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ANNUAL DISTRICT REPORT
FOREST INSECT AND DISEASE SURVEY
BRITISH COLUMBIA, 1977
PART II, PRINCE RUPERT FOREST DISTRICT

by

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DEPARTMENT OF ENVIRONMENT

January, 1978

INTRODUCTION

Normal summer weather prevailed in the Prince Rupert District until late July. Above average temperatures were recorded for most of August, leading to more rapid insect development, particularly in the case of spruce beetle broods.

The field season extended from May 24 to October 7. Aerial surveys were conducted over the Queen Charlotte Islands in July in conjunction with a field survey from July 11-15. The coastal portion of the District south of Prince Rupert was surveyed July 19-21 and the interior portion was flown in September.

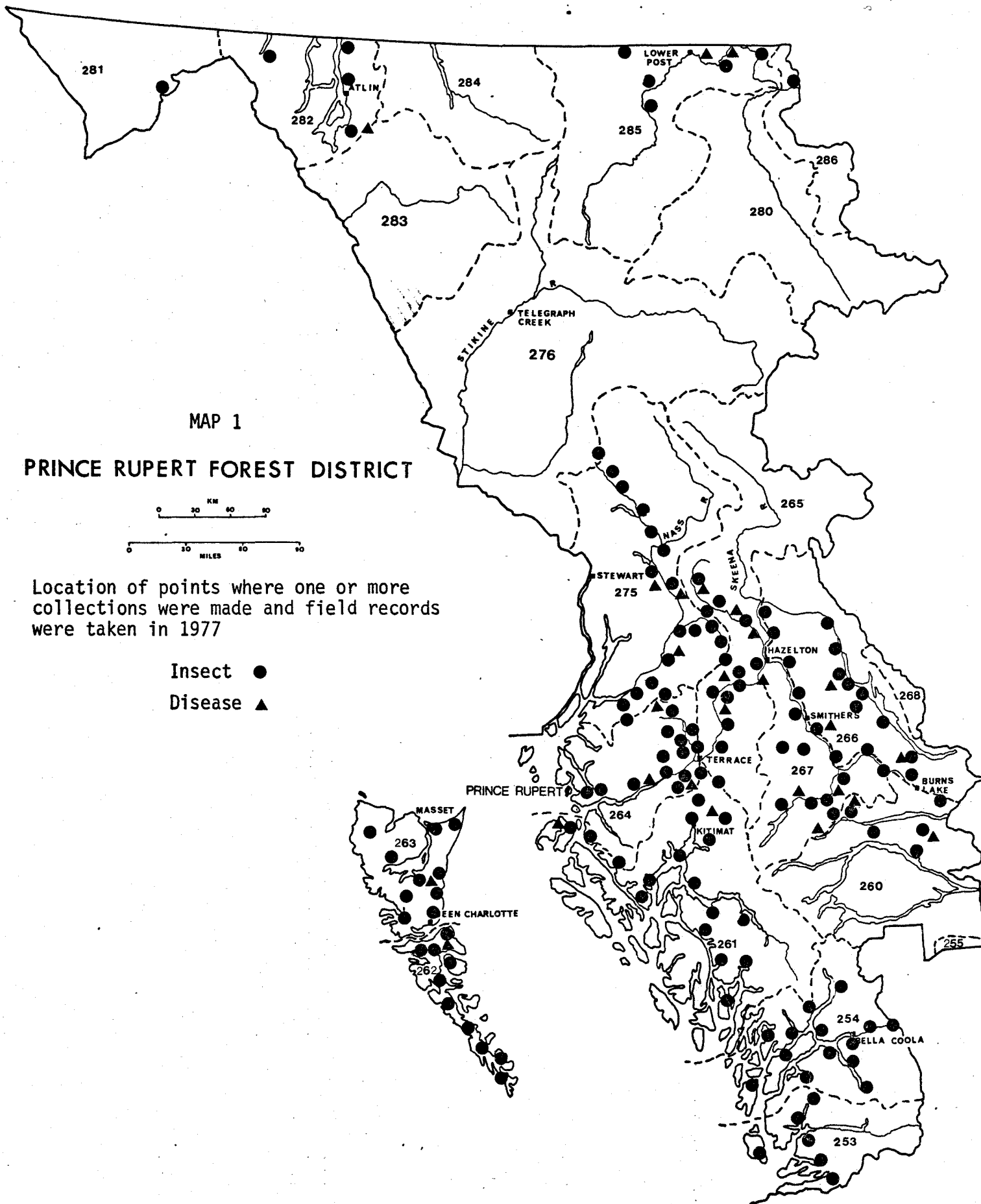
A total of 435 insect and 65 disease collections were submitted to the P.F.R.C. Map 1 shows the general location of field collection points; Map 2 shows the aerial flight lines.

Numbers of defoliators found in the field increased moderately from 1976. The number of collections containing larvae in the western part of the District was up, from 64% positive in 1976 to 71% in 1977; in the eastern portion, positive collections increased to 65%, from 52% in 1976.

Insect problems included spruce beetle, which has reached epidemic proportions over 78 square kilometres (30 sq. mi.) in the Smithers Landing area. Counts of mountain pine beetle infested lodgepole pine decreased from 18,000 red-tops in 1976 to 11,000 in 1977. Western balsam bark beetle continues to be a chronic problem in spruce-balsam stands. The pine sawfly infestation south of Porcher Island appears to have collapsed, though heavy tree mortality was noted along Grenville Channel on Pitt Island. A trace of defoliation on alpine fir, resulting from blackheaded budworm feeding, was found at Oweegee Creek on Highway 37 and along the Nilkitkwa road at Mile 18. Spruce aphids caused severe browning of shoreline Sitka spruce on the Queen Charlotte Islands and at Prince Rupert. A spruce budmoth continued to cause deformation of tops and laterals of regeneration Sitka spruce at Deena Creek on the Queen Charlotte Islands. The light infestation of green velvet looper in the Kitimat River Valley collapsed, but it remains one of the most common insects collected.

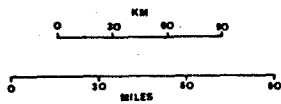
Important disease problems include a snow blight and a dieback responsible for extensive damage of planted young white spruce at Perow Burn and Chapman Lake. Trembling aspen and black cottonwood were infected with a leaf and twig blight in many areas of the District. Red band needle disease severely infected young lodgepole pine near Moricetown, Carnaby and along the Kisgegas road. Both the western gall rust and Stalactiform rust continue to cause damage to lodgepole pine in several areas of the District. Sweet fern blister rust was found in a shore pine provenance trial at Chist Creek. Late frosts killed up to 80% of new shoots of young Sitka spruce and western hemlock in the Kalum and Kitimat River valleys and red belt occurred on about

1 600 ha near Johnny Lake. Porcupine damage to lodgepole pine and western hemlock was prominent along the Skeena River north of Terrace. Chlorine gas from the Port Edward pulp mill severely burned 30 ha of shore pine on Ridley Island.

