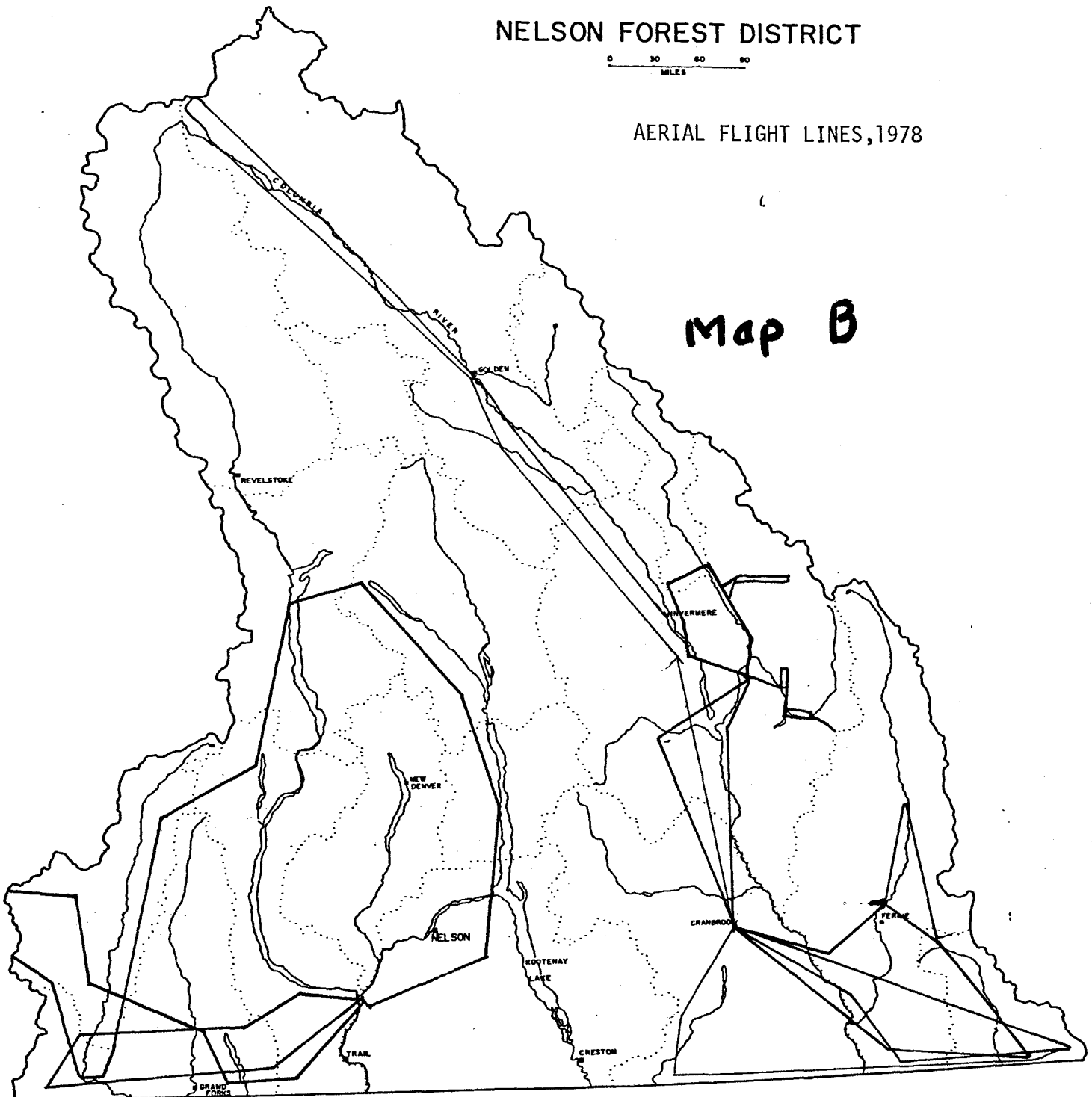


NELSON FOREST DISTRICT

0 30 60 90
MILES

AERIAL FLIGHT LINES, 1978

Map B



Mountain pine beetle, Dendroctonus ponderosae

Mountain pine beetle infestations in lodgepole and western white pine stands continued over 18 129 ha in 1978 in the Nelson Forest Region. Large increases in the number of "red-top" trees killed by this extremely destructive insect occurred in many areas. The most severely infested areas were: the lower Flathead River Valley; White River Drainage; Golden-McNaughton Lake, West Kettle River and Kettle River.

In the western portion of the Nelson Forest Region the increases in red tree counts occurred in and near existing infestations; only a few new infestations were located. The number of red lodgepole pine trees increased by 50% and the number of red western white pine by 500%. The greatest increases were along the West Kettle River from Goathide Creek to Arlington Lakes. These large infestations began in 1968 and have continued at a high population level. Along Trapping Creek several of the logging "leave blocks" were newly infested this year.

The increased activity of mountain pine beetle in western white pine was noticeable throughout the range of the host. There was expansion of existing infestations not under logging control, and several new infestations were recorded.

In the eastern portion of the Nelson Forest Region, a very large increase in the number of red-tops occurred at known infestations. Several new pockets of beetle infested lodgepole pine were found between Yahk and Elko north of the International Boundary.

In the Flathead River Valley, including Akamina, Kishinena, Sage, Cabin, Harvey, Couldrey, Elder and Nettie creeks, the increase in numbers of red-topped lodgepole pine was 5 to 10 times that of 1977. From prism cruises and ground checks, the attack in 1978 was higher than any other area in the

Region. Up to 162 lodgepole pine stems/acre (65 stems/ha) from 4" to 18" d.b.h. were heavily and successfully attacked by mountain pine beetle throughout the locations mentioned above.

The White River-Kootenay River area also had an increased number of "red-tops" in 1978 over 1977. There has been a spread northward along the Kootenay River to Cross River, as well as expansion of the existing infestation. In this infestation there were 66 stems/acre of lodgepole pine currently infested (Table 1).

Table 1. Condition of lodgepole pine trees on cruise strips in Nelson Forest Region, September 1978

Location	Stems/ha \geq 10 cm d.b.h.					Total
	Current*	Red	Partial	Grey	Healthy	
Goathide	8	62	35	35	620	839
Arlington Lakes	80	39	34	126	480	759
White River	165	35	39	38	350	627
Sage Creek	230	27	25	0	561	843
Nettie/Elder Creeks	406	71	96	4	464	1 041

*Current - attacked in 1978

Red - attacked and killed in 1977

Partial - only a portion of the bole attacked currently

Grey - killed prior to 1977, needles fallen

On the west side of the Columbia River from Skookumchuck to Golden there have been significant increases at: Horsethief Creek, on the southwestern slope of Steamboat Mountain, and adjacent to Columbia and Windermere lakes. Ground checks indicated large numbers of green attacked trees.

In the Golden-McNaughton Lake area the infestation of mountain pine beetle in western white pine and lodgepole pine increased significantly near Nicholson, Golden, Donald, Waitabit Creek and the north side of Bush Arm on McNaughton Lake. The numbers of lodgepole pine killed at Blackwater Ridge also increased markedly over 1977.

Table 3 shows that from 10 to 39% of the lodgepole pine stems per ha were attacked in 1978. These trees, the foliage of which will appear red in the summer of 1979, represent almost a twofold increase over 1978 in the West Kootenay area, a five- to sixfold increase in White River and up to a ninefold increase in the Flathead Drainage.

Table 2. Average d.b.h. and range of lodgepole pine infested by mountain pine beetle on cruise strips, 1978 (d.b.h. in cm)

Attack category	Location				
	Goathide Creek	Arlington Lakes	White River	Sage Creek	Nettie-Elder Creeks
<u>Current</u>					
Avg d.b.h.	24	28	30	30	23
Range	20-36	23-26	20-51	20-46	10-36
<u>Red</u>					
Avg d.b.h.	24	26	29	32	28
Range	15-30	15-36	20-36	25-51	20-36
<u>Partial</u>					
Avg d.b.h.	23	24	28	24	18
Range	20-25	20-25	20-30	20-25	13-25
<u>Grey</u>					
Avg d.b.h.	23	25	25	0	34
Range	20-25	15-30	20-36	0	25-41
<u>Healthy</u>					
Avg d.b.h.	18	22	21	21	15
Range	10-36	10-36	13-30	10-30	10-25

Table 3. Per cent of stems per ha by attack category for mountain pine beetle infested lodgepole pine, 1978

Location	% stems/ha				
	Current	Red	Partial	Grey	Healthy
Goathide Creek	10	7	5	5	73
Arlington Lakes	11	5	4	17	63
White River	27	5	6	6	56
Sage Creek	27	3	3	0	67
Nettie/Elder creeks	39	7	9	<1	44

Table 4. Number and area of red-topped pine trees, Nelson Forest Region, 1978

Pine Species	Location	No.	
		Red-tops	Area/ha
lodgepole	<u>West Kootenay</u>		
	Goathide Cr	2 350	608
	Ptarmigan Cr	330	80
	Arlington Ls	1 205	344
	Copper Kettle Cr	60	4
	Trapping Cr	125	12
	China Cr	5	1
	Carmi	30	8
	Wilkinson Cr	10	1
	Ferroux	50	4
	King Solomon Mtn	250	40
	Rock Cr	10	1
	Chenier Cr	30	4
	Kettle R (Bruer Cr to Mohr Cr)	70	2
	Boomerang Cr	75	8
	Fourth of July Cr	10	6
	Winnifred Cr	75	8
	Granby R (across from Howe Cr)	10	1
	Fiva Cr	310	10
	Nicholson Cr	165	16
	McKinney Cr	2	1
	Christina L	15	2
Sub total		5 187	1 161

