

FIDS REPORT 96-8

**HISTORY OF IMPORTANT
FOREST PESTS IN THE
YUKON TERRITORY
1952-1995**

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INTRODUCTION

This report provides a historical record of damage caused by economically and socially important (and some not so important) forest pests in the Yukon Territory, compiled from Canadian Forest Service, Forest Insect and Disease Survey (FIDS), annual reports between 1952 and 1993. Maps of recent spruce beetle infestations are also included. The purpose of the history is to:

- summarize damage in Yukon forests resulting from forest pest activity, and identify the agent(s) involved
- record patterns of population fluctuation and, with current population data, use to predict future activity
- identify higher risk areas where insect and disease problems have commonly occurred and will likely occur in the future.

Further copies of this report as well as annual FIDS reports summarizing forest pest activities in the Yukon are available from:

Canadian Forest Service,
Pacific Forestry Centre,
506 West Burnside Road,
Victoria, B.C.,
V8Z 1M5

A partly annotated listing of 523 insect species and 312 disease organisms collected in the Yukon Territory are listed in "Annotated Checklists of Forest Insects and Disease of the Yukon Territory", BC-X-169 (1978), available from the Pacific Forestry Centre.

History of Forest Insect and Disease Surveys in the Yukon Territory

The first federally funded insect survey in Yukon was conducted in 1948 by an entomologist from Ottawa. Not surprisingly, it was directed toward mosquito classification.

Beginning in 1952, annual FIDS detection surveys of the Yukon were conducted by Rangers working out of the Forest Biology Laboratory in Vernon, B.C. From 1966 to 1972, the survey was based at the Northern Forestry Centre, initially in Calgary, later in Edmonton. In 1973 the responsibility for the Yukon survey was returned to the Pacific and Yukon Region, now centered at the Pacific Forestry Centre in Victoria, where it remains today.

The modern Yukon survey is conducted over an approximate two-week period between mid-June and mid-July of every year. While most of the detection has been accomplished using standard sampling techniques during travels through the Yukon, much reliance is placed upon reports from local foresters and National Parks and Historic Sites personnel. Aerial reconnaissance and bark beetle or defoliator damage surveys have been used periodically. Yukon Forest Resources headquarters in Whitehorse and field offices in Watson

Lake, Haines Junction, Dawson City, Mayo and Carmacks have routinely been contacted to share information and address forest pest concerns. Annual liaison is also made with Parks Canada staff at Haines Junction and Whitehorse to discuss pest problems in Kluane National Park and the proposed Chilkoot Pass National Park.

In general, biological pest activity has been low, due largely to the rigorous climatic conditions of the Territory. The most damaging pest problems were caused by spruce beetle outbreaks during the mid 1940s, during which more than one million white spruce were killed over approximately 19 000 ha near Dezadeash Lake. Spruce beetle populations increased again in the early 1990's and reached epidemic levels in 1994 in the Alsek River Valley in Kluane National Park, and in the Shikwak Valley around Haines Junction.

The most consistent cause of damage in Yukon forests has been the harsh climate. Early frosts, winter cold, late frosts, cold desiccating winds and other related climatic events causing tree mortality, top and branch diebacks and foliage discoloration, have been recorded repeatedly over the years of the survey.

Within the following historical summary, the more common damaging pests are listed by host, in order of importance. Throughout the report are references to numbers of larvae collected in standard beatings. These refer to the standard three-tree beating method, whereby insects are dislodged from trees by beating the branches with a 2.5 meter-long pole. Larvae that fall onto a 2X3 meter canvas sheet are collected, counted and identified. Three trees from a single location sampled in this way constitutes a standard sample.

Definitions

Aerially observed bark beetle mortality is classed in one of three categories according to the incidence of red trees as follows:

light - 1-10% of the stand
 moderate - 11-29% of the stand
 severe - 30%+ of the stand

Aerially observed defoliator damage is assigned one of three defoliation classes as follows:

light - discolored foliage barely visible from the air; some defoliation of upper crowns and branch tips
 moderate - obvious discoloration and thin foliage; top third of many trees more than 50% defoliated; some completely stripped
 severe - tops and some branches completely defoliated; most trees more than 50% defoliated

SPRUCE PESTS

Spruce beetle, *Dendroctonus rufipennis*

Spruce beetle has been the most damaging insect pest of white spruce in the Territory, based on three recorded outbreaks; one in the mid 1940s at Dezadeash Lake, one of lesser intensity in 1967 at the Aishihik power project, and most recently, in the early 1990s in the Haines Junction area.