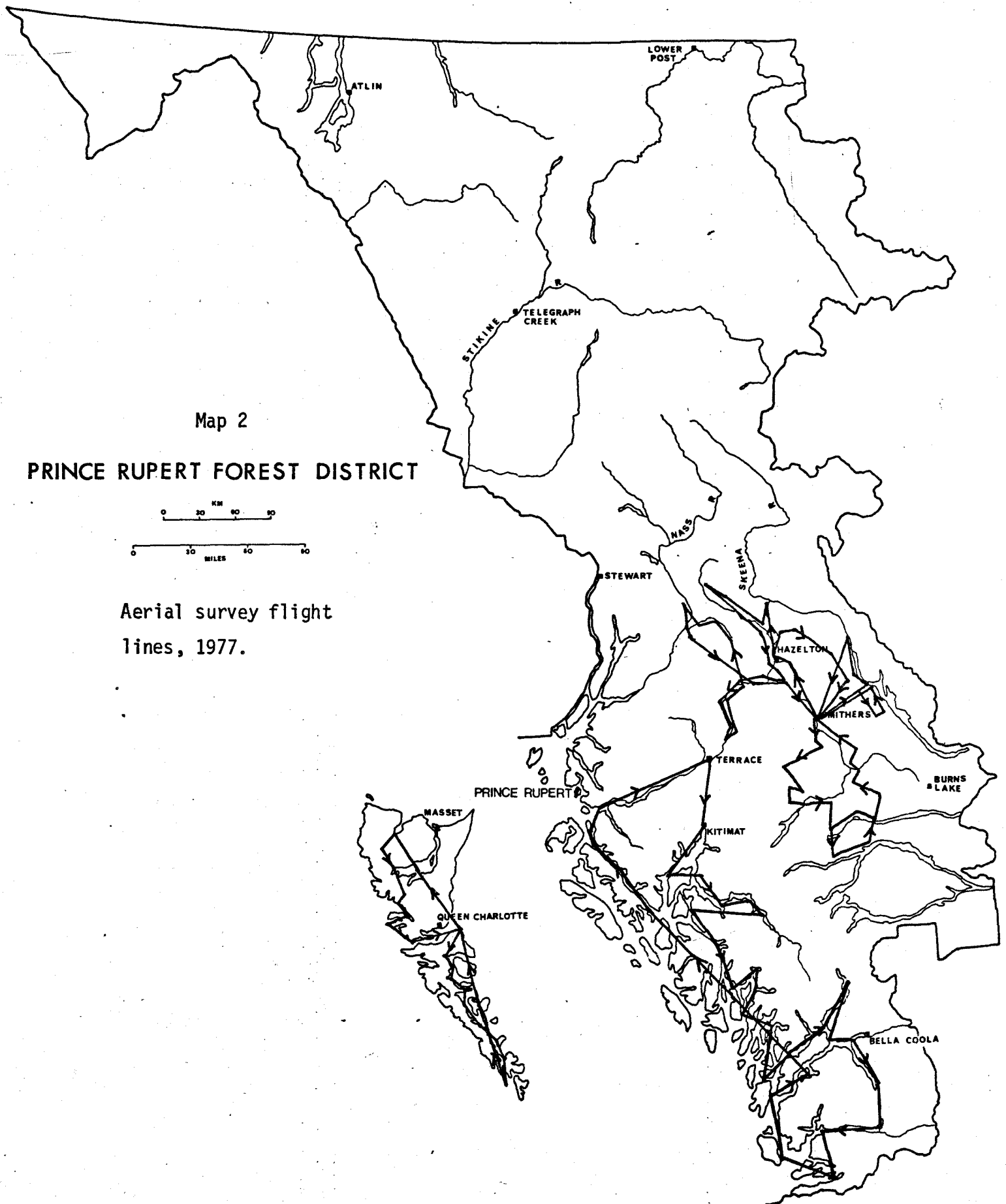


Map 2

PRINCE RUPERT FOREST DISTRICT



Aerial survey flight
lines, 1977.



Spruce beetle, *Dendroctonus rufipennis*

Spruce beetle infestations increased dramatically to 2 280 ha from 100 ha in 1976, the year the epidemic was first reported. The population build-up began in windfalls in 1973, with the initial attack on standing trees probably occurring in 1975.

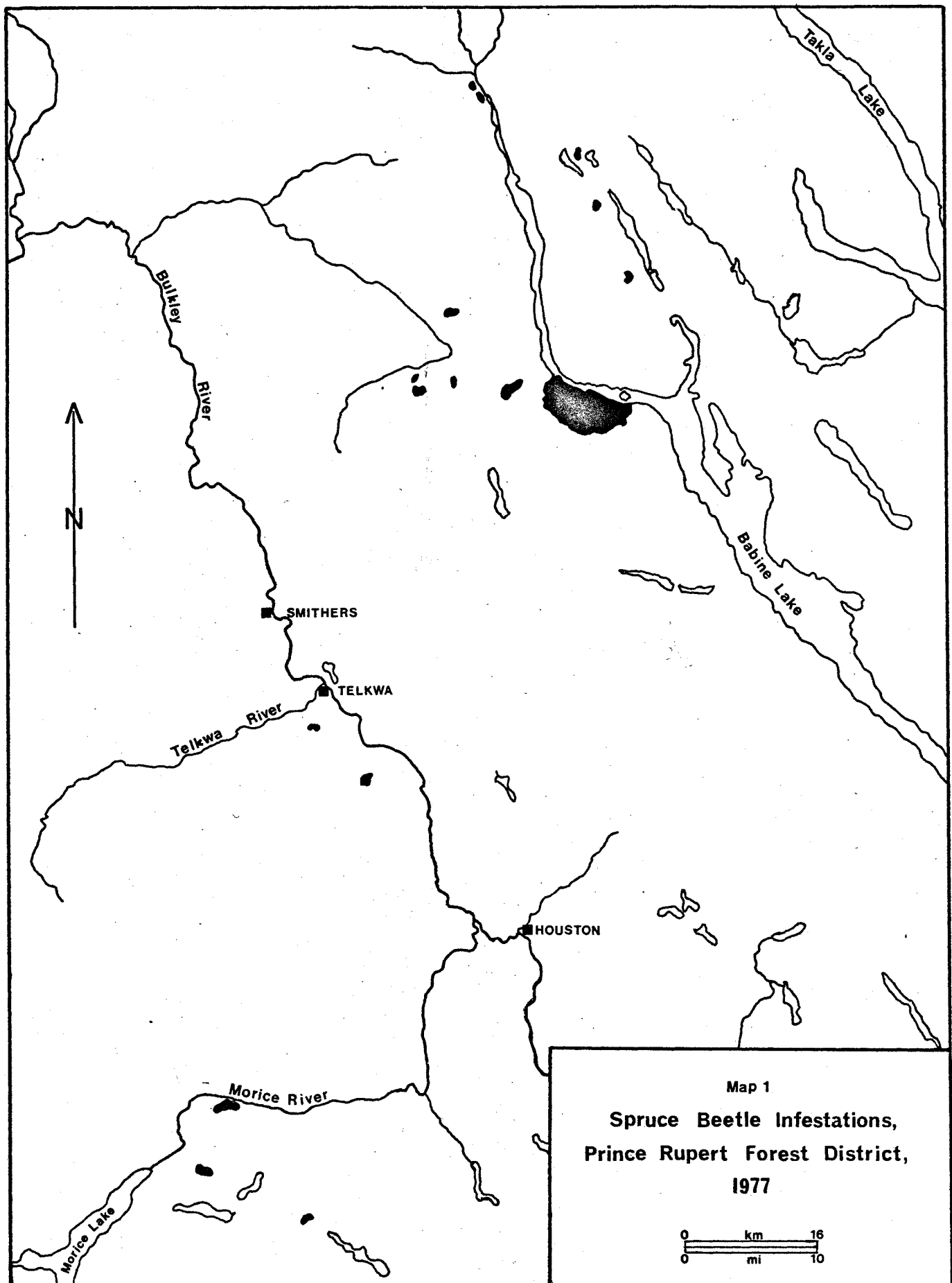
Aerial surveys near Smithers Landing in September revealed an estimated 2 000 ha of infested spruce type along with 200 ha near Pork Chop Lake. Infested spruce trees were also recorded: along the Morice River, 30 ha; Coffin Lake, 20 ha; Frypan Lake, 10 ha; and Bill Nye Lake, 5 ha. Infestations of one to five standing trees were noted at Babine River near the fish fence, Haul and Morrison lakes on the east side of Babine Lake, Holland and Torkelsen lakes, McBride Lake and near Telkwa.