Pine Species	Location	No.	
		Red-tops	Area/ha
lodgepole	<u>East Kootenay</u>		
	White-Kootenay R valleys	210 000	8 000
	Elk Cr	55 000	1 880
	Flathead R Valley	100 000	4 000
	Blackwater Ridge-Donald-Waitabit Cr	15 000	1 200
	Golden to Parsons	2 000	200
	Findlay & Lavington Crs	7 500	600
	Toby & Goldie Crs	3 000	240
	Palliser-Kootenay-Cross Rivers	6 500	440
	Horsethief Cr & Steamboat Mtn	3 000	140
	Subtotal	402,000	16,500
GRAND TOTAL		407,187	17,661
western white	<u>West Kootenay</u>		
	Hamling Cr	10	2
	Wilson L	25	2
	Whatshan R	250	20
	Wilson Cr	75	8
	Plant Cr	140	16
	Pingston Cr	200	120
	Trout L	475	120
	Payne Cr	25	4
	Birch Cr	20	2
	Downie Cr	350	32
	Catherine L	10	2
	Halfway R	25	2
	Meadow Cr	30	4
	Healy Cr	300	24
	Cooper Cr	50	2
	Davis Cr	20	2
	Town Cr	60	2
	Christina L	105	16
	Mt Crowe	25	2
	Hudu Cr	30	2
	Erie Cr	500	80
	Ottawa Hill	25	4
Sub total		2 750	468

Pine Species	Location	No.	
		Red-tops	Area/ha
western white	<u>East Kootenay</u>		
	McNaughton L	<u>15 000</u>	<u>800</u>
	Sub total	15 000	800
	GRAND TOTAL	17 750	1 268
<hr/>			
ponderosa pine	<u>West Kootenay</u>		
	Westbridge	10	2
	Kettle River Rec. Area	90	6
	Zamora	<u>40</u>	<u>4</u>
	Sub total	140	12
	GRAND TOTAL	140	12
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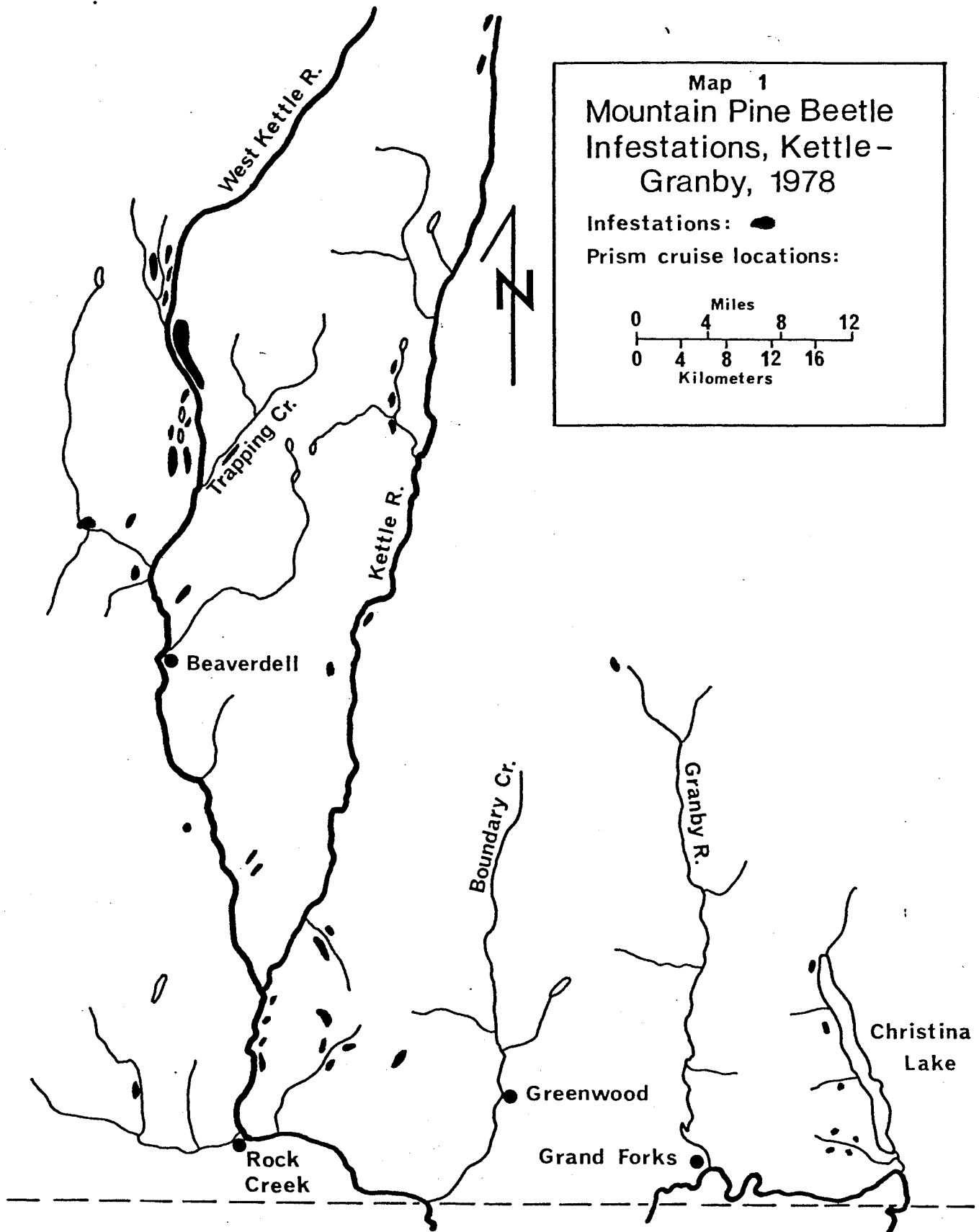
Spruce Beetle, Dendroctonus rufipennis

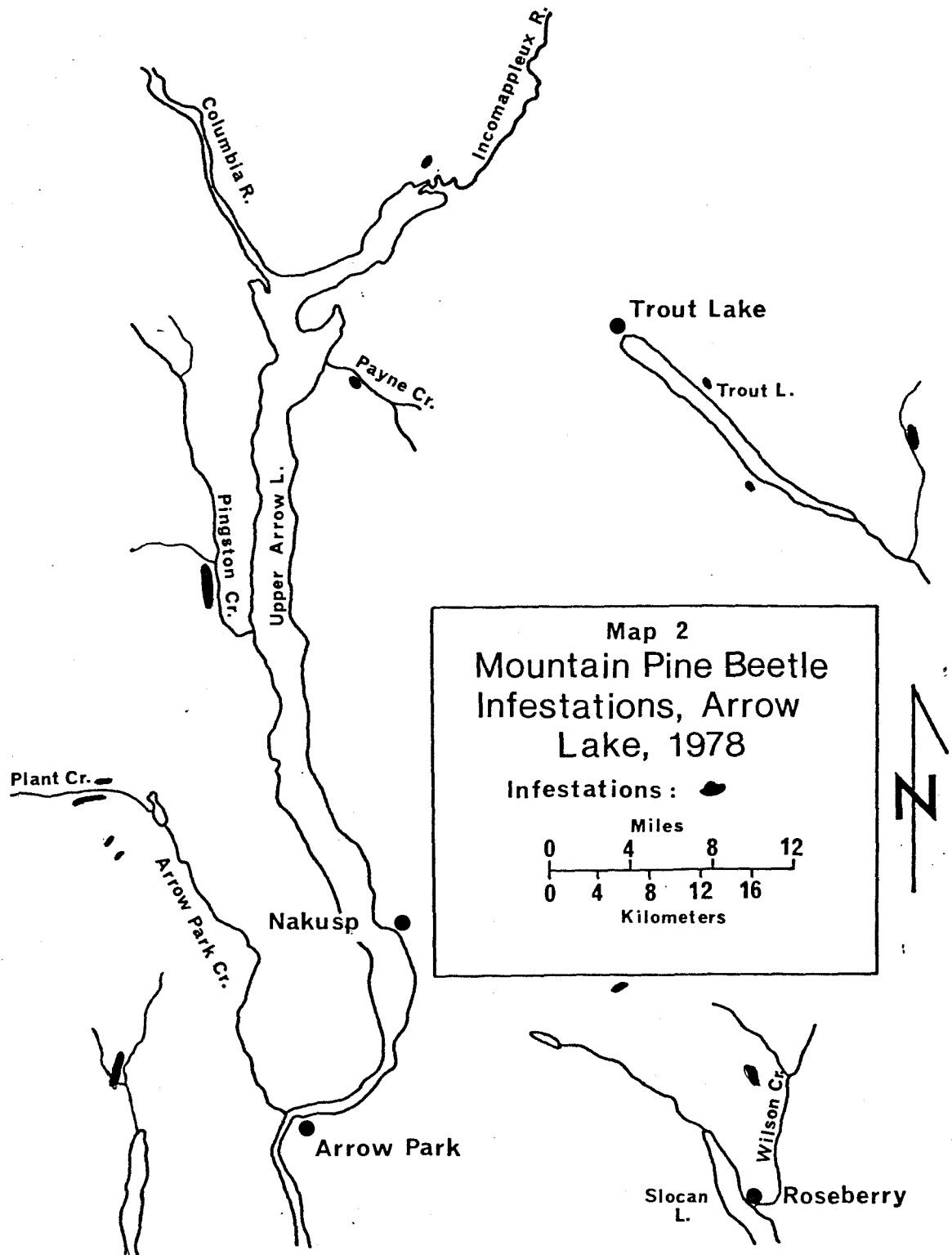
Two new small infestations were located in 1978. At Campbell Creek, west of Beavertown there were 50 affected Engelmann spruce trees of which 25% were green attacked and 75% grey. The other infestation was found on the Kettle River near its junction with Trap Creek.