For spruce beetle to breed successfully and reach infestation levels certain conditions must be met. They include: a large supply of freshly killed or highly stressed host material, relatively mild winters and/or deep snow (especially in the first year of the two-year life cycle), large robust trees that will not dry out before broods have developed, and synchronous brood maturation to ensure mass attacks. It is rare that all of the above conditions are met in the Yukon, and why, therefore, spruce beetle outbreaks have been intermittent and limited to the southwest and southeast, where the vast pure stands of mature white spruce have been subject to periodic environmental stress.

1940-48 Spruce beetle-caused white spruce mortality was first recorded along the Haines Road in 1943. The infestation ran along the southeastern side of the Shakwak Valley, into the valley of the Klukshu River and up the east valley of the Tatshenshini River. Mortality was also reported in side drainages of the main valleys. Patches of mortality were spread through spruce stands over a total of 110 000 ha, with actual infested area estimated to be 19 000 ha. Beetles killed an estimated average of 70 trees/ha, and a total of approximately 1 300 000 trees were killed between 1943 and 1948 when the population collapsed.

The infestation is thought to have started in slash and trees that had been fallen to clear the right of way during the hurried construction of the Haines Road in 1942.

1952-53 Low populations at Mush Lake, 32 km west of the south end of Dezadeash Lake. Attacks were seen in scattered winter-damaged trees throughout the southern portion of the Territory, and in healthy trees at Wolf Creek near Whitehorse.

1954-56 No damage recorded.

1957-58 Light damage was reported along the Watson Lake Airport Road, and at Upper Laird, west of Watson Lake, where five trees were attacked.

Year	Remarks
1959-62	Low populations; in 1961, small numbers of attacked trees at Whitehorse and along the Alcan Highway.
1963	Populations increased with scattered patches of recently killed mature and overmature white spruce along the Alcan Highway and adjacent roads at numerous locations throughout the Territory. One green current attack was found at Km 1619 of the Alcan Highway.
1964	Populations declined. Low populations seen at Km 77, Haines Road and Km 1553, Alcan Highway.
1965-75	Low populations in the Kluane Lake area.
1976	Populations increased significantly in windfall but there was no evidence of attacks in standing trees. Areas attacked included: Ethel Lake (7 attacks per 464.5 cm ²); Albert Creek (4 attacks per 464.5 cm ²); Marshall Creek (3 attacks per 464.5 cm ²); and near Haines Junction.
1977	Beetle attacks occurred over about 100 ha of standing white and black spruce stressed by flooding from the Aishihik power project canal, with an average of 6.5 attacks per 0.1 m ² . Populations in the Haines Junction area increased. In the Marshall Creek area, the average number of attacks in windfalls nearly doubled.
1978	A few currently-attacked trees were observed in flood-damaged stands at the Aishihik power project.
1979	Light attacks occurred between Haines Junction and Champagne, along the Aishihik River and adjacent to an area of recent blowdown near Little Fox Lakes, north of Whitehorse.
1980	Attacks along the Aishihik River and at Haines Junction declined, with occasional roadside trees attacked along Kluane Lake. Partial attacks and pitchouts were noted adjacent to blowdown at the north end of Little Salmon Lake, and at Quiet Lake.

Year	Remarks
1981	Partial attacks and pitchouts were common on an estimated 300 white spruce stressed by road salt, road construction, park development and flooding at widespread locations including: Teslin Lake, Mendenhall River, Aishihik River, Marshall Creek, Stewart Crossing, Carmacks, Frances Lake, Frances and Hyland rivers. Along the Frances and Hyland rivers, 25 trees were killed, with an additional 10 at Marshall Creek.
1982-83	Partial and unsuccessful attacks by spruce beetle were recorded on 150 mature standing white spruce damaged by road construction, ditching and flooding at several locations from Teslin Lake to Johnsons Crossing and from Carmacks to Ross River. All infested trees were felled and partially peeled to accelerate drying and kill the broods.
1984	No activity reported.
1985	Scattered light attacks in mature white spruce, along the La Biche River Valley were reported by Yukon Forest Resources personnel.
1986	No activity reported.
1987	Light attacks in firewood and one standing white spruce in Kusawa Lake Park near a 1982 mudslide which killed mature over two ha.
1988-89	No activity reported.
1990-93	Spruce beetle infestations were initiated and quickly expanded within vast mature white spruce stands in the Alsek River Valley within Kluane National Park, and in the Shakwak Valley between Haines Junction and Kluane Lake.
1994	Extensive white spruce mortality was mapped over 32 000 ha during aerial surveys (Map 1), half in the Alsek River Valley within Kluane National Park, and half in the Shakwak Valley north and south of Haines Junction. Over 10 000 ha of the mortality was recorded as severe (30%+ of stand recently killed). Infestations probably began as early as 1990 and increased rapidly under ideal conditions of relatively mild winters, unusually warm dry summers and vast areas of even age (200+ years) stands of pure white spruce. Strong southwest winds during the beetle flight period greatly accelerated the spread of infestations. These conditions fostered a rapid increase in populations

