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IN BRITISH COLUMBIA, 1969**

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**FOREST RESEARCH LABORATORY  
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INTRODUCTION

The spruce beetle, Dendroctonus obesus (Mannerheim), is one of British Columbia's most destructive forest pests. Its preferred hosts are spruce windfall, freshly cut logs and shaded slash, but under conditions favorable to population buildup in damaged forests large numbers of mature and overmature living trees are attacked. In the latter instance, feeding by the larvae under the bark interrupts the sap flow, killing the affected trees.

Weather conditions have an important effect on populations. For example, the rate of brood development increases with temperature. Under the most favorable conditions they develop from egg to adult in a single summer, attacking new material the following season; usually, however, they develop more slowly, emerging to attack two or three years later. Weather conditions also affect the susceptibility of trees to infestation. Vigorous trees normally produce a sap flow sufficient to drown out attacking beetles; but, hot, dry summers may weaken trees, predisposing them to attack. A drought, combined with a large population of beetles such as might arise from unusually heavy blowdown in the previous year or two, may lead to serious losses.

Tree mortality caused by spruce beetle rose sharply in the province in 1968. These infestations, on Picea glauca (Moench) and Picea engelmannii Parry in the Prince George, Nelson and Kamloops Forest Districts, were believed to have resulted from beetles, building to large numbers in windthrow, attacking trees weakened by the dry summer of 1967. They were reported in the "Annual District Report of the Forest Insect and Disease Survey, British Columbia" for the 1968 season, and the Nelson District infestation was further described in a special report by Andrews and Molnar (1969). Both reports are available from the Forest Research Laboratory, Victoria.

In 1968 extensive sampling was done to define infested stands in the East Kootenay area of the Nelson Forest District. Widespread severe infestation was found in mature and overmature stands.

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The infestation described here is the second within the last decade in the Prince George Forest District. An outbreak of spruce beetle in 1961-1964 killed an estimated 444 million cubic feet of white spruce (Cottrell et al. 1966). In 1965 and 1966, only a few standing trees were attacked but high beetle populations persisted in wind-thrown timber. In 1967, a few localized infestations occurred in the district, notably in the Quesnel area. Infestations of standing trees in 1968 increased greatly over those of the previous three years, with ground surveys indicating that the heaviest damage was in the drainages of the Swift, Cottonwood and Willow Rivers.

Damage in the Kamloops Forest District immediately prior to the currently reported outbreak was negligible.

A general plan of accelerated logging and revision of cutting priorities to recover as much of the damaged timber as possible has been adopted by forest management agencies. One practical means of controlling this pest is through reducing beetle broods by removing infested logs and scheduling logging to provide a consistent supply of preferred material which will absorb beetle broods.

Surveys in 1969 undertook to re-define the limits of infestation and to measure the magnitude of the 1969 attack and determine population trends. This report describes the infestations in the fall of 1969 and forecasts developments for the coming year.

#### METHODS

Spruce beetle infestations were measured by delineating damage from the air, followed by ground sampling in representative areas of different attack intensity and timber type. Severity of attack was mapped from a fixed-wing aircraft in late summer or early fall as light, 1 to 5% of trees killed; medium, 6 to 30%; and heavy, 31% or more. Variable radius (prism) plots were established along sample lines on the ground at two chain intervals. Trees sampled were divided into the following categories:

- 1) healthy: trees not attacked or had repelled attack;
- 2) 1969 killed: trees attacked in 1969, with beetle brood feeding around the basal portion, at least 50% of the circumference (these will die);
- 3) 1969 partial: trees with brood feeding on 50% or less of their circumference (some will survive unless re-attacked);

- 4) 1968 killed: trees attacked and killed the previous year;
- 5) prior killed: trees attacked and killed prior to 1968 but still in merchantable condition.

In the Nelson Forest District, the ground survey was limited compared with the 1968 survey, involving 359 point samples at 10 localities in the main, eastern portion of the infestation, as well as examinations at several other areas where a problem was noted for the first time this year. In the Kamloops Forest District, 141 point samples were made at 4 localities, again a rather brief assessment of a widespread problem. A more intensive survey was attempted in the Prince George Forest District, involving 1,012 point samples on 25.30 miles of strip spread over 32 localities. Here, in addition to volume per acre damage estimates at sample localities, as made in the first two Districts, total gross volume was estimated over the areas where damage was observed from the air. These areas were classified into three damage intensities, and by using B. C. Forest Service 20 chain forest cover maps, into three species composition classes: 80+% spruce, 60-79% spruce and 59-% spruce. Selected trees on sample strips were examined for beetle brood to determine population levels and stage of development, important in predicting future attack.

## RESULTS

### Nelson Forest District

In general, the areas of spruce beetle infestation in the Nelson Forest District (maps 1-5) increased in size as the 1968 attack, expressed now as visible mortality, became evident. This additional damage enlarged the areas by about 3,000 acres where mortality was observed in 1968, and damage covering a further 12,000 acres appeared to the west and north (Table 1).

Sufficient ground strips were run to determine the progress of the infestation and note spread beyond that determined in 1968. The sample strips which were run illustrated the damage which occurred on representative areas.