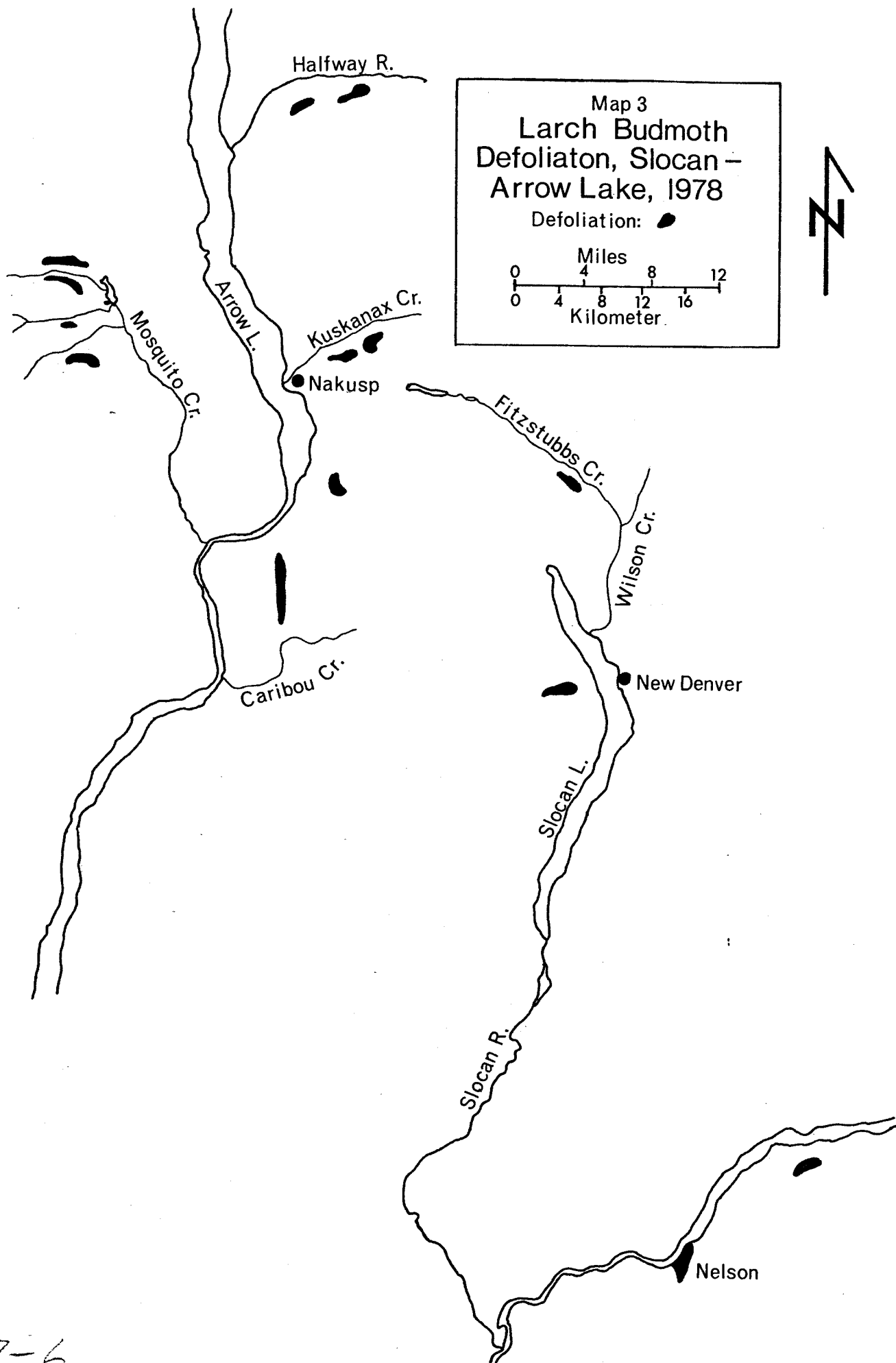
About 120 ha of blowdown in valley bottom Engelmann spruce occurred at Dago Creek in the winter of 1977-78. A smaller area of trees was also blowdown at Stag Leap park during the same period.

Spruce beetle populations remained low throughout the East Kootenay. A small area of Engelmann spruce blowdown near Mt. Haynes in the upper Bull River contained a small endemic population.

Beetle attacked trees at Cultus Creek west of Kootenay Lake were logged in 1977/78.

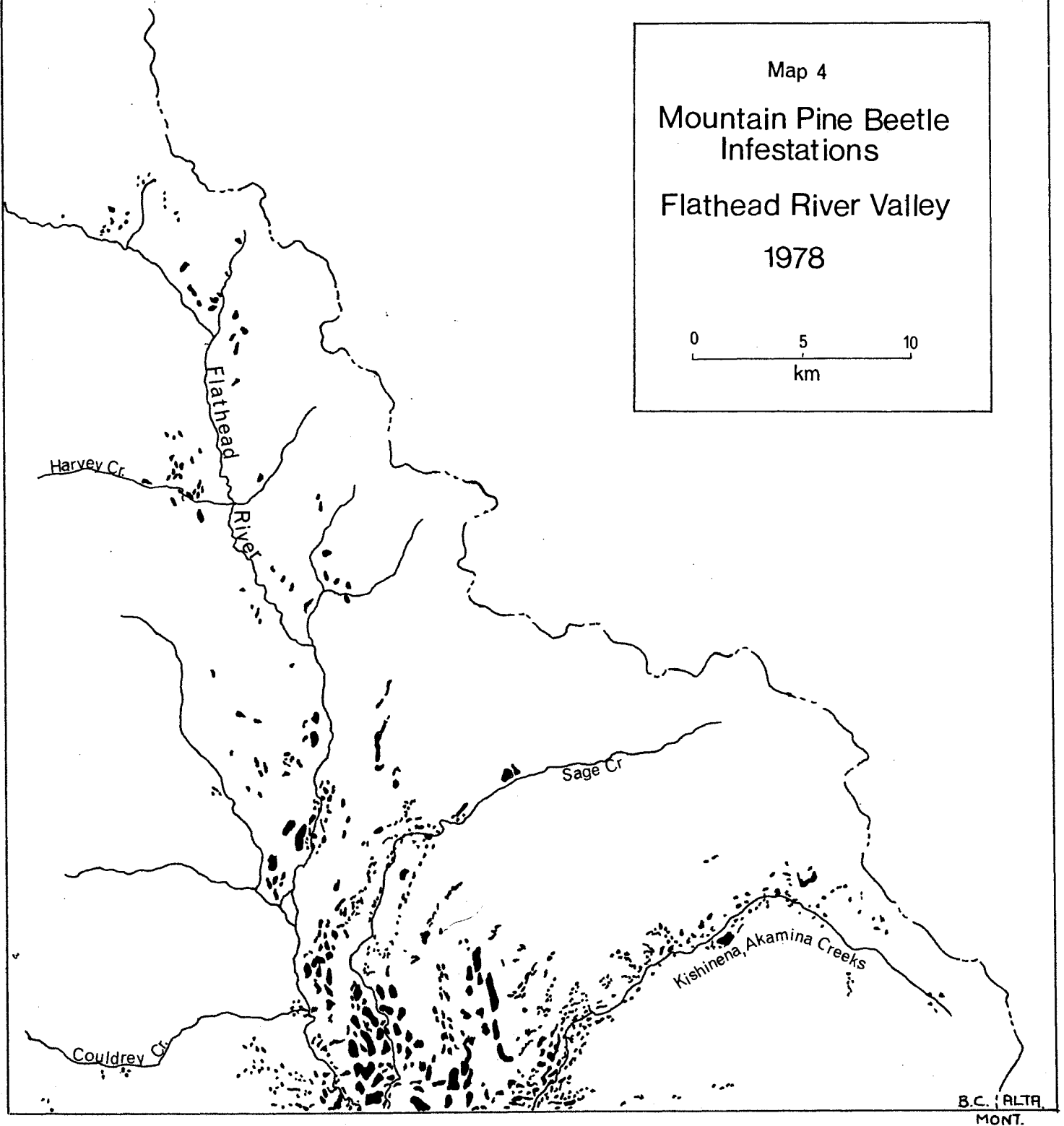






Map 4
Mountain Pine Beetle
Infestations
Flathead River Valley
1978

0 5 10
km

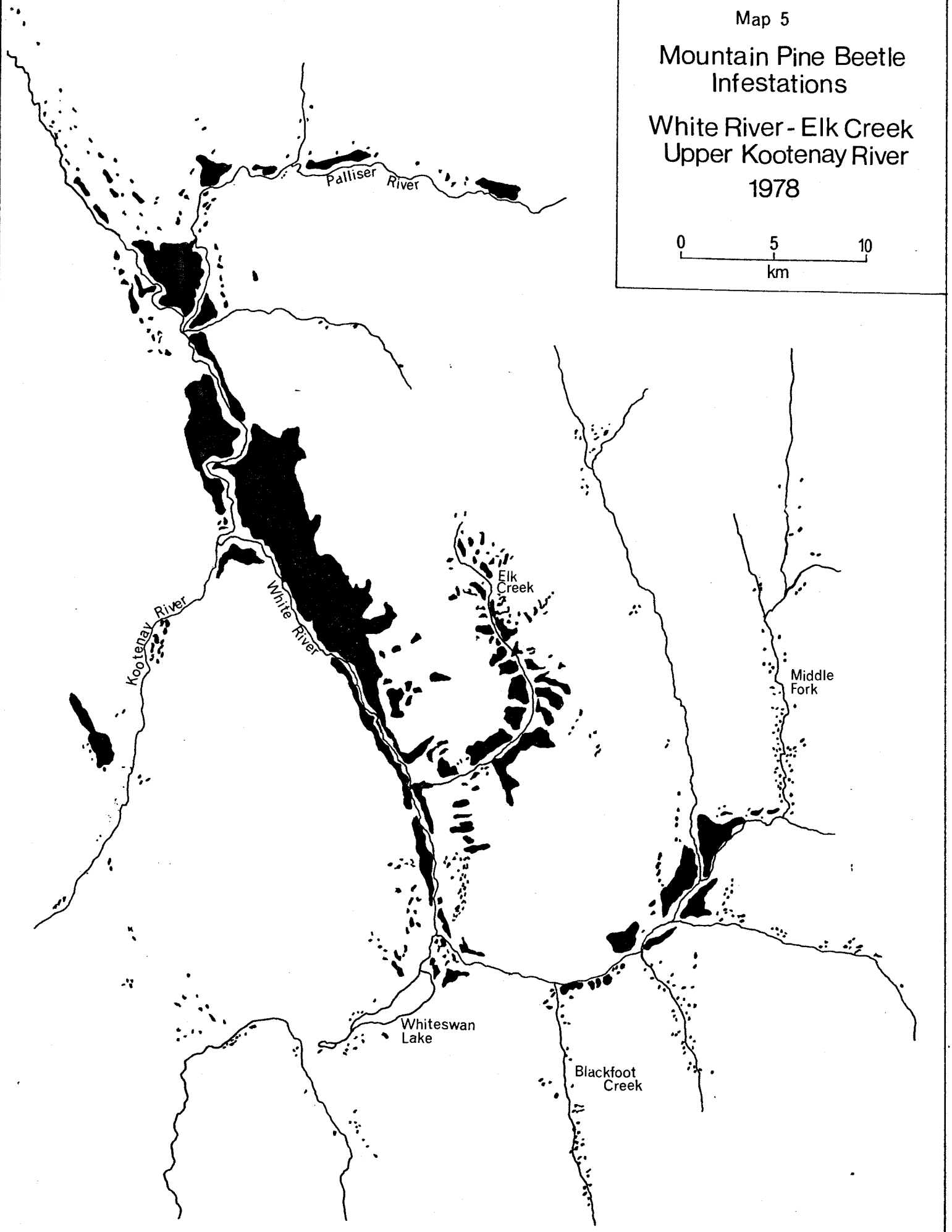
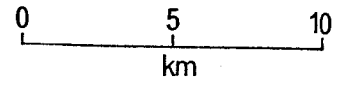


