

# Forest Insect and Disease Conditions

Cariboo Forest Region  
1990

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Forestry Canada Forêts Canada

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## INTRODUCTION

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This report outlines the status of forest pests recorded by the Forest Insect and Disease Survey (FIDS) in the Cariboo Forest Region in 1990, and attempts to forecast some of their trends. Pests are discussed by host, generally in order of their importance.

The Forest Insect and Disease Survey is a nation-wide network working within Forestry Canada (formerly Canadian Forestry Service). It is responsible for producing an overview of forest pest conditions and their implications; maintaining records and surveys to support quarantines; supporting forestry research; providing advice on pest conditions; developing and testing survey techniques, and conducting related biological studies. The cooperation of provincial, industrial and municipal agencies is essential for the effective fulfillment of these mandates and is gratefully acknowledged.

The 1990 field season extended from May 28 to September 30, during which there were 300 insect and disease samples and other pest data collected by FIDS personnel. Pest damage was mapped and photographed during 49.8 hours of fixed-wing aerial survey and 2 hours of survey by helicopter (**Map 1**). The British Columbia Forest Service (BCFS) supplied 43.9 hours of fixed wing time and all the helicopter time; Forestry Canada supplied the remainder. Additional information was obtained from an aerial survey contracted by the BCFS.

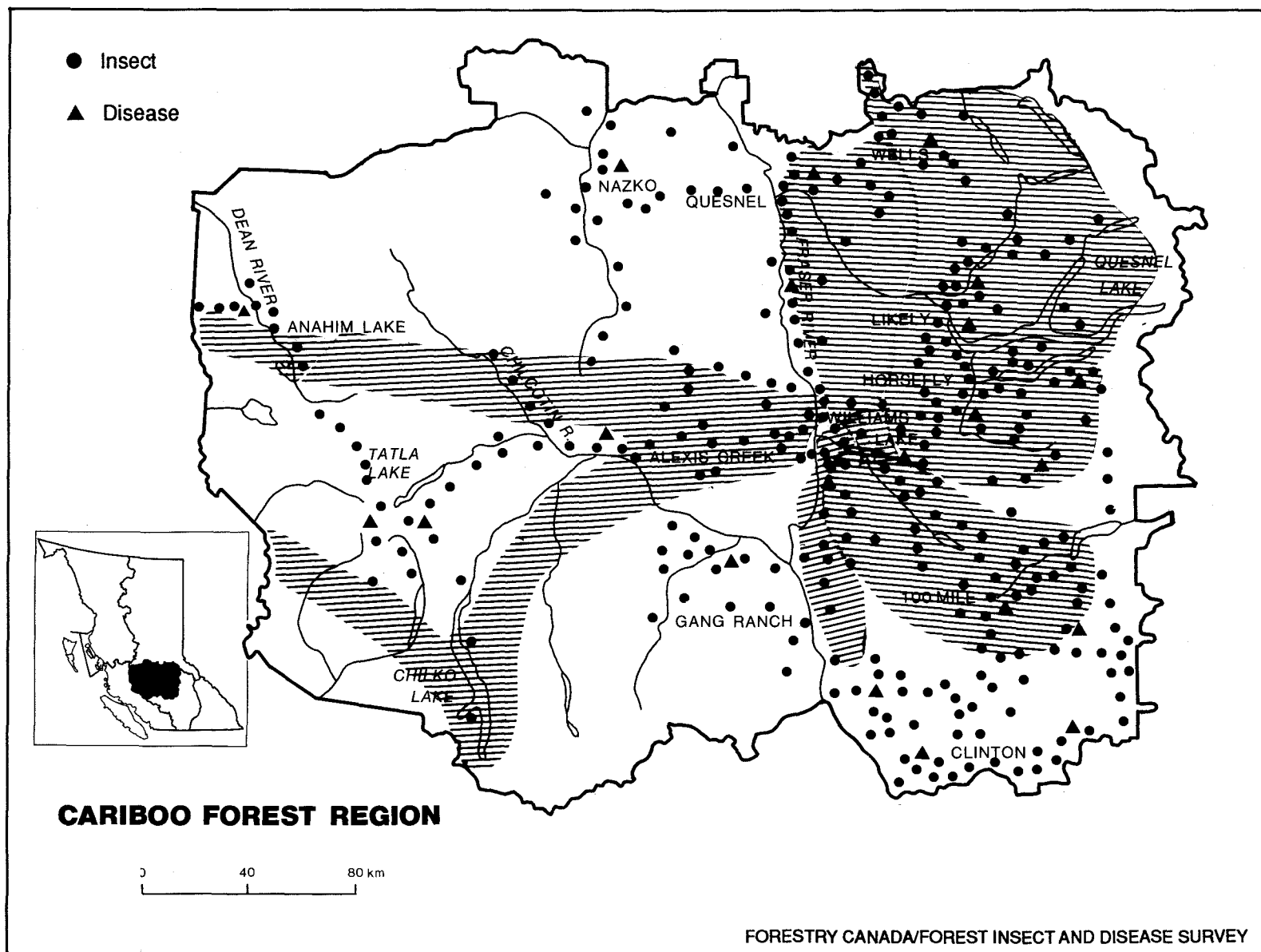
The Forest Insect and Disease Survey has conducted an annual pest survey in the Cariboo Forest Region since the late 1930s and from an established field headquarters at Williams Lake since 1954. Inquiries can be directed to FIDS in the Cariboo Region at this address:

Forestry Canada  
Forest Insect and Disease Survey  
Sidcum Sub., Comp. 33,  
Williams Lake, B.C.  
V2G 2V4, Ph. 392-6067

The field station is closed from October to April; however, FIDS staff including the ranger, may be reached anytime at:

Forestry Canada  
Pacific Forestry Centre  
506 West Burnside Rd.  
Victoria, B.C.  
V8Z 1M5 Ph.363-0600

Larger scale copies of maps included in this report are available on request.



Map 1. Locations where one or more forest insect and disease samples were collected and areas covered by aerial surveys, to map bark beetle and defoliator infestations in 1990.

### SUMMARY

A large increase occurred again in the number of Douglas-fir trees killed by **Douglas-fir beetle**, while the number of lodgepole pine trees killed by **mountain pine beetle** declined slightly, due in part to control efforts by the BCFS. The area of spruce and alpine fir lightly defoliated by **two-year-cycle spruce budworm** increased in the second year of their two-year life cycle. Severe winds on May 5, 1990 caused extensive **blowdown** throughout the region. **Spruce beetle** populations increased in the northeastern part of the region.

Following four years of declining populations, **Douglas-fir beetle** populations increased, killing mature Douglas-fir in 2050 separate patches over 2020 ha from north of Quesnel, south through the host range to Clinton. This was up from 1280 patches over 1160 ha last year. There was no visible defoliation of Douglas-fir by **western spruce budworm** recorded this year, the second consecutive year of decreasing populations.

The area of lodgepole pine killed by **mountain pine beetle** decreased 30% to 315 ha in 155 separate infestations. Ponderosa and lodgepole pine needles were less severely infected than last year by **Elytroderma needle disease** which continued at low infection levels in lodgepole and ponderosa pine in 1990. Defoliation of the current growth of lodgepole pine by **conifer weevil** in the Chilcotin was common in widespread pockets, similar to last year.

**Spruce beetle** populations increased, killing mature spruce over 85 ha in 44 separate infestations, mainly in the northeastern part of the region.

Mature **two-year-cycle spruce budworm** lightly defoliated mainly the new growth of spruce and alpine fir stands over 13 840 ha, up from 2800 ha last year which was a light feeding year of immature larvae. New attacks on immature Engelmann spruce leaders by **spruce weevil** increased to an average of 17% throughout spruce stands in Cariboo region.

Recent mortality of alpine fir caused by **western balsam bark beetle** was mapped at scattered locations throughout the region over 1800 ha, down from 2160 ha last year.

There were 1040 ha of **blowdown** mapped throughout the region, 690 ha of which were at Isaac Lake in Bowron Provincial Park. The damage occurred mainly in stands of spruce, Douglas-fir and lodgepole pine.

