Forest Insect and Disease Conditions Prince Rupert Forest Region - 1994

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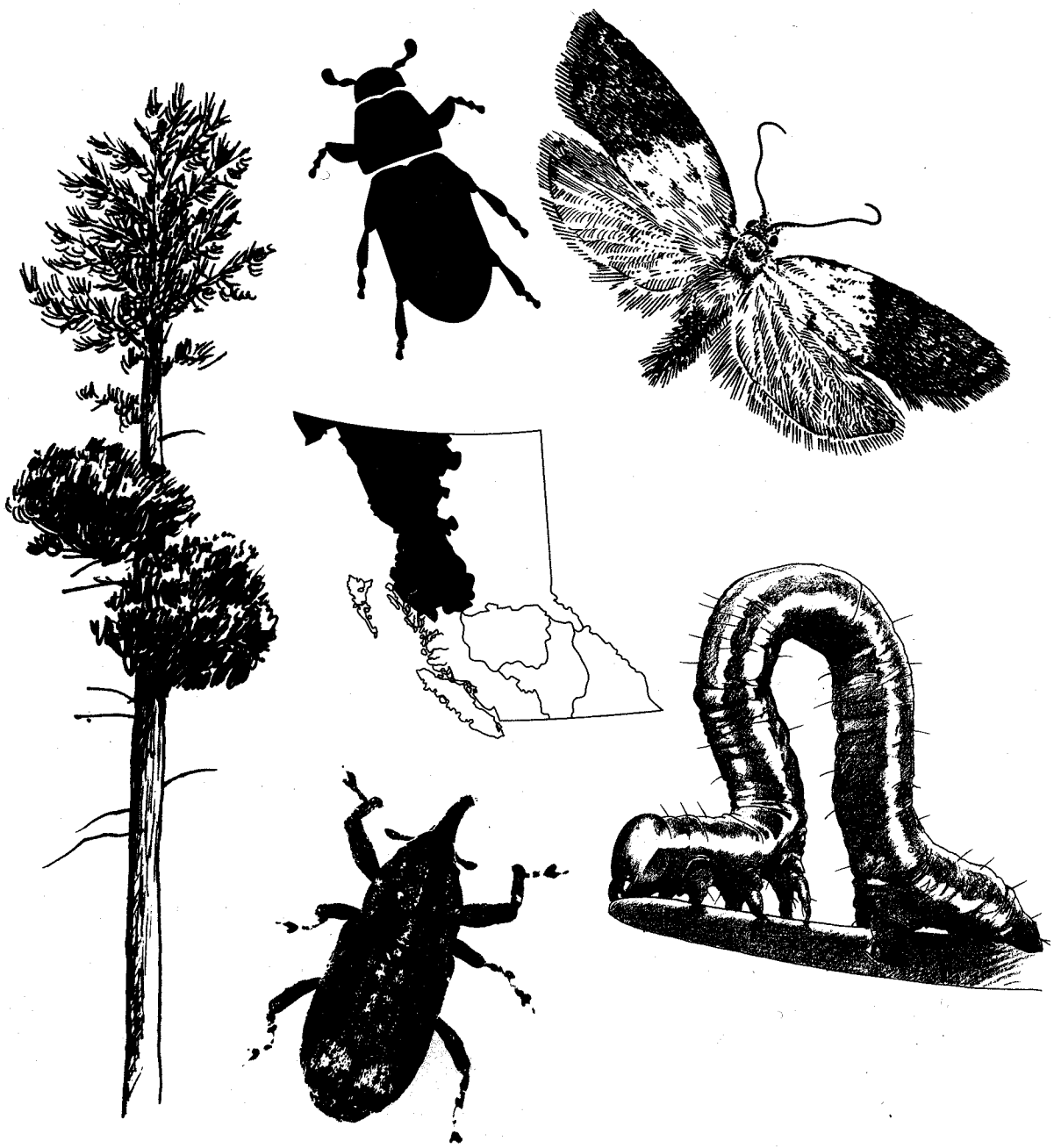
Canadian Forest Service - Pacific and Yukon Region



Natural Resources Canada
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Foreword

The Forest Insect and Disease Survey (FIDS) is a national unit within the Canadian Forest Service (CFS) with the responsibility of: (1) producing an overview of forest pest conditions and their implications, including predictions when possible; (2) maintaining records and surveys to support quarantines; (3) supporting forestry research with records, herbaria and insect collections; (4) providing advice, technology transfer and extension services with respect to current and historical forest insect and disease conditions; (5) developing and testing survey techniques; and (6) conducting related biological and impact studies.

Introduction

This report summarizes forest insect, disease and other pest conditions in the Prince Rupert Forest Region in 1994 and forecasts some of the pest population trends. The results of forest pest surveys in the Prince Rupert Forest Region have been reported by CFS-FIDS since 1939.

Pests are discussed by host, in order of current importance and often in the context of a management unit within a Timber Supply Area (TSA). The Queen Charlotte Islands and the Yukon Territory were also surveyed by FIDS Rangers in the Prince Rupert Forest Region. Pest information for the Queen Charlottes is reported in the Vancouver Forest Region report, and for the Yukon, in a separate FIDS report entitled, Forest Insect and Disease Conditions, Yukon Territory, 1994.

The 1994 field season extended from mid-May to early October. A total of 200 insect and disease collections were submitted from throughout the region by the authors to the Pacific Forestry Centre (PFC) for identification and verification (Figure 1). Twelve collections were received from British Columbia Forest Service (BCFS) staff throughout the region, the Queen Charlotte Islands, and the Yukon.

The BCFS provided 22 hours of fixed wing and 13 hours of helicopter flying time to conduct aerial surveys and on-site pest examinations. Pest survey data were summarized and presented at the annual Forest Health Committee meeting in December 1994, and contributed to a national FIDS report.

The co-operation of provincial, industrial, municipal and academic agencies is essential for the effective fulfillment of the FIDS mandates and their contributions of information, logistical and material support are greatly appreciated.

Definitions

Throughout this report, incidences of aerially observed bark beetle mortality are defined as follows: **light** - 1-10% of a stand; **moderate** - 11-29%; **severe** - 30%+.

Biogeoclimatic units are often referred to in the report in their abbreviated form to conserve space; in alphabetical order they are:

BWBSe - boreal white and black spruce, cordilleran
CWHvh - coastal western hemlock, very wet hypermaritime
CWHws1 - coastal western hemlock, wet submaritime, submontane
CWHwh1 - coastal western hemlock, wet hypermaritime, submontane
CWHvm - coastal western hemlock, wet maritime
ICHmc2 - interior cedar-hemlock, moist cold, upper Nass Basin
ICHmc3 - interior cedar-hemlock, moist cold, lower Nass Basin
ICHvc - interior cedar-hemlock, very wet cold
SBSmc - sub-boreal spruce, moist cold
SBSdk - sub-boreal spruce, dry cool

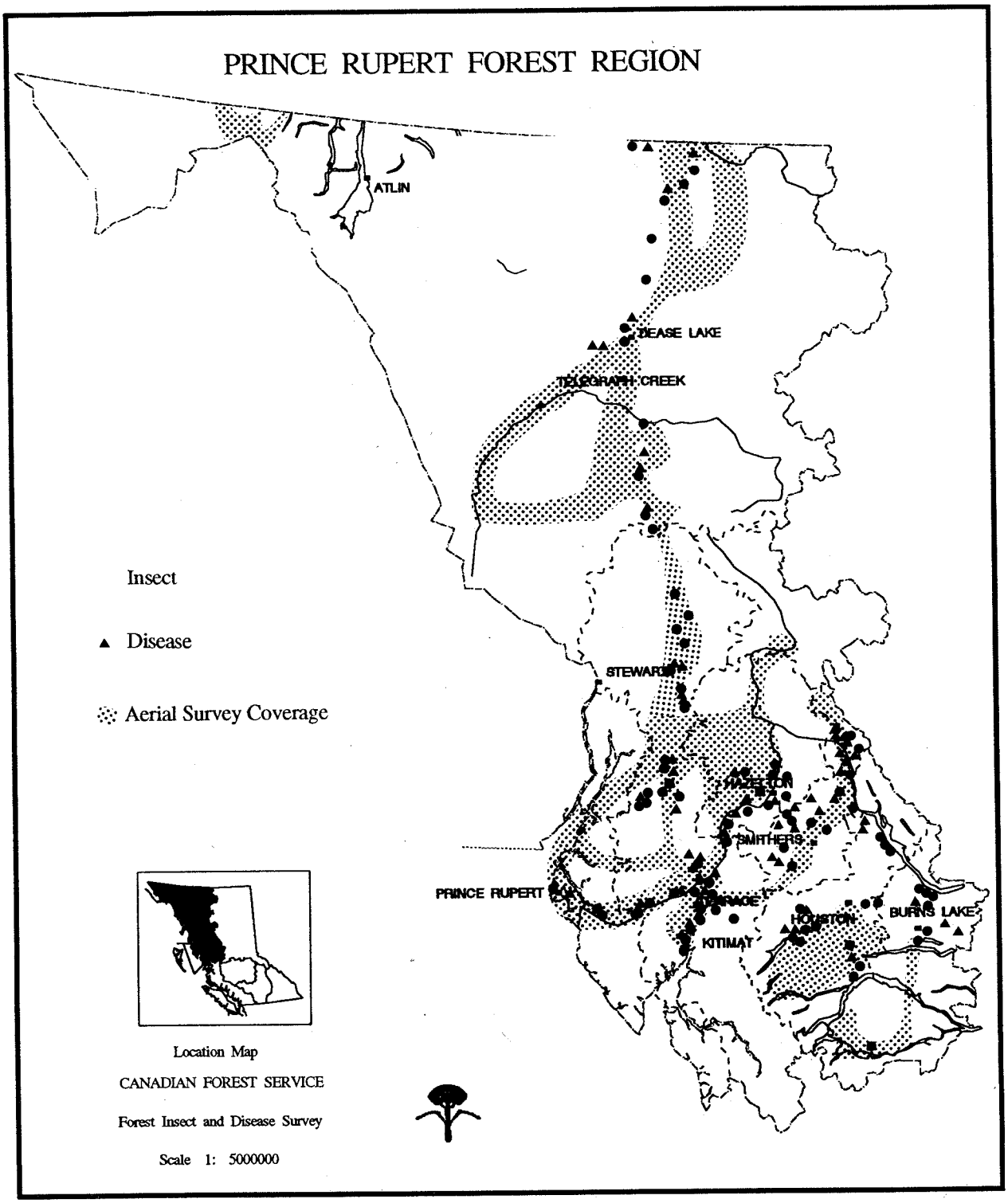

Figure 1. Locations where one or more insect or disease samples were collected, and areas covered by aerial surveys in 1994.

Summary

Mountain pine beetle killed an estimated 142 810 m^3 of lodgepole pine over 5290 ha in 1994, double the volume loss recorded in 1993. High current attack levels indicate further increases in interior stands in 1995. **Lodgepole terminal weevil** populations remained at low levels in the region. Discoloration of up to 80% of year-old needles of pine caused by **pine needle cast** infection continued in the far north, and increased in southeastern areas of the region.

Aerial surveys provided opportunities to map a total of 1690 ha of **spruce beetle** mortality in the far northwestern corner of the province and in the Morice River corridor. Ground surveys identified high current attack levels in both areas. Current attack by **spruce weevil** was at 44% in young Sitka spruce at Lone Wolfe Creek in the Kalum TSA, and ranged from 2 to 44% on 15 surveyed sites throughout the TSA. Elsewhere in the region attacks remained generally low. **Spruce aphid** defoliated 254 ha of Sitka spruce in coastal areas around Prince Rupert. **Eastern spruce budworm** populations declined slightly in the northeastern corner of the region, causing trace-to-light defoliation of white spruce along the Liard River and side drainages as far north as Irons Creek on the Yukon border. **Spruce adelgids** were noted at a number of sites but caused only minor damage.

During increased aerial surveys **balsam bark beetle**-caused alpine fir mortality was mapped over 140 000 ha. Infection of current foliage by the **fir-fireweed rust** continued for the fourth consecutive year from Kitwanga to Meziadin Lake, but at reduced levels. Up to 100% of the current growth of alpine fir was killed by **Delphinella tip blight,** particularly in the ICH biogeoclimatic zone of the Bulkley and Kispiox TSAs.

Hemlock dwarf mistletoe infected up to 11% of western hemlock in two surveyed young stands in the Kalum TSA, and remained a chronic pest in mature and overmature stands through much of the host range in the region.

In a **western hemlock looper** pheromone calibration study, few larvae were collected in standard beating samples but traps caught an average of 62 adults at four sites.

Rhizina root disease killed newly-planted lodgepole pine and spruce seedlings at seven sites in the Bulkley and Morice TSAs. **Black army cutworm** damage was not recorded within the region in 1994. Pheromone trapping indicated increased populations in 1995, but damage potential remained low at all but one site.

In a total of 47 stands examined during **pests of young stand (POYS) surveys** throughout the region, 59% of the trees were pest free. Most of the significant damage resulted from climatic and other abiotic influences.

No visible effects of airborne pollutants or other factors influencing growth and health of forest stands were recorded in the **Acid Rain National Early Warning System (ARNEWS)** plot near Terrace and the more recently established **Biomonitoring** plot near Kitimat.

