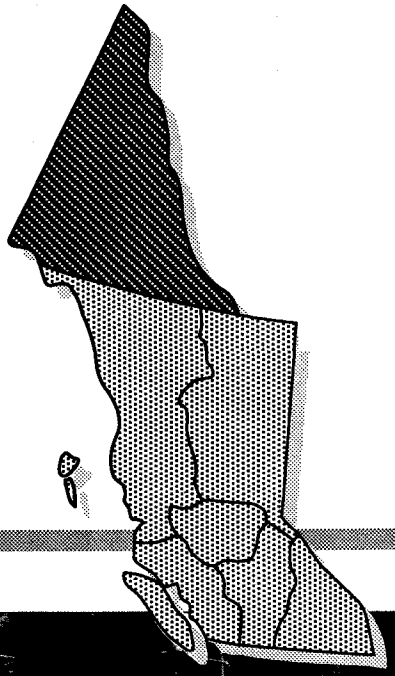
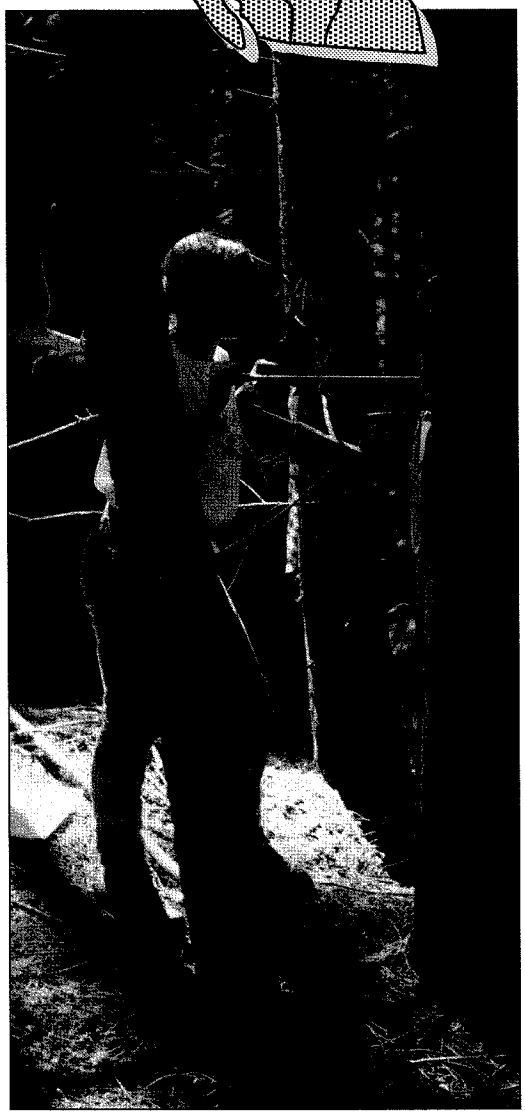
FIDS Report 94-7