In 11 stands 15 years old or younger, the damage most commonly recorded was caused by **lodgepole terminal weevil**, **dwarf mistletoe**, **pine needle blights** or **animals**.

In this report, defoliation ratings are defined as follows:

- Light : discolored foliage barely visible from the air, some branch tip and upper crown defoliation
- Moderate : pronounced discoloration, noticeably thin foliage, top third of many trees severely defoliated, some completely stripped
- Severe : bare branch tips and completely defoliated tops, most trees sustaining more than 50% total defoliation

There was no reported damage to seedlings by **black army cutworm** this year. Damage to roadside conifers occurred again throughout the region, mainly caused by **roadside spray and seepage of salt**. The damage was not as severe or widespread as last year.

**Forest tent caterpillar** moderately to severely defoliated mainly trembling aspen over about 4760 ha in the eastern portion of the region for the fourth consecutive year, up from 3200 ha last year. Surveys and special studies were conducted for **acid rain** at a permanent plot northeast of Quesnel and for **pinewood nematode** throughout the region. There were no adult male **gypsy moths** caught in 25 sticky traps placed in 20 Provincial parks, campgrounds and highway rest areas in the region.

## DOUGLAS-FIR PESTS

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### Douglas-fir beetle Dendroctonus pseudotsugae

The area and volume of mature and overmature Douglas-fir recently killed by Douglas-fir beetle almost doubled to 46 460 m<sup>3</sup> over 2020 ha from 26 600 m<sup>3</sup> over 1160 ha last year (**Map 2**). Infestations occurred in 2050 patches of 3-50 recently killed trees as mapped during aerial surveys, from the Blackwater River north of Quesnel to Clinton, west of the Fraser River to Alexis Creek and east to Horsefly. About 50% of the infestations were new in 1990; the remainder expanded from pockets mapped in 1989.

About 60% of the infestations were mapped in the **Williams Lake TSA**. Along the Chilcotin River in the Chilcotin District, 90 patches of recently killed trees over 110 ha were recorded from southeast of Alexis Creek to Redstone and 11 infestations over about 6 ha along the Chilko River. Recently killed trees were mapped in 630 patches over about 670 ha from Marguerite along the Fraser River to the junction with the Chilcotin River, south of Williams Lake to Dog Creek and from Williams Lake to Chimney and Hawks creeks and north to Tyee Lake.

In the **Quesnel TSA**, over 100 patches were mapped totaling 95 ha, mainly along the Blackwater River from the Euehniko River junction to the Fraser River.

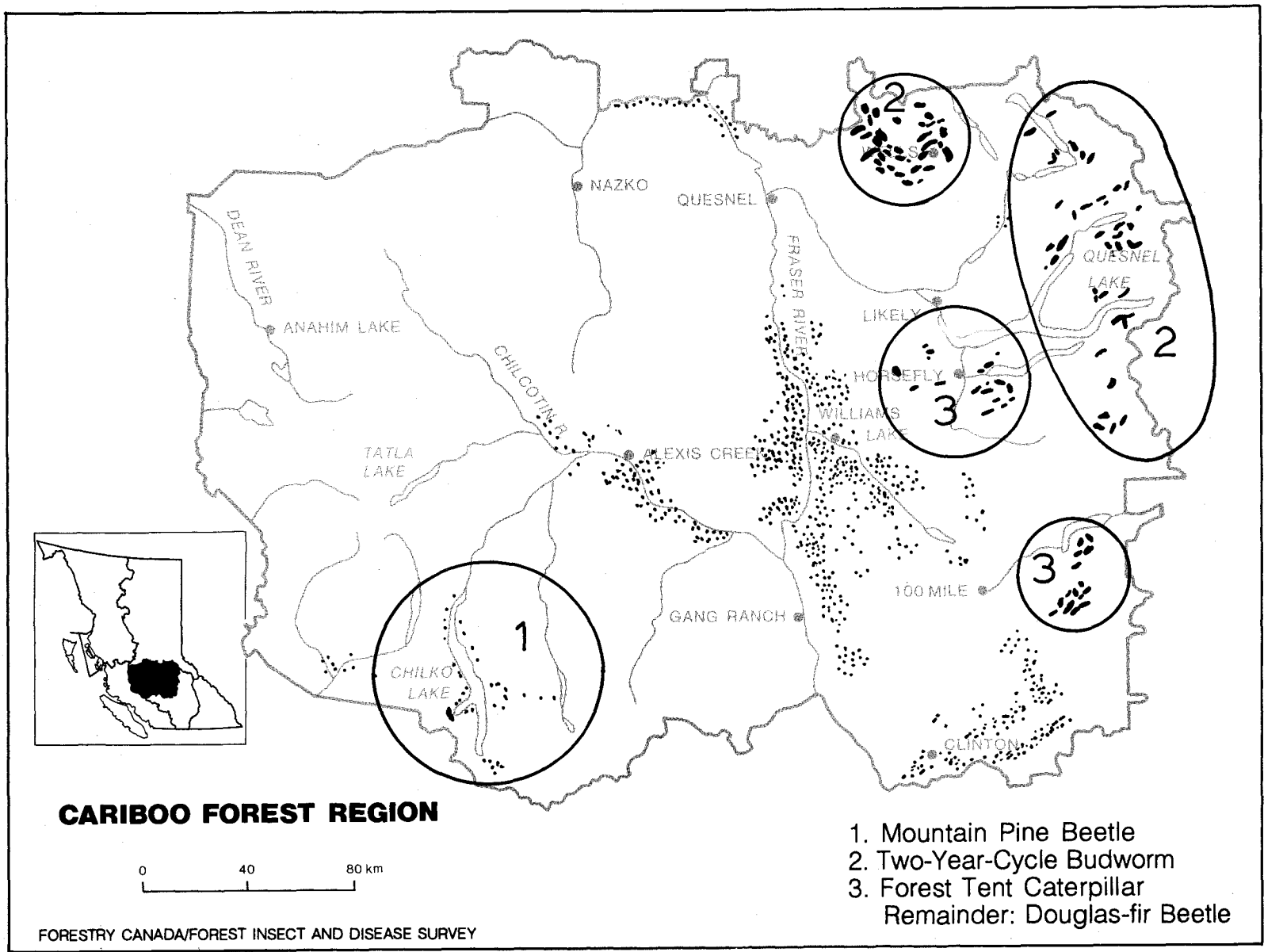
There were 590 infestations mapped over 725 ha in the **100 Mile TSA** west of Clinton to near Kelly Lake, along Loon Lake and Loon Creek and from Clinton to Young Lake in the Bonaparte River Valley.

Infestations were located mainly in the Interior Douglas-fir zone, IDF, and the dry southern subzone of the Sub boreal spruce zone, SBS. The very susceptible mature and over-mature Douglas-fir in the IDF zone extends along the Fraser River from the Highway #20 crossing to Marguerite. In this area trap trees and salvage logging controls are not easily applied due to the steep terrain.

The largest increases and the largest single infestation occurred in the Military Block at Riske Creek where 260 ha in 205 separate infestations were mapped, up from 77 ha in 115 patches last year. The increase was due mainly to high beetle populations and the lack of any control action.

Since 1946, when FIDS records begin in the Cariboo, the largest, Douglas-fir beetle infestations recorded in the Williams Lake TSA were in 1974, when 7500 ha of recently killed trees were mapped and in 1963, when 33 000 trees were killed. This year, about 43 500 large-diameter Douglas-fir trees were killed, more than double the 21 600 mapped last year, making the current infestation the **largest infestation** in the Cariboo ever recorded in FIDS files.

To assess the Douglas-fir beetle population and potential for 1991 attack, 18 fixed-radius plots from 0.12 to 0.39 ha in size were randomly established at representative infestations throughout the epidemic (Table 1).



Map 2. Areas where recent tree mortality and current defoliation were detected during ground and aerial surveys in 1990.



The average current attack was 13% of the stems per ha, range 2-21% and the number of recently killed, red trees averaged 11% (range 4-32%). All plots contained current attack and previously killed grey trees, indicative of established infestations, compared to 1989 when patches of only currently attacked trees were common.