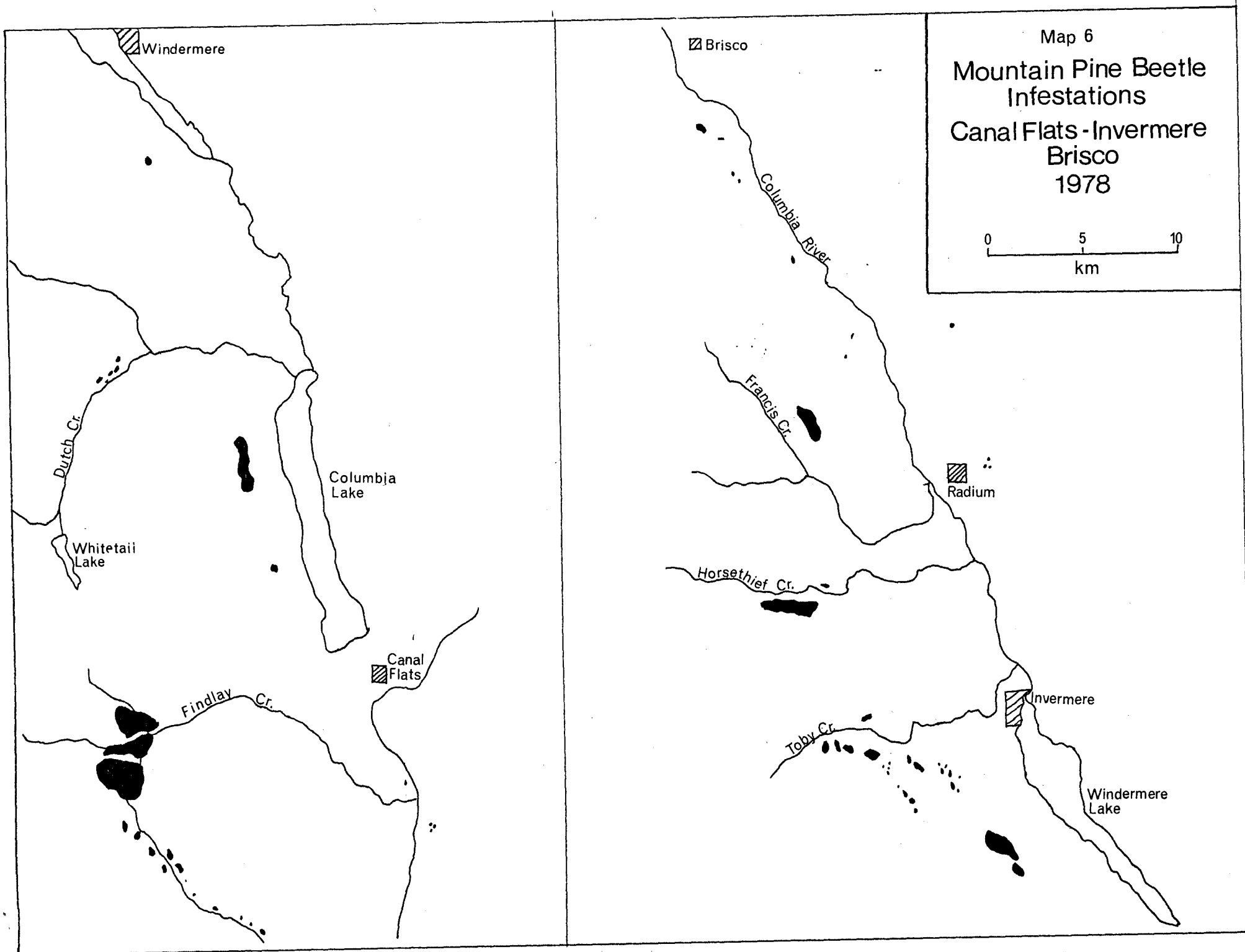
Map 5

Mountain Pine Beetle Infestations

White River - Elk Creek
Upper Kootenay River

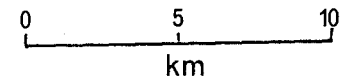
1978





Map 6

Mountain Pine Beetle
Infestations
Canal Flats-Invermere
Brisco
1978

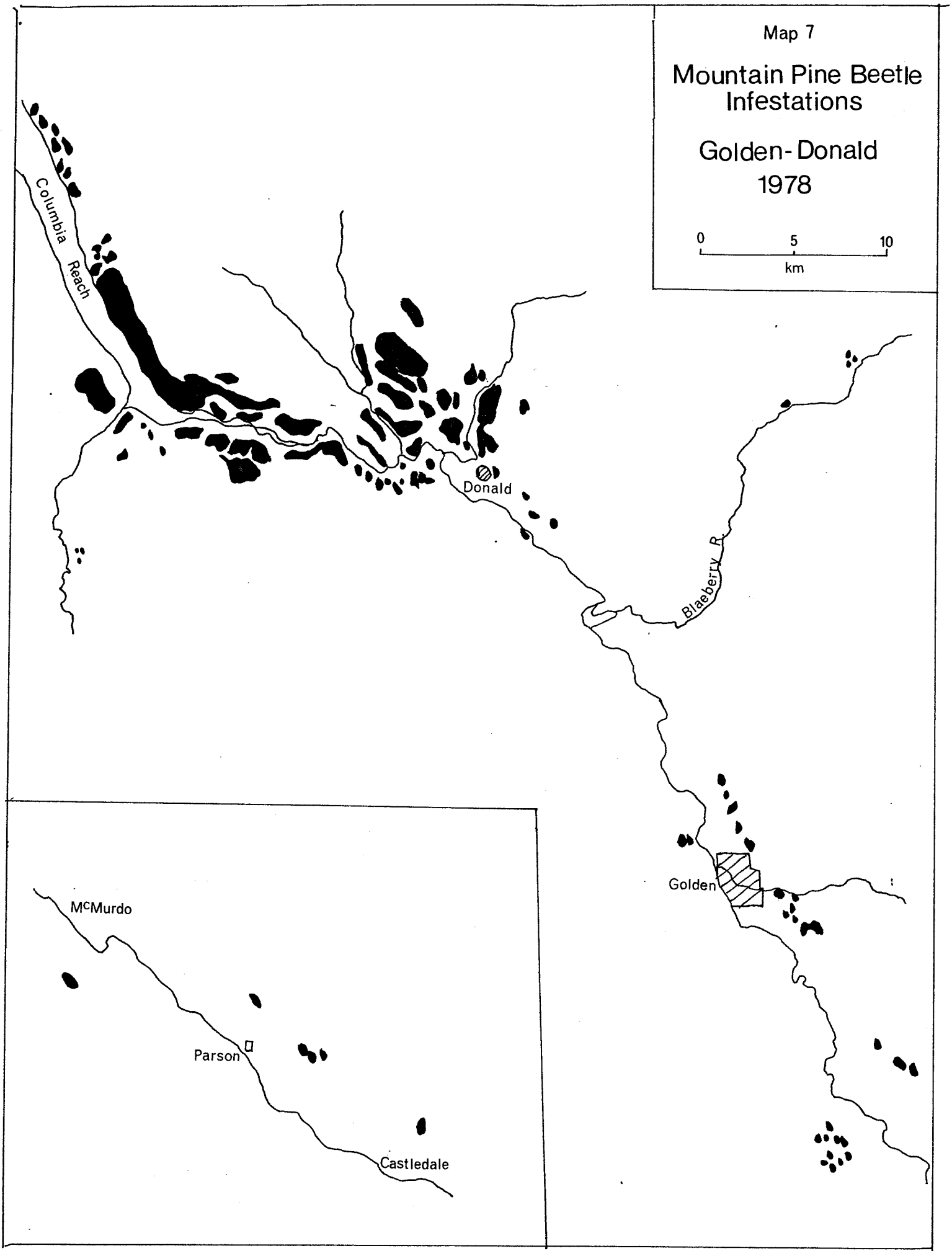


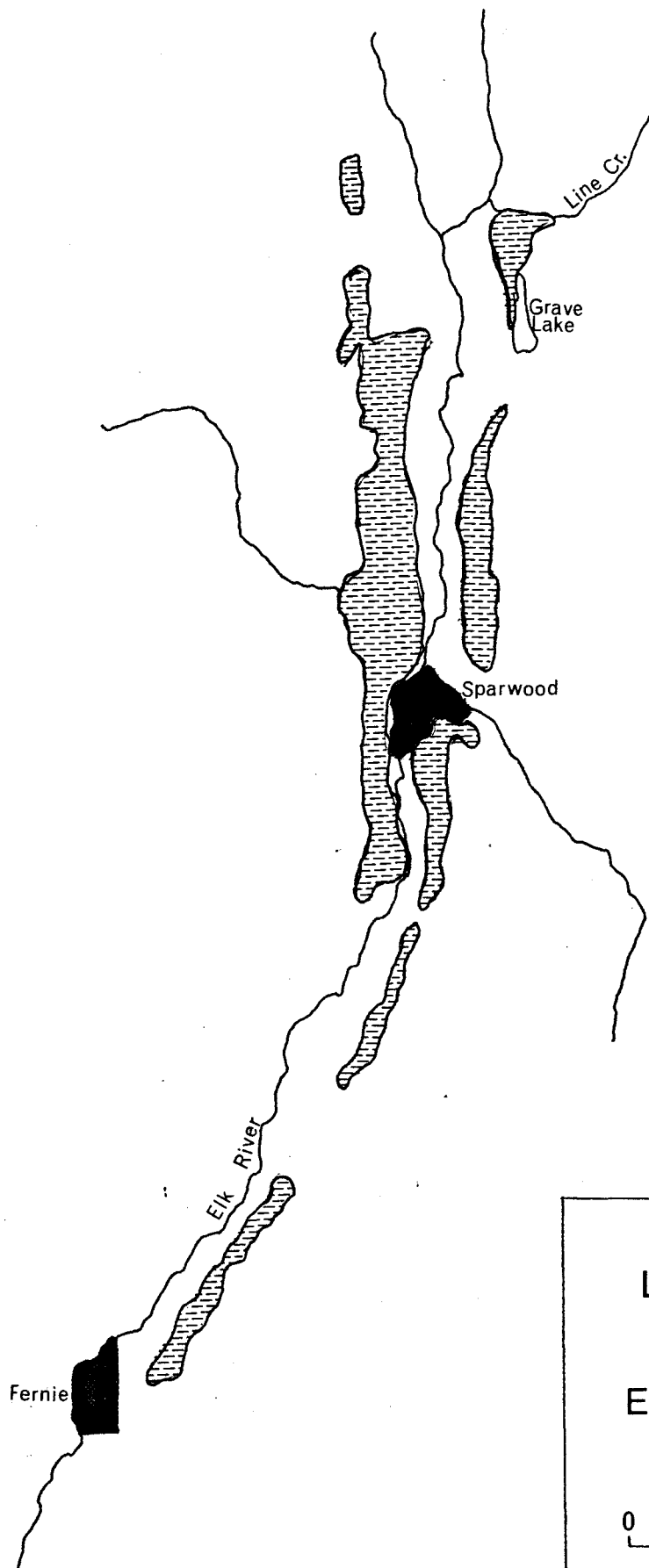
Map 7

Mountain Pine Beetle Infestations

Golden-Donald
1978

0 5 10
km





Map 8

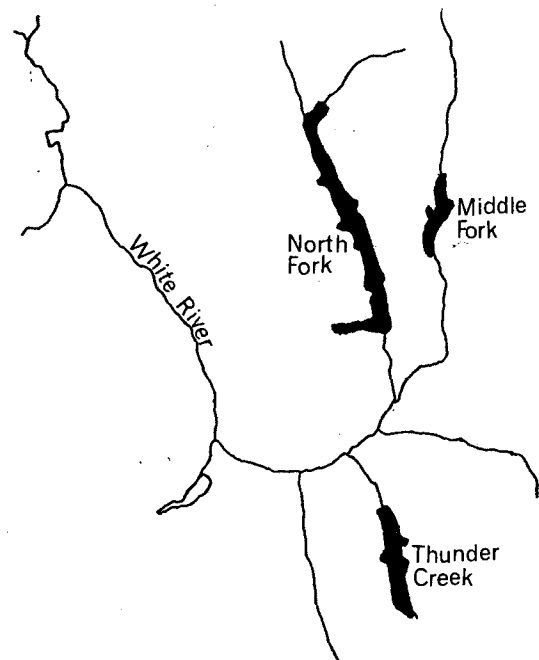
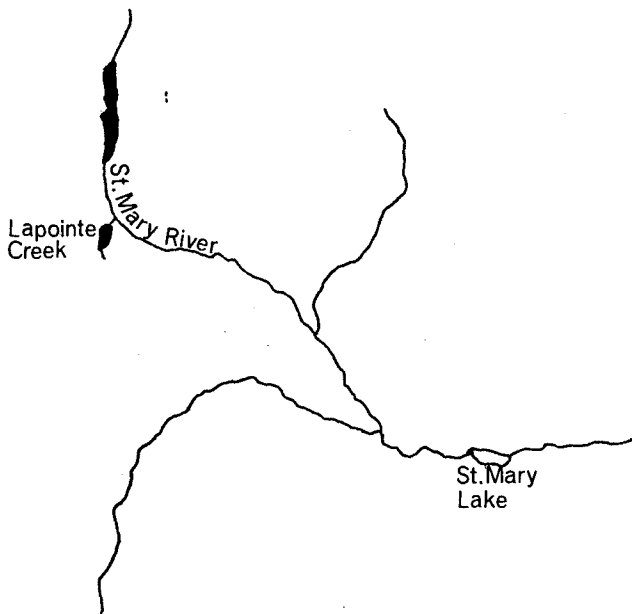
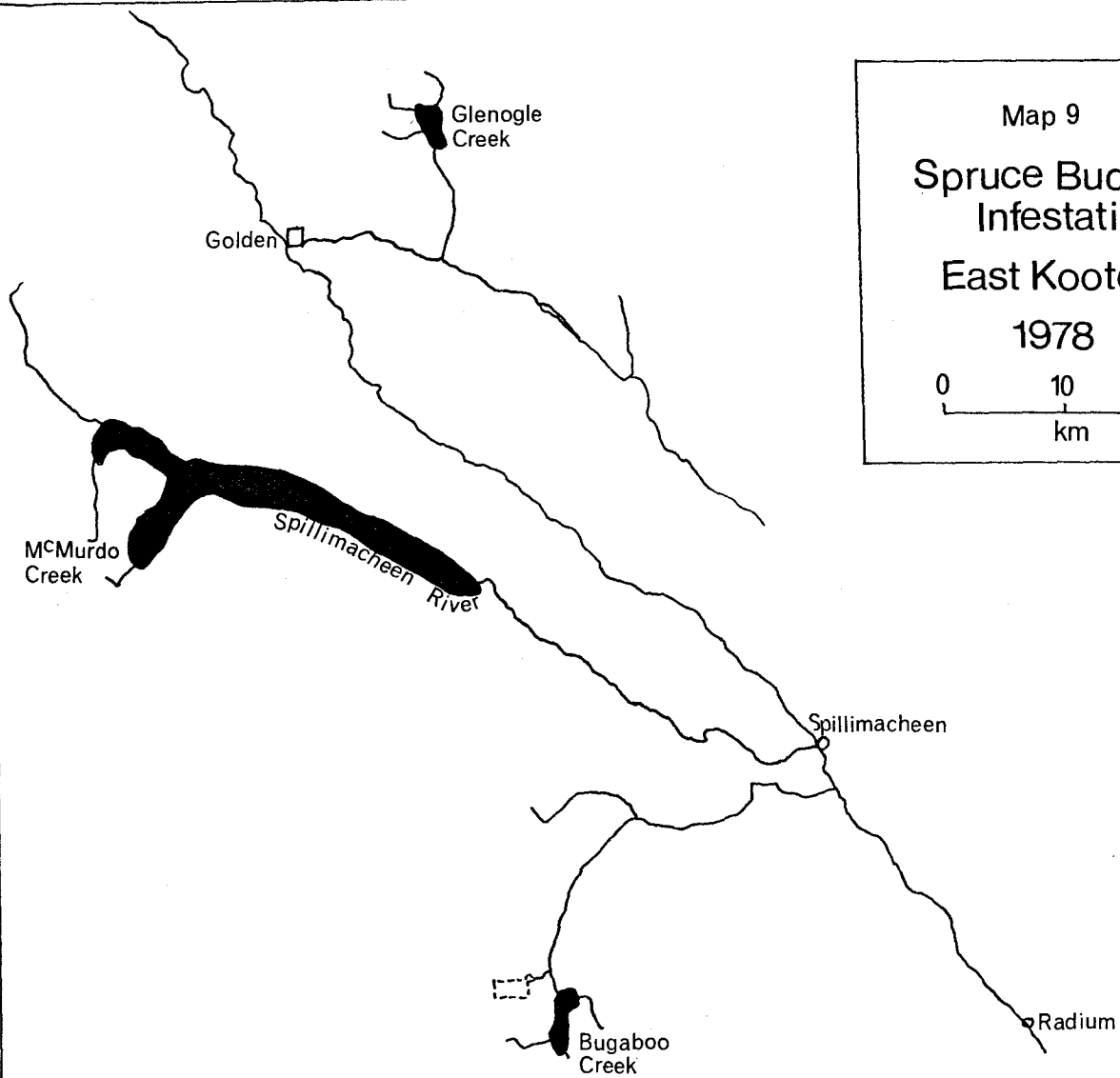
Larch Sawfly
Defoliation

Elk River Valley
1978

0 5 10
km

Map 9
Spruce Budworm
Infestations
East Kootenay
1978

0 10 20
km



Douglas-fir beetle, Dendroctonus pseudotsugae

Single and occasional groups of 2-5 mature and overmature trees were killed at widely scattered locations between Elko and Roosville; from Canal Flats to Radium; near Wycliffe and at Kid Creek.

Pine engraver beetle, Ips pini

Engraver beetles killed several pockets of 10-40 ponderosa pine from Rock Creek to Christina Lake and south of Elko in 1977. Some of the larger stems were also attacked by red turpentine beetle, Dendroctonus valens, in the lower bole.

New pockets of dead trees were found at Elko. Lodgepole pine trees attacked and killed in 1977 were also found at Teepee Creek, 50 trees; Wasa to Canal Flats, 50 trees; Ta Ta Creek to the Old Kimberly Airport, 300 trees; in the Lussier River Valley from Hwy. #93-95 east to the Premier Lake road bridge, 500 dead trees.

Red turpentine beetle, Dendroctonus valens

Small groups of 1-5 ponderosa pine trees were killed by this beetle from Elko to Grasmere, 50 trees; Wasa Lake, 150; Ta Ta Creek, 50; and from Wasa to Canal Flats, 25 trees, Kimberly Golf Course, 5 dead trees. At the Kimberly Golf Course 5 lodgepole pine were also attacked.