A total of 696 ha of **blowdown** was mapped in 18 locations during aerial surveys throughout the region. **Frost** in the late spring of 1992 was responsible for 11 and 9% mortality at two sites.

Porcupines caused 869 ha of damage over 74 areas from the Khutzeymateen Inlet on the coast to the Hyland River near the Yukon border. **Voles** were reported in the south of the Kalum District and caused 9% mortality in a Salvus plantation.

Large aspen tortrix caused mostly moderate defoliation of trembling aspen over 7875 ha in 38 areas scattered over four districts, with much of the damage recorded from southwest of Telegraph Creek to near Dease Lake. **Birch leafminers** caused 661 ha of discoloration in the Echo Lake area and minor damage in the Terrace area. **Northern tent caterpillar** severely defoliated alder, willow and black cottonwood in the Meziadin Lake area and along the Nass River and caused minor damage in the New Aiyansh area. No **gypsy moth** was caught in pheromone traps placed in 45 provincial parks, private campgrounds and port facilities in the region. **Pacific willow leaf beetle** caused light-to-severe defoliation of willow in the Kitwanga area east to near Terrace, and north to Cranberry Junction. A **poplar leafminer** lightly to moderately defoliated black cottonwood over 457 ha between Beaverpond Creek and the Bell-Irving River.

Important **chronic diseases,** which vary little annually but cause significant growth loss and mortality, are tabulated near the end of the report, followed by the **other noteworthy pests** section, wherein incidences of significant pests currently at low population levels, and pests which cause only minor damage are listed.

Pine Pests

Mountain pine beetle
Dendroctonus ponderosae

Mortality of lodgepole pine due to attacks by the mountain pine beetle more than doubled to 142 810 m^3 over 5290 ha in 1994, compared with 62 095 m^3 over 6460 ha in 1993 (Table 1, Figure 2). This was the second consecutive year of increase, reflecting a continued escalation of attacks in the Bulkley and Morice TSAs, and a first-time aerial survey of mountain pine beetle-caused mortality in northern areas of Tweedsmuir Provincial Park. Minor increases in area and volume loss also occurred in the Lakes TSA, while in the Kispiox and Kalum TSAs, the area under attack decreased.

Table 1. Area, volume and number of lodgepole pine recently killed by mountain pine beetle, FIDS, Prince Rupert Forest Region, 1994

Location (TSA)	Area (ha)[1]				Volume (m^3)	No. of trees
	Light	Moderate	Severe	Total		
Kalum	590	-	25	615	15 730	29 130
Kispiox	240	-	10	250	5 100	8 450
Bulkley	1000	375	75	1450	38 200	43 400
Morice	1550	200	200	1950	54 000	48 450
Lakes	260	-	40	300	5 300	6 400
Tweedsmuir Park	640	80	5	725	24 480	20 400
Total	4280	655	355	5290	142 810	156 230

[1] Data for Kalum and Kispiox TSAs were derived from FIDS aerial survey sketch maps; the Bulkley, Morice, and Lakes TSAs were largely mapped by the B.C. Forest Service with the areas and impacts calculated by FIDS from supplied maps.

Kalum TSA

Mountain pine beetle infested 615 ha of lodgepole pine in 1994, down 16% from 730 ha in 1993 in a continued decline begun in 1989. As most affected stands included a component of other hosts, by factoring out other tree species, it was determined that approximately 29 130 lodgepole pine were attacked with an estimated volume loss of 15 730 m^3.

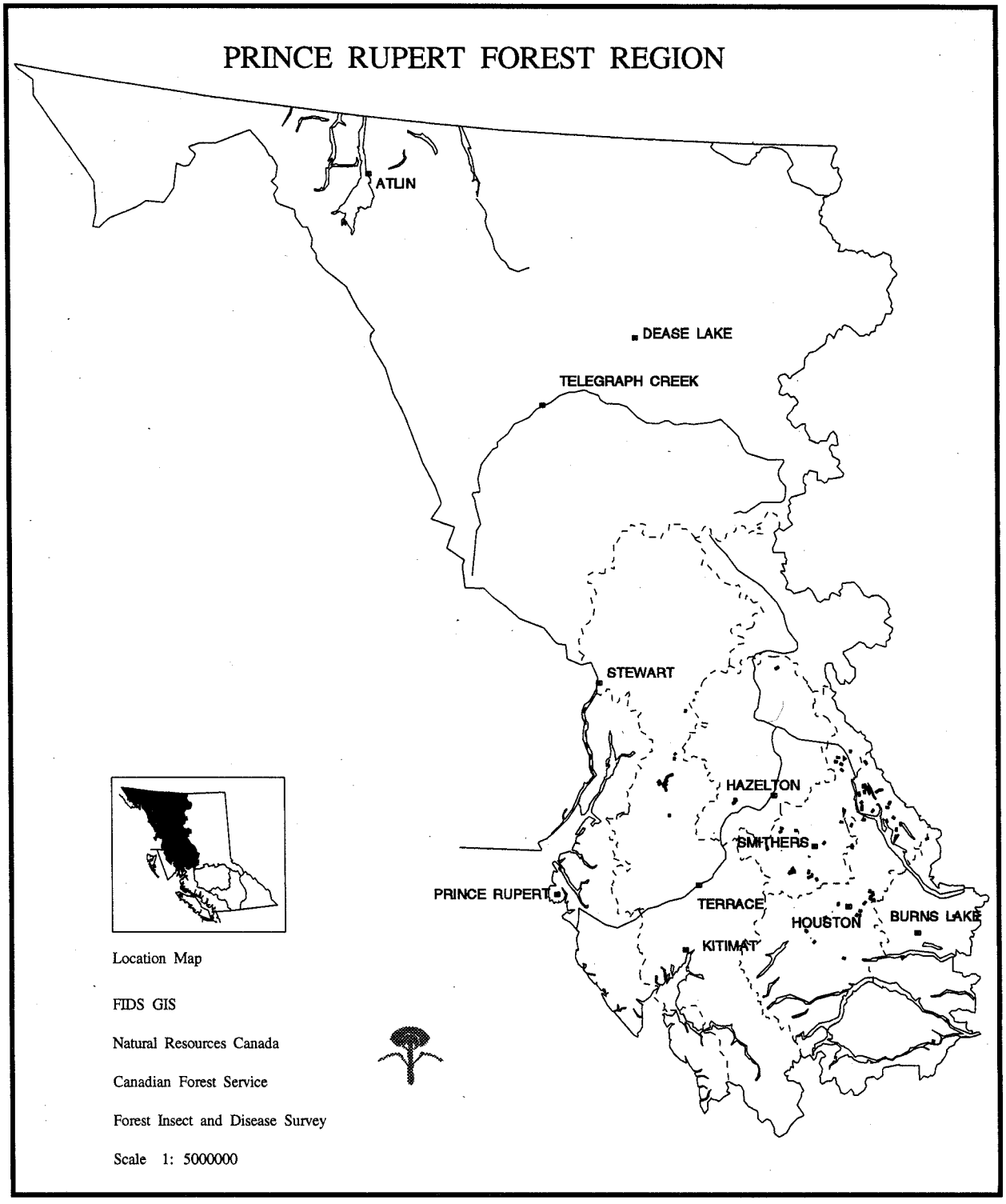

Figure 2. Areas where lodgepole pine was recently killed by mountain pine beetle as determined from aerial surveys in 1994.

Attacks continued in the lower Nass Valley with the most sustained and active infestations in the New Aiyansh area, as in the previous year. The presence of ambrosia beetles was noted in 17% of trees assessed in the spring, which were only lightly attacked by mountain pine beetle but contained large populations of *Hylurgops porosus/H. rugipennis* at the root collars. These secondary agents were possibly responsible for the mortality. Across the Nass River from New Aiyansh, beetle activity continued but decreased for the second consecutive year in the Shumal Creek area and adjacent pine flats. Small scattered infestations continued northeast along both sides of the Nass River to the Cranberry River junction area. Scattered spot infestations were also noted in the Brown Bear Creek area. Along the Kalum TSA portion of the Skeena River, no red-attacks were found for the third consecutive year.

Kispiox TSA

Mountain pine beetle infestations covered 250 ha, compared with 380 ha in 1993. Volume losses totalled 5100 m^3, a 40% decrease, and the number of red trees totalled 8450, a 22% decrease.

The recorded decrease was largely in the Sikintine River Valley, in the extreme northeastern part of the TSA. A total of 1785 red trees were mapped in 14 small infestations over 75 ha; only half the mortality recorded last year.

In the Cranberry River area, infestations continued as only small spots for the second consecutive year. Along the Skeena River near Kitwanga, 20 small scattered infestations totalled less then 100 ha, and light scattered attacks also continued along the Kitseguecla River.

Bulkley TSA

Mountain pine beetle populations rebounded with a more than four-fold increase in red trees to 44 300, but only a slight increase in infested area to 1450 ha. This was due largely to intensification of existing infestations.

A large part of the increase occurred in the Telkwa River Valley where 36 000 red trees were mapped over 515 ha; 81% of all mortality recorded in the TSA and more than double last year's total. Four infestations totalling 300 ha between 900 and 1200 meters in elevation, residing in stands within, and just east of the Jonas Creek drainage, accounted for 75% of the TSA total. Most of the insect activity is now in stands on south-facing slopes well above the river, reflecting the lack of mature lodgepole pine remaining on lower slopes following more than 10 years of infestation and active response logging. Another area of particular concern this year was Goathorn Creek, where significantly increased attacks killed over 600 trees.

Elsewhere in the Bulkley Valley, numerous small spot infestations were again scattered in susceptible mature pine stands including: McDonell Lake area, 380 trees; Trout Creek, 300 trees; Gramophone Creek, 135 trees; Reiseter Creek, 105 trees; Smithers, 340 trees, and Coffin Lake, 205 trees. Farther north, an infestation just west of Chapman Lake expanded to 1000 trees and three small infestations in the Harold Price Creek area killed 230 trees.

Contrary to expectation, recorded mortality in the northern drainages was reduced by 30%, totalling only 1800 trees: 500 in the Nichyeskwa Creek area, 950 in the Babine River corridor and 350 along the Nilkitkwa River. Increased current attacks and a relatively mild 1993/94 winter led to expectations of significant increases in red tree counts in 1994. Though the cause of the reduction is not entirely known, increased sanitation logging of infested stands and fall-and-burn operations undertaken by the BCFS and licensees in the winter were at least partially responsible.

Morice TSA

Recent mortality more than doubled to 48 450 trees, the highest in the Morice TSA since 1985. Infestations in the Morice can be divided into broad infestation areas in the north and south, with little activity in the central area between.

Infestations on the east side of Babine Lake were again the most active, accounting for 75% of the TSA total. Most notable among these were infestations in the Morrison Lake, Tochcha Lake and Nose Bay areas.

In addition to more than 300 previously recorded infestations which remained active in 1994, a total of 724 new infestations were located and pinpointed by the BCFS using a global positioning system (GPS). Red tree counts totalled 8450 (avg. 11.6/site) on these sites. The majority (540) of the new spot infestations occurred in the Houston Tommy Creek area, with lesser concentrations in the Parrot Lakes, Owen Hill, Lamprey Creek and Tsichgass Lake areas. A single infestation containing approximately 400 trees south off the Nadina Main near Jewel Lake, was the southernmost infestation seen in the TSA.

Overwintering brood survival was assessed in early June at a single site near Heading Creek. Twenty trees were assessed and an "R"[1] value of 11 was determined for the site. This high ratio reflected successful brood establishment in 1993 and low overwintering mortality following the relatively mild winter of 1993-94. It also indicated a potential for significantly increased attacks in 1994.

The MSMA[2] treatment program intensified this year by the BCFS and more than 11 000 trees were treated in the summer to kill beetles in recently-attacked trees. This will significantly reduce brood production in the areas treated.

Lakes TSA

In this TSA as well, following high current attack levels in 1993 and despite focused and comprehensive brood removal logging and fall-and-burn programs, red tree counts more than doubled to 6400 trees in 1994.

North of Babine Lake scattered infestations intensified, and a total of 545 red trees were mapped, compared to only 150 last year. A single infestation just north of Klaytahnkut Lake, the most northerly in the TSA, contained more than 200 trees.

A total of 1780 trees in 100 infestations were scattered across the TSA between Babine Lake and Francois Lake. The largest concentrations occurred adjacent to the south and north shores of Taltapin Lake, where concentrations of 400 and 93 trees respectively were mapped. Twenty small infestations totalling 187 trees were grouped along the north shore of Francois Lake, near the Prince George regional boundary.

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1 "R" value = an average ratio of the numbers of brood in 225 cm^2 bark samples vs. the number of beetle entrance holes.
Interpretation of "R" values:
≤2.5 - decreasing population
2.6-4.0 - static population
>4.1 - increasing population

2 monosodium methane arsenate

Continuing a pattern established last year, the majority of recent lodgepole pine mortality within the TSA was again mapped in relatively few infestations south of Francois Lake. The single largest infestation, containing more than 2000 trees was near McDonalds Landing on the south shore of the lake. Farther south in the pondage, ongoing infestations near the southeastern end of Intata Reach totalled over 600 trees, and 10 infestations grouped near the east end of Tetachuck Lake, contained over 500 trees.