Table 1. Status of Douglas-fir beetle populations in cruise plots in the Cariboo Forest Region, 1990.

Location	Percent of stems/ha			
	Current <sup>1</sup>	Red	Grey	Healthy
Drummond L.	12	7	0	81
Drummond L.(W)	18	17	20	44
Drummond L.(N)	19	7	17	57
Drummond L.(NW)	14	11	9	66
Meldrum Cr.	2	13	9	76
The Dome	3	9	12	76
Williams L.	13	17	4	66
Sheep Cr.	12	9	9	70
Fraser R.	3	5	9	83
English Gulch	14	6	2	78
Mackin Cr.(E)	13	10	15	62
Mackin Cr.	21	5	4	70
Williams Lake R.	17	17	7	59
141 Mile House	14	16	3	67
Soda Cr.	12	12	5	71
Hawks Cr.	4	4	10	82
Hart Ridge	21	32	28	19
Bull Canyon	21	9	7	63
Average	13	11	9	67

<sup>1</sup> Current=trees attacked in 1990; red=trees attacked in 1989; grey=trees killed prior to 1989. Only trees 20 cm DBH and greater were recorded.

The Douglas-fir beetle broods in trees attacked in 1990 were healthy, averaging 14 larvae, pupae and adults per 900 cm<sup>2</sup> of bark surface. This was down from 1989 when 25 healthy individuals were counted. Based on the amount of current attack and the viability of the brood at each infestation examined, the epidemic is forecast to continue in 1991 at levels equal to or slightly less than 1990. Moderating factors such as the use of trap trees and salvage logging will eliminate or reduce the expansion of infestations in areas where those management practices have been used. New infestations are expected to

become evident at some locations next year as trees attacked in 1990 change color.

The British Columbia Forest Service and all logging companies with Douglas-fir beetle infestations in the region felled trap trees in many areas last winter to absorb the emerging beetles in 1990. Host material recently felled and greater than 20 cm in diameter are very attractive to the beetle. The continued use of trap trees allows the absorption and removal of some of the population which will effectively reduce the hazard for beetle attack to adjacent, live, large-diameter Douglas-fir.

Douglas-fir beetle will continue to be a major pest of mature and overmature Douglas-fir in Cariboo Region. Complete elimination of the pest is not possible. Continued management of logging slash, removal of infested windfalls and the use of trap trees will help reduce losses.

**Western spruce budworm**  
**Choristoneura occidentalis**

There was a lowered population and no defoliation of Douglas-fir by western spruce budworm for the second consecutive year. This was a drastic reduction from high populations and light defoliation over 8000 ha in 1988, which followed eight consecutive years of damage in Douglas-fir stands in the Clinton area. The collapse was attributed to natural factors such as weather, parasites, predators and disease.

In May, infested bud counts, which can be used to predict defoliation later in the same year<sup>1</sup>, averaged <1% at two locations near Mahood Lake, <1% at Horsefly Lake, 2% at Viewland Mountain and <1% at Keno Lake near Horsefly Lake. There was no defoliation recorded at the locations sampled in 1990. Standard three-tree beating samples averaged 25 larvae per collection west of Clinton at Cavanagh Creek. Elsewhere in the region, the average number of budworm larvae per three-tree beating sample dropped to <1 from four last year. Egg samples, collected only at Cavanagh Creek, indicated the possibility of light defoliation in 1991.

At a plot established in 1988 at Bridge Lake to monitor long-term budworm population trends, an average of six moths per pheromone-baited Multipher<sup>R</sup> trap were caught, down from nine at the same location last year. A total of three larvae were collected in three branch tip beating samples on each of 25 trees at the same location, similar to the numbers collected in samples there last year. These results indicate a low budworm population in 1991. However, trapping will continue as part of a province-wide study to improve the detection of rising western spruce budworm populations by comparing numbers of larvae and adults to subsequent defoliation levels.

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<sup>1/</sup> 0% of the buds infested = no defoliation  
1-15% of the buds infested = light defoliation  
16-30% of the buds infested = moderate defoliation  
31%+ of the buds infested = severe defoliation

In the Kamloops Region south of Clinton, egg sampling indicated a rising population. Light defoliation is also expected nearby at Cavanagh Creek where 23 egg masses per 10 m<sup>2</sup> of foliage were found<sup>2</sup>. Elsewhere in the region, western spruce budworm populations will generally remain low in 1991.

**Rhizina root disease**  
**Rhizina undulata**

There were no infected seedlings or fruiting bodies found in recently burned, logged blocks at 10 sites surveyed near Cariboo Lake and Horsefly River. Last year, 12% of the newly planted two-year-old Douglas-fir seedlings were killed by Rhizina root disease over five hectares, north of Jacobsen Brothers Forest Products camp, west of Cariboo Lake. Weldwood of Canada in 100 Mile House also reported damage east of 100 Mile House in 1989.

The spores of this fungus are stimulated to germinate when the cut blocks are burned. Newly planted seedlings will be killed if planted in a recently burned, logged block that contains the fungus. Spore dispersal occurs after fruiting in late summer. If moist conditions occur at this time, the disease could spread to nearby blocks that may be destined for burning and infect seedlings planted there within two years.

Infection has been more frequent in the eastern part of the region. The last documented seedling mortality was in 1983 at Hen Ingram Lake east of Horsefly, where an estimated 30% of seedlings were killed in a single plantation over an unknown area. Collections of sporophores and infected seedlings have been made from Raft Creek and Mitchell Bay near Horsefly in 1968 and in a thinning by fire project in 1977 near Riske Creek.

Severe infection can cause up to 75% seedling mortality. Surveys of newly burned, logged blocks for Rhizina root disease will continue in 1991.

**Armillaria root disease**  
**Armillaria ostoyae**

Infections of coniferous trees by this fungus were common throughout the region. The most severe damage was to mature Douglas-fir in several 0.25-0.5 ha patches along the north side of Mahood Lake east of 100 Mile House. The infected trees, 30-60 cm dbh, were also attacked by Douglas-fir beetle, a common situation throughout the Cariboo Region. The dry, rocky, southern exposure probably amplified the effects of moisture stress caused by root rot infection.

Similarly sized patches were also infected near Pendleton Lakes, northwest of Mahood Lake, where Douglas-fir and minor stand components, lodgepole pine and Engelmann spruce, were infected.

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<sup>2/</sup> 1-50 egg masses/10 m<sup>2</sup> of foliage = light defoliation  
51-150 egg masses/10 m<sup>2</sup> of foliage = moderate defoliation  
151+ egg masses/10 m<sup>2</sup> of foliage = severe defoliation

The fungus responsible for this root rot, A. ostoyae, is an aggressive pathogen of conifers that was recently identified as the main component of the group of species causing Armillaria root rot in British Columbia. Diseased trees are scattered singly or in groups and display a variety of symptoms ranging from growth reduction to death. Severe tree mortality can occur in disease centers up to four hectares in size. Once established in the stand, the disease remains until the infected roots and stumps are removed by physically lifting them out of the soil. Infection will continue throughout the Cariboo Region next year.

## PINE PESTS

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### **Mountain pine beetle Dendroctonus ponderosae**

Mature lodgepole pine recently killed by mountain pine beetle, were mapped in 155 separate infestations over 315 ha, mainly in the Chilko Lake area, down from 206 infestations over 720 ha last year (**Map 2**). Elsewhere, populations remained low since the collapse of the last major infestation in 1985, which was mainly due to cold weather and host depletion.

Small infestations, 0.5-2 ha, were mapped over about 100 ha on both sides of Franklyn Arm, similar to 110 ha infested last year at the same location. At the head of Franklyn Arm, the largest single infestation continued over only 250 ha in 18 separate patches along Deschamps and Nine Mile creeks, down from 350 ha in 20 patches there in 1989. About 45 small patches, 0.25-2 ha, were mapped along both sides of Chilko Lake for its entire length, similar to 1989. Only five small infestations over 0.25-1 ha each, were mapped east of Chilko Lake from Yohetta Lake to the Gunn Valley west of Taseko Lake, identical to 1989. There was a major decrease to about 60 ha in 13 infestations along Edmond Creek at the south end of Chilko Lake from over 250 ha in 42 separate infestations last year, mainly due to host depletion. Small patches of 1-5 dead trees were mapped elsewhere at widely scattered locations throughout the region.