At the 10 sample locations in the main infestation in the East Kootenays, the percentage of stems killed in 1968 and in the preceding year or two ranged from 5 to 50, and the volume per acre killed in 1968 ranged from 60 cubic feet to over 1,500 (Table 2). From 0 to 20% of the stems and from 0 to 460 cubic feet per acre were attacked in 1969.

Table 1. New Spruce Beetle Infestations as Delineated by  
1969 Aerial Surveys, Nelson Forest District

Location	Area (approximate acreage)
Extension of areas mapped during 1968 aerial survey	
Kishinena Creek	500
Flathead River	1,750
Quinn Creek	400
Galbraith Creek	600
Wild Horse River	125
Total	<u>3,375</u>
New infestation observed for the first time	
Bloom Creek	250
Lussier River	500
Stork Creek	300
White River	3,000
Palliser River	300
Wild Horse River	575
Albert River	250
Findlay Creek	200
Trapping Creek	975
Kettle River	900
Kid Creek	1,750
Carney (Pork) Creek	650
Howser Creek	375
Slewiskin Creek	325
Buchanan Mountain	100
Lendrum Creek	50
Woodbury Creek	125
Cascade Creek	200
Lake Creek	375
Cooper Ridge	250
Howser Ridge	550
Total	<u>12,000</u>
Total new infestation	15,375

Table 2. Spruce Attacked by Spruce Beetle as Determined by Ground Surveys,  
Nelson Forest District, 1969

Location of sample	Damage intensity	Strip length (chains)	No. of point samples	No. of spruce examined	% stems		Approx. gross vol/acre (ft <sup>3</sup> )			
					1969 killed	1968 & prior	1969 killed	1969 partial	1968 killed	Prior killed
E. White R.	L	50	25	133	10	15	55	270	300	210
Cabin Cr.	M	80	40	140	0	30	0	0	750	140
Bighorn Cr.	M	80	40	177	15	50	95	400	1,020	305
Bighorn Cr.	M	20	10	38	3	35	460	80	1,535	380
Stork Cr.	M	60	30	129	2	10	60	0	285	160
Quinn Cr.	M	60	30	114	3	20	115	40	530	375
Wigwam R.	L	118	59	172	0	5	0	0	60	60
Sage Cr.	H	50	25	84	10	30	45	370	890	40
Burnham Cr.	H	80	40	115	15	50	205	50	1,270	320
Kid Cr.	H	132	60	202	20	15	290	370	440	40

Thirty-eight trees examined for spruce beetle brood showed some larvae, but very few adults. Of these, sixteen trees had small numbers of overwintering larvae; 10 had adults. Eleven had somewhat larger numbers (11-50 per square foot) of larvae and 8 had young adults.

Damage was noted for the first time in 1969 in the Lardeau River drainage and along Kootenay Lake (Map 3), to the west of the main infestation. Cooper Ridge, a heavily logged area with about 2,000 acres of slash, had infested trees in seed-blocks containing up to 60 young adults per square foot of bark. The Lake and Cascade Creek infested areas contain almost 2,000 acres of fire-damaged, merchantable timber. Beetles were found in lightly damaged trees near the burn perimeters and in patches throughout the main burns. About 15% of the trees were affected and those examined contained heavy populations of adults or large larvae. At Howser Ridge, about 15% of the spruce (10 stems per acre) were attacked in 1969. Heavy populations were made up mostly of larvae, but there were appreciable numbers of young adults.

At another new infestation at Trapping Creek in the Kettle River Valley (Map 5), tree mortality involving over 600,000 cubic feet resulted from attack initiated in 1968. However, only one tree was found in which attack was begun in 1969. Infestations in the Kettle River - Damfino Creek area were light and acreages affected were small.

#### Kamloops Forest District

Spruce beetle damage covering approximately 40,000 acres appeared in the Kamloops Forest District in 1969 (Table 3) (Maps 6-8). Ground checks made at four selected locations helped reveal the extent of the problem (Table 4).

An infestation covering 2,500 acres in the Powers Creek Drainage (Map 6), with heaviest damage occurring along the west fork of Lambly Creek and along Powers Creek, was examined. Forty point samples in the area indicated that only about 4% of the spruce were killed and overwintering populations were very low. No current attack was found.

Light to medium spruce mortality was observed from the air over 4,000 acres in the Peterson-Skull Creeks drainages (Map 7). A series of 70 point samples was made near Dunsapie Lake, revealing that 14% of the spruce was attacked in 1968 but only a further 1% attacked in the current year. Trees attacked last year had negligible brood; those attacked this year had very few young beetles or larvae.

At Kiethly Creek, near Likely, from 20 to 80% of the spruce were attacked in 1968 (Map 8). Woodpecker feeding was heavy and winter beetle mortality appeared to be high. In the same area, at Spanish Creek, a similar situation existed except that some 1969 attack was detected.