Western balsam bark beetle, Dryocoetes confusus

Mortality of high elevation alpine fir trees caused by Dryocoetes confusus occurs annually throughout its range in the region. Large numbers, 8 000 per year, have been recorded in recent years. In the west Kootenay, alpine fir were killed at Silverton Creek, 1 000 red-tops; Galloping Mountain, 1 000; and Mt. Moore, 750 red-tops. In the east Kootenay the largest number of dead trees, 2 000, was recorded in Spillimacheen River Valley. Trees were also killed in high elevation stands in the St. Mary River Valley, 1 000, and in the Goat River Valley, 500 red-tops.

Defoliators

Larch casebearer, Coleophora laricella

Defoliation of western larch by larch casebearer was the same intensity as 1977 and somewhat more widespread. Moderate to severe defoliation occurred along the Kootenay River from Blewett to Castlegar, at Fruitvale and in the Creston area. In the Pend d'Oreille River Valley western larch was severely defoliated on the south side of the river. From Kaslo to New Denver and near Edgewood there were small pockets of severe defoliation. Larch casebearer was detected for the first time in the Sage Creek area in the Flathead River Valley. Damage was more severe in the Elko-Kimberly-Riondel triangle where defoliation was generally light to moderate with scattered pockets of severe defoliation on understory and fringe trees.

Defoliation at 5 permanent sample plots is shown in table 5.

Table 5. Western larch defoliation by larch casebearer at 5 permanent plots, Nelson Forest Region, 1978

Location	Elevation	Defoliation*
Fruitvale	690 m	heavy
Salmo	660 m	light
Rykerts	660 m	moderate
East Arrow Creek	720 m	light
Yahk	840 m	light

* light: 0-25% discolored
 moderate: 26-50% "
 heavy: 51-75% "
 severe: over 75% "

There were no parasite releases in the Nelson Forest Region in 1978, however a collection of 100 Agathis pumila from East Arrow Creek was released at Cherryville, in the Kamloops Forest Region.

Larch casebearer larvae and pupae were collected at the 5 permanent plots on April 25 and May 19, and reared for parasite emergence (Table 6, see appendix). 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 overwintering larvae counts.

On October 24, the collections for overwintering larvae counts were done using the system mentioned above. the results are displayed in Table 7.

Table 6. Larch casebearer parasites recovered through rearing

Location and date	No. of adults (per cent)		No. of pupae
	<u>Agathis pumila</u>	<u>Chrysocharis laricinellae</u>	
Fruitvale, April 25	3 (1.5)	0	200
" May 19	14 (7)	3 (1.5)	"
Salmo, April 25	0	0	"
" May 19	0	6 (3)	"
East Arrow Creek April 25	6 (3)	0	"
" " " May 19	100 (50)	0	"
Yahk, April 25	4 (2)	0	"
" May 19	0	0	"
Rykerts, April 25	0	0	"
" May 19	1 (0.5)	0	"

Table 7. Overwintering larvae population at 5 plots, Nelson Forest Region, 1975-78

Location	Avg no. larvae per 18", 45 cm branch			
	1975	1976	1977	1978
Fruitvale	2 (2)*	18 (9)	48 (11)	124 (43)
Salmo	14 (16)	47 (21)	81 (49)	244 (86)
Rykerts	63 (68)	157 (64)	110 (61)	217 (58)
East Arrow Cr	105 (57)	91 (31)	42 (30)	11 (6)
Yahk	3 (4)	17 (9)	19 (14)	15 (6)

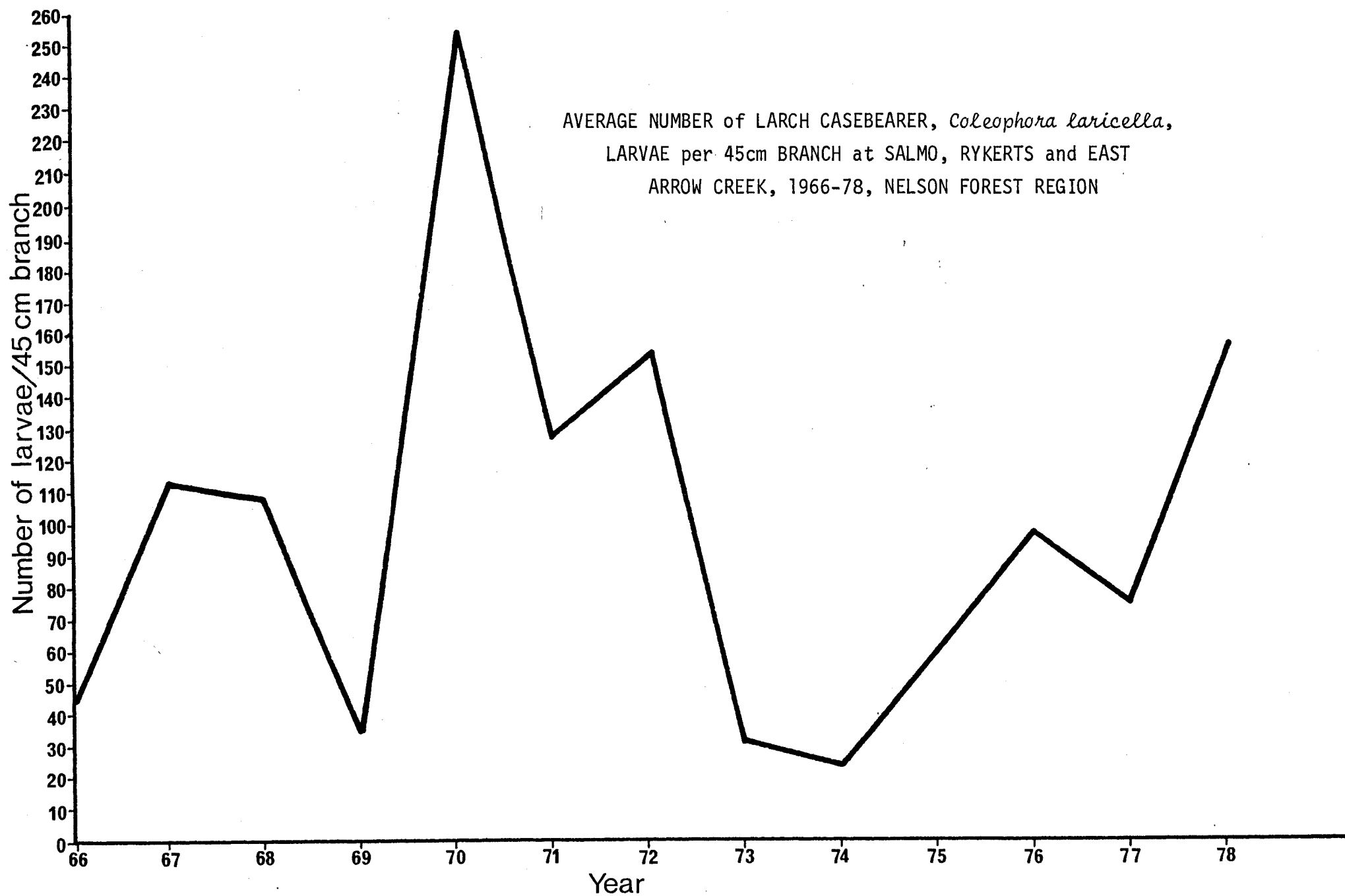
*Figures in brackets are number of casebearers per 100 fascicles

Larch sawfly, Pristiphora erichsonii

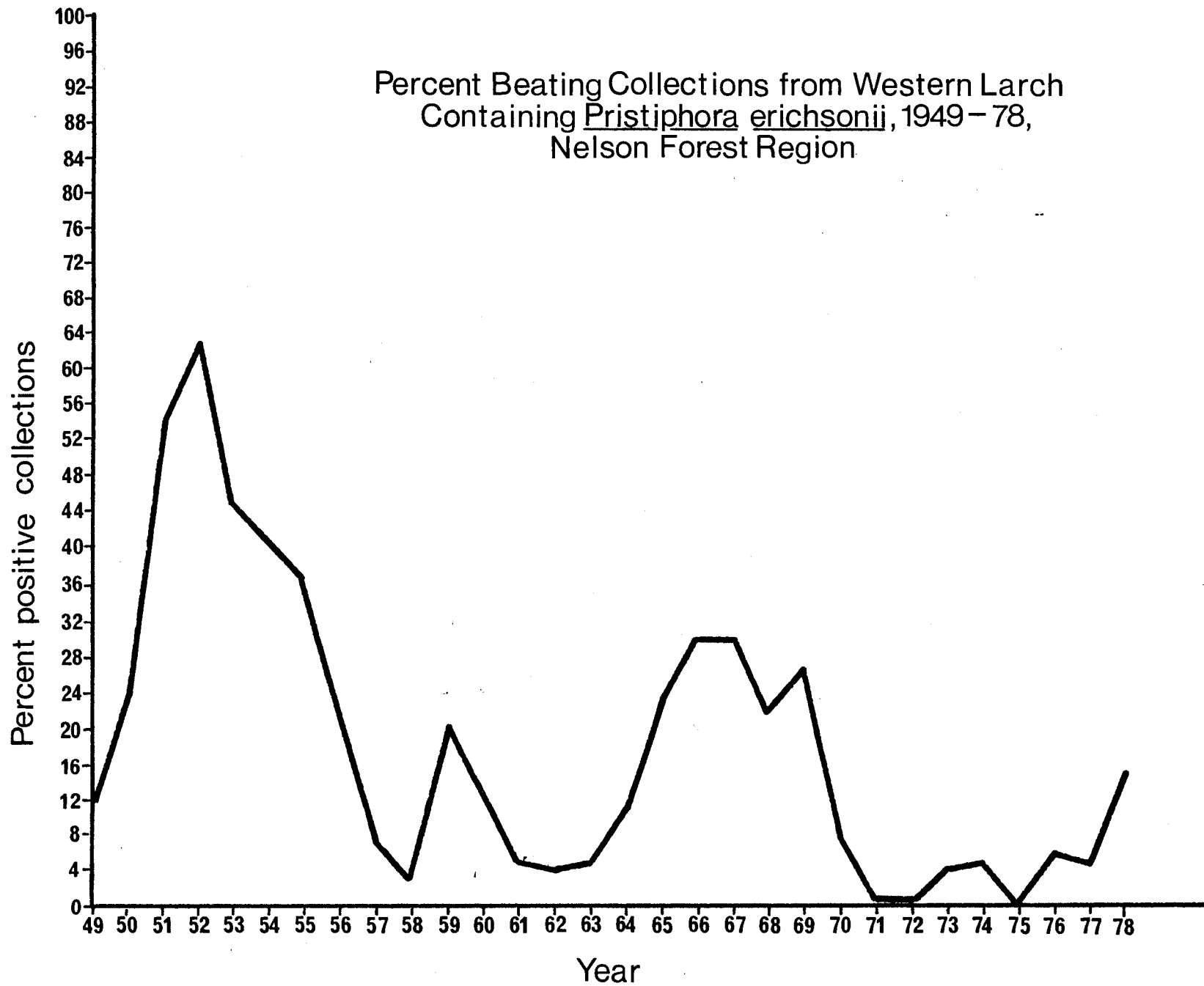
Defoliation of larch by this insect in the Elk River Valley continued for the third year and expanded to 4 600 ha. Defoliation extended from Grave Lake-June Creek south along both sides of the Elk River to Sparwood and Hosmer; along the Fernie Ridge to east of Fernie (see map 8). The trees were generally less than 50% defoliated with small 10 ha pockets of severe, >75% defoliation, where only the uppermost crown and occasional branch tips were not defoliated. Larval feeding was complete by Aug. 15. Small numbers of larvae were found east of the Kootenay River, north to Canal Flats.