Tweedsmuir Provincial Park

For the first time in many years an aerial survey was conducted to map beetle infestations in the northern section of the park. Recent mountain pine beetle-caused mortality was mapped in 43 separate infestations over a total of 720 ha, primarily along the north shore of Eutsuk Lake between Redfern Rapids and Sand Cabin Bay. Smaller infestations also occurred along the south shore, on the slopes of Mount Preston, and near Connelly Bay.

The survey was conducted in response to increased mountain pine beetle activity in adjacent areas of the Lakes TSA, lying to the east of the Park. These infestations are thought to have been initiated by beetles migrating out of the Park. Though no immediate management action is contemplated within the Park, populations will be monitored and if increases continue, a managed burn may be attempted by BCFS and B.C. Parks to eliminate the largest infestations along the north shore of the lake.

Fall Surveys and Control Strategies

In the Kalum District, in a cruise near New Aiyansh, 12% of trees were currently attacked. This was slightly less then the 16% current attack the previous year but matches the also slightly lower brood size of "R" = 3.8 (range .33-20) with small populations found in the spring. The C:R ratio (current-to-red ratio compares the frequency of current attacks to attacks in the previous year) was 2:1, also slightly lower then the previous year. The remaining healthy host represented 57% of the pine in the stand with average diameter approximately the same as the currently attacked trees.

In the three eastern TSAs routine fall probes were conducted in October and November by BCFS contractors to determine current attack levels and identify potential control sites. As in the previous two years, current attack levels were high with C:R ratios averaging 3 and 4:1.

In the Bulkley TSA, C:R ratios consistently averaged close to 1:1, with current attacks slightly outnumbering reds in the Reiseter Creek and McDonell Lake areas, and reds slightly outnumbering currents farther north in the Nilkitkwa. Probers subsequently found, just east of Nilkitkwa Lake, a stand containing over 400 current attacks with no associated red trees. A winter fall-and-burn program and brood removal logging will attempt to control the spread of infestations.

In the Morice TSA, C:R ratios were very high, averaging over 4:1, with some areas reporting as high as 10:1. Preliminary plans call for treatment of up to 4000 trees through fall-and-burn, and an additional 1400 through helicopter logging.

In the Lakes TSA, C:R ratios averaged 4:1, also indicative of significant increases. Due to the relatively small scale of individual infestations and overall TSA mortality, all infestations will be addressed either through fall-and-burn operations or sanitation logging.

Most significant in recent years has been the addition of small scale helicopter logging to the arsenal of mountain pine beetle control alternatives. In 1993, limited largely experimental use of helicopters to remove infested trees in the Bulkley and Morice TSAs, proved successful.

By the use of helicopters forest managers can: ensure the elimination of broods because trees are removed from the forest, reduce volume losses to the beetle, and, by salvaging the timber values, partly or wholly defray the cost of treatment. Though limited by terrain and distances to landings, the helicopter option is expected to be used increasingly in coming years.

Forecasts

Based on the historical progression of infestations and fall assessments of current attack levels, the number of red trees resulting from 1994 mountain pine beetle attacks is expected to increase marginally within the region in 1995. More dramatic increases in the Lakes and Morice TSAs and in Tweedsmuir Park, will be tempered somewhat by static or slightly declining levels in the Bulkley and Kispiox TSAs. In the Kalum TSA, spring assessment indicated healthy but static populations and limited fall surveys indicated increasing reds for 1995. However, the limited suitable host, increasing proportion of greys and continued active harvesting, suggests limited opportunity for expansion in the New Aiyansh area, and no indication of expansion in other areas.

Lodgepole terminal weevil
Pissodes terminalis

Attacks by the lodgepole terminal weevil remained low within the region in 1994 with only scattered single attacks being recorded. Populations collapsed in stands along the Augier Main in the Lakes TSA where, in 1993, up to 20% of stems were attacked in some stands. Assessments in 1993 found moderate parasite levels in the weevil population, and brood numbers indicated only a slight decline for 1994. Since the relatively mild winter probably had little adverse affect on the weevil population, it is suspected that parasite, predator and/or disease impacts increased in the months following the assessment.

Population monitoring will continue in 1995.

Pine needle cast
Lophodermella concolor

Discoloration and subsequent shedding of year-old needles caused by pine needle cast increased significantly this year in southern areas of the region, and remained high in areas of chronic infection in the north, near the Yukon border (Table 2).

The increase in incidence of pine needle cast in the Prince Rupert Forest Region reflected a general increase throughout the province this year. In the Cariboo, Kamloops and Nelson regions, a total of 870 000 ha of discolored pine was mapped during aerial surveys; a four-fold increase from 1993.

Table 2. Incidence and intensity of infections by pine needle cast, *Lophodermella concolor*, FIDS, Prince Rupert Forest Region, 1994

TSA/Location	Description	Associated fungi
Lakes		
Endako	20-100% 1993 needles (avg. 60%) from Endako west for 20 km	*Hendersonia pinicola*
Augier Main	avg. 40% 1993 needles throughout area	
Morice		
Km 48 Morice Owen	up to 100% 1993 needles on all trees	
Bulkley-Kispiox		
Moricetown to New Hazelton	avg. 20% trees lost 40% 1993 needles	*H. pinicola*
Cassiar		
French River	avg. 80% 1993 needles throughout area	
Kalum		
Kitwanga	10-90% 1993 needles Kitwanga to near Terrace along Hwy. 16	*H. pinicola*

Blister rusts

Cronartium comandrae, C. coleosporioides

Of 39 stands surveyed under the Pests of Young Stands program this year in which lodgepole pine was a major component, blister rusts, *Cronartium* spp. rusts were found in 17. In these stands however, a total of only 7 trees were recently killed, while an additional 30 supported stem cankers and were considered life-threatened.

Comandra blister rust, *Cronartium comandrae*, caused cankers on 13% of lodgepole pine in a 15-year-old plantation in the Kitanweliks Creek area of the Nass River drainage. Most of the cankers were on the stems of the trees. Approximately 1% of trees were dead.

Stalactiform blister rust, *Cronartium coleosporioides*, has been commonly found in young stands throughout the range of lodgepole pine in the region over the years. At two six-year-old Cottonwood River plantations 1% of pine had stem infections.

At Willow Creek, 2% infection by an unidentified *Cronartium* sp. was found, and in a seven-year-old mixed stand at Pine Lake, similar infection resulted in 1% mortality.

While the diseases kill seedlings and young growth, infection levels are generally very low and little impact has been noted. Spacing in these stands is an effective control; it removes infected trees and normally results in more rapid growth of the leave trees. Infected residuals also stand a better chance of outgrowing the cankers. Spacing with branch pruning may be even more effective as most stem cankers begin as lower branch infections.

Spruce Pests

Spruce beetle
Dendroctonus rufipennis

Recent spruce beetle activity increased significantly in the region this year and was aerially mapped over a total of 1690 ha. The damage occurred in two widely separated areas; in the extreme northwestern corner of the Cassiar TSA, adjacent to the Alaska border, and in the Morice River drainage of the Morice TSA.

Cassiar TSA

Spruce beetle infestations in Alaskan areas of the Chilkat River drainage were first noted in 1990, and by 1992 had expanded significantly. Ground-based probes have been carried out annually in the Rainy Hollow area of the Klehini River, to monitor any increase in spruce beetle populations. Other tributaries of the Chilkat originating in B.C. however, had not been surveyed. In June of this year, an aerial survey was undertaken to map infestations in all of these areas (Table 3).

Table 3. Locations where recent spruce beetle infestations were mapped by aerial survey, FIDS, Prince Rupert Forest Region, 1994

TSA	Location	Area(ha)	Remarks
Cassiar	Klehini River (Haines Road)	200	mostly current attacks; some grey
	Kelsall River	220	avg. 20% of stand trees; most grey
	Klemer River	420	<10% of stand trees; red and grey
	Upper Chilkat River	50	small groups of trees; most grey
	Arrival Creek	8	about 50 trees affected
Morice	Morice River	800	up to 50% of stand trees grey with pockets of concentrated current attack

Much of the mortality, especially in the Klehini and Kelsall river areas resulted from attacks in 1992, and this year were mapped as grey trees. Some red trees were mapped in the upper Klemer and Chilkat rivers, but here again most of the attacks appeared to be two years old.

An infested area in the Klehini River (Rainy Hollow) area was examined from the Haines Road in late June to assess populations and determine attack patterns in the stand. The probed area was located about 14 km by road from the Alaska border, in a high elevation stand, just below the tree line. The stand was composed of an almost equal mix of mature Sitka spruce and western hemlock. Of the spruce component: 51% were healthy, 42% were currently attacked, 1% was red (attacked in 1993) and 6% were grey (all 1992 attacks). In the current attacks, parent adults and eggs were found in fully developed parent galleries; pupae

were found in the few red trees and no progeny were found in the greys. These signs all indicated that the beetle population was on a uniform two-year cycle.

Along the Stikine River one small area, south of Arrival Creek, of about 8 ha containing some 50 infested trees, was noted during August aerial surveys of mostly the east and south of the district.

Morice TSA

Spruce beetle has been actively attacking white spruce on islands and in river bottom stands along the Morice River corridor since 1988. As in the northern infestations, significantly increased attacks occurred in 1992 and most of the mortality mapped during a September aerial survey stemmed from that time. Additional light mortality was mapped along the south shore of Chisholm Lake, following an ambitious beetle control operation in the fall of 1993. In early June trap trees felled by industry to absorb remaining populations had been heavily attacked and were evidently successful at absorbing the bulk of the beetle flight, as only one standing current attack was found. Removal of the trap trees will provide a significant measure of control over the local population.

In early August, parts of the Morice corridor were probed to determine the incidence of current attack. The probes were focused in roadside stands along the West Morice Main from Km 45-60 (Table 4).

Table 4. Incidence of spruce beetle current attacks at four locations along the Morice River corridor, FIDS, Prince Rupert Forest Region, 1994

Location	Results
Km 45 West Morice FSR	few blowdown lightly attacked by spruce beetle, more heavily by Ips spp. and some woodborer
Km 52	Morice River flood plain; large mature spruce predominated; 0/16 trees attacked
Km 56	well removed from river; light attack in smaller mature spruce; alpine fir predominated
Km 57	closer to river; mixed spruce/alpine fir; 7/7 spruce attacked, 4 less than 20 cm diameter
Km 59.5	below road on Morice River flood plain; large mature spruce with 20% lodgepole pine; 32/56 (70%) spruce currently attacked, few grey trees

It was apparent from the probe that spruce beetle attacks were intensifying in some of the largest trees in the most vigorous stands, and becoming more widely dispersed in stands to the east of the main infestation. This will be expressed next year in increased numbers of red trees in these areas. Because of the apparent abundance and vigour of attacking beetles,

susceptible stands on the north side of the river as far as Chisholm Lake are expected to also contain significant levels of current attack.

Most of the infested area is contained within a special management zone which extends along the river corridor, and is designed to preserve its aesthetic and ecological integrity. No logging is permitted within the zone and therefore no active beetle control strategy has been implemented. Spruce beetle infestations have played an active role in the cycling of stands within the corridor and will continue to do so in the future. Infestations are fueled largely by recurring high winds which funnel up Morice Lake and pass along the corridor causing blowdown in the shallow-rooted river bottom spruce stands. Based on historic patterns of spruce beetle infestations, populations can be expected to peak either in this current attack year or possibly in two years following another cycle, and then decrease dramatically.

Spruce weevil
Pissodes strobi

Spruce weevil, *Pissodes strobi,* remained active throughout its range, with the highest recorded current attack levels occurring in the Kitimat Valley, with 44% attack recorded at Lone Wolfe Creek (Table 5). This was similar to a site nearby which recorded 46% in 1992, and only slightly higher then last year's record of 36% at Leanto Creek, north of Terrace.

Several of the sites present major management concerns. The Lone Wolfe Creek and adjacent Cecil Creek sites, planted to spruce, showed near 100% cumulative attack. While spruce represented only about 50% of plot trees, the remaining trees were predominantly naturally regenerated, smaller and younger hemlock. As in previously assessed plantations, hemlock will probably become the main crop tree. This again means years of growth loss and loss of the primary, preferred species. Generally, in the Kitimat Valley, the surveyed stands with spruce as a major component (39-97%) continue to be severely affected (range 42-95%). Add to this the problems of susceptibility of young spruce to frost and these plantations continue to revert to predominantly hemlock stands by nature, and by choice during spacing programs.

In the Nass Valley, in the Dragon Lake area, total attack was only 29% but additional, severe frost damage has resulted in replanting and conversion to a mix of other species. On the north side of the Nass River, at Tchitin River, 2% current attack was found in one stand. This was a very young stand and increased weevil activity is anticipated, as indicated in older stands in the area. At a Kwinamuck Lake site, 10% current and 16% old attack was found despite a clipping project in 1993. The north side of the Nass River was considered at one time to be relatively isolated and unlikely to suffer major problems. Clearly the last four years have shown the contrary; as the stands have grown to susceptible height, they have become infested by the weevil.