Table 3. Spruce Beetle Infestations as Delineated  
by 1969 Aerial Surveys, Kamloops Forest District

Location	Area (Approximate acreage)
Lemieux Creek	500
West of Little Fort	1,200
Peterson-Skull Creeks (Dunsapie Lake)	4,000
Moirs Lake	100
Powers Creek (Lambly or Bear Lake)	2,500
Cariboo River (including Spanish Creek)	19,000
West of Quesnel Lake	5,000
North of Quesnel Lake (Abbott and Grain Creeks)	8,000
Total	40,300

Table 4. Spruce Attacked by Spruce Beetle as Determined by Ground Surveys,  
Kamloops Forest District, 1969

Location of sample	Strip length (chains)	No. of point samples	No. of spruce examined	% stems		Gross vol/acre (ft <sup>3</sup> )			
				1969 killed	1968 & prior	1969 killed	1969 partial	1968 killed	Prior killed
Powers Cr.	80	40	186	0	4	0	0	100	105
Weaver Cr.	30	15	173	1	80	50	0	3,200	325
Spanish Cr.	40	20	87	20	30	310	0	1,045	0
Dunsapie L.	40	20	47	4	19	60	24	227	0
Dunsapie L.	80	40	119	0	18	0	0	223	13
Dunsapie L.	12	6	21	0	0	0	0	0	0

### Prince George Forest District

Aerial surveys in the Prince George Forest District in 1969 revealed about 46,000 acres of infested mature and overmature spruce: 28,000 acres were classified as lightly attacked, 13,000 acres as medium and 5,000 acres as heavy (Maps 9-10). Total gross volume losses were estimated at approximately 30,000,000 cubic feet (Table 5). Of this volume, 64% was killed in 1968 but only 3% in 1969. Heaviest losses were in British Columbia Forest Service Ranger Districts 3, 15 and 16.

Beetle populations in standing trees were greatly reduced during the winter of 1968-1969, and significant 1969 attack occurred only in one location, southwest of Stony Lake. Of 235 infested trees in the District inspected routinely for beetle brood in the course of running sample strips, only 24 contained 1969 attack and 48, 1968 attack. Numbers of living brood were small, with a slight predominance of larvae.

Table 5. Spruce Beetle Infestations as Determined from Aerial and Ground Surveys in 1969,  
Prince George Forest District

Region	Compartment	Approx. area of Damage (acres)			Approx. gross volume (ft <sup>3</sup> )				
		Light	Medium	Heavy	1969 killed	1969 partial	1968 killed	Prior killed	Total vol. dead or dying
56	3	2,270	550	100	8,200	30,900	826,400	512,900	1,378,400
	4	4,640	790	110	10,500	79,800	1,373,100	979,800	2,443,200
	6	370	50	0	1,000	4,400	68,300	74,600	148,300
	7	140	310	0	2,300	1,400	171,100	88,600	263,400
	9	640	320	0	4,400	7,600	212,200	181,100	405,300
	10	460	110	0	1,500	7,200	135,700	96,700	241,100
	11	380	90	0	1,800	5,800	101,600	80,400	189,600
	12	360	0	0	0	8,100	91,700	55,000	154,800
	13	380	120	0	2,500	4,900	84,100	92,600	184,100
	14	400	920	830	133,100	51,500	1,387,500	566,600	2,138,700
	17	80	0	30	3,800	1,200	40,500	22,400	67,900
	20	0	110	0	1,400	1,000	53,000	22,500	77,900
	30	10	0	0	0	200	2,400	1,400	4,000
	Totals		10,130	3,370	1,070	170,500	204,000	4,547,600	2,774,600
59	45	280	0	0	0	7,100	75,400	42,800	125,300
	47	450	0	0	0	10,800	2,110,300	68,400	2,189,500
	50	210	0	0	0	1,800	28,800	36,200	66,800
	68	60	0	0	0	500	8,700	10,900	20,100
	69	120	0	0	0	0	17,800	19,000	36,800
	77	240	0	0	0	4,000	42,000	89,500	135,500
	79	310	0	0	0	7,800	82,900	47,000	137,700

Table 5. (Continued)

Region	Compartment	Approx. area of Damage (acres)			Approx. gross volume (ft <sup>3</sup> )				
		Light	Medium	Heavy	1969 killed	1969 partial	1968 killed	Prior killed	Total vol. dead or dying
59	83	250	0	0	0	4,900	60,300	38,500	103,700
	84	460	230	0	1,900	9,500	219,500	120,200	351,100
	90	30	0	0	0	500	6,100	4,100	10,700
	114	620	750	180	39,700	20,800	637,500	324,700	1,022,700
	115	1,050	570	230	39,200	20,400	706,100	366,400	1,132,100
	116	510	110	60	9,500	4,400	192,000	123,000	328,900
	117	560	720	120	21,500	22,300	568,900	290,000	902,700
	118	1,450	1,180	0	18,000	21,900	781,700	360,700	1,182,300
	119	180	180	240	16,900	23,000	369,300	224,900	634,100
	120	120	250	50	11,200	8,800	145,500	128,400	293,900
	121	1,270	930	790	128,100	67,000	1,515,500	750,200	2,460,800
	122	760	280	0	5,000	13,500	237,700	186,200	442,400
	123	540	1,390	300	55,700	44,000	768,500	567,200	1,435,400
	124	520	520	300	48,000	21,300	671,500	314,100	1,054,900
	125	640	420	50	6,900	21,000	425,800	211,300	665,000
	126	130	200	0	2,700	4,400	112,400	63,100	182,600
	134	140	0	0	0	3,700	38,800	22,000	64,500
	138	70	0	0	0	1,800	19,400	11,000	32,200
	144	190	0	0	10,900	8,500	168,900	79,300	267,600
	145	2,980	1,430	1,090	162,000	108,100	2,432,800	1,192,200	3,895,100
Totals		14,140	9,160	3,410	577,200	461,800	12,444,100	5,691,300	19,174,400