Larch sawfly was found for the first time in recent years, along the Whatshan Lake Road near Needles and at Slewiskan Creek. The numbers of larvae were small, vg. 5 larvae per positive sample, but this could be an indication of an increasing population.

Based on the number of overwintering cocoons containing larvae the outbreak is expected to continue in intensity and expand in area in 1979.



7927-5



7927-5

Table 8. Number of overwintering larvae in cocoons per 10 000 cm² of duff in four areas in the Elk River Valley, 1978

Location (see appendix)	Number of larvae		
	1976	1977	1978
1 Sparwood	<1	561	675
2 Farm, Elkford Rd.	-	132	505
3 Gas Pipeline	-	39	641
4 Water Tower Rd.	-	-	497
Average/tree		27	58

The 1942-45 and 1965-67 infestations were first found in the Elk River Valley; subsequently the insect expanded also in the west Kootenay.

The larch sawfly parasite, Olesicampe benefactor was released for the first time in British Columbia when approximately 60 male and female adults were released in a stand adjacent to Sparwood (appendix). Larch sawfly cocoons were collected in September from the parasite release site and will be examined for the presence of O. benefactor in early 1979. Further releases are proposed for 1979.

Western spruce budworm, Choristoneura occidentalis

Douglas-fir and western larch were lightly defoliated on 80 ha along Johnstone Creek in 1978. Three-tree-beating samples on Douglas-fir contained an average of 150 larvae per beating. In 1977 there was a high number of larvae/ beating but no visible defoliation. From larvae collected in 1978 there appears to be no diseases or parasites present in the population. The results of an egg survey are displayed in the following table.

Table 9. Results of spruce budworm egg sampling, Nelson Forest Region, 1978

Location	Avg no. eggs per 10 cm ²	% total defoliation	Predicted defolia- tion for 1979
Johnstone Cr.	73.2	15	moderate
Bridesville	75.4	9	"

Larch budmoth, Zeiraphera improbana

The infestations of larch budmoth at Granby River, Kelly River, St. Annes Creek and Thone Creek collapsed in 1978. New areas of defoliation were found from Slocan Lake to Arrow Lake at Halfway River, Kuskanax Creek, Slewiskan Creek, Wee Sandy Creek, Holmes Creek, Wilson Creek, Lasca Creek, Caribou Creek, Plant Creek, Cusson Creek and Rioulx Creek. The high altitude defoliation, 1 140 m-1 500 m, was visible June 21. Pupation took place about the second week in June. Moth traps, some baited with a pheromone, others not, were placed in the infestation at Halfway River. No larch budmoth moths were trapped. There was 1 890 ha of defoliation in 1978.

Larch looper, Semiothisa sexmaculata

In 1977 Semiothisa sexmaculata caused 4 590 ha of defoliation in the Arrow Lakes-Slocan Lake-Kootenay Lake area. In 1978 the infestation collapsed, except for substantial members of larvae in some 3-tree beating samples on western larch. The 1977 defoliation occurred in a band from 900 m to 1 200 m elevation, whereas the 3-tree beating samples were in the valley bottom. No defoliation was visible.

Two-year-cycle spruce budworm, Choristoneura biennis

The "on year" form defoliated the current growth of Engelmann spruce and alpine fir in the north, middle and east forks of the White River and in Thunder Creek (see map 9, appendix).

In the north fork, including Colin Creek, north to Russell Peak area, the damage over 2 500 ha was variable. In the east fork, damage was light, <25% current foliage defoliated, on 1 200 ha from Mile 33 to Mile 37. Damage was light in the middle fork and Thunder Creek.

Populations of the "off year" form persisted in the Spillimacheen River Valley-McMurdo-Caribou creeks area, causing light current growth defoliation of Engelmann spruce and alpine fir on 2 600 ha. In Glenogle Creek, Kicking Horse Pass area, damage was light on 750 ha for the second year. Stands in the south fork of Bugaboo Creek (250 ha); St. Mary River (500 ha); and Lapointe Creek (200 ha) were also light defoliated.

The "off year" form is expected to cause more severe defoliation in 1979.

An Entomophthora virus was isolated from the "on year" populations in the north White River, where it was previously collected in 1972 (see appendix).

Western blackheaded budworm, Acleris gloverana

Current foliage of young Engelmann spruce in a small 2 ha area in the Blaeberry River Valley was lightly defoliated. The population in Mathew Creek near St. Mary Lake collapsed.

Satin moth, Stilpnotia salicis

Poplar trees at the base of Red Mountain were 100% defoliated by satin moth on 150 ha again in 1978. There is no tree mortality yet however if the defoliation re-occurs in 1979 some top and branch mortality could result.

European pine shoot moth, Rhyacionia buoliana

There were few infested branch tips in 1978 on the Muhgo pine planted at the Hugh Keenlyside Dam lookout near Castlegar. Traps baited with a pheromone failed to trap any moths. In Trail at the I.C.B.C. Claim Centre, 1977 infested Mubgo pine were not infested in 1978 and no moths were trapped.

Other Noteworthy Insects

Pacific Willow leaf beetle, Pyrrhalta carbo

This insect again caused 100% browning of willow trees from Fauquier to Revelstoke along Arrow Lakes, north of Revelstoke to the Goldstream River and in Glacier National Park.

The birch sketetonizer, Bucculatrix canadensis

This insect and a leaf miner, Lyonetia sp. continued to cause spectacular discoloration of white, paper and water birch in many areas of the east Kootenay for the third consecutive year, most noticeably in the Kicking Horse Pass; Crawford Bay to Riondel on Kootenay Lake and in the Horsethief Creek Valley where 100% of the hosts were discolored on 2 500 ha. Damage was also common in the Fairmont-Spillimacheen-Golden area and along Bugaboo Creek.

In the west Kootenay white birch was again discolored from 8 Km west of Kaslo to Kootenay Lake and north to Trout Lake.

Forest tent caterpillar, Malacosoma disstria The old infestation at Fort Steele and Moberly remained at low levels. Single isolated colonies were found in the northern part of the Rocky Mountain Trench.

Western tent caterpillar, Malacosoma c. pluviale Localized pockets of this insect were found near Cranbrook, Elko, from Grasmere to Roosville and in Kikomun Provincial Park where a colony of 5 000 was located.

Fall webworm, Hyphantria cunea

Colonies of larvae were common on a variety of deciduous hosts along roads between Wasa and Fort Steele, Bull River, Creston, from Wycliffe to Kimberly and near Fairmont. In the west Kootenay chokecherry and apple trees were defoliated from Nelson to Castlegar.

Mourning cloak butterfly, Nymphalis antiopa

Single trembling aspen, black cottonwood and willow were defoliated at Skookumchuk, Glacier and Revelstoke National Parks and along Rock Creek.

Apple and thorn skeletonizer, Anthophila pariana

This small leaf roller browned and defoliated apple trees from Castlegar to Crescent Valley in 1977 and again in 1978. In the east Kootenay, apple trees were defoliated at Creston and between Yahk and Canal Flats.

Yellowheaded spruce sawfly, Pikonema alaskensis

Individual ornamental spruce were defoliated in Castlegar, at the Hugh Keenlyside dam, in Trail and at Grand Forks. A 40 ha plantation of Engelmann spruce at Kuskanax Creek east of Nakusp was infested with spruce sawfly. The trees were 60% defoliated at the branch tips with light back feeding.

Cottony maple scale, Pulvinaria innumerabilis

In 1977 this insect caused defoliation and some twig mortality to boulevard and ornamental maple in Trail and Castlegar. In 1978 it was reduced and the damage caused was no longer a problem.

Western larch sawfly, Anoplonyx occidens

This other larch sawfly was common in the Region throughout the range of its host. Large numbers, 30-60 per three-tree-beating, were encountered at St. Mary River, Premier Lake, Findlay Creek, Salmo, Paulson, Slocan and Arrow lakes. No defoliation was found.

Douglas-fir needle midge, Contarinia sp.

The Douglas-fir needle midge and a woolly aphid, Adelges sp. combined to cause severe discoloration and premature needle loss to young trees from Elko to Golden. The most severe damage was between Canal Flats and Brisco where up to 75% of the current years needles were infected (see Table 10).

Table 10. Per cent needles infected by Contarinia sp. and Adelges sp. at five areas, Nelson Forest Region, 1976-78

Location	Percent needles infested		
	1976	1977	1978
Canal Flats	35	15	75
Invermere	15	5	25
Radium	10	5	35
Edgewater	30	5	30
Brisco	20	2	25

Leaf beetles, Dichelonyx sp.