Assessments to monitor the northern expansion of the weevil's range have indicated no change in the last four years, with the Meziadin area remaining the northern limit. At the Bell-Irving River crossing and in a pure spruce plantation at Spruce Creek, no attacks have yet been found despite an abundance of susceptible host and being in a biogeoclimatic zone (ICHvc) with a recent history of weevil attack. Farther north into the Dease Lake TSA, no attack was found, and none was reported.

Weevil damage is expected to continue unabated. Planting of spruce in the "weevil zone" remains contra-indicated. Monitoring will continue in 1995.

Table 5. Spruce weevil in the Kalum TSA, FIDS, Prince Rupert Forest Region, 1994

Location	Percent attack			Percent Spruce Component	Remarks
	Current[1]	Old	Total		
Kitimat Valley					
Cecil Cr.	0	100	100	3	minor spruce component
Cecil Cr.	0	100	100	16	minor spruce component
Cecil Cr.	39	57	95	39	spruce plantation, high parasitism, hemlock regen.
Lone Wolfe Cr.	44	46	90	54	spruce plantation, hemlock regen. may take over
Little Wedeene R.	24	71	94	15	mixed older stand (25+)
Clearwater Cr.	6	37	42	79	young stand, severe frost damage, plantation failure
Herman Cr.	9	63	72	34	mixed older stand, some alder overstory
Onion Lk.	28	42	69	97	biomonitoring plot, older stand, good growth
Schulbuckhand Cr.	0	100	100	1	minor spruce component
Skeena River					
Salvus	12	0	12	15	severe vole, brush problems, 1 m stand
Nass Valley					
Ksedin R.	0	75	75	4	older, mixed stand, porcupine area
Dragon Lk.	2	27	29	48	severe frost damage, replanted to mixed species
Tchitin R.	2	0	2	58	very young plantation, weevil will increase
Kwinamuck Lk.	10	16	26	71	unsuccessfully clipped in 1993, +/- 1.5 m stand
Northern areas					
Spruce Cr.	0	0	0	100	continues weevil free area

[1] includes current only and current plus previous attacks.

Spruce aphid
Elatobium abietinum

The spruce aphid, *Elatobium abietinum,* defoliated 254 ha of Sitka spruce in 16 infestations mainly along the coast in the Prince Rupert region. Light and moderate defoliation was noted along the west side of Kaien Island and into Prince Rupert. Similar attack occurred on the north end of Digby Island, across in the Metlakatla area on Tugwell Island and north on Finlayson Island and adjacent islands.

In Prince Rupert, many scattered urban Sitka spruce were moderately and occasionally severely discolored. Scattered mostly endemic spruce aphid attacks were again noted in the Terrace area and at Radley Park in Kitimat. Tree mortality in the region has not been recorded recently but may occur especially with repeated severe attacks.

Eastern spruce budworm
Choristoneura fumiferana

An infestation of eastern spruce budworm which has caused repeated trace-light defoliation of white spruce in the extreme northeastern corner of the region since 1986, continued in 1994, though at slightly reduced levels from last year. Mostly trace or light defoliation of white spruce was continuous from the south edge of the Egg Fire to the Prince George regional boundary. For the second consecutive year, high populations of budworm spanned the Egg Fire, probably in a narrow band of surviving mature timber along the Liard River, and caused trace levels of defoliation in stands north of the fire as far as Irons Creek, just across the Yukon border. A standard three-tree beating in this area yielded 56 *C. fumiferana* larvae, a yield commensurate with the minor damage.

No defoliation was noted and no larvae were collected in three-tree beatings along the northern end of Highway 37, where trace defoliation was reported in 1990.

The infestation is the western edge of a much larger infestation that has defoliated large areas in the Liard and Fort Nelson river drainages in the Prince George Forest Region, stretching into the Northwest Territories and the Yukon. This year, defoliation in the Prince George region covered 173 000 ha, almost unchanged from last year.

Eastern spruce budworm defoliation within northern stands of the Prince Rupert region has been largely confined to current growth, and, at worst, stripping of the upper crown foliage. The damage has had little effect on the growth or vigour of the trees.

A sample of larvae collected at Irons Creek was sent to the PFC Insectary for rearing. Of 61 larvae reared, 4 (6%) died of unknown causes, 10 (16%) were diseased and 47 (77%) reared through to adult stage. This high level of healthy emergence with no apparent parasitism, suggests the possibility of significant increases in populations next year.

Spruce adelgids
Pineus spp., *Adelges lariciatus*

Galls and woolly adelgids were found at several locations broadly distributed across the region. Most samples were identified as *Pineus* spp. with one identified as *Adelges lariciatus.*

At Clearwater Creek, woolly adelgids or galls were common on 16% of the spruce but caused only minor damage. *Adelges lariciatus*, which requires the alternate host *Larix* sp. to complete its life cycle, was identified at this site. While larch was not found, western larch, *Larix occidentalis*, has been planted as a minor component in a number of plantations in the valley. At Tchitin River, *Pineus* spp. adelgids and galls were found on 54% of spruce but caused negligible damage. At Willow Creek, *Pineus similis* was found on only 2% of spruce.

Pineus galls found at Clearwater Creek and Tchitin River have yet to be identified to species, these galls have generally been showing up more frequently in recent years. Damage by adelgids is generally very low and of concern only in high value ornamentals or where spruce might be used for Christmas tree production.

The unprecedented increase in new *A. cooleyi* galls observed in a number of localities last year was not evident at these new sites, and did not recur in sites infested last year. Due to the two-year development cycle of *A. cooleyi*, significant declines in incidence of galling was expected.

Sampling will intensify throughout the region in 1995 when dramatic increases in fresh galling are expected.

True Fir Pests

Western balsam bark beetle complex
Dryocoetes confusus, Ceratocystis dryocoetidis

Recent mortality caused by the western balsam bark beetle/disease complex was mapped over an area of 140 000 ha. The reduction in recorded overall infested area (158 000 ha recorded in 1993) and, on the other hand, the broadening of recorded distribution of infestations this year (Figure 3, Table 6), reflected changes in aerial survey coverage rather than changes in balsam bark beetle activity. Aside from annual surveys in the Kalum, Kispiox and parts of the Bulkley TSAs, FIDS aerial coverage was expanded to include parts of the Cassiar TSA and Tweedsmuir Provincial Park, neither of which had been flown for balsam bark beetle damage in many years. Some areas where infestations have been mapped in recent years were not flown this year. Some additional map information on infestations was provided by the B.C. Forest Service.

Kalum TSA

Substantial beetle activity was noted only over 930 ha in 100 infestations along the Bell-Irving River north of Bowser Lake. Beetle infestations previously recorded in the Cranberry River drainage was not assessed this year.

Cassiar TSA

Balsam bark beetle was mapped over 6970 ha in 140 infestations during a partial overview aerial survey of the district, covering primarily the Iskut and Stikine valleys and the northeast. Along the Klappan River, 16 infestations were recorded between Tumeka Lake and the Stikine River; small patches of red trees were noted along the Eagle River as far as Moose Lakes. Beetle activity was almost continuous from north of Nuttlude Lake through the Kinaskan Lake area and along the Iskut River to Forest Kerr Creek, with additional infestations noted in the Bob Quinn Lake to Alger Creek areas. Many of the affected areas were in Mount Edziza Park. Along the Stikine River, beetle activity occurred from Oksa Creek northeast to the Glenora area. One infestation was mapped east of Tatsho Creek near Dease Lake. Farther north, the beetle was notably active along the highway corridor near the Cottonwood River in 13 areas covering 930 ha.

This was the first aerial survey in several years and covered only part of the district. Further surveys in the next few years will likely reveal other affected areas.

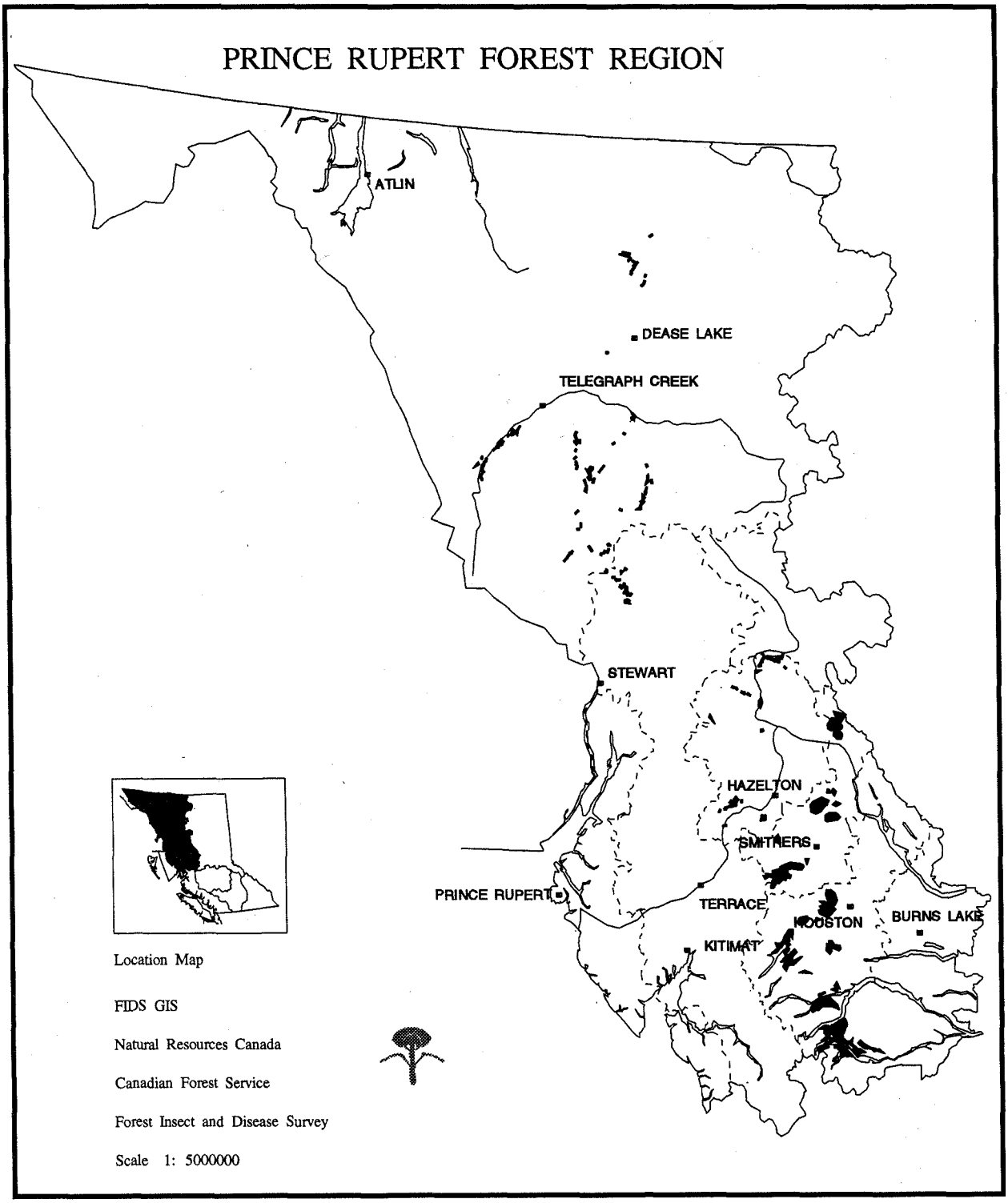

Figure 3. Areas where alpine fir was recently killed by balsam bark beetle as determined from aerial surveys.

Table 6. Location and area of infestations causing recent mortality of alpine fir, FIDS, Prince Rupert Forest Region, 1994

TSA	Location	Area (ha)
Kalum	Bell-Irving River	930
Cassiar	Klappan River	1 350
	Eagle River	110
	Bob Quinn-Echo lakes	360
	Cottonwood River	940
	Tatsho Creek	30
	Iskut River	160
	Natadesleen/Kinaskan lakes	1 600
	Kakiddi Cr.-Mowdade Lake	570
	Stikine River	1 700
	Alger Creek	150
Kispiox	Kitseguecla River	1 500
	Upper Skeena River	5 000
	Kitwanga	2 500
Bulkley	Telkwa River	17 400
	McDonell Lake	1 500
	Harold Price Creek	6 100
	Blunt Creek	10 700
	Nilkitkwa Lake/River	14 200
Morice	Walcott	15 400
	Thautil River	3 500
	Morice Lake	6 200
	Nanika River/Kidprice Lake	6 500[1]
	Whitesail Range	10 800
	Mosquito Hills	1 000
	Nadina/Poplar Mts.	3 800
Tweedsmuir Provincial Park		26 000
	Total	140 000

[1] these infestations were largely moderate in intensity; all others were light

Bulkley TSA

Infestations in the Telkwa River Valley have been ongoing for many years, particularly in the headwater areas and the major side drainage of Howson Creek. Four years ago major increases in activity were seen along almost the entire north slope of the valley. Though not mapped in their entirety this year, infestations continued in the McDonell Lake area, along the east side of the Bulkley Valley, especially in the Blunt Creek drainage, and on the west side in

the John Brown Creek area. Farther north, large ongoing infestations were mapped in the Harold Price Creek drainage, and in the northern extremes of the TSA, large areas of low intensity (less than 2% of stand red) occurred around Mt Horetzky, and along both sides of the Nilkitkwa River.