Table 5. (Continued)

Region	Compartment	Approx. area of Damage (acres)			Approx. gross volume (ft <sup>3</sup> )				
		Light	Medium	Heavy	1969 killed	1969 partial	1968 killed	Prior killed	Total vol. dead or dying
69	72	180	0	0	0	4,600	48,500	27,500	80,600
	75	120	200	0	3,800	6,500	124,600	58,700	193,600
	82	200	30	70	9,800	6,400	133,200	62,100	211,500
	87	130	0	0	0	3,300	34,500	19,500	57,300
	92	1,520	260	0	5,000	4,700	339,600	286,300	635,600
	93	270	0	0	0	2,700	52,600	41,600	96,900
	102	30	0	0	0	700	7,500	4,300	12,500
	105	460	0	0	0	0	66,400	71,100	137,500
	106	80	0	0	0	0	12,200	13,000	25,200
	107	120	0	0	0	0	17,600	18,800	36,400
	108	270	140	0	900	6,900	147,500	71,900	227,200
	109	50	50	220	6,400	20,300	302,700	123,500	452,900
	111	0	190	0	3,400	3,000	85,600	40,300	132,300
	112	120	0	0	0	0	17,200	18,400	35,600
	113	190	0	0	0	0	26,900	28,800	55,700
114	110	0	0	0	0	16,000	17,100	33,100	
Totals		3,850	870	290	29,300	59,100	1,432,600	902,900	2,423,900
Grand totals		28,120	13,400	4,770	777,000	724,900	18,424,300	9,368,800	29,295,000

## DISCUSSION

In the years 1968 and 1969, spruce mortality caused by spruce beetle became evident over several large areas in the interior of the province. An aerial and ground assessment in 1969 indicated that new attack this year was lower than in the previous two years, although losses cannot be accurately determined until 1970 when the trees change color. The cold winter of 1968-1969, which reduced broods above the snow cover, and the summer of 1969, at least somewhat favorable to tree growth and survival, have also reduced the hazard. Examinations of attacked trees revealed only small numbers of adults; these would attack in 1970 while the more abundant portion of the brood, larvae, would not attack until 1971. Nevertheless, appreciable new damage could appear in 1970 in some areas. However, it is still too early to predict the degree of hazard for 1971.

This survey has confirmed that a serious bark beetle problem persists in the interior of the province and that priority should be given to logging mature and overmature spruce, particularly where mortality is heavy and salvage is possible. It is not practical to try to prevent beetles from attacking trees or to kill them by direct means after they are in the trees.

More detailed information on some of the infested areas has been supplied to the forest management agencies concerned. Those interested in more specific information on any area should contact the Survey Head at this laboratory.