The BCFS used 1850 pheromone baits at 43 locations to contain mountain pine beetle populations in the Chilcotin and 100 Mile House Forest Districts. Small, endemic infestations were contained by baiting trees and subsequently destroying the brood produced in those trees either with MSMA which kills the brood under the bark, or by cutting and burning the trees. These methods are effective to control expansion of infestations where the patches are small.

The largest infestations, at Franklyn Arm and Edmond Creek, are expected to continue to decline next year, due to host depletion. The untreated patches elsewhere along Chilko Lake, will probably expand next year unless natural limiting factors such as adverse weather and lack of susceptible host affect them; however, most of the small spots in the region are usually treated.

**Elytroderma needle disease**  
**Elytroderma deformans**

Infection of ponderosa pine by Elytroderma increased in the chronically infected areas near Loon Lake, where there were 5-30 brooms per tree on 50% of the trees from the lake to the junction with Highway 97. In the Clinton area and west to Kelly Lake, 80% of the ponderosa pine were infected with single branch or whole crown defoliation and multiple brooms, averaging 5 per tree.

Infection of lodgepole pine was down near Haines Lake, southwest of Alexis Creek, but increased over a widespread area near Big Bar Lake where an average 6% (range 5-10%) of two-year-old needles were infected on scattered trees 2-15 m high. Infection ranged from 5-40% (average 35%) in all the trees in 0.5-5 ha patches near Green Lake east of Clinton. This area was infected last year; however, the only consequences were up to 40% needle loss and suspected but unconfirmed growth reduction.

The consequences of infection are usually slight in lodgepole pine stands, depending on the severity of infection and the condition of the trees. However, ponderosa pine the main host of Elytroderma, can be severely affected, causing some mortality of weakened trees and branches, especially in dense, overstocked stands. In British Columbia, despite the fact that infections are generally not as intensive as in the USA, Elytroderma needle disease is still the most important foliar disease of ponderosa pine.

**A conifer weevil**  
**Magdalis sp.**

Young, 1-4-m high lodgepole pine were lightly defoliated at two locations south and east of Williams Lake, similar to the levels of damage recorded in 1989.

East of Alexis Creek, 1-2-m high pine in and around the boundaries of three cut blocks were 30% defoliated. Similar intensities of damage were found south of Williams Lake along cut block boundaries, power lines and road rights-of-way.

The beetles multiply in recently created slash and defoliate nearby young lodgepole pine during their maturation feeding. Populations will diminish in areas where the slash has become dry and unattractive to the weevils. Fresh slash from logging or silvicultural treatments in 1991 could contribute to levels of defoliation similar to 1990.

**Lophodermella needle cast**  
**Lophodermella concolor**

Infection of year-old needles of lodgepole pine, resulting in premature needle loss, was widespread this year, an increase from 1989. Multi-aged stands were 50% infected from km 30-km 45 on the Palmer Lake road, west of there to Alexis Creek, east to the Mackin Creek road and in the Timothy Lake area near Lac la Hache. If weather conditions are suitable for spore dispersal, severe infection of trees can occur in successive years, resulting in the loss of foliage and some growth reduction.

**Red band needle disease**  
**Scirrhia pini**

About half of 10-15 m high lodgepole pine over 15 ha near the west end of Mahood Lake were infected by red band needle disease for the first time in more than six years. The disease is not known to have been epidemic in the region; however considerable damage has occurred on ornamentals and in Christmas tree plantations in the Kamloops and Nelson regions. It has been shown in the USA that growth loss begins at 25% defoliation and at 75% all growth stops.

The infected trees at Mahood Lake lost about 60% of their foliage; hence, growth was reduced this year. The disease intensifies under warm, moist spring conditions so the spread next year will depend on the weather early in 1991. The infection is not expected to spread much beyond the lower valley along Mahood and Canim lakes due to lack of host.

**Pinewood nematode**  
**Bursaphelenchus xylophilus**

Sampling for pinewood nematode continued in the Cariboo Region for the eighth consecutive year. There were no nematodes extracted from any of the samples collected. The sampling included 40 adult woodborers collected in flight at log decks in the forest (Table 2), 14 representative low quality lumber samples, and 78 slabs of bark and wood from randomly selected dead and dying trees throughout the region. The whitespotted sawyer beetle, Monochamus scutellatus, was identified in 60% of the collections, making it the most commonly collected woodborer. Small numbers, (1-3) of several other Cerambycidae were found, as well as flatheaded woodborers, Buprestidae spp. and horntails, Siricidae spp.

Table 2. Adult woodborers and horntails collected for pinewood nematode extractions, Cariboo Forest Region, 1990.

Woodborer/Horntail	Number collected	Locations
<u>Buprestis lyrata</u>	1	Pendleton Ls.
<u>B. nuttalli</u>	2	Moffat Ls. Rd.
<u>Dicerca tenebrosa</u>	3	100 Mile House
<u>Monchamus clamator</u>	1	Bull Canyon
	1	Moffat L. Rd.
<u>M. scutellatus</u>	11	100 Mile House
	10	Matthew R.
	3	Pendelton Ls.
	1	Maeford L.
	1	Williams Lake
	1	Narcosli Cr.

(Cont'd)

Table 2. (Cont'd)

Woodborer/Horntail	Number collected	Locations
<u>Rhagium inquisitor</u>	1	Horsefly R.
<u>Sirex juvencus californicus</u>	1	Matthew R.
<u>Strictoleptura canadensis cribipennis</u>	2	Moffat Ls. Rd.
	1	Williams L.
Total	40	

In 1990, only one sample, a white spruce woodborer-attacked log from Watson Lake, Yukon, contained pinewood nematode (confirmed by J. Sutherland, Pacific Forestry Centre). This, combined with previous positive collections from five infected trees and only one adult woodborer in 11 years of sampling throughout BC, confirm that pinewood nematode is extremely rare in the forests of British Columbia.

#### Animal damage

There was an increase in the amount and severity of animal damage this year in the region. East of Quesnel, near Thirteen Mile Lake, 20% of the 4-m high lodgepole pine were partially or completely girdled, probably by horned animals, possibly moose, resulting in 5% tree mortality and some branch mortality. There was similar damage in the area last year: however, the rate of tree mortality was only about 1%.

Damage resulting from feeding by squirrels on mistletoe or rust infections was common in several areas in the Chilcotin. At Bull Canyon, west of Alexis Creek, 50% of the 10-m high lodgepole pine had 10% of the branch tips killed by squirrels over about 2 ha. Over 30% of the 10 m high lodgepole pine had 1-40 flagged branches per tree in .25-50 ha patches near Tatla, One Eye and Bluff lakes. The damage caused by the squirrels will not have a lasting effect on the trees except for some branch mortality.

#### White pine blister rust Cronartium ribicola

High-elevation stands of whitebark pine were examined at two locations in Cariboo Region and found to be infected by this important disease of five-needle pines in British Columbia. About 5% of the 2-5 m high trees were infected by blister rust over four ha at Black Dome Mountain southwest of the Gang Ranch and half of the same size trees were also infected over 15 hectares at Heckman Pass west of Anahim Lake.

The stand at Black Dome had very few active cankers, most of which were removed by the feeding of squirrels. There were some old dead tops from former infections. The infection at Heckman Pass was more active, illustrated by the number (1-3) of active cankers per tree.

Most blister rust infections are usually lethal, especially in white pine; however, the disease in whitebark pine may not proceed in the same manner. Little is known at this time about the way the infection advances in whitebark pine.

## SPRUCE PESTS

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### Spruce beetle Dendroctonus rufipennis

Spruce beetle populations increased in the region in 1990, killing mature Engelmann spruce in 44 separate spots (1000 m<sup>3</sup>) at nine locations in the northeastern part of the Cariboo Region, totalling 85 ha which contained 730 trees. This was a significant increase from single, recently killed trees recorded at scattered locations last year. Recently killed trees were mapped in the eastern part of the Quesnel TSA along Cariboo, Mitchell and Matthew rivers, near Kruger Lake and west at Towkuh, Big Valley, Rebman and Alice creeks, (Table 3).