Morice TSA

Current aerial survey information covered only the southern half of the TSA. The Walcott area southwest of Houston, with over 15 000 ha of continuous infestation contains one of the longer-standing and more devastating infestations. Between 30 and 60% of the alpine fir has been killed, and between 2 and 5% of the trees were red this year. At the northwest end of Morice Lake, on the slopes of Nanika Mountain, an estimated 10% of trees in stands over about 1200 ha were red, and at the north end of Kidprice Lake, and estimated 20% of trees were red over 1600 ha. These are some of the highest attack levels ever recorded for balsam bark beetle. Attacked trees normally retain needles for between 2 and 4 years after succumbing to attacks by the beetle and fungus. In these stands, therefore, between 2.5 and 10% of the trees may have been attacked in a single year. Historically, red tree components rarely exceed 5% in any one year.

Long standing infestations in the Whitesail Range, and Poplar and Nanika Mountain areas continued at low levels (1% red). In the Shelford and Mosquito Hills, host depletion, caused by the combined effects of chronic infestation and clearcut logging, has reduced infestations substantially in recent years.

Tweedsmuir Park

Most of the 26 000 ha of infested alpine fir stands mapped within the Park were situated along the north shore of Eutsuk Lake, beginning just east of Sand Cabin Bay, and stretching unbroken to Whitesail Lake. Additional infestations were mapped along the south shore of the Lake, and on the western shore from Chikamin Bay Portage to Chikamin Mountain.

Since trees retain red foliage for up to four years following attack, infested areas identified during aerial surveys include old as well as recent attacks. Annual attacks average 1-2% of the stands, and tend to be clumped in small groups of trees. Over time these infested pockets coalesce forming larger continuous patches of mortality with increasing portions represented by grey stems and pockets of alpine fir regeneration in the created openings.

Mortality is caused not only by the physical girdling of beetle larvae but also by the Ceratocystis fungus which is brought in by the adult beetles in special thoracic repositories. Fungal spores rubbed off during gallery construction, germinate and grow within the living phloem and block translocation.

Balsam bark beetle mortality is expected to continue at similar levels.

Fir-fireweed rust and Delphinella tip blight
Pucciniastrum epilobii and *Delphinella sp.*

Both the fir-fireweed rust and Delphinella tip blight infect current growth of true fir. *Pucciniastrum epilobii* infects only current needles causing them to turn color and drop off later in the season, while the tip blight, *Delphinella* sp., infects buds and growing tips causing discoloration and dieback. Damage fluctuates year to year, increasing with abundance and proximity of alternate host (for *P. epilobii*) and favorable climate during the spring infection period.

Infection of current foliage caused by the fir-fireweed rust was moderate to severe on lower crowns of young alpine fir in a 2 ha area near Lava Lake. Discoloration of true firs was moderate to severe on young roadside regeneration and light to moderate on lower crowns of older trees from Kitwanga to Moonlit Creek. Both fir-fireweed rust and Delphinella tip blight have been previously identified as causing discoloration in this area. In the Meziadin area only very light discoloration was noted.

In a 20 ha true fir plantation established near Meziadin Lake in 1991, an average of only about 5% of current needles were affected, a continued decline in infection from 20% in 1993 and 40% in 1992. The study at this site was established to help determine if the rust was capable of causing mortality or severe dieback in new plantations. No mortality or dieback has been recorded at this site related to the rust.

Minor discoloration of current foliage was also noted in two young stands surveyed under the Pests of Young Stands (POYS) program. Both stands were in the Kitanweliks Creek area with 69% of alpine fir affected in one stand and 42% in the second stand. Alpine fir represented 41% and 54% of the component respectively; infection rates were light, and both *P. epilobii* and *Delphinella abietis* (a rare sample that was mature enough to identify to species) were present.

In the interior TSAs widespread high incidence of bud and growing tip-kill caused by Delphinella tip blight affected the entire crowns of young understory and roadside regenerated alpine fir, and the lower crowns of larger trees. Up to 100% of the growing tips were affected, mainly in the ICHmc2 and ICHmc3 biogeoclimatic variants in the Bulkley and Kispiox TSAs. Most severely affected were alpine fir in mixed fir-spruce-hemlock stands on the mid slopes on both sides of the Bulkley Valley between Smithers and Hazelton, and in mixed stands in the Kispiox River drainage. Also severely affected were sapling and young growth alpine fir in the SBSmc subzone in the McDonell Lake area.

Hemlock Pests

Hemlock dwarf mistletoe
Arceuthobium tsugense

Hemlock dwarf mistletoe remains a serious chronic parasite on hemlock through much of the Kalum District, south of the Meziadin area. Of nine POYS surveys where hemlock was a major component, 1% and 11% of the hemlock were infected in two stands. At a Cecil Creek spaced site, the only tallied, infected tree, was an old-growth seed tree; no other crop trees in any of the plots were as yet showing signs of infection. However, other scattered old growth also likely harbor mistletoe and the potential for spread is high. At a Schulbuckhand Creek spaced young stand, infected trees were scattered throughout the stand.

In these and other young hemlock stands, the potential for significant losses and carry-over from rotation to rotation will persist unless addressed. Key opportunities exist for management in young stands. Identification of infested stands is important prior to implementation of silviculture enhancement programs. Sanitation opportunities may be viable during spacing, brushing or weeding projects. In heavily infected stands a 'no spacing' or stand conversion strategy could be considered as spacing can seriously exacerbate mistletoe activity. Increasing light into these stands by spacing can activate previously dormant and nearly invisible mistletoe plants.

Hemlock dwarf mistletoe has been recorded in treated young stands for the last four consecutive years. Monitoring for this and other pests in treated young stands will continue.

Western hemlock looper
Lambdina fiscellaria lugubrosa

A province-wide study was undertaken to calibrate yields of western hemlock looper larvae in standard three-tree beating samples with adult catches in pheromone-baited traps. Four locations were sampled in western parts of the region where hemlock looper larvae had been collected in past beatings (Figure 4, Table 7). The study was done in co-operation with a pheromone development program at Simon Fraser University.

Table 7. Comparitive yields of western hemlock looper larvae from standard beating samples and adults from pheromone traps, at four locations, FIDS, Prince Rupert Forest Region, 1994

	Standard Beating		No. moths in Pheromone traps	
Location	Host	No. larvae	10 micrograms[1]	100 micrograms
Chimdemash Creek	wH[2]	0	9,22,20	10
Spencer Lake	SX[2]	2	9,46,16	167
	alF[2]	2		
South Hazelton	wH	0	1,40,90	210
Kitwanga	wH	0	0,36,16	300

[1] Pheromone concentration

[2] wH - western hemlock, SX - Sitka/white hybrid spruce, alF - alpine fir

The low numbers of larvae collected in the beatings provided limited useful data for the calibration study, but did emphasize the effectiveness of the pheromone. The relatively high moth catches suggested that the pheromone was attracting moths from a wide radius.

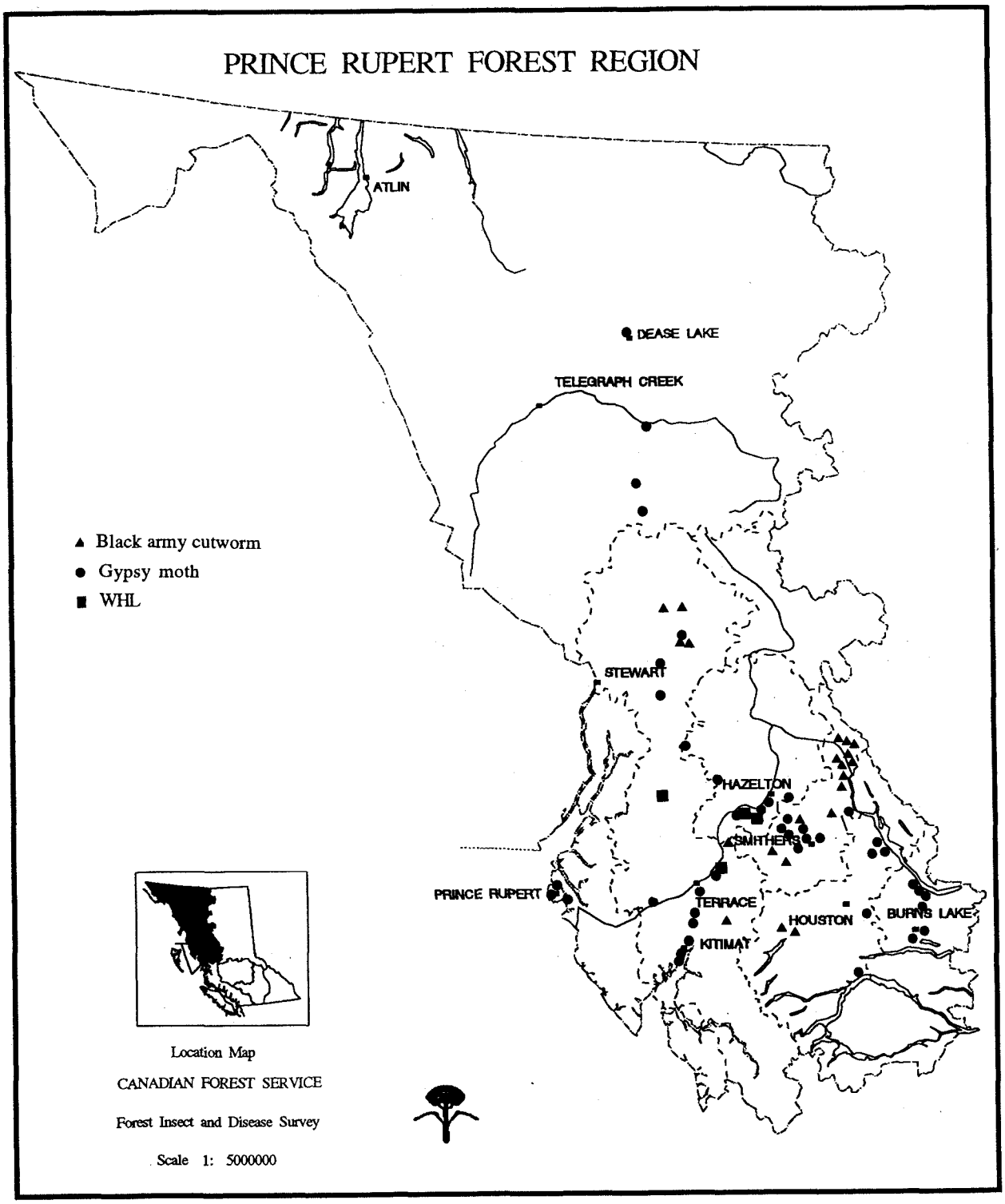

Figure 4. Locations where one or more pheromone-baited traps were deployed in 1994.

Multiple Host Pests

Rhizina root disease
Rhizina undulata

Following three consecutive years of declining incidence of Rhizina root disease in broadcast burns in the region, renewed disease activity resulted in seedling mortality ranging from 4-30% on seven sites (Table 8).

Table 8. Location and intensity of damage to lodgepole pine and white spruce plantations by Rhizina root disease, FIDS, Prince Rupert Forest Region, 1994

Company	Block	Location	% Seedlings[1] killed
Pacific Inland Resources Ltd. (PIR)	CP 521.2	off Km 55 Nilkitkwa FSR	30
PIR	CP 308.3	off Km 28 Telkwa R. FSR	24
BCFS Small Business		off Km 81 Nilkitkwa FSR	13
PIR	CP 632.2	off Km 86 Nilkitkwa FSR	12
PIR	CP 520.2	off Km 55 Nilkitkwa FSR	5
BCFS Small Business		off Km 31 McDonell FSR	5[2]
PIR	CP 632.4	off Km 86 Nilkitkwa FSR	4

[1] All sites planted with a mixture of white or hybrid spruce and lodgepole pine. All of these spp. are equally susceptible to infection by the disease.

[2] Seedlings died very soon after planting; no Rhizina fruiting bodies were seen in September, and no disease was identified on root samples. Mortality may have been due to planting shock.

An additional seven sites; one near Blunt Creek, one in McKendrick Pass, three off the Nilkitkwa FSR and two along the Morice River (Silver Tip FSR), broadcast burned in the fall of 1993, were examined in the fall of 1994. All were found to be free of Rhizina fruiting bodies or suspected Rhizina-caused seedling mortality.

In the Kalum TSA, only one of the six areas burned contained sporophores. The Hunter Creek site was moderately burned and not planted. Only occasional, scattered fruiting bodies were found. This was the lowest level of fruiting activity in the western part of the region since 1988.

Observations of the incidence and spread of Rhizina root disease over the past seven years in the Prince Rupert region have led to some inferences. The first and most important is that Rhizina inoculum can be present on sites regardless of the incidence of recent disease outbreaks in the area. Also, if an outbreak occurs on a certain site one year, it will not necessarily occur on an adjacent site burned the following year. Conditions adverse to the growth of the fungus such as dry weather and light burn intensity seem to be more limiting than inoculum availability.