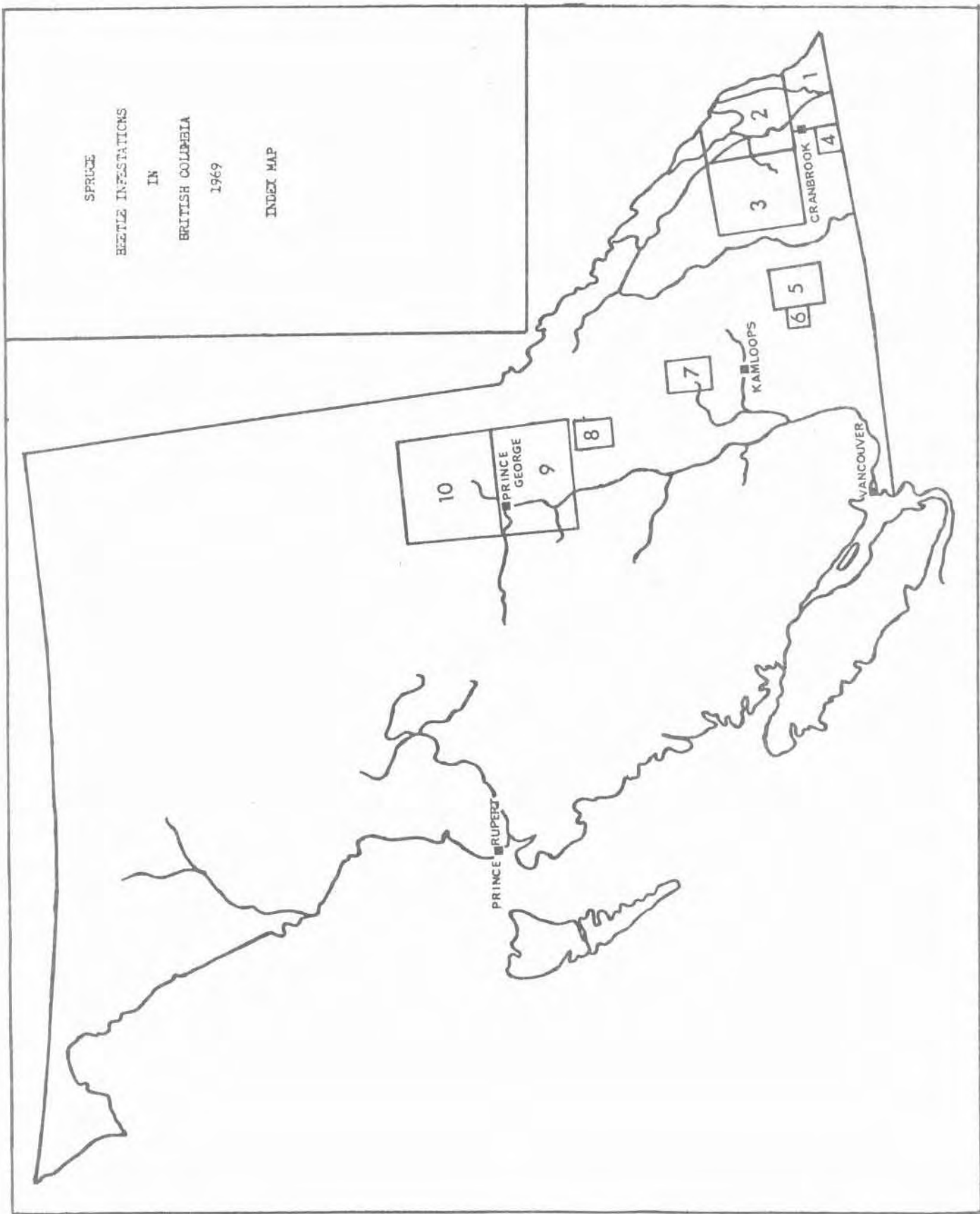
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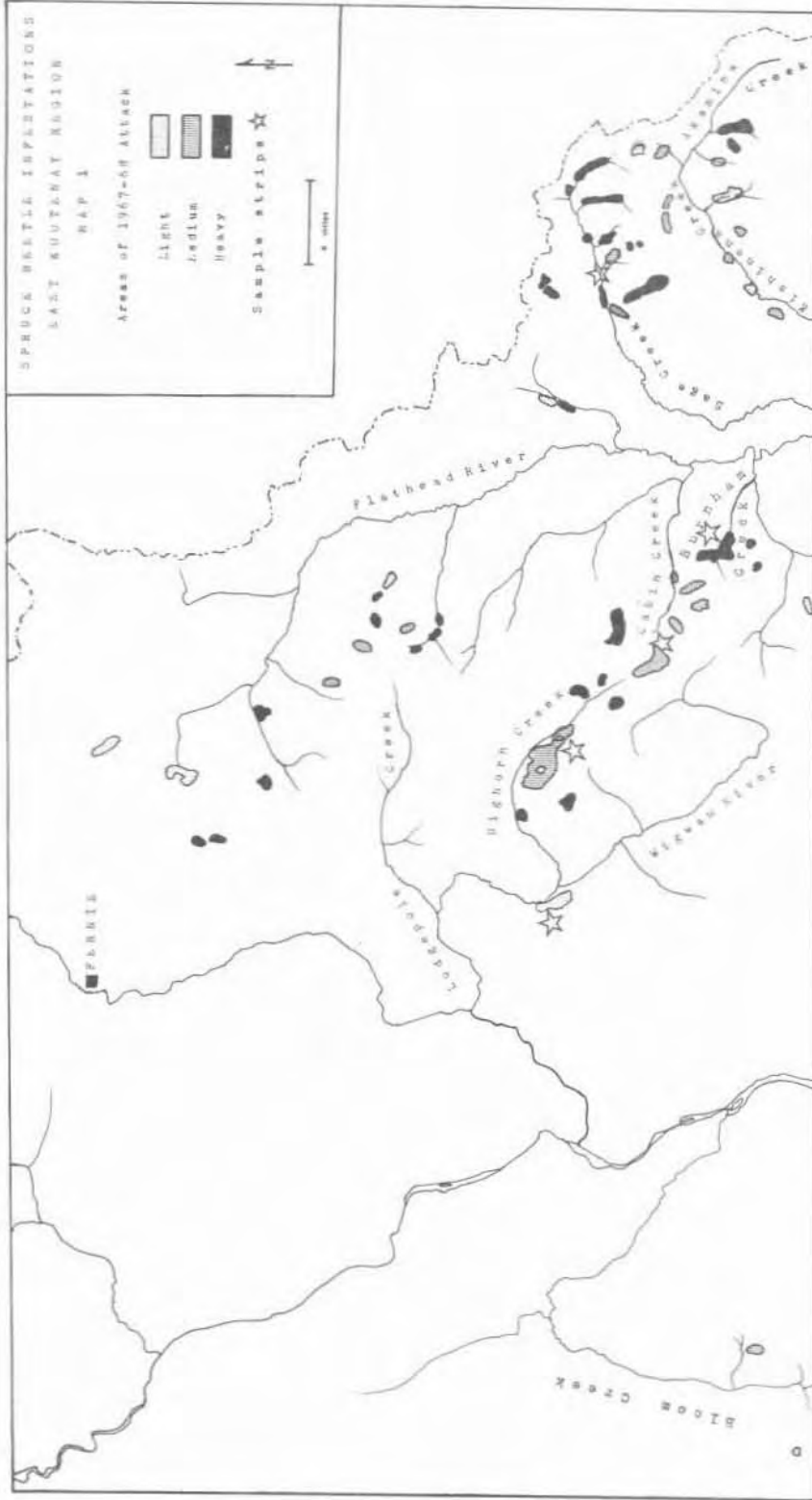
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