Table 3. Location, area and number of Engelmann spruce recently killed by spruce beetle, Cariboo Region, 1990.

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TSA and location	Number of infestations	Area (ha)	Number of recently killed trees
<u>QUESNEL</u>			
Mitchell R.	2	12	50
Matthew R.	11	20	70
Bowron L.	1	5	10
Kruger L.	7	10	90
Towkuh Cr.	1	2	40
Big Valley Cr.	2	3	40
Rebman Cr.	13	20	300
Alice Cr.	3	6	100
Cariboo R.	4	6	30
<hr/>			
Totals	44	84	730

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Forest Insect and Disease Survey records show that three spruce beetle epidemics have occurred in the Cariboo Region since 1940; the first in 1962-65 near Big Valley Creek and Cottonwood River, then 1969-70 near Cottonwood River and Cariboo Lake, and the most recent from 1980-86 in Bowron Provincial Park and other scattered locations in the northeastern part of the region. The largest of these epidemics was from 1969-70 and peaked at 26 260 ha in 1970. However, nearby in the Prince George Region, the 1962-65 infestation covered about 222 000 ha, nearly three times larger in area than the largest of the two succeeding infestations in the Cariboo Region.

The last three major epidemics all followed hot, dry, summers and periods of widespread blowdown, causing infestations that started in 1962, 1968 and 1980 in both Cariboo and Prince George regions.

Limited ground surveys revealed light (about 3%) current attack, with only 1-10 recently killed trees per infestation. However, blowdown occurred May 5th, 1990 in the area and the population building up (see "Blowdown" section) in the blowdown could promote expansion of the infestations beginning in 1991.

Faced with an increasing population, forest managers must place high priorities on blowdown salvage for spruce beetle population control in any mature spruce stand. The high spruce beetle hazard forest types do not respect regional boundaries, so the spruce beetle populations building along the northeastern boundary between Cariboo and Prince George regions should be considered as a single infestation in management plans.

#### **Two-year-cycle spruce budworm Choristoneura biennis**

Mature two-year-cycle spruce budworm lightly and moderately defoliated spruce and alpine fir stands over 13 840 ha from Willow River in the Quesnel TSA to north of Mahood Lake in the 100 Mile House TSA (Map 2, Table 4)

This was an increase from 2790 ha of light defoliation in the same areas last year caused by immature larvae. However, it was about 60% less than in 1988 when 40 500 ha were lightly and moderately defoliated by mature larvae.

Most of the defoliation was mapped in the **Quesnel TSA**. There were over 8400 ha of light and 110 ha of moderate defoliation: in 20-500 ha patches along the Willow River from the regional boundary south to Barkerville, along Lightning Creek from Pinegrove to Stanley, and along Big Valley Creek. Light defoliation was recorded in Bowron Provincial Park over 1070 ha at Huckey, Betty Wendle and Turner creeks and at the south end of Isaac Lake, up from about 600 ha of light defoliation in 1988.

In the **Williams Lake TSA**, Engelmann spruce and alpine fir were lightly defoliated over 400 ha in 20-200 ha patches in the Quesnel Lake area, down from 11 630 ha in areas infested in 1988. New infestations were mapped along Penfold Creek south of Mitchell Lake. The remaining infestations were located in the same areas as in 1989 but at lower intensity. Defoliation was mapped along the north and east arms of Quesnel Lake and in the Crooked Lake-Hendrix Lake area.

Table 4. Location and area of spruce and alpine fir defoliated by two-year-cycle spruce budworm, as determined from aerial and ground surveys, Cariboo Forest Region, 1990, 1988.

TSA and location	Area of defoliation (ha)		
	Light	Moderate	Total
<u>QUESNEL TSA</u>			
Paput Cr. - Archer Cr.	1220		1220
Tregillus Cr.	900		900
Willow R.	4040	110	4150
Big Valley Cr.	980		980
Lightning Cr.	810		810
Matthew R.	400	30	430
<u>Bowron Provincial Park</u>			
Isaac L.	640		640
Lanezi L.	130		130
Betty Wendle Cr.	40		40
Huckey Cr.	260		260
<u>Bowron Park</u>			
Subtotal, 1990	1070		1070
Subtotal, 1988	500		500
TSA Subtotal, 1990	9420	140	9560
TSA Subtotal, 1988	21 200	400	21 600
<u>WILLIAMS LAKE TSA</u>			
Mitchell Lake	230		230
Niagara Cr.	90		90
Penfold Cr.	150		150
North Arm Quesnel L.	900		900
Roaring R.	250		250
Quesnel L. (East arm)	1510		1510
Horsefly R.	350		350
MacKay R.	100		100
TSA Subtotal, 1990	3580		3580
TSA Subtotal, 1988	11 630	1260	12 890
<u>100 MILE HOUSE TSA</u>			
Deception Cr.	700		700
TSA Subtotal, 1990	700		700
TSA Subtotal, 1988	5800	210	6010
GRAND TOTAL, 1990	13 700	140	13 840
GRAND TOTAL, 1988	38 630	1870	40 500

Infestations were reduced in area and intensity in the 100 Mile House TSA, with light defoliation over only 700 ha at Deception Creek, down from 6010 ha in 1988. This was also a decrease from 1989, a non-feeding year, when 2020 ha of light defoliation were mapped at Rushing, Deception and Spanish creeks.

The moth flight and egg laying occurred after July 15 at most locations. Five pheromone-baited traps caught an average of 221 moths per trap at Bowron Lake and 312 per trap at Wells, up from 117 and 62, respectively, in 1988. However, there were only 1.3 late instar larvae per 45-cm branch tip beating sample from each of three branches from 25 trees at each permanent plot location. The data from these plots will be used to equate level of damage to the relative size of the budworm population. The number of adults caught in the traps suggests a sufficient population to continue the infestation.

To predict defoliation of alpine fir and spruce stands for 1990, 100 buds were examined at each of eight locations throughout the infestation in May (Table 5). The resulting defoliation was as predicted or slightly less intensive at all locations sampled.

Table 5. Percent buds infested by 2-year-cycle spruce budworm, predicted defoliation and actual defoliation, Cariboo Forest Region, 1990.

TSA and location	Percent of buds infested (May)	Defoliation	
		Predicted <sup>1</sup>	Actual (August)
<u>QUESNEL TSA</u>			
Paput Cr.	8	L	Trace
Willow R.	15	L	L
Tregillus Cr.	25	L	Trace
Nine Mile Cr.	5	L	Trace
<u>WILLIAMS LAKE TSA</u>			
Horsefly R.	6	L	L
MacKay R.	12	L	Trace
Sellers Cr.	10	L	Trace
Hendrix L.	5	L	Trace

<sup>1</sup> Percent buds infested in second year of life cycle = percent defoliation, (FIDS Report 84-1)

There was an average 210 egg masses per 10 m<sup>2</sup> of foliage, collected at two locations in the Barkerville area, less than an average 276 from eight locations in 1988. Collections of two mid-crown branches from each of 10 trees at each location were used to determine the number of egg masses per 45 cm

branch tip. This number was extrapolated to the number per 10 m<sup>2</sup> of foliage to allow prediction of defoliation for 1991<sup>3</sup>.

Budworm populations are affected to a minor degree by parasitism and diseases: however, the climate seems to be the greatest single factor causing change of numbers. Based on the egg counts and lack of parasitism and disease in larval collections, the outbreak is expected to continue next year. The small, immature larvae could cause light defoliation in patches in the Barkerville-Willow River area.

Top-kill, branch dieback and loss of annual increment are some of the major results of continuous budworm infestations in spruce and alpine fir stands. In severe infestations, the added stress of defoliation could help predispose the large diameter spruce to spruce beetle attack.

### Spruce weevil Pissodes strobi

Attacks on immature Engelmann spruce leaders by spruce weevil continued at varying intensities throughout immature spruce stands in the region.