The spruce beetle normally has a 2-year life cycle, i.e., overwintering first as a larva and the following winter as an adult, before attacking windfall or standing trees. Examinations of spruce beetle broods in the Smithers Landing infestation revealed that approximately 60% of the progeny are one-year cycle and will overwinter as adults and attack in late spring of 1978. Presumably the one-year cycle was induced by the long, warm summer of 1977. Thus any attempts at reducing the population with a trap tree program should begin this winter. Salvage operations should commence immediately, as cruise data near Smithers Landing disclosed that 83% of the spruce trees were killed in 1977.

Mature spruce stands are usually winter-logged and clear-cut, producing large openings which, if not designed to ameliorate the effects of wind on the remaining stand, will result in blowdown along the edges. Shaded windfall is the primary breeding site for spruce beetles^{1/}. Snow cover on windthrow prevents woodpecker predation, a very important factor in reducing bark beetle populations in standing trees. Annual removal of windthrown trees from cutting boundaries for at least 2 years following logging and road construction is recommended.

As usual with bark beetles, an extremely cold winter in conjunction with below normal snowfall could significantly reduce the spruce beetle population.

^{1/} Spruce beetle brood production in logging slash and wind-thrown trees in British Columbia, E.D.A. Dyer and D.W. Taylor, Can. Dep. Environ., Pac. For. Res. Cent., Victoria, BC-X-62, 1971.



Mountain pine beetle, *Dendroctonus ponderosae*

Mountain pine beetle continued to cause mortality of lodgepole pine in the western interior area of the Prince Rupert Forest District. An estimated 11,000 dead trees were detected during aerial surveys in 1977; however, this epidemic which has been in progress since first noted in Date Creek in 1969 showed the first sign that it might be declining, as there were an estimated 18,000 red-tops in 1976.

In 1972 the British Columbia Forest Service mounted a salvage and control program, then expanded it in 1973, using methods recommended by Dr. L. Safranyik of the Canadian Forestry Service. This program has been continuous until 1977. The program was considered successful in eliminating beetle populations in the Smithers - Houston areas. The only areas in the eastern portion of the District with continued beetle damage were at Cunningham Lake (40 red-tops), and across from Donald Landing on Babine Lake where 70 red-topped lodgepole pine were noted. Beetles continued to kill trees along the Bulkley River between Smithers and Hazelton; areas noted were: Bulkley Canyon (200 red-tops); New Hazelton (150); Four Mile Creek (140); Two Mile Creek (40); Gramophone Creek (35); Nine Mile Creek (30); Duckwing Lake (30); Porphyry Creek (25); Atrill Creek (20); Sharpe Creek (15); and Rossvale Lake (5). In the western area of the Smithers Ranger District, the Harold Price Creek infestation declined to 2,575 red-tops in 1977 from 4,200 in 1976. The numbers of red-tops in the Suskwa River Valley also declined from 1,900 to 465 in 1977. The counts for Harold Price Creek and the Suskwa River were made from oblique 5" x 5" (70 mm) Hasselblad photographs. The Hazelton Ranger District, which has mounted control and fringe clean-up logging in the Kispiox River Valley, has reduced the numbers of red-tops in 1977 to 1,200 from 1,900. Small groups of red-tops were mapped near Kitsegucla Lake, and the Nipples in the Kitsegucla River Valley had 150 red-tops in 1977 as compared with 350 in 1976.

The infestation along Harold Price Creek which was inaccessible to salvage logging in 1976 now has a road within striking distance of the area. If the beetle shows signs of spreading onto the flats at the headwaters of the creek immediate action can be taken. The present infestation isn't being salvaged because of the extreme roughness of the terrain, also because it is a sensitive fish and wildlife area.

The western districts (Hazelton and Kitwanga) still have large beetle problems from Hazelton to Dorreen along the Skeena River, with a total of 5,475 red-tops in this area: Ritchie (1,500 red-tops), an increase of 500; Woodcock (1,000), also an increase of 500; opposite Carnaby (1,000), down 1,000; Price Creek (570), an increase of 170; Seeley Lake (330), a decrease of 670; Andimaul-Andi Creek (250); Juniper Creek (150); Kitwanga (140), reduced by 60; Flint Creek (105); Insect Creek (100); Cedarvale (100); Mill Creek (55), a decrease of 70; North Juniper Creek (50); Dorreen (25); Nash Y (15), down 155; Kitsegucla (10); Wilson Creek (5); and Sedan Creek (5). Another area of concern is Kitwanga and Cranberry rivers areas with 975 red-topped lodgepole pine: at Aluk-Douse creeks (360), reduced by logging from the original 3,000 recorded in 1975; Kitwanga Lake (180), down 70; Radio Tower Hill (110), down from 5,000 in 1975; Kitwancool Creek (100); West Burdick

Creek (55); Derrick Creek (15); Moonlit Creek (35); Tsugwinselda Creek (30); West Douse Creek (30); Kitwancool (15); 5 miles north of Kitwanga Lake (10); and Calmin Creek (10). The areas along the Skeena River and the Kitwanga-Cranberry rivers are presently being salvage logged where feasible; unfortunately some areas such as Woodcock are inaccessible and will be left. The northern expansion of the beetle (Derrick Creek) is being monitored very closely in order to detect any further extension of the beetle in the Cranberry-Nass rivers.