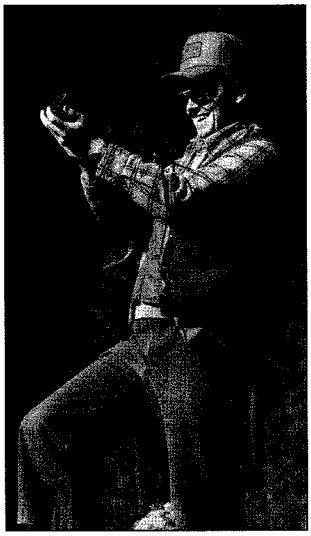


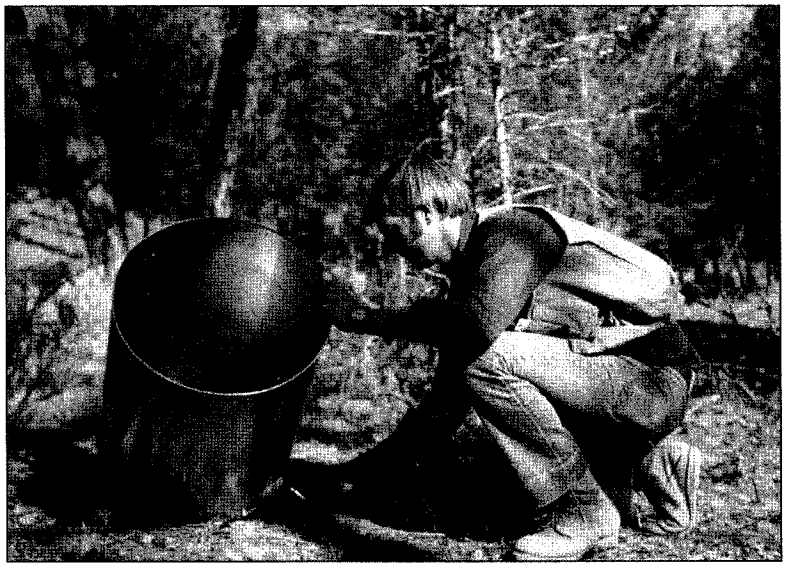
Forest Insect and Disease Conditions

Yukon Territory • 1993

Rod Garbutt







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Contents

Foreword 2

Introduction 2

Summary 2

Spruce Pests 4
- Eastern spruce budworm, *Choristoneura fumiferana* 4
- Western/eastern blackheaded budworm, *Acleris gloverana/ A. variana* 5

Pine Pests 5
- Pine needle cast, *Lophodermella concolor* 5
- Lodgepole terminal weevil, *Pissodes terminalis* 6

Special Directed Surveys 6
- Joint Canada-Sweden lodgepole pine trial 6
- Biomonitoring plot #925 7

Multiple Host Pests 7
- Environmental damage 7
- Mammal damage 8

Deciduous Tree Pests 8
- Large aspen tortrix, *Choristoneura conflictana* 8
- Aspen serpentine leafminer, *Phyllocnistis populiella* 9
- Willow leafminer, *Lyonetia* sp. 10

Other Noteworthy Pests 10

Appendix 12

Foreword

Forest Insect and Disease Survey (FIDS) is a nation-wide network within Natural Resources Canada, with the responsibility of: (1) producing an overview of forest pest conditions and their implications, including predictions where possible; (2) maintaining records and surveys to support quarantines; (3) supporting forestry research with field studies, records and Herbarium and Insectary collections; (4) providing advice and extension on forest insect and disease conditions; (5) developing and testing survey techniques; (6) and conducting related biological and impact studies.

Introduction

This report summarizes forest insect and disease conditions in the Yukon Territory in 1993. Pests are listed by host with emphasis given to those capable of sudden damaging outbreaks.

During the 14-day survey in late June and early July, over 60 insect and disease collections were made at permanent sample sites and pest-affected stands (Map 1) throughout the southern Yukon.

Yukon Forest Service staff were contacted at Whitehorse and Haines Junction to inform them of FIDS work plans and to exchange information about current forest pest activities. Discussions were held with Parks Canada administrative and field staff in both Whitehorse and Haines Junction with respect to pest problems within the proposed Chilkoot Pass National Park, and in Kluane National Park.