In the Kikomun-Elko-Jaffrey area up to 50% of the current growth of single Douglas-fir trees was defoliated. From 75 to 200 adults were collected in three-tree-beating collections. In the Canal Flats-Findlay Creek-Columbia Lake area damage was light, <25% defoliation of current growth.

The beetles also caused light damage to willow in the Nicholson-Harrogate area and north of Golden.

A weevil, Scythropus spp.

This weevil discolored the 1977 needles of ponderosa pine in many areas of the east Kootenay. The discoloration affected less than 50% of the foliage, however pockets of severe discoloration were evident in the Elko and Skookumchuck areas, particularly on young understory trees.

Pine pitch moth, Vespa mima sequoiae -

The damage caused by this insect is common in pine stands in the southern part of the region. Damage is most noticeable in the Castlegar-Nelson area of the west Kootenay, and from Elko to Fernie and at the Kimberly golf course in the east Kootenay. At the Kimberly golf course it appeared to have pre-disposed the trees to attack by the red turpentine beetle, Dendroctonus valens.

Cone and Seed Insects

The maximum infestation of cone samples by cone and seed insects was 45% by Barbera colfaxiana of Douglas-fir cones and 45% of western larch cones by Hylemia sp. (see appendix).

Diseases

Larch needle cast, Hypodermella laricis

Larch needle cast was widespread resulting in discoloration of up to 95% of the foliage at Silverton Creek, Gardner, Salisbury and Caribou creeks, Whatshan Lake road, Koch, Wilson, Conkle and Pass creeks. Grand Forks, Kettle River Valley and Kuskanax Creek. The intensity of infection varied from light to severe with up to 80% of the foliage discolored.

Next to the Rocky Mountains from Fernie to Canal Flats and in the Flathead River Valley, there was infection of up to 25% of the foliage with pockets up to 2 ha of over 60%.

Moist, windless periods during late spring and early summer are associated with high infection. Branch tip dieback up to 45 cm is apparent on single trees at widespread locations in the east Kootenay which may be caused by the larch needle cast.

Pine needle blight, Leptomelanconium cinereum

Infection of older ponderosa pine foliage by this disease was widespread throughout its range in the southern part of the east Nelson Region, causing premature needle loss for the second consecutive year. Infection was generally less than 10% of total foliage except the Elko-Grasmere-Kikomun-Bull River-Norbury Lake are where up to 90% of the foliage was infected in pockets up to 5 ha. The infected trees end up with a "bottle brush" appearance.

Pine needle cast, Lophodermella concolor

Lodgepole and western white pine were discolored by this disease in widespread locations. Up to 30% of the foliage on 60-80% of the trees at Summit Lake, Hills, Nakusp to Galena Bay, Monashee Hwy. and at Little Sheep Creek where red band disease, Scirrhia pini was prevalent in 1977. Young dense stands were also severely infected in the Elk, Flathead, Bull and White river valleys, in the Goat River Valley and between Yahk and Koocanusa Lake where 90% infection on 1977 needles was common in localized areas.

Leaf and shoot blight of aspen, Venturia macularis

This disease along with V. populina on black cottonwood discolored stands up to 40 ha from New Denver to Kaslo, and up to 12 ha from Rossland to Big Sheep Creek. In the east Kootenay infection was widespread with infection ranging from light to 100% infection of all trees in small clones of young poplar.

Armillaria root rot, Armillaria mellea

Tree mortality caused by this root rot occurs annually throughout the Region. In the Columbia River Valley between Skookumchuck and Edgewater, there were dead Douglas-fir trees in groups of 10+ where 10% mortality of all age classes occurred. In the Lodgepole-Harvey creeks summit area up to 5% of the open growing immature alpine fir over 1 200 ha were killed by this root rot. Very few trees were killed by this disease in the west Kootenay in 1978.

Black stain root disease, Verticicladiella wagenerii

Since this root disease was first collected in B.C. in 1976 from lodgepole pine and Douglas-fir in the Kettle River area, it was been found in dead and dying conifers in the Kamloops, Prince George, Vancouver and Vancouver Island Regions. However it has not been collected from the region east of Trail to the Alberta-B.C. border.

Indian paint fungus, Echinodontium tinctorium

The Indian paint fungus infected up to 50% of the mature western hemlock trees in a 600 ha area along 8 km of road at Kid Creek, near Kitchener, where 20 trees had external sporophores. In Quartz Creek east of Glacier National Park, 100% of the mature western hemlock were infected over 2 ha.

Lodgepole pine dwarf mistletoe, Arceuthobium americanum

Mistletoe causes significant annual volume loss to immature and mature stands throughout the Region. Pine stands are infected up to 90% along the White, Kootenay and Spillimacheen river valleys, and west of the Columbia River in the McMurdo Bench area. Stand improvement programs are underway in the White and Kootenay river valleys. The mistletoe parasite, Wallrothiella arceuthobii was collected in the Spillimacheen River Valley at Bugaboo Creek.

White pine blister rust, Cronartium ribicola

White pine blister rust is common throughout the host range in the Region. Tree mortality and "top-kill" are widespread in the west Kootenay, with the largest amount of dead and dying trees along the Kaslo River and from Kootenay Lake north to Trout Lake.

Tree mortality was less prevalent in the east Kootenay where branch mortality and "top-kill" are most common. In the St. Mary River drainage, 100% of the mature white pine exhibit infection. In the McLatchie Creek area between Flathead and Harvey Pass 100% of the immature second growth are infected over 200 ha.

Atropellis canker of pine, Atropellis piniphilia

One hundred percent of the lodgepole pine stems in a 10 ha area were infected near McGregor Creek, at the tributary of Horsethief Creek, causing growth deformation and blue-black stain of the sap and heartwood.

Bud blight, Dichomera gemmicola

This disease killed up to 30% of the buds on young Douglas-fir at Davis Creek near Lardeau. Less severe infection was found at Pass Creek near Grand Forks, from Fletcher Creek to Kaslo and at Argenta on Kootenay Lake. Bud mortality was 50% on single Douglas-fir trees at widely scattered locations in the east Kootenay. Repeated infection in some areas has resulted in growth reduction and a "bushy" appearance.

Conifer-cottonwood rust, Melampsora occidentalis

This needle rust which was widespread in 1977 was less severe in 1978. Near Slocan Lake a small Douglas-fir stand was infected and suffered needle drop.

Fir needle rust, Pucciniastrum epilobii

Alpine fir trees over 100 ha on Mt. Kirkup near Rossland were infected and discolored up to 80% of the current foliage. At Glacier Creek near Duncan Lake 90% of the current needles on 80 ha were affected.

Weir's spruce cushion rust, Chrysomyxa weirii

This disease infected 100% of the 1977 needle on 50% of the Engelmann spruce in a mixed 200 ha stand along the Fernie watershed access road causing discoloration and premature needle drop. Light infection, less than 5% of the foliage infected, was common in most Engelmann spruce stands in the District.

Climatic Injury

Lower than normal precipitation during the previous two years associated with poor site conditions resulted in mortality, top-kill and branch dieback of Douglas-fir trees along Hwy. 3/93 and 93/95 from Yahk north to Brisco and along secondary roads in the Windermere-Invermere area. Examination of affected trees showed typical "drought" symptoms. Symptoms are described by McMinn and Funk in Canadian Journal of Botany, Vol. 48, No. 12, 1970 (see also attached report, Appendix X).

Approximately 250 "red-topped" open growing second growth conifers were recorded on the N.W. slope of Mount Nedbum in the Blacberry River attributed to drought conditions.

Rodents

Top-kill of immature western larch by rodents has occurred annually for many years and continued in 1978 in many areas including; Paulson, Blueberry-Stewart and McKinney creeks and at Conkle Lake ^h were top kill averaged 8 metres on trees 7 to 11 metres tall, averaging 4 trees per acre. In the Yahk-Cranbrook-Rosville areas, in Lodgepole creek and in Mause Creek-Lussier River area up to 50% exhibit top-girdling in localized 5 ha areas but is generally less than 10% elsewhere.

Other Diseases

Disease	Host(s)	Location	Remarks
<u>Melampsora epitea</u> Hemlock-willow rust	willow	Wasa	Single shoot.
<u>M. paradoxa</u> Needle rust of western larch	larch, western	Elk & Flathead river valleys	Varying intensity.
<u>M. medusae</u> Conifer-Aspen rust	larch, western	Elk & Flathead river valleys	5% of foliage on 10 trees.
<u>Coleosporium asterum</u> Pine needle rust	pine, lodgepole	Bighorn Creek-Ram Creek access road, Km 12, Estella Mine Rd.	25% of older needles in 1 ha areas.
<u>Chrysomyxa pirolata</u> Cone rust	spruce, Engelmann	Wigwam-Bighorn and Harvey-Flathead areas	Infection less than 10%. Infected <u>Pyrola</u> spp. was collected at White River was <u>not</u> found in area where BCFS collected.
<u>Caloscypha fulgens</u>	seeds	Hawkin-Freeman creeks	
Branch & tip dieback	pine, ponderosa	Findlay Creek Road	90% of trees on 15 ha. Foliage discoloration on current growth 10-90%. (Suspect Sclero- derris canker).
<u>Cronartium commandra</u> Commandra blister rust	pine, ponderosa	Kimberly-Cranbrook Hwy. junction	1 of 50 trees affected.
Grey mould	Chokecherry	Morrissey Park	Up to 50% of leaves infected. (Possibly new genus or host).
<u>Cronartium coleosporioides</u> <u>f. coleosporoides</u> Stalactiform blister rust	pine, lodgepole	Goldie Creek at east end of Toby Creek.	10% of mature pine infected.
<u>Delphinella abietis</u>	fir, alpine	Lizard Creek, Prov. Park, km 100, Bull River Road	50% of current growth on 50% of trees affected.

<u>Disease</u>	<u>Host(s)</u>	<u>Location</u>	<u>Remarks</u>
<u>Cenangium singulara</u> Sooty bark canker	aspen, trembling	Lizard Creek Prov. Park	Collected from single tree, 1st collection from Kootenay.
<u>Crepidotus fulvotomentosus</u> Decay fungi	aspen, trembling	Lizard Creek Prov. Park	New host record for B.C.