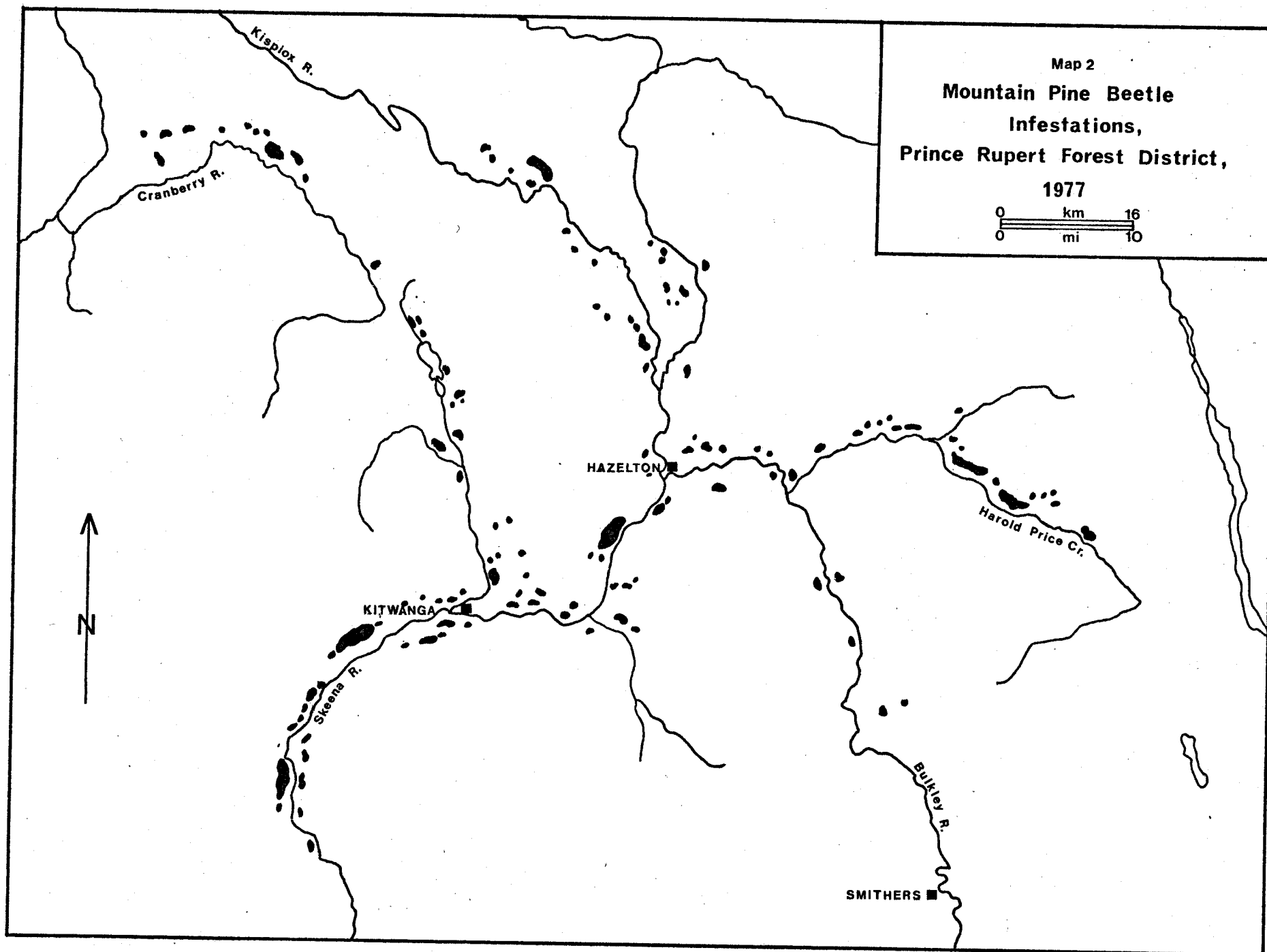
The third area of concern is in Tweedsmuir Park near the junction of the Dean and Takia rivers, where 1,150 red-tops were mapped on 450 ha. This area is in the park as well as being inaccessible to normal salvage and control methods, therefore the progress of the infestation will merely be monitored for historical purposes.

Brood checks along the Kispiox River, Harold Price Creek, Cranberry River, Kitwanga and Seeley Lake indicated that the beetle populations are sufficient to still cause problems.

Map 2
Mountain Pine Beetle
Infestations,
Prince Rupert Forest District,

1977

0 km 16
0 mi 10



Western balsam bark beetle, *Dryocoetes-Ceratocystis* complex

In 1977, *Dryocoetes confusus*, in association with the lesion-causing fungus *Ceratocystis-Dryocoetidis*, continued to cause mortality of alpine fir in the Prince Rupert Forest District. An estimated 2,700 red-topped alpine fir were mapped in scattered patches near Smithers in addition to 5 900 ha in the McKendrick Pass area, which is a chronic problem area because of continuous alpine fir mortality. During the 1976 aerial surveys, 5,200 dead alpine fir were mapped; the decrease in numbers in 1977 was probably due to poor aerial survey conditions, i.e. rain and smoke from slash burns which made mapping of red-topped alpine fir very difficult, and not to any actual decrease in beetle activity. Areas and numbers of red-tops mapped during aerial surveys in 1977 were: McDonnell Lake (50); Serb Creek (250); Winfield Creek (500); Jonas Creek (200); Cumming Creek (500); Pine Creek (200); Howson Creek (500); and Dome Mountain (500).

Studies have shown that approximately 35% of alpine fir mortality is due to direct attack by the beetle, the remainder being attributed to the beetle-induced, lesion-causing fungus *Ceratocystis dryocoetidis*. Initial beetle attacks may be pitched out, but subsequent attacks on trees weakened by lesions are often successful; coalescing lesions may kill trees without further beetle activity.

Alpine fir trees killed by the complex may retain their needles for up to 5 years, therefore determination of year of actual attack must be made on the ground. Aerial surveys are the best method for surveying the large tracts of infested alpine fir, especially since the infested stands are usually inaccessible.

Control is not presently feasible except through stand management.

Spruce budworm, *Choristoneura ? biennis*

Larval populations of this budworm, on white spruce and alpine fir, continued at low population levels. Sixty-five positive collections (beating samples containing insects) garnered only two larvae. No significant defoliation by this species has occurred since the termination of the previous outbreak in 1964 along Babine Lake.

Traps to assess adult male budworm populations were baited with a sex attractant (97 parts trans-11-tetradecenal) and set out at eight locations (5 traps per location) in the interior of the District.