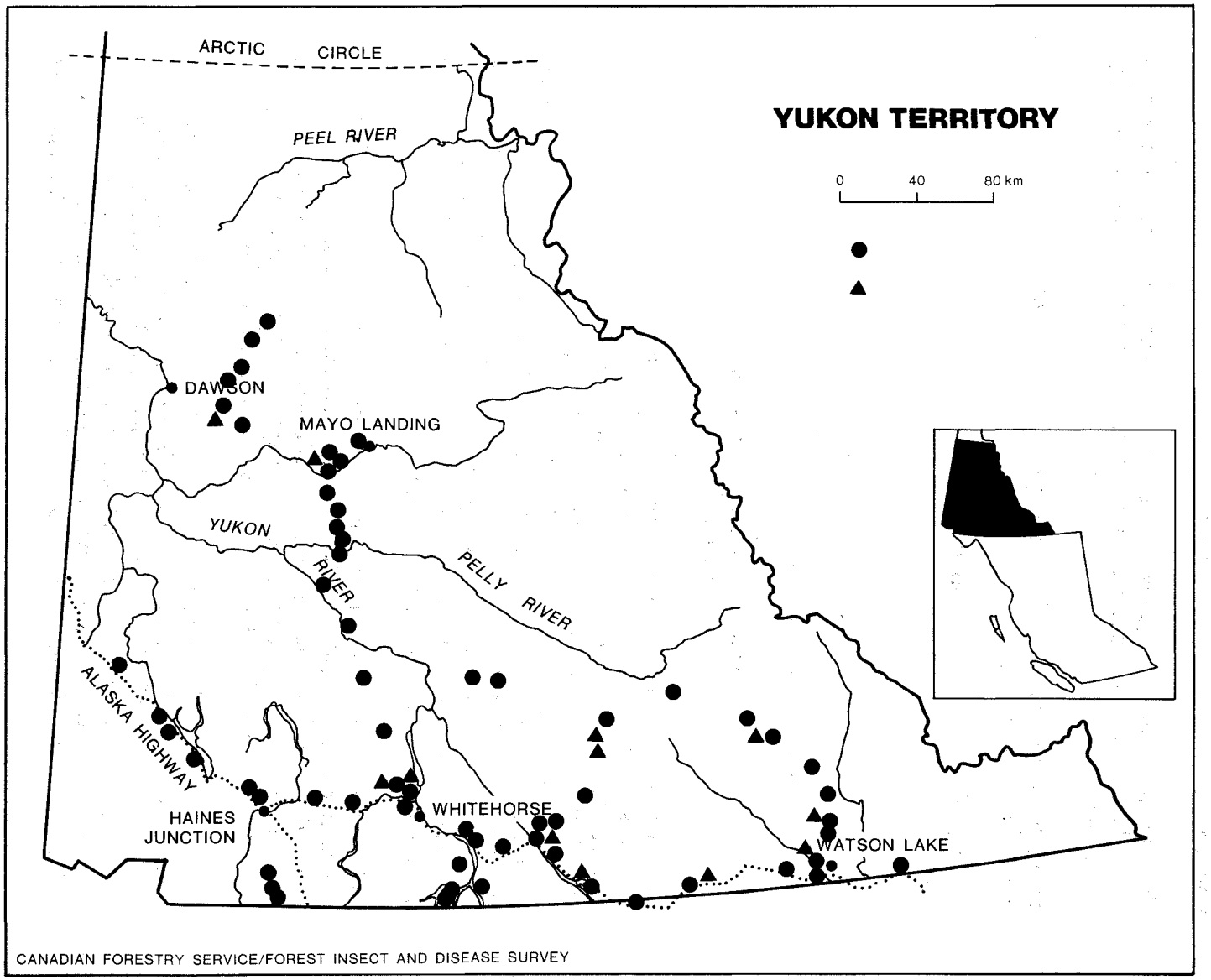
Summary

Eastern spruce budworm populations increased in the Liard River drainage.

A **pine needle cast** disease caused light-to-severe discoloration of year-old needles of lodgepole pine over a broad area centered at Watson Lake. The widespread distribution of **lodgepole terminal weevil** attacks remained similar to last year, but the frequency of attacks declined significantly. Populations of **larch sawfly** declined, with just scattered trace levels of early season oviposition noted.

An annual pest survey within a joint **Canada-Sweden co-operative growth trial** at Takhini found tree survival in the lodgepole pine and Siberian larch plots to be similar to 1992, with the vigour of most trees improving steadily. **Comandra blister rust** and **western gall rust,** however, were found on some lodgepole pine plot trees for the first time.

No changes were found during an annual condition assessment within the long- term study plot established in 1992 in the Takhini Forest Reserve, to monitor the effects of airborne pollutants on forest health. The study is part of the a **National Biomonitoring System**



Map 1. Locations where one or more insect and disease samples were collected, Yukon Territory, 1993.

(formerly called the **Acid Rain National Early Warning System**), and is one of a growing number established nationwide.

Winter cold, in some areas in combination with **calcium salt** used for dust suppression, is suspected responsible for chronic dieback and foliage loss of white spruce and other coniferous and deciduous species, in many areas.

For the fifth consecutive year, **large aspen tortrix** populations caused widespread defoliation of trembling aspen. The damage was much more widespread this year and almost all defoliation was severe.

Branch tip mortality caused by the stripping of immature cones by **squirrels**, was once again common in the southeast.

A summary of the incidence of **other noteworthy pests** is included as Table 2, at the end of this report.