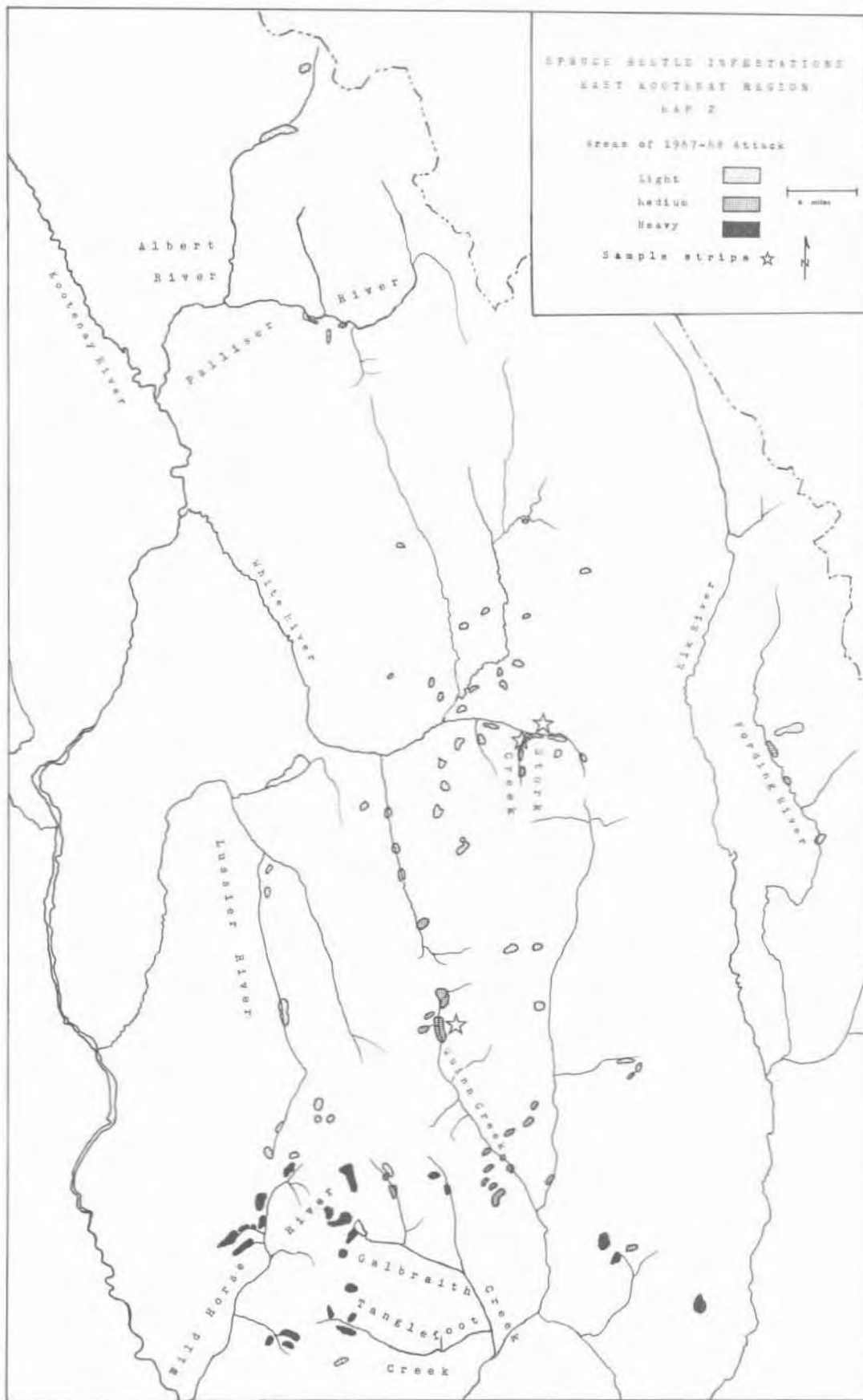
The generous assistance of personnel of the Nelson, Kamloops and Prince George Forest Districts, British Columbia Forest Service, is gratefully acknowledged.