Table 1. Average number of *Choristoneura* sp. male adults collected by pheromone traps, Prince Rupert District.

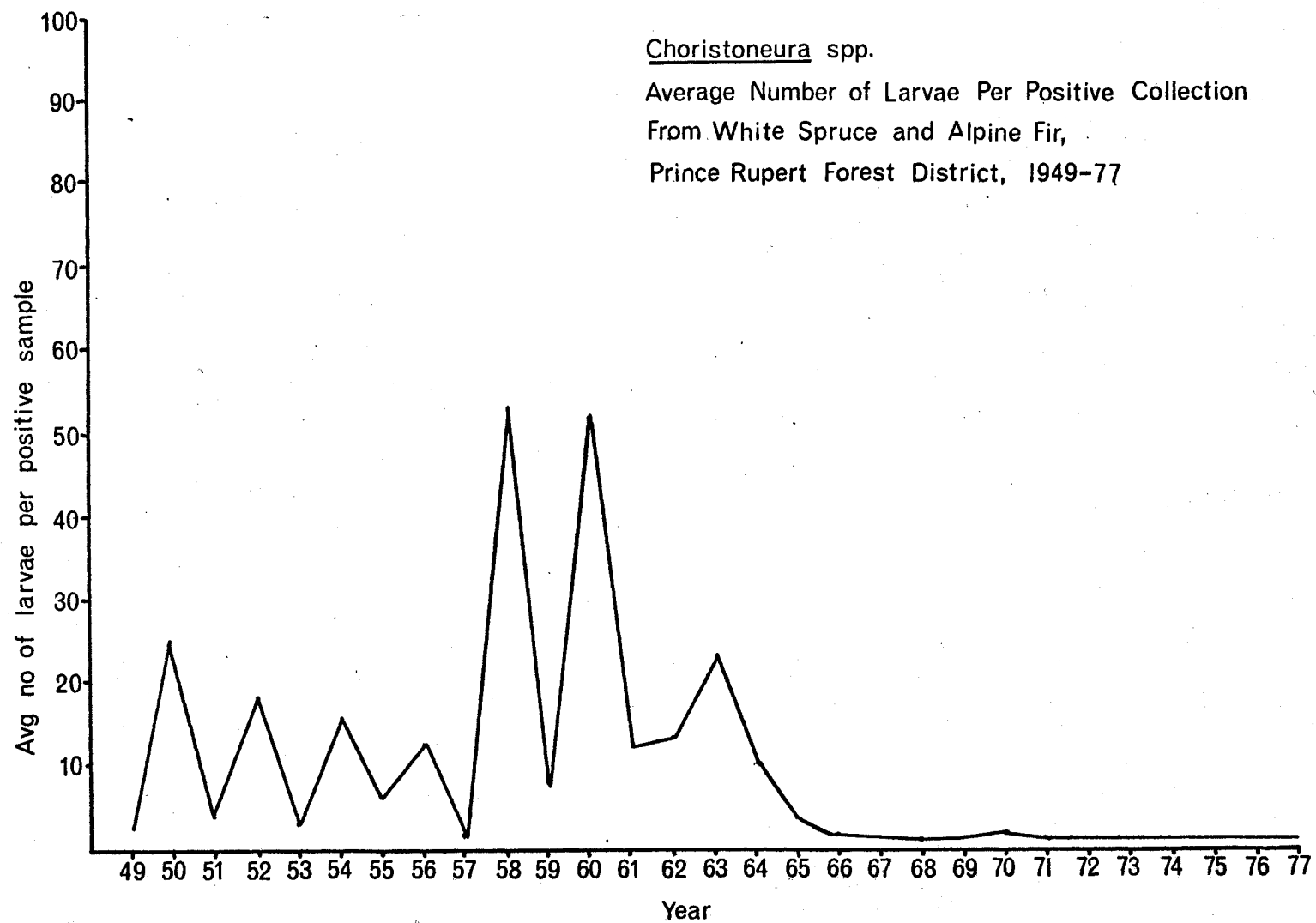
Location	1972	1973	1974	1975	1976	1977
Oweegee Cr	-	-	-	102	150	70
Glacier Cr	-	-	-	65	201	56
Bell Irving R	-	-	-	118	202	59
Skumsnat Cr	69	3	-	75	17	37
Smithers Landing	8	5	-	74	34	23
Telkwa R	-	-	-	1	3	1
Morice R	2	4	31	19	6	0
W. Morice R	2	2	18	5	-	4

Even though 1977 is a supposed non-flight year for *C. biennis*, substantial numbers of adults were captured in the traps north of Meziadin Lake, leading to the theory that there may be some *C. fumiferana* populations farther south than previously realized. There is no evidence in larval beating collections that there is an "off cycle" phase of *C. biennis* present in the District.

Light *C. biennis* populations are expected in 1978 in most areas; no damage is expected.

Table 2. Summary of *Choristoneura* sp. collections from white spruce and alpine fir by year, from 1949-77, Prince Rupert District.

Year	No. of samples during larval period	% samples containing larvae	Avg no. larvae per positive sample
1949	67	6	2
50	61	41	25
51	104	13	4
52	180	43	19
53	210	16	3
54	102	33	17
55	223	11	7
56	148	21	13
57	119	6	2
58	105	10	53
59	132	23	8
60	71	46	50
61	90	22	10
62	102	52	11
63	99	7	25
64	197	19	10
65	261	3	3
66	223	6	1
67	226	3	1
68	177	3	1
69	148	6	1
70	119	4	2
71	158	8	2
72	180	13	2
73	109	8	1
74	139	14	2
75	110	8	2
76	78	14	1
77	88	2	1



Blackheaded budworm, *Acleris gloverana*

Blackheaded budworms remain at low population levels in the District, with only 7% of beating samples containing larvae (Table 3). Highest populations were found at Mile 18, Nilkitkwa road (50 larvae/beating) and Oweege Creek, Highway 37 (23 larvae/beating).

Plots with 50 trees each, established to study the effects of defoliation over a period of years, were re-examined in mid-summer on the Queen Charlotte Islands at Kwaikans Island in Masset Inlet and at Deena Creek. Cumulative tree mortality as a result of severe budworm defoliation in 1973 and 1974, was 62% on immature western hemlock at Kwaikans Island and 27% in a mature stand at Deena Creek; an increase over 1976 of 35% and 13%, respectively. Additional tree mortality can be expected in both areas for several more years.

Assessment of adult male budworm populations was attempted using traps baited with a sex attractant (trans-11-tetradecenal). Traps set out at Oweege Creek averaged 1.0 moths, indicating a light population in the area.