There had been no wildfires or broadcast burns in either the Nilkitkwa area or the Telkwa River in the last few years, and no prior history of disease outbreaks during the former epidemic (1988-91). Studies conducted in Europe concluded that Rhizina spores could remain viable for up to two years and survive being frozen for short periods. Four possibilities suggest themselves to explain the amount of inoculum in these burns this year;

1. Sufficient spores were produced from scattered localized landing burns to supply the recent burns with inoculum.
2. Spores remain viable longer than the two years now considered maximum.
3. Spores are transported long distances by the prevailing winds.
4. There is a sufficient inoculum base in the unburned forest to sustain inoculum levels.

For mass fruitings of Rhizina to occur, it appears evident that fungus inoculum must be on the site prior to the burn. Spores are stimulated to germinate by heat such as that generated by a broadcast burn, and grow quickly to occupy the site as a post-burn pioneer species. The largest mass fruitings of the fungus and greatest subsequent seedling mortality have occurred on moderate burns where temperatures were sufficiently hot (optimum about 70 degrees C.) to stimulate germination, but not hot enough to kill the spores. After the first growing season Rhizina is overcome by more aggressive fungi colonizing the burn site, and after the second year, fruiting bodies are normally not seen.

Black army cutworm
Actebia fennica

At two Irving Main sites, trace to patchy light to moderate feeding by black army cutworm exclusively on herbaceous growth was noted. Only eight sites were pheromone trapped in 1993, following an unusually poor burning season in the fall of 1992. Trap catches had all been below threshold levels[3], and no serious damage had been anticipated.

To aid in forecasting 1995 populations, pheromone-baited plastic "multipher" traps were placed at 21 locations broadcast burned in the fall of 1993 (Figure 4, Table 9).

Trapping results indicate that there is a moderate to high potential for defoliation at the Bell-Irving (CP 10-5) location. This location of 108 ha was generally lightly burned as was the adjacent site (CP 10-4) where few adults were captured. At all other sites trap catches were below the level where defoliation can generally be expected. The traps placed in the wildfire burn at Little Oliver Creek captured very few adults. This was possibly because the fire was confined primarily to the understory with most of the overstory remaining intact, thus disrupting the orderly dispersion of the pheromone.

Though numbers of moths caught using the 1994 lure averaged only 50% of those caught using the older lure, the new lure out-performed the old on two of the four test sites. There was, therefore, considered to be no significant difference in performance of the two lures.

Assessment of the Bell-Irving sites (CP10-5 and CP10-4) in May of 1995 for larval populations would be appropriate especially if spring planting was planned. Black army cutworm populations will continue to be monitored in 1995.

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[3] From province-wide trap results, approximate hazard levels have been worked out. Moth catches of 350-600 indicate a low infestation potential, increasing to moderate and high with catches of over 600 moths.

Table 9. Locations and number of male adult black army cutworm caught in pheromone baited "Multipher" traps, FIDS, Prince Rupert Forest Region, 1994

Location	Number of Moths[1]	
	New Lure	Old Lure[2]
Bulkley TSA		
Pacific Inland Resources Ltd. (PIR)		
CP 508.3 Blunt Cr.	152	
PIR CP 522.4 off Km 38 Nilkitkwa FSR	142	
PIR CP 523.1 off Km 48 Nilkitkwa FSR	170	
PIR CP 520.2 off Km 55 Nilkitkwa FSR	129	
PIR CP 521.2 off Km 55 Nilkitkwa FSR	72	
PIR CP 600.1 off Km 65 Nilkitkwa FSR	260	
PIR CP 622.2 off Km 81 Nilkitkwa FSR	121	102
PIR CP 632.4 off Km 86 Nilkitkwa FSR	80	382
PIR CP 632.2 off Km 86 Nilkitkwa FSR	102	
PIR CP 312.5 off Km 38 McKendrick Pass	302	
PIR CP 308.3 off Km 28 Telkwa R. FSR	280	
BCFS Small Business off Km 31 McDonell FSR	180	
BCFS Small Business off Km 81 Nilkitkwa FSR	120	
Morice TSA		
Northwood CP 535.4 Km 6 Silver Tip FSR	155	
Northwood CP 536.2 off Km 4 Silver Tip FSR	370	
Kalum TSA		
Bell-Irving R. (CP 10-4)	12, 126	
Bell-Irving R. (CP 10-5)	704, 567	
Bowser Main (CP 13-5)	82	53
Deltaic Creek (CP 15-3)	127	281
Little Oliver Creek[3]	5, 15	
Hunter Creek[3] (Blk. 5-200-3)	110, 8(windthrown)	

1 From province-wide trap results, approximate hazard levels have been worked out. Moth catches of 350-600 indicate a low infestation potential, increasing to moderate and high with catches of over 600 moths.

2 Moth catches using the old lure (produced in 1993 and kept frozen) were compared with catches using the 1994 lure to check the uniformity of the pheromone formulation.

3 wildfires

Pests of Young Stands

A total of 47 young stands were surveyed in the region in 1994 to record the incidence, severity and impacts of a full range of forest pests and other factors. Most surveyed stands had been treated under the Forest Resource Development Agreements (FRDA I or II). Unlike prior years when stands were selected with no regard to pest occurrence, this year's survey placed emphasis on spruce stands in areas known to be infested with spruce weevil. More plots were established in these stands. The purpose was to provide information on the distribution and intensity of spruce weevil attacks within the province and to monitor spruce weevil development over time at specific sites. For this reason the number of weevil-infested trees as a percentage of the total number of trees examined, cannot be regarded as representative.

Of the 7235 trees of seven conifer and one deciduous species surveyed in 1994, 4285 (59%) were pest-free (Figure 5), slightly less then the 61% in 1993. Only 126 trees or 2% were recorded as recently dead and 239 (4%) were severely deformed or life threatened. A further 940 (17%) were considered to have net volume loss or to expect loss of long term growth potential. A total of 59 different pests or damage conditions were recorded, ranging from sunscald to moose browse to insect and disease damage. A listing of the major pests/ damage conditions by host is contained in Table 10. Of these 59 pests, 30 caused significant damage (>SI 3, see Figure 5 for definition) while mortality was associated with only 16.

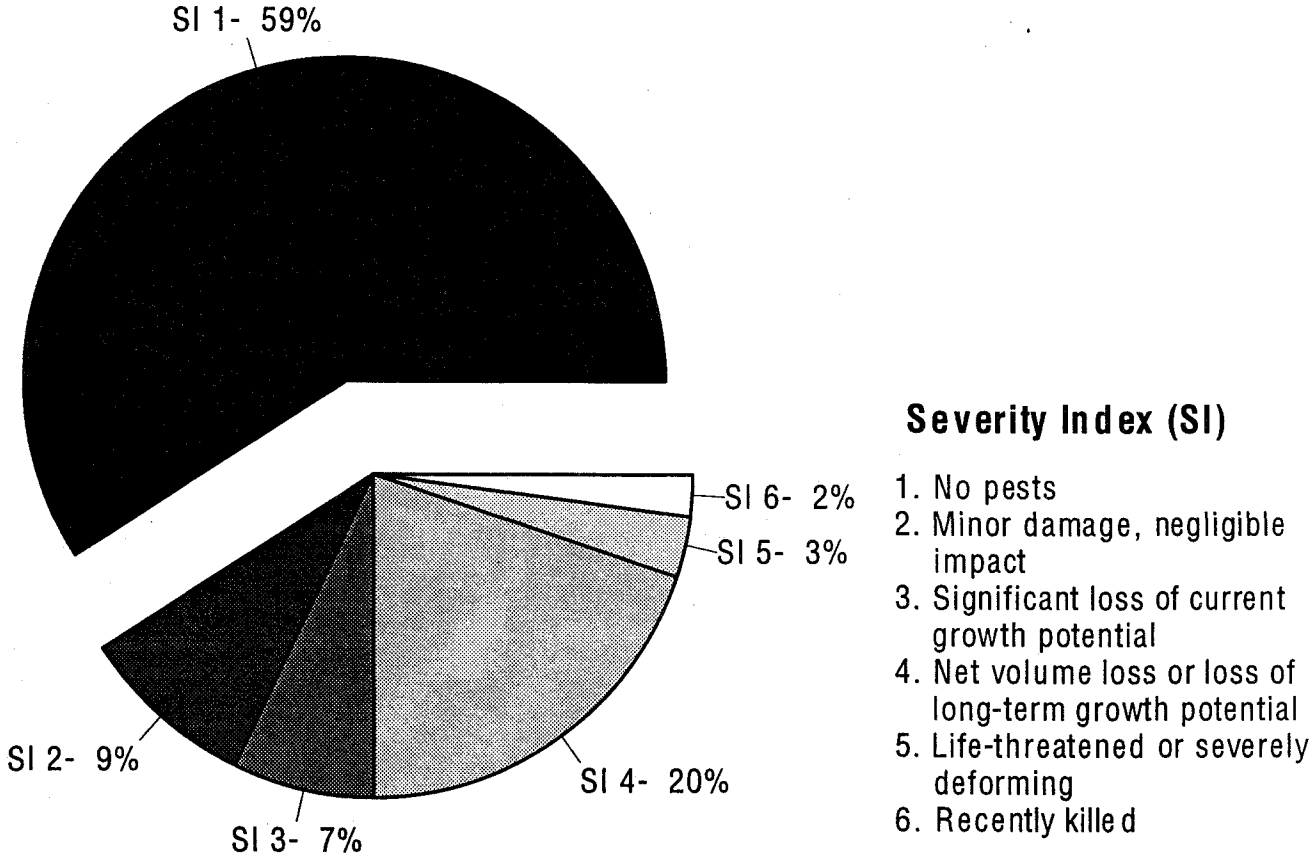

Figure 5. Percentage of 7235 trees of seven conifer and one deciduous species in each of six severity classes (defined above) determined during surveys of 47 young stands, FIDS, Prince Rupert Forest Region, 1994.

Table 10. Frequency, by host, of most damaging pests/conditions in young stands treated under FRDA I/II, FIDS, Prince Rupert Forest Region, 1994

Host/Pest	No. Trees by Severity Index Code (SI)[1]				No. Stands Affected	% Trees Affected by Host		% Trees Affected by Stand[2]	
	6	5	4	3+2		Avg.	Max.	Avg.	Max.
Lodgepole pine-2719 trees, 39 stands, 26 pests/conditions, 1927 (71%) pest free									
Environmental[3]	30	3	-	18	10	10	36	5	15
Cronartium spp. rusts	7	30	-	10	17	4	13	3	10
Western gall rust	2	25	-	61	12	6	18	44	12
Atropellis canker (*A. piniphila*)	2	-	45	-	10	6	18	4	14
Damage cause unknown[4]	1	39	156	131	28	13	40	3	27
Competition	-	11	103	4	19	6	19	4	18
Pine needle cast	-	-	-	141	5	32	99	30	6
Atropellis canker (*A. pinicola*)	-	-	-	22	1	22	22	19	19
Spruce(all spp.)-2392 trees, 41 stands, 26 pests/conditions, 830(35%) pest free									
Environmental	49	37	25	144	13	19	92	1	12
Competition	1	-	276	-	21	26	73	9	64
Spruce weevil	-	6	650	-	17	51	100	13	49
Damage cause unknown	-	22	142	326	28	19	52	2	12
Pineus spp. galls	-	-	5	58	11	9	21	4	14
Western hemlock-1221 trees, 21 stands, 18 pests/conditions, 1042(85%) pest free									
Environmental	23	13	20	2	8	5	16	3	7
Damage cause unknown	-	4	10	34	22	16	30	2	5
Competition	-	-	30	4	6	12	24	6	16
Hemlock dwarf mistletoe	-	-	10	-	2	6	10	4	7
True fir(all spp.)-590 trees, 28 stands, 21 pests/conditions, 291(49%) pest free									
Damage cause unknown	-	8	11	15	24	23	100	2	12
Environmental	-	1	3	5	5	8	13	1	3
Fir-fireweed rust	-	-	-	162	6	55	97	19	53
Competition	-	-	-	29	11	23	75	2	6
Western red cedar-250 trees, 12 stands, 11 pests/conditions, 187(75%) pest free									
Vole	4	-	5	-	1	36	36	8	8
Damage cause unknown	3	-	2	2	5	11	25	2	4
Competition	-	-	14	2	4	24	50	2	5
Environmental	-	-	1	30	1	94	94	26	26
Black cottonwood-63 trees, 1 stand, 4 pests/conditions, 13(21%) pest free									
Damage cause unknown	32	-	-	-	1	51	51	28	28
Moose browse	-	-	6	16	1	38	38	21	21

[1] SI 2 - minor damage, negligible impact
SI 3 - significant loss of current growth potential
SI 4 - causing net volume loss or loss of long-term growth potential
SI 5 - life-threatening or severely deforming
SI 6 - recently killed

[2] all hosts

[3] A range of agents including: drought, frost, flooding, ice/snow, sunscald and windthrow.

[4] A range of conditions including: atypical growth, basal sweep, dead or broken tops, fork of pronounced crook, lean, mechanical damage, multiple tops, multiple leaders and uncharacterized damage.

To ensure a valid representation of stand conditions, a minimum of 100 trees were examined in a minimum of 10 stocked plots (15 plots in the spruce weevil-specific surveys). Plot sizes varied from site to site ranging from 1/200 ha (3.99 m radius) to 1/100 ha (5.64 m radius) depending on stocking. A standard minimum plot interval of 50 m, was increased to 100 m in larger openings to ensure representative coverage. In the Prince Rupert Forest Region this year 7235 trees were examined. An average of 12 plots and 154 trees were examined per site, for an average of 13 trees per plot. Stocking, based on sampling all trees over 0.5 m, averaged 1667 trees per ha, and ranged from 718 to 3209 trees per ha.