SPRUCE  
BEETLE INFESTATIONS  
IN  
BRITISH COLUMBIA  
1969  
INDEX MAP











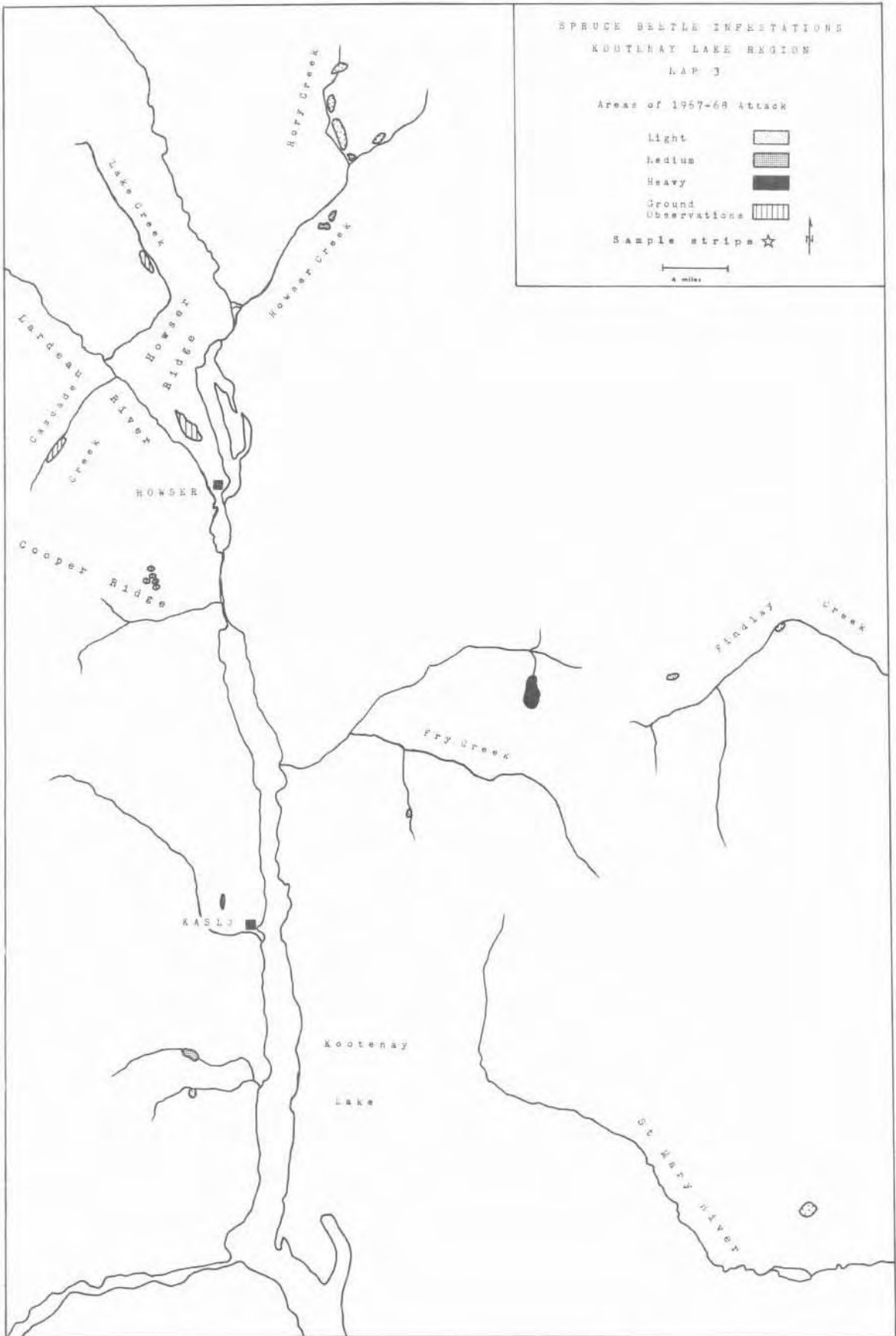
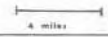


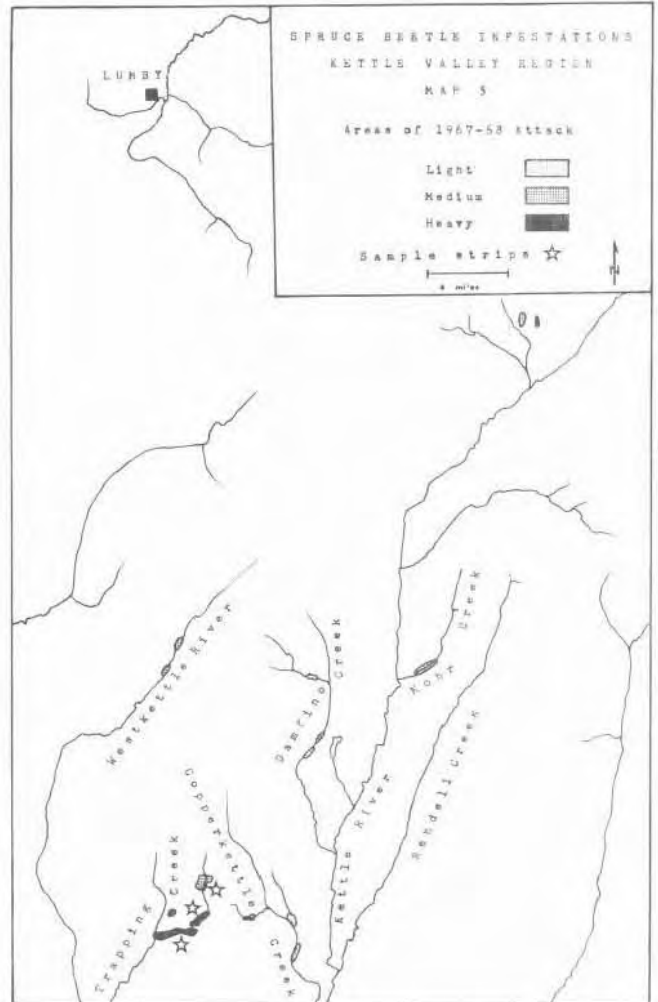
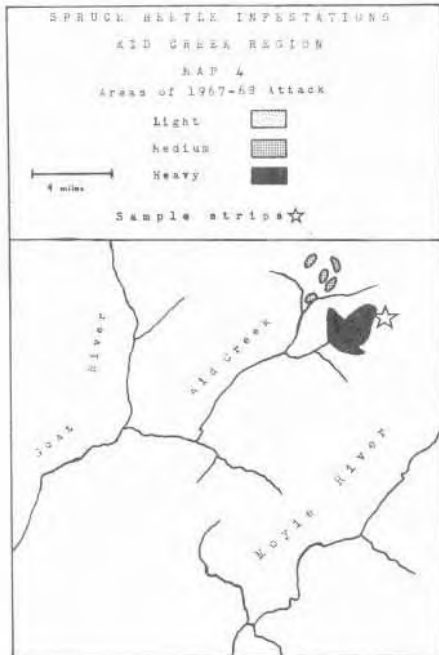
SPRUCE BEETLE INFESTATIONS  
 KOOTENAY LAKE REGION  
 LAP 3