Table 3. Summary of blackheaded budworm collections from western hemlock, white spruce and alpine fir, by drainage division, Prince Rupert Forest District

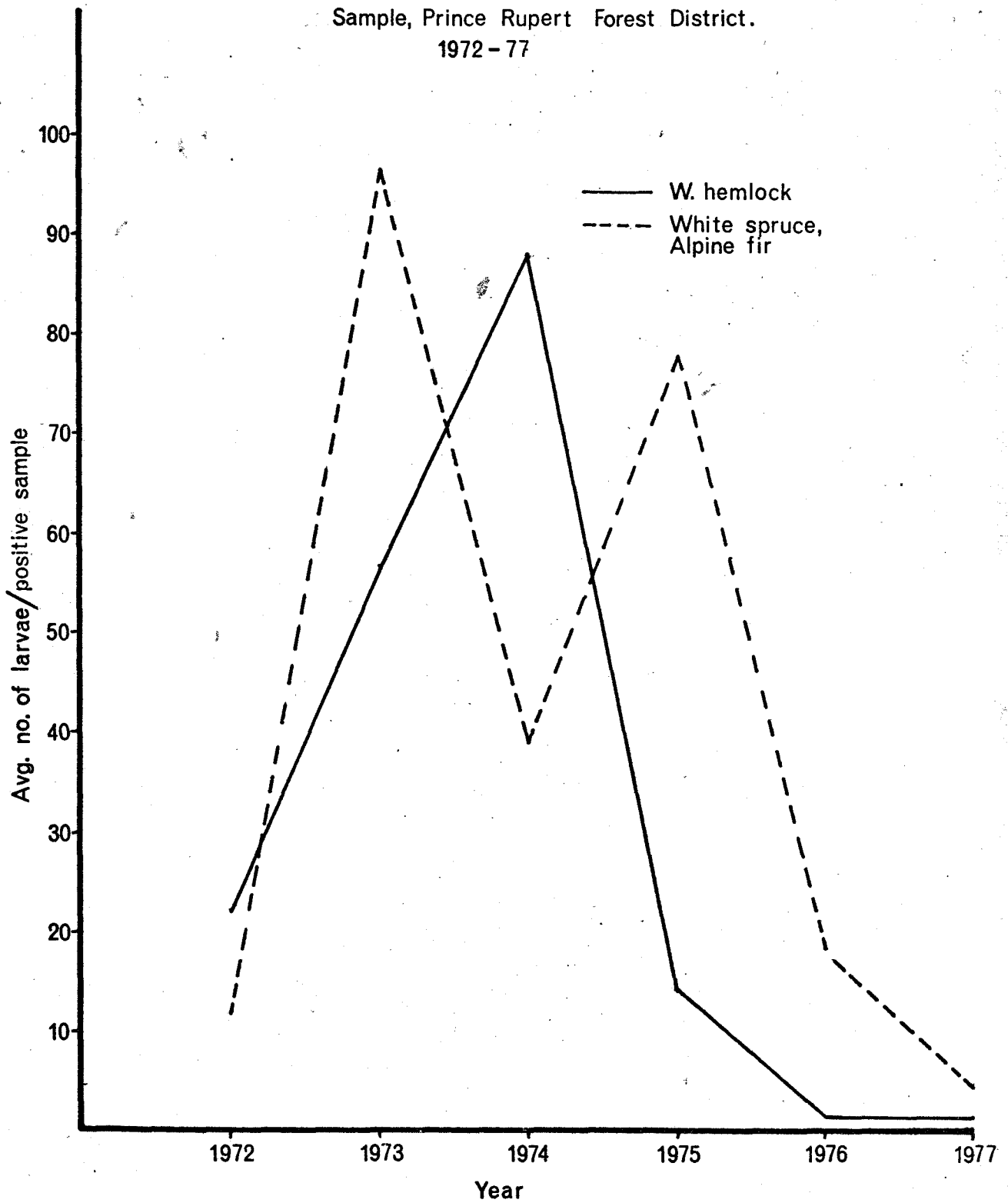
Host	Drainage ^{1/} Division	No. of samples during larval period					% samples containing larvae					Avg no. larvae per positive sample				
		73	74	75	76	77	73	74	75	76	77	73	74	75	76	77
Western hemlock	261	26	17	17	13	26	65	76	4	0	8	8	100	8	0	1
	262	20	13	7	7	6	50	69	14	0	0	100	39	2	0	0
	263	22	17	10	15	10	27	76	60	0	0	4	43	120	0	0
	264	44	28	35	22	18	52	82	53	5	0	6	75	2	1	0
	265	18	14	14	12	14	67	57	57	0	0	5	70	1	0	0
	275	0	18	2	11	9	0	72	2	9	0	0	15	0	1	0
White spruce	266	26	32	32	18	23	69	75	81	11	13	65	40	54	1	1
	267	16	22	17	8	17	75	64	76	25	0	145	33	66	1	0
Alpine fir	266	25	30	24	17	19	72	70	87	12	26	72	42	69	2	10
	267	15	15	15	8	12	80	53	67	0	17	106	33	95	0	1
	275	1	11	5	8	6	0	9	40	50	50	0	1	400	50	9

^{1/} See Map 1.

Western Blackheaded Budworm

Average Number of Larvae per Positive
Sample, Prince Rupert Forest District.

1972 - 77



Pine sawflies, *Neodiprion* sp.

The infestation of sawflies on shore pine on the outer islands south of Prince Rupert appears to have collapsed south of Porcher Island. No new defoliation was noted, but heavy tree mortality was evident along Grenville Channel on Pitt Island between Kxngal Inlet and Rippon Point, a distance of approximately 30 km. Tree mortality is the result of 2 years of heavy defoliation by sawflies. These shore pines are typically stunted and have no commercial value.

In mid-June high sawfly populations were found lightly defoliating shore pine at Hunts Inlet on Porcher Island, however a subsequent examination was not possible, so the resultant damage is unknown. A few sawfly colonies were also found on Prescott Island, but no defoliation occurred. No evidence of sawflies was found on Digby Island, a primary source of Christmas trees for Prince Rupert.

Further reductions of sawfly populations on shore pine are expected in 1978 as disease and parasitism become more prevalent.

At Flint Creek, south of Cedarvale, sawflies caused light defoliation of immature western hemlock at the 600 foot elevation level. A beating sample there contained more than 500 larvae.

South Coast:	Allard Bay	- wH - 44
	Kwatna Bay	88
	Labouchere Channel	48
	Carlson Inlet	255

Woolly aphids, *Pineus* prob *similis*

Plantations throughout the interior of the Prince Rupert District were infested by this aphid, which causes galls to form on both the leaders and laterals of white and Sitka spruce. Two areas examined by the Canadian Forestry Service were: Sweetin River, which had an average of 26% of the foliage infested on 36% of the trees; and at Perow where there was 30% average infestation on 21% of the trees. Heavy damage was reported at Perow and Chapman Lake in 1976, so the B.C. Forest Service initiated a complete survey of all plantations where a preliminary survey had indicated significant damage to the planted trees. B.C. Forest Service data indicated that *Pineus* was the most common type of damage encountered on the 16 plantations they examined (Table 4). *Pineus* infests both planted and natural stock, although usually planted trees are the preferred host (Table).