The 47 surveyed stands were divided among four biogeoclimatic zones; 21 in the SBS zone, 14 in CWH, 10 in the ICH, and 3 in the BWBS zone. Of stand treatments, 27 were spaced, 8 were planted or fill-planted, 5 were mechanically brushed and weeded, 1 was chemically brushed and weeded, 3 were pruned and 1 was fertilized. The remaining two sites had not been treated.

The 1994 POYS surveys found windthrow to have caused the most mortality in lodgepole pine, while in the spruce (mainly Sitka and hybrid) and hemlock, frost, stemming from a 1992 May freeze, was the main agent of mortality. The only other significant mortality was recorded in a single stand at Salvus, where 31 black cottonwood had been killed by an unidentified agent. The most commonly occurring pest was spruce weevil which had infested (from current and prior attacks) 656 trees in 17 stands. Much of the remaining damage of significance was in the form of growth effects such as forks and crooks, dead or broken tops and others, most of which stemmed from events many years in the past, and for which no cause is known. Competition from other tree, brush and herbaceous species was the third major cause of growth loss and low vigour.

Abiotic damage, primarily frost and windthrow, caused 67% of the mortality and 10% of the overall serious damage (i.e. >SI 3). Assorted damage conditions (combined under the title of "Damage cause unknown") were responsible for 14% of the mortality but 55% of the significant damage. Spruce weevil was the only insect recorded this year causing significant damage. Because of the emphasis on surveying weevil-infested stands, 33% of the instances of damage were attributed to this one pest. Diseases, most notably *Cronartium* spp. stem rusts and western gall rust in lodgepole pine, caused less then 5% of the total mortality and only 6% of the serious damage. Mammals, primarily voles, caused 4% mortality but less than 1% of overall significant damage. A summary of the incidence of the more severe pests and damage is contained in Table 11.

As in prior years, insects and diseases were found to be far less problematic than abiotic influences such as wind and frost. Much of the significant damage was in the form of forks, crooks, and broken or multiple tops, which could only be recorded as effects with no direct links to cause. These types of damage are thought to have been predominantly environmental in origin. Where insects and diseases were the main concern, only a few species caused significant damage. Rather than being outbreak-based like most of the foliage-destroying insects and diseases, these were of the chronic variety and included such pests as stem rusts and spruce weevil. The significance of their damage is based primarily in their long-term activity. This characteristic makes them more responsive to stand-specific management strategies such as spacing regimes or species conversion.

By identifying stands with pest problems that can be mitigated by specific management techniques, POYS surveys provide opportunities to enhance stand values. They also provide valuable "snapshots" of stands taken at the beginning of a period of unmonitored growth. Planned follow-up POYS surveys in five or more years, particularly in stands with significant long-term pest problems such as dwarf mistletoe, stem rusts and spruce weevil, will provide an additional valuable dimension to the record - that of time.

Table 11. Most important pests and/or damage conditions in young stands by frequency and severity, FIDS, Prince Rupert Forest Region, 1994

Pest	No. trees affected[1]			No. stands	No. trees[2]	% trees in stand[3]		
	SI6	SI5	SI4			Avg.	Min.	Max.
Frost	72	25	46	12	656	14	.7	49
Uncharacterized dam.[4]	32	-	2	2	39	16	.3	33
Windthrow	28	3	-	6	31	5	2.6	12
Cronartium spp.	7	30	-	12	47	3	.8	10
Vole	7	5	-	1	12	5	.8	9
Western gall rust	2	25	-	17	88	4	.5	12
Mechanical	1	12	39	24	93	4	.3	14
Tree competition	1	11	444	27	476	12	.3	64
Ice and snow	1	11	11	7	70	10	.6	43
Atypical growth	-	39	6	12	45	4	.3	13
Lean	-	15	2	7	19	2	.7	6
Dead or broken top	-	4	17	23	39	1	.2	5
Basal sweep	-	2	6	5	15	2	.9	5
Flooding	-	2	1	2	3	1	.7	1
Fork or crook	-	1	105	37	322	6	.2	41
Spruce weevil	-	-	656	17	656	13	.7	49
Multiple tops	-	-	117	29	359	6	.8	73
Atropellis canker (*A. piniphila*)	-	-	46	10	47	7	.6	119

1 SI 4 - causing net volume loss or loss of long-term growth potential
SI 5 - life-threatening or severely deforming
SI 6 - recently killed

2 Includes trees with pest damage in SI categories 2 and 3 which have little or no long-term significance.

3 Affected stands only

4 Caused the death of 32 black cottonwood seedlings in a single plantation at Salvus

Special Directed Survey

ARNEWS/Biomonitoring

Between 1984 and 1986, 15 ARNEWS (Acid Rain National Early Warning System) plots were established throughout the province in support of a national program designed to detect early signs of damage related to aerial pollutants or acidified precipitation. Since establishment the plots have been closely monitored and any changes in health and composition have been recorded. In 1992 an additional 12 plots, now called biomonitoring plots, were established to address concerns that some biogeoclimatic zones and major tree species were unrepresented or underrepresented in existing plots. In addition to establishing the new plots in 1992, the focus of analysis was expanded for all plots to better assess conditions in the total forest environment.

In 1994, monitoring of the plot in the Terrace Watershed near Deep Creek continued. No visual evidence of acid rain or aerial pollutants was noted. In sampling using the three-tree beating method, one hemlock looper, *Lambdina fiscellaria lugubrosa* was captured. Minor chlorosis primarily on older foliage of western hemlock (the major host) was noted but no pathogen was found. A combination of shading and climatic stress could be responsible. Evidence of minor incidences of broken tops, stem cankering, galling and sapsucker damage remained unchanged from previous years.

The 1992 established Sitka spruce plot at Onion Lake was again monitored and collection of baseline data from subplots on regeneration, shrubs, herbs, forbs, mosses, lichens and litter was completed. No visual evidence of acid rain or aerial pollutants was noted. Pest damage was similar to the previous year with 28% current attack by *Pissodes strobi* compared to 31% last year and damage from combined old and current attack increased to 69% from 61%. A variety of other pests or conditions were present at very low levels similar to last year. These included trace of old (1992) frost damage, *Zeiraphera* sp., *Chrysomyxa* sp., several *Pineus* sp. galls on one tree, very light rabbit feeding on one tree and minor crooks and forks. Standard beating sampling was again negative for defoliator larvae.

Climatic Damage

Blowdown

During aerial surveys, 696 ha of severe blowdown were noted in 18 different areas over three districts and one class "A" provincial park. This is similar to results documented last year but the damage was recorded in some very different areas due to substantial changes in aerial survey routes.

In the North Coast District, two small areas were mapped at McGregory Point in the Khutzeymateen Inlet while several older previously noted blowdown areas were mapped including the Ishkheenickh River area.

In the Kalum District, old blowdown was noted at Davies Creek in the upper Kitimat River and at Bubo Creek just north of Lava Lake. An area not previously noted was mapped along Exchamsiks River and one along Exstew River. Scattered minor blowdown, which seems to occur annually along the Kitwanga to Meziadin Highway corridor, was again noted during ground assessments.

The only notable blowdown in the Cassiar District, mapped during a partial aerial survey, was two small areas totalling 27 ha along the Klappan River across from Tsargoss Lake.

In the Bulkley TSA a high wind that occurred on August 19 caused extensive scattered blowdown of white spruce and lodgepole pine as well as deciduous species along the Telkwa River corridor. Much of the material was readily accessible and has already been salvaged.

In Tweedsmuir Park, during a special directed aerial survey, two areas of severe blowdown totaling 94 ha were noted just south of Redfish Lake.

Frost

A severe late frost on May 19 and 20 of 1992 (see FIDS annual report for 1992) caused extensive damage to new plantations and young stands in areas from north of Kitimat through to the Cranberry River area in the Nass River Valley. Effects of this severe frost were still clearly evident in two young stands surveyed in 1994.

In one stand near Clearwater Creek, 79% of which was spruce, 92% of the spruce was damaged by the frost, of which 14% was dead and 12% life threatened or severely deformed. In this stand 73% of all trees were affected by frost and 11% were killed. This plantation was located mostly in a low receiving site with frost ponding as a problem even under less severe conditions. The additional problem of severe spruce weevil attack has led to a BCFS decision to replant with an alternative species (primarily lodgepole pine) in 1995.

At Dragon Lake, spruce was also seriously damaged. Representing 48% of the stand, 30% of the spruce were affected, 19% of the spruce were killed and a further 3% severely damaged. This damage represents 9% mortality in the stand. The additional problem of spruce weevil and severe brush has resulted in almost complete replanting of the site in 1993. Mostly lodgepole pine and western red cedar replace the spruce.

Spruce is clearly one of the species very sensitive to untimely frosts. This is yet another reason against using spruce as a pioneer in a monoculture in many areas.

Mammal Damage

Porcupine

No porcupine damage surveys were done, but during regular aerial overview flights in parts of the region, 869 ha of porcupine damage were recorded in 74 separate areas, a sharp reduction from the porcupine-focused surveys of last year when 3012 ha of damage in 228 infestations was recorded.

In the limited North Coast District survey, damage was again concentrated in the Khutzeymateen Inlet with 208 ha affected in 16 areas and along the Ishkheenickh River with 127 ha of damage in 12 areas. In the Kalum District, damage continued in the Shames River drainage with 188 ha affected in 10 areas. In the corridor from Sand River to Terrace, 13 areas totalling 127 ha were noted, although side drainages in this chronically attacked area were not flown this year. In the Nass River Valley, two spots were noted north of Lava Lake, one near Ansedagan Creek and two areas near the mouth of the Kiteen River.

Along Furlong Creek, south of Terrace, scattered attack continued in patches of west facing, semi-mature, lodgepole pine. Eight small areas totalling approximately 100 ha had between 1 and 5% of trees currently discolored, although up to 40% of the pine component was dead or damaged. Adjacent western hemlock and western red cedar were not affected.

In the Cassiar District, porcupine-caused mortality was scattered over widely separated areas. Nine areas totalling 114 ha were mapped from Klastine River south to Burrage Creek. One area was noted near the mouth of Klappan River and one area of 42 ha of light damage in the north along the Hyland River near its mouth. This was the first aerial recording of

porcupine in the district in a number of years and represented only a partial picture, limited to the segment of the district assessed.

Porcupine damage is chronic in parts of the region and can be a serious threat to young stands where repeated attacks occur. Damage may consist of scarring, top kill or tree mortality in young stands. Aerial surveys information usually does not distinguish between top-kill and mortality. Sub-lethal impact has not been clearly quantified. Monitoring of porcupine damage will continue 1995.

Vole

Vole damage was reported from plantations in the Douglas Channel area but damage was noted at only two sites during surveys. At the Salvus area, where voles have been responsible for plantation failures in past years, 17% of western red cedar seedlings were killed and 21% damaged while 10% of hemlock seedlings were damaged at one site. This totalled 9% mortality for the stand, and included both old and new damage, collared and unprotected seedlings. At Dragon Lake, in a plantation replanted because of losses to frost and spruce weevil, one lodgepole pine seedling (representing <1% of surveyed trees) was girdled and dead probably as the result of vole activity.

In a final follow-up assessment at the Oweegee Creek (CP17-5) plantation, no changes had occurred since the previous year and there was as yet no evidence of resurgent vole populations. As previously recorded, 24% of spruce were killed but no fir seedlings dead as a result of vole feeding in 1991. No change in seedling status was noted to date and no recovery by seedlings occurred. Overall only 59% of spruce seedlings were found healthy, 11% additional mortality was due to unknown causes and 5% were damaged by snowpress, vegetative competition or chlorosis. Of the fir, 87% were healthy, with 13% mortality due to unknown causes. The plantation after three years now averages 600 trees/ha based on losses noted in 12 plots assessed.

This study contrasts a reported finding several years ago of a lodgepole pine plantation which showed good recovery from attack. Little recovery was noted at Oweegee Creek. Mortality occurred either immediately or within a year after attack by the vole and spruce was clearly preferred over true fir seedlings. How lodgepole pine might have fared under the above conditions is a question whose answer could affect future species choices in areas where voles are a recurring problem.

Deciduous Pests

Large aspen tortrix
Choristoneura conflictana

Large aspen tortrix populations expanded, defoliating trembling aspen over 7875 ha in 38 infestations scattered over four districts, compared to only 417 ha mapped in one district in 1993. In the Kispiox District, defoliation occurred for the second year in the Cranberry area over 1148 ha compared to 417 ha in the same area last year.

In the Cassiar District, large aspen tortrix was reported in 1993 in the Telegraph Creek area but no aerial surveys were completed. This year 6398 ha of mostly moderate defoliation was recorded in the district in 30 infestations. In 12 areas from south of Glenora to north of

Telegraph Creek, trembling aspen was defoliated on both sides of the Stikine River over 2381 ha. A further 3475 ha of moderate defoliation was recorded in 11 areas on both sides of the Tanzilla River near Cariboo Meadows. Farther south, one area of deciduous defoliation over 249 ha along the Iskut River at the Hoodoo River was found. In the north, the tortrix defoliated 293 ha in six areas along Fourmile River near McDame.