There was high incidence of recent terminal mortality was near Walker Creek along the Horsefly River, where 9% of 1-15 year old, 2-m high spruce were attacked. Half of the affected leaders were currently infested with large numbers of progeny to continue the infestation next year. Elsewhere in the region, infestations ranged from very light to severe (2-30% attack) and are also expected to continue in 1990.

Clipping and storage of the infested leaders at the clipping site in a cage, enables the parasites to emerge while containing the emerging adult weevils. This is still the most effective method of spruce weevil control. There are several criteria that should be followed for this method to be effective (pers. commun. J.W.E. Harris):

- 1) select a plantation that is isolated from other infested stands by approximately 1-2 kilometers;
- 2) clip all old and currently infested leaders;
- 3) take enough of the leader to ensure all of the progeny are removed;
- 4) treat the plantation again the following year to ensure all the weevils were collected;
- 5) maintain quality control of work performed.

This method, while not perfect, is the best one available at present and will greatly reduce the total losses in height growth in infested plantations.

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<sup>3/</sup> 1 to 50 egg masses = light defoliation  
51 to 150 egg masses = moderate defoliation  
151+ egg masses = severe defoliation

ALPINE FIR PESTS

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Western balsam bark beetle-fungus complex  
Dryocoetes confusus  
Ceratocystis dryocoetidis

Recently killed mature alpine fir were mapped over 550 ha in 25 separate infestations in high-elevation spruce and alpine fir stands throughout the region, down from 2160 ha in 70 infestations last year. About 3240 m<sup>3</sup> of fir were killed compared to 12 450 m<sup>3</sup> last year. The most severe damage was recorded over 180 ha along Franklyn Arm on Chilko Lake and from there to Tatlayoko Lake. Other areas of noteworthy tree mortality included over 160 ha near Hendrix Lake and over 40 ha in the MacKay River drainage. This reduction is reflected more by the current patterns of aerial survey rather than a biological change in the population.

The number of trees killed fluctuates from year to year, generally expanding until the mature fir component is depleted. Western balsam bark beetle is a chronic pest of high-elevation spruce-balsam stands throughout British Columbia and infestations and tree mortality are expected to continue next year.

PESTS OF YOUNG STANDS

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Stands 4-18 years old, were surveyed at 11 locations to monitor pest damage in the 11th consecutive year of study. The natural and planted regeneration was sampled using fixed radius plots, 2.82-4.9 m, on transects through the plantations (Table 6).

Table 6. Summary of pests of young stand surveys in the Cariboo Region, 1990

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Host/Pest	Percent trees affected	No. of stands affected	Severity index <sup>1</sup> and remarks
<b>Lodgepole pine</b>			
Lodgepole terminal weevil <u>Pissodes terminalis</u>	1-7	4	S.I.=3. 7.5% of pine 2 m high infested at Kloakut L.
Warrens, root collar weevil <u>Hylobius warreni</u>	1,2	2	S.I.=6. Continued low pop. throughout the region.
Pine needle cast <u>Lophodermella concolor</u>	7	1	S.I.=3. 20% total defoliation at Mackin Cr.
Dwarf mistletoe <u>Arceuthobium americanum</u>	4	1	S.I.=4. Severe stem infection on 90% of trees infected at Joes L. Rd.

(Cont'd)

Table 6. (Cont'd)

Host/Pest	Percent trees affected	No. of stands affected	Severity index <sup>1</sup> and remarks
Animal damage	1-14	4	S.I.=5. 60-100% of stems partially girdled at Cottonwood R. causing 20% tree mortality. 1-14% of young trees bent or deformed by cattle near Enterprise Cr. and Williams L.
Conifer weevil <u>Magdalis lecontei</u>	7,66	2	S.I.=3. 5 and 10% total defoliation in 14- and 18 year-old, spaced stands throughout the pine stands west of the Fraser River.
Elytroderma needle disease, <u>Elytroderma deformans</u>	5	1	S.I.=3. 20% defoliation of trees infected at Enterprise Cr.
<b>Douglas-fir</b>			
Cooley spruce gall adelgid, <u>Adelges cooleyi</u>	78	1	S.I.=3. 20% of trees infested had 5% of needles damaged near Mt. Timothy.
<b>Engelmann spruce</b>			
Cooley spruce gall adelgid <u>Adelges cooleyi</u>	50	1	S.I.=2. 25% of the new shoots were galled at Mackin Cr.
Spruce weevil <u>Pissodes strobi</u>	9	1	S.I.=4. The attacked trees were all currently attacked at Horsefly River.
<b>Alpine fir</b>			
Fir-fireweed rust <u>Pucciniastrum epilobii</u>	14	1	S.I.=3. 20% total defoliation of trees infested near Quesnel L.

<sup>1</sup> Severity index (S.I.):

1. Pest free
2. Negligible damage
3. Loss of current growth potential
4. Loss of long term growth potential and volume
5. Life threatening
6. Mortality

Lodgepole pine was the main component of the six stands sampled in the IDF biogeoclimatic zone, with spruce and alpine fir the major components in the ICH and SBS zones.

One of the most common types of damage was caused by cattle and rabbits, occurring in 30% of the plots. Damage resulted in deformed stems on 5% of the trees, and girdling of 60-100% of the circumference of the stems often resulting in tree mortality. These types of damage can reduce stocking and will significantly affect the type of mature stand that will result.

Young lodgepole pine examined were slightly more severely infested by **lodgepole terminal weevil**, Pissodes terminalis, this year. There was an average 3% of trees attacked in 36% of the stands, compared to an average 2% in 42% of the plots last year. The trees infested will lose all height growth for one to two years and the dying top will offer an infection point for secondary fungi. **Warrens' root collar weevil** Hylobius warreni, infested less than 2% of trees in 18% of the pine stands, resulting in tree mortality in mainly the wetter areas of the plantations. Populations of the **conifer weevil**, Magdalis sp., remained low, causing 5-10% total defoliation in two stands. Little permanent damage usually results from infestations of this insect since populations are only high when allowed to build up in slash from logging or stand management such as spacing. **Pine needle diseases**, **Elytroderma needle disease**, caused by Elytroderma deformans and **Lophodermella needle disease**, caused by Lophodermella concolor, infected an average 20% of foliage in two stands.

The climatic injury which occurred in 1989 in the eastern portion of the region, did not result in further damage to plantations, possibly because of the damp fall and spring last year which contributed to good growth. Damaged trees were able to refoliate with only slight branch and bud mortality. **Spruce weevil**, Pissodes strobi, killed 9% of the spruce leaders in a single plantation near Horsefly River, up from 4% last year. The prediction made last year of possible increases in **Rhizina root disease** in seedlings, caused by Rhizina undulata, did not occur possibly because climatic conditions were not favorable to the disease.

Assessment of young stands will increase in 1991 as a larger percentage of forest management resources are focused on young stands.

#### MULTIPLE HOSTS PESTS

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##### Blowdown

Widespread blowdown occurred throughout the Cariboo Region on May 5, 1990. There was a total 1040 ha of spruce, Douglas-fir and lodgepole pine windfelled in patches large enough to be mapped throughout the region. The most severe was in overmature Engelmann spruce and alpine fir in Bowron Lake Provincial Park. There were over 690 ha mapped in the northeast corner of the park on both sides of Isaac Lake and in small patches south of Indianpoint Lake and along the east shore of Bowron Lake. Most of the damage occurred on west facing slopes, cut block edges, road rights-of-way and selectively logged areas.

Blowdown was recorded in the Chilcotin over 10 ha near Charlotte Lake, 70 ha south of Alexis Creek, and over 35 ha in the Itcha Range. Over 210 ha were mapped near Narcosli Creek and Nazko River southwest of Quesnel and 20 ha southeast of 100 Mile House. Many scattered individual trees were also blown down but not recorded. This type of single tree damage occurred mainly through the IDF biogeoclimatic zone around Williams Lake.