Table 4. Plantations examined by the B. C. Forest Service for woolly aphids, Pineus prob similis, Prince Rupert Forest District, 1977.

Location	% white spruce infested	
	Planted	Natural
Ganokwa Cr	26	2
Parrott Cr	1	1
Perow Burn	36	3
Decker Cr	2	0
Stoney Cr *	0	48
Date Cr	51	6
Elizabeth L	33	10
Binta L	25	0
Seventeen Mile Cr	36	5
Twelve Mile Mtn	55	2
Chapman L	22	5
Nash	0	8
Francois L	14	3
Tagetochlain L	1	0
Whitesail L	1	0
Sam-Goosly	45	1

* Note: at the Stoney Creek plantation the natural reproduction was infested, while the planted stock was undamaged, an unusual occurrence.

Black army cutworm, *Actebia fennica*

Light populations of late instar black army cutworms were found in the soil on June 14, 3 km east of Fulton Lake. This area had been "prescribe-burned" in the fall of 1975 and it was expected that the cutworm would migrate to this area from the main Fulton Lake infestation in the summer of 1976. Light and pheromone traps in the 1975 prescribe-burned area in 1976 caught a low number of adults and it was expected that only a few larvae would be found in 1977. This turned out to be the case. The B. C. Forest Service reported a population of cutworms in the Buck Creek area in the Houston Ranger District; this report wasn't confirmed.

No light or pheromone traps were used in 1977.

Spruce budmoth, *Zeiraphera* sp.

First reported in 1975, this insect continues to cause deformed tops and laterals on 54 ha of pre-commercially thinned Sitka spruce along Deena Creek on Moresby Island. Alterations in form and height growth resulting from bud destruction were evident on approximately 30% of the trees examined.

Previous history indicates that epidemic populations causing damage last about 5 years. That being the case, continued infestation of young Sitka spruce can be expected in 1978.

Elsewhere in the District, populations were low.

Saddleback looper, *Ectropis crepuscularia*

Saddleback loopers were obtained in ten samples of western hemlock and Sitka spruce this year, as compared to only one in 1976; the average was one larva per beating. Only one larva was obtained in the former infestation area at Kitimat.

Green velvet looper, *Epirrita autumnata*

A light infestation in 1976 in a mixed hemlock and amabilis fir stand along the west side of the Kitimat Valley collapsed. At Raley Creek, where 147 larvae were collected in a sample in 1976, only one larva was collected this year. Although there are generally fewer larvae this year, it remains one of the most common insects collected, showing up in 21% of all positive

collections in 1977 as compared to 23% in 1976.

A trace of defoliation was noted on alpine fir at Nadina River.

Spruce weevil, *Pissodes strobi*

There are 10 permanent spruce weevil plots of 100 marked white spruce in the eastern area of the Prince Rupert Forest District and they are examined periodically in order to detect any increase in the incidence of the weevils in both natural stands and plantations. Of the 9 plots examined, only Glacier Creek had any evidence of new attacks (8% of the trees in the plot were attacked); the other areas: Erickson Seed Production area (Buck Creek Flats), Morice F.D.R., Endako River, Taltapin Lake, Chapman Lake, Telkwa River, McKendrick Creek, Sheedy Creek and Perow (unable to locate in 1977) were unattacked in 1977. In addition to the plot examinations, a casual roadside survey was made along Highway #16 between Smithers and Hazelton from a moving vehicle; 78 new attacks were noted along the 64 km of highway.

Continued emphasis on the planting of white spruce in the District could cause spruce weevil to become a major problem when the plantations are older.

Aspen leaf miner, *Phyllocnistis populiella*

Trembling aspen between Hazelton and Kispiox Village were moderately infested; no permanent damage is expected.

A pine terminal weevil, *Pissodes terminalis*

Leaders of lodgepole pine between miles 30 and 31 on the west Morice River Forest Development Road were examined again, and nine new attacks were noted as compared with 11 in 1976. Weevil attacks were also noted at km 963 Alaska Highway (Fireside). No quantitative survey was conducted. The present levels of damage in the District present no problem.

A conifer seedling weevil, *Steremnius carinatus*

No evidence of this weevil was found in the District. The B. C. Forest Service nursery at Telkwa thought they might have a problem; the nursery was checked - no problem.

Spruce aphid, *Elatobium abietinum*

The spruce aphid caused severe discoloration and needle drop of shoreline Sitka spruce on the Queen Charlotte Islands and on the adjacent mainland in the Prince Rupert area. Some light defoliation also occurred farther inland.

Discoloration was particularly evident on Moresby Island between Sandspit and Alliford Bay, and at Cumshewa Head; on Louise Island between Skedans and Girard Point; and on Graham Island in scattered locations from Queen Charlotte City along the coastline to Tlell, near Masset, along Rennell Sound, and south of Van Inlet.

In Prince Rupert and neighbouring Port Edward areas, aphid damage was prevalent on both native and ornamental spruces. Trees on Lucy Island, west of Prince Rupert, were also severely attacked. No tree mortality was evident, but another mild winter (which favors the aphid) could result in heavy attack in 1978 and cause some tree-kill.

Western gall rust, *Endocronartium harknessii*

The rust of lodgepole pine, with its conspicuous galls, continues to infect 12% of trees at mile 8 of the Morice River Development road, 26% at mile 18, and 38% at Bulkley Canyon. Stem galls, which are the most damaging to the tree as they produce a weakening of the stem, occurred on 6% of the trees at mile 8, 18% at mile 18, and 24% of the trees at Bulkley Canyon.

The above areas were along roadsides, usually in low value trees varying from 5 to 25 years, however, this disease is a potential problem in pine plantations, i.e., an example of *E. harknessii* damage was collected by the B. C. Forest Service from a plantation along Tagetochlain Lake, indicating that high value planted trees are susceptible.

Stalactiform rust, *Cronartium coleosporioides*

This rust of lodgepole pine is often prevalent in reproduction stands, along roadsides and in re-stocking burns. Three areas where it occurred in the Prince Rupert District: Francois Lake - Morice Lake roads' junction where 11% of the pine examined were infected; Bulkley Canyon 10%, and Telkwa Pass 10%. Branch and tree mortality result from girdling although on larger stems, growth loss and deformity are the principal results of infection.

The disease alternates between pines and Indian paintbrush, the secondary host. However, once the pine is infected the disease is perennial until the infected portion dies.

No major problems are expected in the District.

Bud necrosis, *Camarosporium strobilinum*

This disease, normally a bud fungus, caused leader dieback on 34% of the white spruce in a 4- to 6-year-old plantation near Division Lake. This same area had 80% infection in 1976. Other plantations infected were at: Ganokwa Creek, where three areas examined had 64, 44 and 8% infection; Parrott Creek, 39%; Decker Creek, 20%; Whitesail Lake, 20%; and Sam-Goosly Lake, 28%. This disease pattern is different than expected and the long-term effect on these spruce plantations is not known. However, leader dieback is prevalent enough for concern and continued monitoring is necessary.