Spruce Pests

Eastern spruce budworm,
Choristoneura fumiferana

In a significant expansion of a chronic eastern spruce budworm infestation based primarily in northeastern B.C., almost continuous light defoliation of white spruce followed the Liard River north through the Egg Fire and across the border into the Yukon at Irons Creek. The damage was limited primarily to current growth with some partial top stripping. Defoliation also increased significantly in the northeastern Prince George and adjacent areas of the Prince Rupert forest regions, causing mostly light and moderate defoliation of white spruce over an area of more than 170 000 ha. Populations of eastern spruce budworm in the La Biche River drainage in the southeast corner of the Yukon, though inaccessible for monitoring purposes, have historically fluctuated in synchrony with populations in the adjacent Liard River drainage near the B.C.- Northwest Territories border.

A standard three-tree beating sample near Irons Creek yielded 75 budworm larvae and pupae (about equal numbers of each), as well as 12 spruce coneworm *(Dioryctria reniculelloides),* and 8 eastern blackheaded budworm *(Acleris variana).* Only two budworm larvae however were collected in a standard beating sample at the Liard River crossing just west of Watson Lake, and none were found in 70 beatings elsewhere in the Yukon.

The unusually warm early spring accelerated development of the budworm and, when population samples were taken on the 17th of June, half of the population had already pupated, a full week in advance of normal. Of a collection of 95 budworm larvae, sent to the PFC Insectary for rearing, 45 (47%) died from an unidentified disease possibly caused by the nucleopolyhedrosis virus, 4 were parasitized with a dipteran and 1 with an hymenopteran parasite. An additional 20 died from unknown causes. Only 25 (26%) reared through to the adult stage, an unusually low level of survival.

Defoliation by eastern spruce budworm can cause growth loss, and repeated severe defoliation can cause branch mortality and top-kill. Damage in recent years has been limited primarily to current growth with a subsequent slight loss of growth potential.

Though damage has fluctuated from year to year the budworm infestation has continued unabated since 1986. This historical impetus suggests that, at least the core of the infestation, in B.C., will continue in 1994. However, the prevalence of disease in the larval collection from Irons Creek indicates a probable reduction or even collapse of the fringe population in the Yukon.

Western/eastern blackheaded budworm,
Acleris gloverana, A. variana

Blackheaded budworm larvae were collected in 12 of 71 standard beating collections made in white spruce throughout the Yukon in 1993. High populations however, were found only in stands in the extreme southwest corner of the Territory, with the largest collections being 99 larvae at Million Dollar Falls near the Yukon-B.C. border, and 45 larvae at Klukshu. These larval populations were sufficient to cause only trace levels of defoliation to the current foliage. Two other random beatings in the same area yielded four and six larvae. All other positive collections contained only single larvae. Populations in the proposed Chilkoot Pass National Park remained low for the second year following an outbreak in 1991.

In British Columbia and Alberta, the Rocky Mountains are accepted as being the geographic dividing point between the two species of blackheaded budworm; *Acleris variana* prevailing to the east of the mountains and *A. gloverana* to the west. In the Yukon however the mountain range is reduced to foothills and consequently the division between the populations is less distinct. Past collections have shown *A. variana* to prevail in the Watson Lake area and from Carmacks north, while *A. gloverana* predominates in the southwestern area including Whitehorse and the Haines Road. In areas between, the separation of the species is considered to be variable and less distinct.

Historically, neither species of budworm has caused significant damage in the Yukon. The most severe recorded infestation occurred just north of Haines Junction in 1963, when *A. gloverana* larvae caused localized light defoliation of white spruce. Monitoring will continue in 1994.

Pine Pests

Pine needle cast
Lophodermella concolor

Discoloration of year-old lodgepole pine foliage by pine needle cast was again widespread in the southeast, but not as severe as in 1992. Up to 80% of the 1992 needles were discolored in scattered pockets of mostly young roadside pine in the Watson Lake area. Less severe discoloration affecting up to 60% of 1992 needles in scattered pockets occurred in stands as far north as Km 210 along the Robert Campbell Highway. Infection of up to 60% of older needles on 20% of the trees was seen over a small area near Lower Sheep Creek at Km 138 of the South Canol Road.

Lodgepole terminal weevil
Pissodes terminalis

Though the distribution of terminal weevil was similar to 1992 and greatly expanded from observed distribution prior to 1992, populations declined to near endemic levels in most areas of the southern Yukon. One notable exception was an infestation at Km 34 of the Atlin Road (just north of the Yukon - B.C. border), where 20% of the lodgepole pine terminals were killed by the weevil. This was the highest level of infestation yet recorded in the Yukon. In all other areas infested last year, mainly in young pure pine stands between Whitehorse and Watson Lake, only trace levels of infestation could be found.