West of Williams Lake in the DND Block near Riske Creek, there were an average 6 lodgepole pine and Douglas-fir trees blown down per hectare on mainly west-facing slopes; average 3 lodgepole pine per hectare at Big Creek; 2 Douglas-fir per hectare at Enterprise Creek, .25-2 ha patches of lodgepole pine in the Palmer Lake area, 2-20 ha patches of pine near Mackin Creek and 1 Douglas-fir tree per hectare near Alkali Lake.

A survey of the patches of blowdown in Bowron Provincial Park was conducted September 18-24 in cooperation with BC Parks and the BC Forest Service. The purpose of the study was to determine the status of the spruce beetle, Dendroctonus rufipennis, population in the blowdown to predict the potential for attack in currently healthy spruce, in and adjacent to the park. An estimated 29% of the windthrown spruce contained an average of 12 spruce beetle attacks per m<sup>2</sup> of bark.

To estimate the amount and quality of windfall and the incidence of recent attacks by spruce beetle, 15 cruise lines were established at Isaac Lake on compass bearings through the patches of windfall. Three-person crews used fixed-radius plots every 50 m to measure the fallen trees and remaining stand. Recent spruce windfalls were examined for spruce beetle attack as they were encountered along the cruise lines. These trees were sampled by removing three 20X25 cm areas of bark, one each at the base, mid and top of the log. The number and category of each life stage was recorded on a 12.7X20 cm subsample on each of the three samples. The data were analyzed (Table 7) using standard statistical analysis methods at Pacific Forestry Center, with the help and cooperation of Drs. T. Shore and L. Safranyik. The averages were weighted by the numbers of trees sampled.

About 29% of the spruce windfall contained beetle progeny in one or more samples. The population consisted of 5% eggs, 5% 1-3-instar larvae, 62% 4-6-instar larvae, 11% pupae, 15% teneral adults and 2% mature adults. There was an average of 12 attacks per m<sup>2</sup> of bark area with the majority of the population (79%) in a normal 2-year-cycle and 21% in a 1-year-cycle. The "R" value<sup>4</sup>, a ratio of attacks to brood used to predict population trends, was 0.9, indicating a static population, not about to expand greatly.

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<sup>4</sup>/ "R" values: decreasing = 0.7; static = 0.8-1.3; increasing = 1.4+.



Table 7. Summary of spruce beetle cruises in blowdown in Bowron Lake Provincial Park, Cariboo Forest Region, 1990.

Cruise No. and location	No. of logs attacked by spruce beetle	Total no. logs	Average no. per m <sup>2</sup>			
			eggs	larvae	pupae	adults
1 Wolverine Bay	8	38	34	69	10	16
2 South Shore	9	51	19	75	4	14
3 Peever Point	7	30	0	92	29	0
4 Wolverine Bay	3	29	0	370	0	103
5 Nigoo Cr.	21	34	18	94	14	13
6 Nigoo Cr.	11	12	0	202	74	190
7 Nigoo Cr.	1	1	0	335	26	348
8 Indianpoint Portage	10	31	0	101	58	11
9 South Shore	9	41	7	153	0	11
10 South Shore	3	25	0	90	0	4
11 Mt. Peever	1	20	0	129	25	0
12 Mt. Peever	8	14	0	242	0	3
13 Moxley Cr.	1	1	0	194	0	0
14 Moxley Cr.	1	1	0	194	0	25
15 Mt. Peever	1	9	0	387	0	0
Total:	94	337				

Additionally, 40% of the samples contained woodborers, Cerambycidae, which affected 2.8% of the phloem area; 27% contained engraver beetles, *Ips* spp., which affected 3% of the phloem; and 29% were infested by ambrosia beetles, *Trypodendron lineatum*, which affected less than 1%. The galleries of these insects contribute to the drying effect in the sapwood making it unsuitable for attack by spruce beetle. The condition of the phloem in the bark samples was estimated using moisture content as a basis. In 87% of the 1011 bark samples examined, the phloem was considered suitable for attack by spruce beetle.

The majority, 79%, of the population was 2-year-cycle, which means the main part of the population will emerge in 1992 and the remainder in 1991. However, there was a small, endemic population at Isaac Lake which will emerge next year.

The windfall with roots in the soil will remain attractive to emerging beetles in 1991 and possibly 1992 as well. According to Forest Insect and Disease Survey files, the last blowdown in the park in 1975 remained attractive until 1977. If the blowdown is still available to spruce beetle in 1991, it will protect the nearby standing green trees by absorbing some of the beetles destined for them. Some trees were broken off 2-5 m above the ground. These trees, and those partially infested by spruce beetle, woodborers, and engraver

or ambrosia beetles will probably not be suitable for attack by spruce beetle next year<sup>5</sup>.

The last infestation from 1980-86 in Bowron Lake Provincial Park coincided with an infestation in the Prince George Region in the Bowron River drainage outside the park. At the height of that infestation in 1982, there were 133 attacks per m<sup>2</sup> of bark surface in windfalls compared to 12 this year at Isaac Lake<sup>6</sup>.

Beetle populations in windthrow in Bowron Lake Provincial Park are small; however, they could increase and threaten adjacent trees in 1992. Reduction of the numbers of beetles in the windfall would reduce the potential for spruce beetle attack.

Populations in adjacent areas outside the park in the Cariboo and Prince George regions increased this year for the first time since 1986. Numerous small spots of recently killed spruce mapped during aerial surveys have the potential to increase and attack spruce in the area.

Previous infestations in the Cariboo Region began with large-scale blowdown and usually followed the same pattern; the population built up in the windfall, many completing their life cycles in one year, which concentrated the numbers of emerging beetles and resulted in more successful attacks in standing green trees. Other factors contributing to spruce beetle epidemics include abnormal weather conditions, which can cause moisture stress in mature spruce forests, and deep snow cover, which insulates the developing beetles from low temperatures and predation by woodpeckers.

The Douglas-fir blowdown in the IDF zone near Williams Lake is also infested by Douglas-fir beetle (average three attacks per 900 cm<sup>2</sup> of bark) which will add to the population of beetles expected in the next flight in the area in in the spring of 1991.

#### **Black army cutworm** **Actebia fennica**

There were no reports of cutworm populations or damage to seedlings in the region this year. The last reported damage to seedlings was in 1985 in the Horsefly-Likely area.

Pheromone-baited Multipher<sup>R</sup> traps were placed at four locations, two in the Horsefly River drainage and two near Cariboo Lake, to monitor and detect rising cutworm populations. There were nine male moths caught southeast of Cariboo Lake, none southwest of the lake, and two at MacKay River near the Horsefly River. The traps were placed in recently burned areas not yet refoliated, still black, and attractive to black army cutworm. Populations did exist at each area sampled; however, the numbers were well below the tentative

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5/ Schmid, J.M. and R.H. Frye, USDA For. Serv., Gen. Tech. Rep. RM-49. Dec. 1977

6/ Andrews, R.J., 1982. Forest Insect and Disease Conditions, Cariboo Forest Region, For. Can, FIDS, PFC, Victoria

infestation threshold. The areas will be re-checked in 1991. If weather conditions favorable to black army cutworm development, such as an early warm spring, occur at any recently burned and logged blocks there could be a build-up of populations at those locations next year.

### Salt damage

The amount and severity of salt-caused damage to roadside conifers was much reduced this year. Scattered defoliated branches were observed along Highway 97 from Williams Lake to Clinton and along Highway 20 from Williams Lake to Bella Coola where large numbers of trees were 100% defoliated and killed last year. The large amount of mortality visible in segments of those highways was mainly caused by the previous year's damage.

The damage resulted when salt spray from snowploughs contacted the branches of roadside trees and the saline run-off permeated the soil supporting them. The damage was most severe on the lower parts of the roads and on hills and corners where large amounts of salt were applied. Trees weakened by salt become attractive to secondary beetles and Douglas-fir beetle.

Damage will probably occur again next year, since there is no economical alternative to salt application for ice control on interior highways.

## DECIDUOUS TREE PESTS

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### Forest tent caterpillar Malacosoma disstria

The area of aspen forest lightly to severely defoliated by forest tent caterpillar east of Highway 97 increased to 4760 ha in 74 separate patches in 1990 from 3210 ha in 71 infestations last year (Map 2).