In the eastern districts, defoliation occurred over 132 ha on the northeast side of Tyhee Lake near Telkwa and also along the north side of Burns Lake as an extension of much larger infestations in the adjacent areas of the Prince George Forest Region.

Predictive tools for this defoliator have not been developed, but infestations often last 2-3 years resulting in reduced tree vigor, some growth reduction but little mortality. Various predators and parasites are common but starvation is often cited as the major contributor to collapse.

Birch leafminers

Lyonetia speculella, Profenusa thomsoni

White birch in the area from Echo Lake to north of Bob Quinn Lake was discolored by a birch leafminer, *Lyonetia speculella* for at least the fourth consecutive year. In this first aerial survey in several years, severe damage was recorded over 661 ha compared to the estimate of 5000 ha for the previous year when attack was earlier and more extensive. Little significant damage has resulted to date.

In Terrace, the amber-marked birch leafminer, *Profenusa thomsoni* was again common in patches along some roadsides. Feeding remained light to moderate and occurred late in the season causing no appreciable damage.

Northern tent caterpillar

Malacosoma californicum pluviale

Northern tent caterpillar caused severe defoliation of alder and willow in continuous patches along the highway corridor from south of Tintina Creek through the Meziadin Lake area to the Hanna Creek area. Areas of up to 0.2 ha were up to 100% defoliated. Numerous colonies and severe damage were also noted in cutblocks throughout the area, affecting especially brush alder, willow, wild rose, with lesser defoliation of scattered young black cottonwood. During aerial surveys, moderate to severe defoliation of alder regeneration was mapped over 97 ha in three older cutblocks along the Nass River. In the New Aiyansh area, light defoliation and tents were noted on alder, birch and trembling aspen in two cutblocks. As predicted, defoliation in the Terrace area was negligible to scattered very light.

In the Meziadin area, in fall egg mass surveys in cottonwood and willow, an average of 8.4 egg masses per tree (range 3-27) were found, indicating continued severe defoliation. Numerous egg masses were readily visible in the camping area of Meziadin Provincial Park where severe defoliation is also expected. At the site near New Aiyansh, no egg masses were found on trembling aspen or willow and no defoliation is expected in 1995.

Infestations typically collapse after 3-4 years, as occurred in the Terrace area, usually due to diseases, parasites, predators or weather conditions. No significant mortality has been recorded, although branch dieback and reduced increment occurs with repeated severe defoliation.

Gypsy moth
Lymantria dispar

No moths were caught in single pheromone-baited traps placed at 45 locations in the region (Figure 4) as part of an ongoing cooperative program to detect any introduction of this pest into B.C. No moths have been caught to date in the region in traps placed by FIDS, or in additional traps placed by Agriculture Canada and the B.C. Forest Service.

Trapping was focused in areas frequented by travelers, such as provincial parks, private campgrounds, major highway rest areas, airports and at port facilities. Freighters continue to pose the greatest threat of introduction of the Asian gypsy moth from ships arriving from infested Soviet ports. Recreation vehicles often carry egg masses from central and eastern areas of the continent, where the European gypsy moth is established, and are considered the primary vectors in the spread of the insect.

Pacific willow leaf beetle
Pyrrhalta decora carbo

The Pacific willow leaf beetle caused severe skeletonizing of willow along Highway 16 from Kitwanga to Oliver Creek for the fourth consecutive year. Feeding damage this year expanded along this corridor with moderate discoloration to near Terrace. Foliage browning of both cottonwood and willow was also severe north of Kitwanga, becoming mostly moderate and intermittent in the Cranberry River area.

From Kitwanga to north of Cranberry, by September, adult beetles caused notable discoloration of willow not attacked by earlier larvae as well as on second, or later flushed foliage of previously skeletonized host.

Infestations in the past four years have generally been limited to feeding on willow although this year severe browning/skeletonizing also occurred on young roadside cottonwood north of Kitwanga. No mortality has been recorded and infestations have been reported lasting from 2-10 years.

A Poplar leafminer
Phyllonorycter apparella

A poplar leafminer, *Phyllonorycter apparella,* caused light to moderate discoloration of black cottonwood over 457 ha in 12 infestations north of the Bell-Irving River. Moderate discoloration was noted, on all age classes from roadside regeneration to overmature trees, in six areas over 118 ha along Highway 37 between Beaverpond and Snowbank creeks. Light defoliation was mapped over 339 ha in six areas along Teigen Creek and along the Bell-Irving River north of Hodder Creek.

Outbreaks of this insect have not been previously reported in British Columbia. Little is known about this insect, but similar leafminers generally have little adverse effect on host trees. *Phyllonorycter apparella* is believed to have one generation per year. Adults are thought to overwinter and lay eggs in the spring, probably on undersides of the leaves.

No predictions are available regarding populations or damage expected in 1995, but monitoring in this area will continue.

Chronic Diseases

A number of chronically-occurring diseases (Table 12) are important causes of damage and losses, but are not annually surveyed because they are widespread and fluctuate little from year to year. Management practices to mitigate these diseases are most commonly applied during harvest-regeneration or juvenile stand tending.

Table 12. Important chronic diseases, FIDS, Prince Rupert Forest Region, 1994

Disease	Host(s)[1]	Location	Remarks
Atropellis canker *Atropellis piniphila*	lP	southern half of region	sporadic stem deformation, locally severe impact
Cedar diebacks unknown cause(s)	wrC yC	throughout host range	long term top-down dieback leading to mortality
Comandra blister rust *Cronartium comandrae*	lP	throughout host range	kills young trees especially in crowded stands; locally severe impact
Aspen trunk rot *Phellinus tremulae*	tA	throughout region	causing extensive decay
Hemlock dwarf mistletoe *Arceuthobium tsugense*	wH	through most of host range	widespread, particularly severe in remaining old-growth stands
lP dwarf mistletoe *Arceuthobium americanum*	lP	southeastern part of region	widespread but sporadic, causing significant growth loss
Red ring rot *Phellinus pini*	sS,wS, wH,aF,alF	throughout region	widespread, particularly in old-growth stands
Indian paint fungus *Echinodontium tinctorium*	wH	throughout host range	widespread in old-growth stands, decay common
Spruce broom rust *Chrysomyxa arctostaphyli*	wS	throughout host range	widespread, particularly in northern half of region
Stalactiform blister rust *Cronartium coleosporioides*	lP	throughout host range	particularly damaging in young crowded stands; locally severe impact
Tomentosus root disease *Inonotus tomentosus*	wS lP	throughout interior	growth loss, windthrow and mortality in old-growth, increasing mortality in young stands
Western gall rust *Endocronartium harknessii*	lP	throughout host range	infections widespread in all age classes; minor mortality and stem breakage

1 aF - amabilis fir; alF - alpine fir; lP - lodgepole pine; sS - Sitka spruce; tA - trembling aspen; wH - western hemlock; wrC - western red cedar; wS - white spruce; yC - yellow cedar

Other Noteworthy Pests

Insect populations and the incidences of many diseases fluctuate from year to year; in any one year levels of some potentially damaging pests are sufficiently low that little damage is reported. Occurrences of such pests and others of minor significance are reported in Table 13.

Table 13. Other noteworthy pests, FIDS, Prince Rupert Forest Region, 1994

Host/pest	Location	Description
CONIFERS		
Lodgepole pine		
Atropellis canker *Atropellis pinicola*	Kalum Lake	common, up to 5% of branches infected on some trees
Western gall rust *Endocronartium harknessii*	Cottonwood R., Kitanweliks Cr.	primarily minor incidence of branch galls
Sequoia pitch moth *Synanthedon sequoiae*	Clearwater Cr.	minor incidence
Tomentosus root disease *Inonotus tomentosus*	Sockeye Creek	small pockets of dead pine
Lodgepole pine beetle *Dendroctonus murrayanae*	Km 59 West Morice FSR	killed single large tree
Northern pitch twig moth *Petrova albicapitana*	Nass River	numerous in one plantation
Whitebark pine		
White pine blister rust *Cronartium ribicola*	Astlais Mtn.	causing canker disease and killing branches and/or stems of 70% trees
Spruce (all spp.)		
Engraver beetle *Ips tridens*	Atlin	heavy attack of recent blow-down
A spruce bark beetle *Dryocoetes affaber*	Houston	secondary attack of shade-stressed tree
Yellowheaded spruce sawfly *Pikonema alaskensis*	Terrace; Chimdemash Cr.	mod/sev in several spots; 4 larvae

Table 13. (Cont'd)

Host/pest	Location	Description
A spruce needle blight *Lirula macrospora*	Meziadin Provincial Park	light to mod discoloration of several trees
Large-spored spruce-Labrador -tea rust *Chrysomyxa ledicola*	Dragon Lake; Tatsho Creek	common, low incidence; 83 ha of mod/sev disc of current foliage, young trees
Western hemlock		
Hemlock sawfly *Neodiprion* sp.	Exchamsiks Park	16 larvae from one sample
Ambrosia beetle *Trypodendron lineatum*	Orenda Camp	numerous logs infested
True firs		
A Lachnellula canker *Lachnellula agassizii*	Schulbuckhand Creek	causing occasional incidental branch dieback
Dermea dieback *Dermea pseudotsugae*	Herman Creek	new host record, incidental top dieback in plantation
Balsam twig aphid *Mindarus abietinus*	Schulbuckhand Creek	incidental in young stand
Greenstriped forest looper *Melanolophia imitata*	Kitimat	occasional larvae
Western red cedar		
A tip dieback *Sydowia polyspora*	Little Wedeene R.	new host record, causing minor top dieback
Multiple hosts		
Hemlock looper *Lambdina f. lugubrosa*	Deep Cr., Spencer Lk., Chimdemash Cr.	incidental larvae in standard sample (1-alF[1],2-wH[2],2-xS[3])
Western blackheaded budworm *Acleris gloverana*	Kinaskan, Exchamsiks parks, ChimdemashCr.	occasional larvae in standard samples (2-wH,2-wH,2-wH)
DECIDUOUS		
Black cottonwood		
Poplar shoot blight *Venturia populina*	Mosquito Flats Tyhee Lake	killed up to 20% of terminal and lateral shoots

Table 13. (Cont'd)

Host/pest	Location	Description
Cottonwood leaf blight *Discosphaerina* sp.	SCI nursery	new host record
Poplar leaf blotch *Linospora tetraspora*	SCI nursery, Bob Quinn Lake	common, causing minor damage
Trembling aspen		
Aspen serpentine leafminer *Phyllocnistis populiella*	Kitwanga	5% of leaves of aspen and bCo[4] mined
Aspen leafroller *Pseudexentera oregonana*	Terrace	5-80% of foliage on trembling aspen affected throughout
Aspen shoot blight *Venturia macularis*	Hwy 37 Burrage Cr.	killed more than 50% shoots and leaves on all trees
Cytospora canker of poplar *Valsa sordida*	Km 60 Atlin Road	all older trees severely malformed
A poplar leaf beetle *Chrysomela* sp.	Kitwanga	mod-sev defoliation from adult maturation feeding
Septoria leaf spot of poplar *Mycosphaerella populicola*	Kitwanga	all leaves on lower crown of single tree infected
Prunus sp.		
Taphrina leaf curl *Taphrina flectans*	Hazelton	gouting and witches brooms on many stems near Hagwilget bridge
Mountain and red alder		
Pepper-and-salt moth *Biston cognataria*	Kwinitsa River	incidental along Hwy. with alder sawfly infestation
Fireweed		
A fireweed Sphinx moth *Hyles galli*	Hunter Creek	causing scattered mod./sev. fireweed defol. in burned cutblock

1 alpine fir
2 western hemlock
3 hybrid white X Sitka spruce
4 black cottonwood

Appendices

1. Pest Report - Mountain pine beetle in Tweedsmuir Provincial Park
2. Pest Report - Large aspen tortrix in the Prince Rupert Forest Region
3. Pests mapped during aerial surveys, Prince Rupert Forest Region, 1994.
4. Summary of Forest Pest Conditions, Prince Rupert Forest Region, 1994.
5. Pests of young stands summaries, Prince Rupert Forest Region, 1994.
6. Forest pests in provincial parks, Prince Rupert Forest Region, 1994.
7. ARNEWS and Biomonitoring surveys data, Prince Rupert Forest Region, 1994.

Field stations are located in Smithers and Terrace; from May to October correspondence can be directed to:

Forest Insect and Disease Survey
Box 2259
Smithers, B.C.
V0J 2N0 Ph. 847-3174

Forest Insect and Disease Survey
Box 23
Terrace, B.C.
V8G 4A2 Ph. 635-7660

For the remainder of the year, FIDS Rangers are located at the Canadian Forest Service headquarters for the Pacific and Yukon Region:

Forest Insect and Disease Survey
Pacific Forestry Centre
506 West Burnside Road
Victoria, B.C.
V8Z 1M5 Ph. 363-0739

Additional copies of this report and copies of other reports and publications such as national pest survey overviews, forest pest leaflets, and regional forest pest histories as well as those mentioned in the appendices can be obtained from the Forest Insect and Disease Survey at the above address.