The early and prolonged cold of the winter of 1992/93 adversely affected survival of weevil progeny, and in the Atlin Road population, very few living larvae were found in examined leaders. Populations are therefore expected to decline significantly in this area and remain low in all other areas in 1994.

Weevils attack developing terminals, killing them down to the first branch whorl. High incidences and repeated attacks will result in growth loss and formation of forks and crooks. Damage of this type has never been reported from the Yukon.

The drop in populations this year and the apparent low survival of the progeny in the Atlin Road population has greatly reduced the likelihood of significant weevil damage being found in 1994. However, considering the dramatic increase in the distribution of the weevil in 1992, the potential for significant future damage still exists, and the activity of this pest will be closely monitored in years to come.

Special Directed Surveys

Joint Canada-Sweden lodgepole pine trial

Pest conditions within a six year-old co-operative Canada-Sweden lodgepole pine trial established on the Takhini Forest Reserve near Whitehorse were evaluated by FIDS again in 1993. Two years after the collapse of snowshoe hare populations and the severe winter of 1990-91, both of which caused severe damage within the plantation, surviving lodgepole pine and Siberian larch continued to recover. An evaluation of individual tree condition in 11 randomly selected lodgepole pine replicates found 94% of the original stock to be surviving, similar to last year. Survival in four of the five Siberian larch replicates averaged 80%, also similar to last year.

For the first time, cankers caused by Comandra blister rust, *Cronartium comandrae* infected a total of 18 lodgepole pine in four of the replicates. Of these, 12 of the infections had resulted in stem cankers and 6 had resulted in branch cankers. Seven trees in one plot alone (rep. C 62) were infected. This plot was situated near the centre of the plantation in an area where substantial ingrowth of aspen had occurred. Only one of the 12 stem-infected trees had died from the disease. The source of the infection was thought to be naturally regenerated lodgepole pine at the southwest corner of the clearing, some of which were also diseased. Also for the first time, single branch and stem galls caused by western gall rust, *Endocronartium harknessii* were seen on pine in two plots.

The rapid establishment of these two virulent diseases in one year indicates how susceptible these small plantation trees can be, especially trees in recovery from severe winter and hare damage. Levels of infection and subsequent mortality, from the Comandra blister rust and, to a lesser extent from the gall rust, can be expected to increase in subsequent years.

The Takhini trial is the most northerly of five experimental plantations established in the Pacific Region in co-operation with Svenska Cellulose, a Swedish forest company. Lodgepole pine in the plots were grown from seed produced in Swedish seed orchards. The parent trees had been grown in Sweden from seed collected within various northern B.C. provenances. One of the purposes of the trials is to determine how the trees, one generation removed from their native environment, respond to native pests and environmental conditions when reintroduced. The plots will be re-assessed in 1994.

Biomonitoring plot #925

A year following establishment of a permanent **Biomonitoring** plot in the Takhini Forest Reserve as part of the **Acid Rain National Early Warning System (ARNEWS)**, soil pits were established and soil analysis is in progress. In addition, an annual detailed assessment of the health and vigour of 58 plot trees, along with a baseline foliar chemistry study was undertaken. No change in the condition of the plot trees was detected this year.

This Biomonitoring plot is one of 12 established in 1992 to supplement the existing 15 ARNEWS plots established in the mid 1980's, to monitor the affects of airborne pollutants on forest health. The scope of the program has since been broadened beyond the effects of acid rain to include aspects related to biodiversity and general forest condition .

Plot trees will be assessed again in 1994.

Multiple Host Pests

Environmental damage

This year various types of environmental damage were seen in Yukon forests. The cause of the most serious damage has not yet been identified, but the effect, progressive dieback and mortality of mainly white spruce, has been documented over many years. The most significant damage continues to occur in stands between Burwash Landing and Beaver Creek, along the Klondike Highway between Stewart Crossing and Carmacks and again in the Spirit Lake area south of Whitehorse, and along Little Atlin Lake. Reports from Parks Canada and the Yukon Forest Service office in Haines Junction describe similar damage affecting up to 80% of the white spruce in large patches in both the Alsek and Donjek river drainages within Kluane National Park. Some of this damage can be attributed to the repeated occurrence of cold desiccating outflow winds during the long Yukon winter but much of the damage occurs out of the path of such winds. Other suggested causes for damage limited to transportation corridors include the lingering effects of calcium chloride, a salt used to inhibit dust before the highways were paved, and the toxic effects of dust from the "B-trains" which hauled ore concentrate for years between Faro and Skagway.