The infestation moved northward from near Bridge Lake area to the Horsefly area. The extent and severity of the defoliation was reduced in the Bridge Lake area to 1560 ha light to severe from 1950 ha severe last year. The two consecutive years of severe defoliation has caused minor branch and top mortality and mortality of some weaker trees.

Poplar stands south of Canim Lake were lightly to moderately defoliated over 1380 ha, up from 900 ha last year. In the Horsefly area, new infestations caused 1250 ha of severe defoliation, mainly from the Horsefly River north to the west end of Horsefly Lake. Other patches of new defoliation were located east of Hendrix Lake over 480 ha. Isolated, small 2-20 ha patches were mapped again east of Lac la Hache near Timothy Lake. Small poplar and willow shrubs, 1-3 m high, were 100% defoliated over about 20 ha north of Barkerville in the Williams Creek Valley. This area was not infested last year.

To help predict the trend of the tent caterpillar population, egg masses were assessed on each of three trees at four representative infestations (Table 8). The surveys indicated 50% of the sample areas would be severely defoliated in 1991. In 1990, infested stands were defoliated at the intensity predicted in 1989.

Table 8. Location, number of egg masses and predicted defoliation of trembling aspen by forest tent caterpillar, Cariboo Forest Region, 1990.

Location	Av. no. of egg masses/tree		Avg. dbh (cm)	Predicted <sup>1</sup> defol. 1991	Avg. defol. 1990
	New	Old			
Horsefly	10	2	14	moderate	moderate
Eagan L.	3	21	32	light	light
Meiss L.	16	4	15	severe	severe
Canim L.	18	19	24	severe	severe

<sup>1</sup> A 10-cm dbh tree would be 100% defoliated with 11+ egg masses.

In 1983-84, infestations included the same areas that were infested this year. At that time, the Quesnel River Valley and areas near Horsefly and Likely were also infested. It is expected that the tent caterpillar populations will spread into these areas in 1991. To support the prediction further, the large infestation in the Prince George Region has spread down the Fraser River Valley toward Quesnel.

Wherever poplar and other deciduous trees are infested by forest tent caterpillar, the results are growth reduction and branch and top dieback and a great nuisance to the public since many of the areas affected are private and recreation property.

**Northern tent caterpillar**  
**Malacosoma californicum pluviale**

Small poplar, alder and willow were 50% defoliated over 200 ha from the south side of Cariboo Lake to 1300 m elevation. The infested trees were 1-3 m high in logged areas that have become overrun with brush. An identical infestation, which occurred south of Horsefly River last year, collapsed probably due to natural factors such as weather, disease and parasites.

The range of this colonial defoliator is very large, usually infesting deciduous trees in areas of moderate rainfall. It has been more common in coastal areas of British Columbia than in the interior.

**Gypsy moth**  
**Lymantria dispar**

There were no adult male gypsy moths caught in 25 pheromone-baited sticky traps placed in 20 forest recreation areas, parks and highway rest areas in the region in 1990 (Table 9).

Table 9. Gypsy moth trapping program, Cariboo Forest Region, 1990.

Location		Number of sticky traps per site	Number of male moths caught
Loon Lake	Provincial park	1	0
Downing	Provincial park	1	0
Green Lake	Provincial park	3	0
Lac la Hache	Provincial park	2	0
Canim Lake	Provincial park	1	0
Ruth Lake	Provincial park	1	0
Bridge Lake	Provincial park	1	0
Horsefly Lake	Provincial park	1	0
Bull Canyon	Provincial park	1	0
Tweedsmuir Park	Provincial park	2	0
Ten Mile Lake	Provincial park	1	0
Cottonwood (Historic)		1	0
McLeese Lake	Rest area	1	0
Australian Cr.	Rest area	1	0
Riske Creek	DND	1	0
Kokanee Bay	Private park	1	0
Bella Coola Airport		1	0
Total		21	

The continuing gypsy moth survey is a cooperative project with Agriculture Canada (Plant Health), Forestry Canada and the British Columbia Forest Service, to monitor the spread of this important defoliator of deciduous trees.

About 120 adult males were caught at 16 locations on Vancouver Island, near Vancouver and in Yoho National Park, up from 25 adults in 10 areas in 1989. None was caught near Kelowna, where in 1988 moth catches prompted aerial and ground application of the biological insecticide Bacillus thuringiensis (B.t.). Trapping will continue in 1991 at areas frequented by tourists, where populations can become established from egg masses hitch-hiking on their recreational vehicles and equipment.

OTHER PESTS OF MINOR SIGNIFICANCE

Collections and observations of other potentially damaging pests, currently of minor significance, are listed by importance in Table 10.

Table 10. Pests of minor significance in the Cariboo Forest Region, 1990.

Host/Pest	Location	Damage	Status <sup>1</sup>
<u>Coniferous Hosts</u>			
<b>Douglas-fir</b>			
Douglas-fir needle cast <u>Rhabdocline pseudotsugae</u>	Horsefly R.	80-100% of the trees were 50% discolored over 50 ha.	S
Conifer-cottonwood rust <u>Melampsora occidentalis</u>	Quesnel Forks Antoine L.	60-100% of the 2-m high trees had 15% of the foliage infected over 2 and 40 ha, respectively.	S
<b>Whitebark pine</b>			
White pine blister rust <u>Cronartium ribicola</u>	Blackdome Mtn. Heckman Pass	5-50% of trees, 2-10-m high, with 1-6 cankers per tree on stems and branches.	I
A needle cast <u>Leptostroma</u> sp.	Blackdome Mtn.	May be a sexual stage of <u>Dothistroma</u> sp.; 20% of trees had 30% of the foliage infected.	S
<b>Ponderosa pine</b>			
Pine needle blight <u>Leptomelanconium</u> sp.	Loon L.	35% of the foliage was infected on 60% of the trees over about 20 ha.	S
<b>Alpine fir</b>			
Fir-fireweed rust <u>Pucciniastrum epilobii</u>	Seller Cr. Grain Cr. Matthew R.	80-100% of the trees had 30- 90% of the foliage infected in 2-100-ha patches.	I
<b>Engelmann spruce</b>			
A needle blight <u>Stigmina verrucosa</u>	Keno L.	80% of the foliage was infected by this parasitic disease, on all the trees over 10 ha.	S

(Cont'd)

Table 10. (Cont'd)

Host/Pest	Location	Damage	Status <sup>1</sup>
<b>Western hemlock</b>			
Western hemlock looper <u>Lambdina f. lugubrosa</u>	Quesnel L.	All 20 m high western hemlock and western red cedar had trace defoliation over 20 ha on Lynx Peninsula. The first time since 1984.	I
<b><u>Deciduous Hosts</u></b>			
<b>Poplar</b>			
Poplar shoot blight <u>Venturia populina</u>	Little R.	50% of the leaves of cottonwood 1-15-m high were infected on all trees over 10 ha.	S
Shepherd's crook <u>Venturia macularis</u>	Pendleton Ls.	60% of the aspen foliage was infected on 30% of the trees in 0.25-0.5 ha patches.	S
Poplar canker <u>Leucostoma nivea</u>	Lac la Hache	Associated with 60% mortality of mature aspen in 0.25-0.50-ha clones. The other pathogen was not identified. Further surveys will be carried out.	I
Ink spot of aspen <u>Ciborinia whetzeli</u>	Narcosli Cr.	All of the trees were 45% infected in several 0.5-ha patches.	S
Birch-aspen leafroller <u>Epinotia solandriana</u>	Alexandria	There was 80% defoliation of all trees over 10 ha, similar to the infestation at Macalister in 1989.	S
<b>White birch</b>			
Amber-marked birch leafminer <u>Profenusa thomsoni</u>	Quesnel Dog Cr. Rd.	All the trees over a large area were defoliated an average of 40%. The damage this year was more severe than in 1989.	I
<b>Willow</b>			
Ink spot of willow <u>Ciborinia foliicola</u>	Antoine L.	100% of the trees had 20% of the foliage infected over 50 ha.	S

<sup>1</sup> I = Increasing; D = Decreasing; S = Static