Leaf and twig blight of poplars, *Venturia macularis*, *V. populina*

Leaf and twig blight were prominent throughout the District on both trembling aspen and black cottonwood. Severe browning of trembling aspen stands surrounding Hazelton and near Kitwanga was caused by *V. macularis*. On black cottonwood, *V. populina* was also severe in this area and along the Nass River between Kiteen River and Cranberry Junction. Elsewhere, moderate browning of trembling aspen was observed from Smithers to Quick, along the Perow Burn access road, from Eastman Creek to Kinaskan Lake, and near Iskut along Highway #37.

Some refoiliation occurred during the summer, but crowns of severely infected trees remained thin during the growing season.

Snow blight, *Lophophacidium hyperboreum*

Dieback affected about one-third of the lower branches on 80% of 7- to 13-year-old white spruce on two parts of the Perow Burn, and on 85% of 9-year-old spruce at Chapman Lake.

In 1977, the B. C. Forest Service examined any plantations in which problems were detected. In 16 plantations, 21% of the planted trees and 1% of the naturals were infected on the Perow Burn. Comparable values were: Chapman Lake 43% and 14%; infection in the other 14 plantations in the Interior varied from 0-4% (Table 3).

A spruce needle cast, *Lirula macrospora*

Up to 100% of the 1- and 2-year-old foliage on immature and mature Sitka spruce was discolored in several inland areas of the Queen Charlotte Islands, particularly in TFL 39 along Deena Creek and near Alliford Bay. Lighter infections were common elsewhere on Graham and Moresby islands. Nearer the coastline aphid damage was also present.

Light infections were noted east of Atlin Lake for 10 km along O'Donnell Creek, where 30% of the foliage on 25% of the white spruce was affected.

Lirula macrospora causes the needles to be prematurely cast.

Large-spored spruce-Labrador-tea rust, *Chrysomyxa ledicola*

This rust was common on bog-site Sitka spruce between Tlell and Port Clements, where the alternate host, Labrador-tea, was abundant. In one area examined at Woodpile Creek, 100% of the spruce had 25% of the needles infected. Some minor infections were found near Masset.

Sweet-fern blister rust, *Cronartium comptoniae*

A shore pine provenance trial at Chist Creek flats, examined for the presence of *Cronartium comptoniae*, revealed that 3% (75 trees) of 2,580 trees were infected. Though *C. comptoniae* has been found in the Kitimat Valley before, the rust canker was probably introduced from Cowichan Lake where the stock originated, since the alternate host, *Myrica gale*, was not found in the vicinity of the plantation. All infected individuals were flagged for easy removal.

Porcupine damage

Porcupine damage to lodgepole pine and western hemlock appears to be increasing in various locations of the District. Continued killing of immature lodgepole pine was noted in scattered pockets of 10 to 100 trees each along both sides of the Skeena River from Terrace to Flint Creek. In other areas, small patches of pine mortality and top-killing were observed at Clio Bay south of Kitimat, north of Terrace along Lean-to Creek and Crater Creek, and at Guess and Mooseskin Johnny lakes.

Climatic injury, Red Belt

Red belt occurred on approximately 1 600 ha near Johnny Lake located in the lower southeast corner of the Prince Rupert District. Red belt occurs during the late winter months or in early spring, most frequently on south- and west-facing slopes. All native conifers may be affected, but lodgepole pine is the most susceptible. Damaged trees usually recover.

Frost damage

Late frosts in May killed up to 80% of new shoots of young Sitka spruce and western hemlock in low lying areas of the Kalum and Kitimat River valleys. Most severe damage occurred to Sitka spruce near Alice Creek in the Kalum Block and to 70 ha of planted spruce and hemlock regeneration in the Chist Creek flats area, south of Terrace. No permanent damage is likely to occur unless young terminal shoots were killed; this may result in crooked leaders.

Chlorine injury

Nearly all shore pine in a 30-ha swath across Ridley Island turned a brick red color following a chlorine gas escape from the Canadian Cellulose pulp mill at Port Edward on April 26, 1977. Approximately 50% of the trees examined had dead buds; the remainder had flushed. Shore pine on the island are stunted and have little commercial value. Western red cedar appeared unaffected.

Armillaria root rot, *Armillaria mellea*

The B. C. Forest Service is initiating spacing of 15-year-old Douglas-fir at Noosgulch and near Firvale in the Bella Coola Valley. Examination of these areas revealed the presence of the root rot *A. mellea*, in scattered patches.

A. mellea symptoms are typical, chlorotic foliage, heavy pitch flow at the base of the tree, and a distress crop of cones. Attack by *A. mellea* can be verified by the presence of a fan-like growth of mycelium under the bark at the base of the tree, or by dark brown shoestring-like structures (rhizomorphs) on or under the bark. If the trees are examined in early fall, fruiting bodies (mushrooms) may be found at the base of the tree. The root rot spreads from tree to tree by means of root contact or rhizomorphs.

If spacing of Douglas-fir is being considered, an intensive survey should be conducted to determine the presence, extent and intensity of root rot.

A pine needle rust, *Coleosporium asterum*, infected 80% of the roadside lodgepole pine at km 13 on the Morice River Forest Development road, and 50% of the trees at km 27 of the Telkwa River road.

A twig blight, *Delphinella (Rehmiellopsis) abietis*, infected one alpine fir tree at km 35 Kisgegas road.

Leaf rust, *Melampsora epitea* complex, caused light infections on willows at Topley Landing and Taltapin Lake.

Fir-fire-weed rust, *Pucciniastrum epilobii*, lightly infected alpine fir at Topley Landing, Chapman Lake, Moricetown, and the Nash area.

Vaccinium rust, *Pucciniastrum goeppertianum*, lightly infected alpine fir at the Morice River - Francois Lake roads' junction, and at Byman Creek.

Plantation and Damage Assessments

Personnel of the B. C. Forest Service conducted a survey of the 16 plantations in which a preliminary examination had indicated a significant problem existed. Over 8,000 white spruce were examined on the 16 areas, and 58% of the trees had some type of damage (Table 3 of Appendix).

No startling information was realized from the survey as far as pest problems were concerned, however these data will certainly be valuable in providing a base for further pest monitoring of plantations. Additional monitoring of permanent sampling areas will have to be done in order to determine the long range effects of woolly aphid, snow blight and the dieback. This dieback, *Camarosporium strobilinum*, has the potential of being the most destructive pest as it kills the leaders and could result in cactus tops. With the exception of some particularly susceptible trees, it appears that most of the white spruce grow past where woolly aphids, *Pineus* sp., have much effect. As has been noted many times, the main problems in plantations continue to be poor planting and incorrect site; this survey will probably result in better quality control.