More immediate damage was caused by cold winter winds blowing through the pass at the Continental Divide, just west of Rancheria. All mature lodgepole pine were discolored over an area of about 200 ha above Km 1164 of the Alcan Highway, in a south-facing 100 meter-

wide elevation band near 1400 meters. At Km 1138, young roadside pine over 2 ha were similarly discolored, losing all but the current foliage.

An unusually severe and prolonged early frost in September of 1992 caused the still-green leaves of white birch, some willow species and cottonwood in the Dawson area to freeze. Because the leaves froze quickly, they failed to form a normal abscission layer and were retained by the trees throughout the winter and well into the following growing season. Though no significant damage resulted from this quick freeze, the retained brown and shriveled leaves remained on the trees well into June of 1993 contrasting sharply with the newly flushed foliage.

Environmental stresses cause by far the most consistent and severe damage of any agents affecting the health of Yukon forests. The various and often mysterious ways in which these stresses are expressed in the forest will continue to be monitored and rationalized in the future.

Mammal damage

Squirrels continued to cause damage to young lodgepole pine by stripping the immature cones from young trees during the winter and early spring. Most notable this year, though at reduced levels compared to 1992, were intermittent occurrences of damage along Little Atlin Lake, near Km 500 of the Klondike Highway and between Teslin Lake and Rancheria.

The forced removal of immature cones by squirrels tears the cambium layer and effectively girdles branches, killing the distal growth. The damage becomes apparent in the early summer when the branch tips turn red. The damage normally occurs in immature stands in centres corresponding to local squirrel nests. In some pockets, 15 or more branch tips per tree have been killed and, particularly in early summer, damage has been very showy.

Deciduous Tree Pests

Large aspen tortrix,
Choristoneura conflictana

Large aspen tortrix populations were again high within the south-central parts of the Territory but infestation patterns were very different from last year. Scattered and sometimes single large infestations severely defoliated trembling aspen over a total area of 2950 ha in three widely separated areas (see Table 1).

Ninety per-cent of the entire infested area was severely defoliated, with light and moderate defoliation occurring only at the infestation fringes. Three separate patches were seen on south facing slopes above the Mayo Road from Km 4 to 10, near Km 16 and between Km 36 and 38. The Klondike highway bisected a single large infestation at Braeburn. Seven infested patches in the south occurred in a vast area of almost pure trembling aspen stretching from west of Jakes Corner to Nisutlin Bay along Teslin Lake. The infestations were scattered along the southwest facing slopes above of the highway, and at one location, near Deadman Creek, crossed the highway and stretched down to the lakeshore.

Table 1. Location, number and size of infestations of large aspen tortrix in the Yukon Territory, 1993.

Location	# of infestations	Total area (approximate ha)
Jakes Corner - Teslin Lake	7	1300
Stewart Crossing - Mayo	3	1250
Braeburn	1	400
	Total	2950

When the two northern infestation areas (Mayo and Braeburn) were visited in late June, the tortrix adults had emerged and were mating. However, mass collections of tortrix larvae and pupae had been made a week earlier in the Deadman Creek area were reared at the PFC Insectary to determine levels of disease and parasitism. Of 113 pupae placed into rearing, 80 (71%) were parasitized, primarily by hymenopteran parasitoid, 25 (22%) died of unknown causes, 6 (5%) were infected with an as yet unidentified disease (probably the nucleopolyhedrosis virus) and 2 (2%) emerged as healthy adults.

Judging from the low levels of successful emergence, infestations in the Teslin Lake area are not expected to repeat in 1994. In the northern infestations, however, observation of large numbers of adults coupled with high proportions of empty pupal shells indicating successful adult emergence, suggest the possibility of continued infestation in these areas in 1994.

Severe defoliation over two or more successive years can cause dieback and some mortality especially of understory and suppressed trees. This year's defoliation however, is expected to cause little more than a loss of current growth potential, and, unless they become reinfested, the stands will fully recover next year.