Areas of 1957-68 Attack

- Light 
- Medium 
- Heavy 
- Ground Observations 

Sample strips ☆





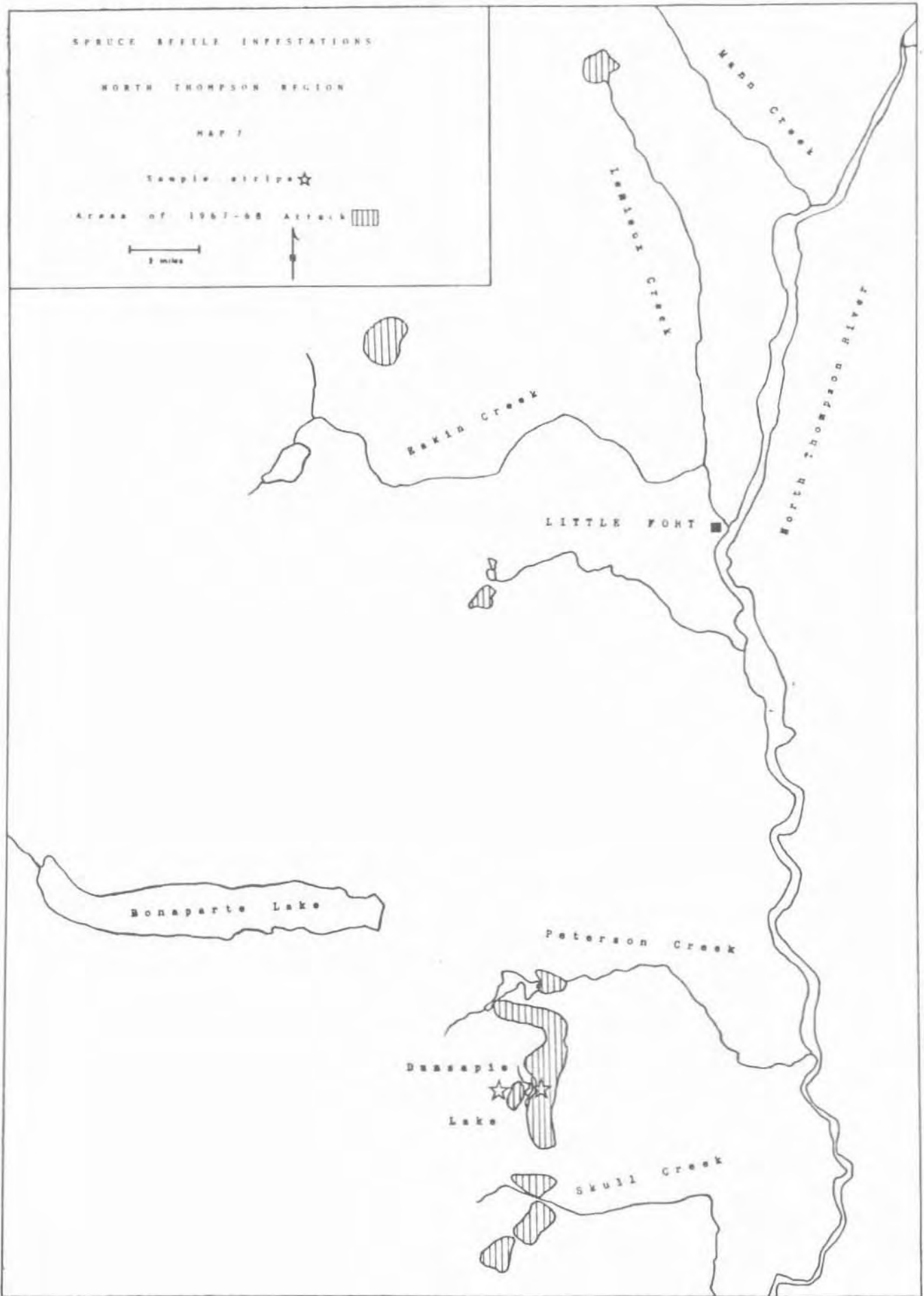
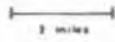
SPRUCE BEETLE INFESTATIONS

NORTH THOMPSON REGION

MAP 7

Sample sites ☆

Area of 1967-68 Attack ▨



SPRINK BENTLE INFESTATIONS  
QUESNEL LAKE REGION  
MAP 8

Area of 1967-68 illness



Sample sites