Map 1

SPRUCE BEETLE 1994

YUKON TERRITORY



FIDS GIS
Natural Resources Canada
Canadian Forest Service
Forest Insect & Disease Survey

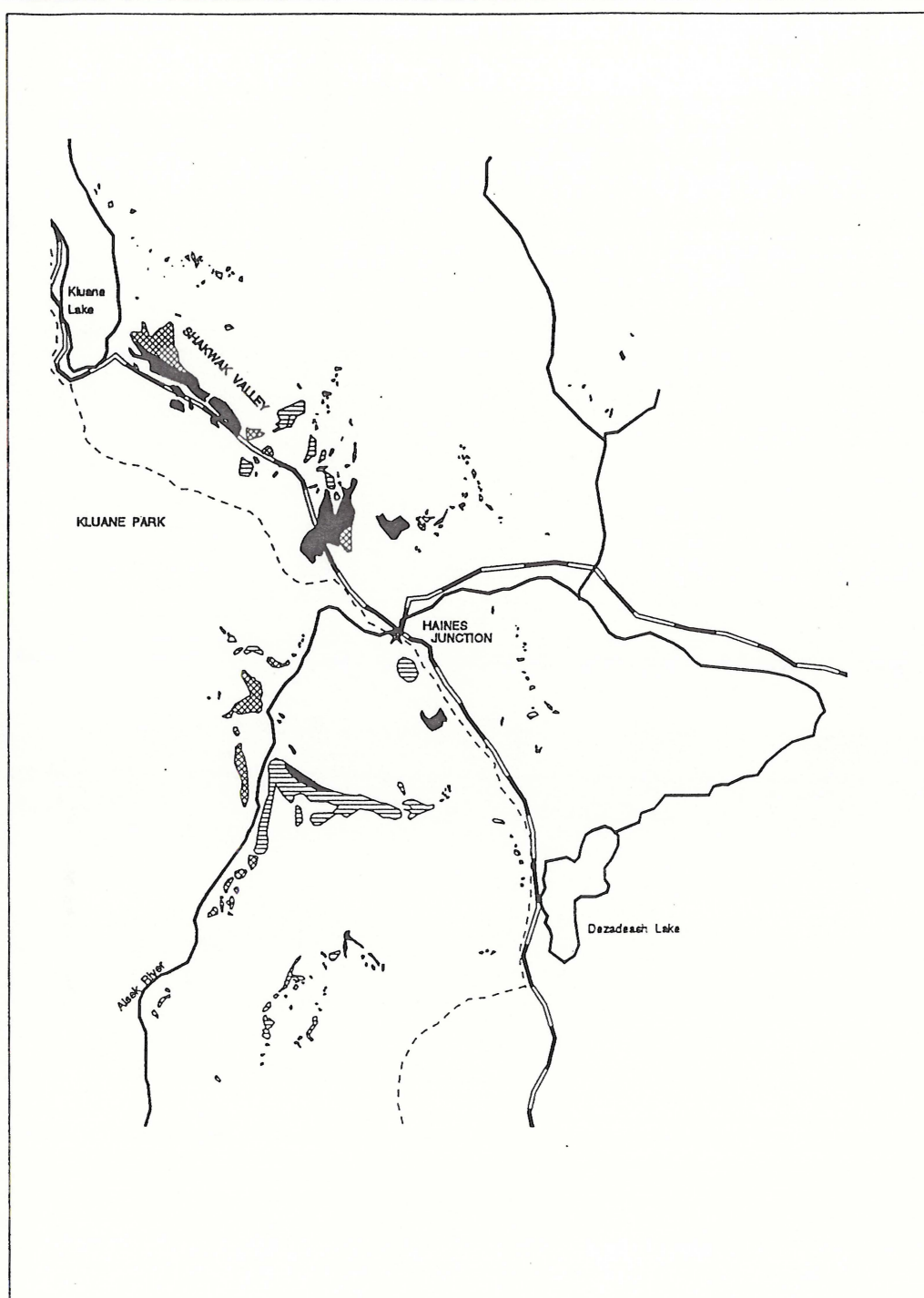
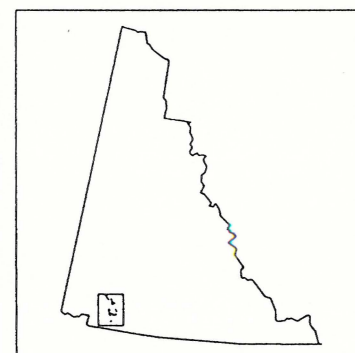
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Map Projection : Lambert