Aspen serpentine leafminer, *Phyllocnistis populiella*

Trembling aspen between Dawson City and Carmacks were infested by the aspen serpentine leafminer for the second consecutive year. In the most northerly observation, 5% of aspen and black cottonwood leaves were mined in roadside stands at Km 2 of the Dempster Highway. Farther south along the Klondike Highway, levels of infestation increased steadily until, at McQueston, an average of 60% of aspen leaves were infested. The most severe infestation was between Stewart Crossing and Mayo where up to 80% of leaves were mined. South of Stewart Crossing, infestation levels declined steadily until evidence of the insect disappeared south of Carmacks.

Though the leafmining activity is very visible in areas of high population, the damage is negligible as even severely infested trees retain much of their photosynthetic capacity.

Willow leafminer
Lyonetia sp. (undescribed)

An infestation of an undescribed **willow leafminer** caused discoloration of willow leaves in the Little Atlin Lake area. This infestation was the northern fringe of a large infested area centered near Atlin. The small green larvae, hanging in great numbers from the trees on silk threads attracted notice and caused discomfort to hikers.

Reared adult material was submitted to the Centre for Land and Biological Resource Research in Ottawa, and subsequently to the Smithsonian Institution in Washington D.C. for identification. Specialists at the Smithsonian have requested additional material to facilitate description of this new species.

Other Noteworthy Pests

Table 2. Other noteworthy pests, Yukon Territory 1993.

Host/pest	Location	Remarks
	Conifers	
Lodgepole Pine		
Lodgepole pine beetle *Dendroctonus murrayanae*	Km 26 South Canol Road	killed five stressed trees
Nutrient deficiency	Km 20 South Canol Road	discolored needles of all imm. pine in alpine meadow
Pine needleminer *Coleotechnites* sp.?	Km 65 Robert Campbell Hwy.	light incidence of severed needles and needle mining - damage only
Pitch midge, Cecidomyiidae	Stewart Crossing, Carmacks	light infestation of 20% trees in both areas
White Spruce		
Pine leaf adelgid *Pineus pinifoliae*	Stewart Crossing	light infestation of lower crowns and understory trees
Greenheaded spruce sawfly *Pikonema dimmockii*	Klondike Hwy.	common in low numbers in standard beating samples
Spruce gall adelgid *Adelges lariciatus*	Km 56 Robert Campbell Hwy.	5% tips infested on all trees

Table 2. (Cont'd)

Host/pest	Location	Remarks
Yellowheaded spruce sawfly *Pikonema alaskensis*	throughout Yukon	common in low numbers in standard beating samples
Alpine Fir		
Fir needle cast *Isthmiella* sp. and Snow blight *Phacidium* sp.	Km 138 South Canol Road	co-infecting 80% of 1992 needles on all trees
	Deciduous	
Trembling Aspen		
Gall midge Cecidomyiidae	Carmacks, Stewart Crossing	light infestation on 30% trees - possibly undescribed species
Gall mite *Phyllocoptes didelphus*	Km 490 Klondike Hwy.	mite galls on 30% of leaves of all trees
Cytospora canker *Cytospora* sp.	Km 662 Klondike Hwy.	causing stem cankers on immature and suppressed trees
Black Cottonwood		
Leaf beetle Chrysomelidae	Burwash Landing	light leaf skeletonizing
Flatheaded woodborer Buprestidae?	Km 450 Klondike Hwy.	boring in stems of 60% of immature trees over .5 ha - damage only
Willow sp.		
Willow leafminer *Lyonetia saliciella*	Haines Junction	mined 30% of leaves

Appendix

The following related reports are available on request from FIDS

I. History of Important Forest Pests in the Yukon Territory 1952 - 1990.
II. Summary of Svenska Cellulose lodgepole pine trials in B.C. and the Yukon.
III. Summary of data from ARNEWS plot established in the Takhini Forest Reserve

Detailed copies of maps, pest reports, leaflets, monographs and other reports in addition to those listed above are available from the Pacific Forestry Centre upon request. Correspondence and inquiries with respect to forest pest problems in the Yukon can be directed to FIDS headquarters at:

Pacific Forestry Centre
Canadian Forest Service
506 West Burnside Road
Victoria, B.C.
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and from June to October at:

Forest Insect and Disease Survey
Canadian Forest Service
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