Map Produced 23 Nov 94

YUKON TERRITORY

Reference Map



Legend:

Lakes & Rivers

Roads

National Park Boundary

Tree Mortality

Light

Moderate

Severe

Total

Number of Infestations

136

53

53

242

Area (ha)

13726

8223

10589

32538

Definitions:

LIGHT

10 % or less of stand recently killed

MODERATE

11 - 29 % of stand recently killed

SEVERE

30 % + of stand recently killed

Map 2

SPRUCE BEETLE 1995

YUKON TERRITORY



FIDS GIS

Natural Resources Canada
Canadian Forest Service

Forest Insect & Disease Survey

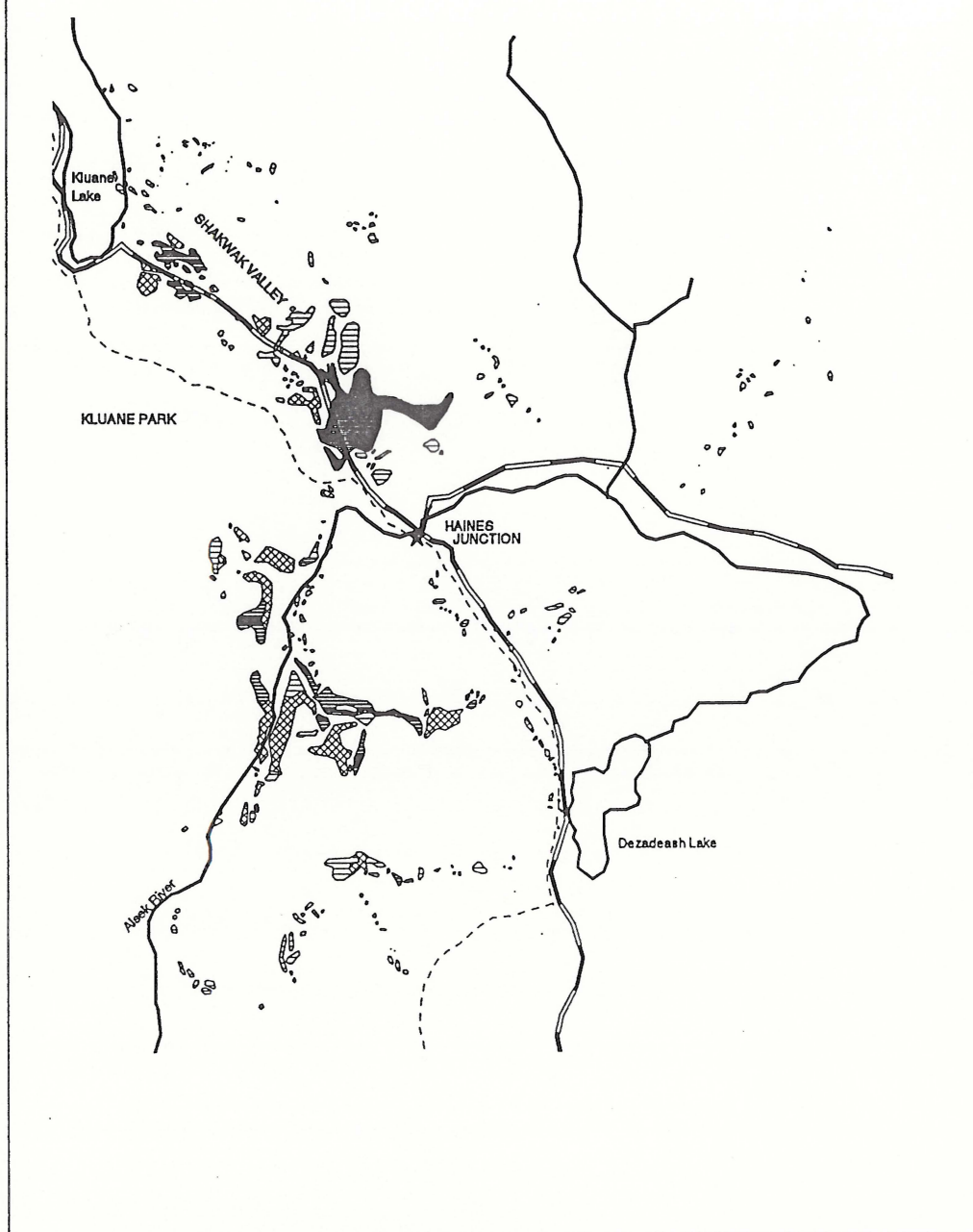
Scale 1: 1000000

Map Projection : Lambert

Map Produced 18 Jan 96

YUKON TERRITORY

Reference Map



Legend:

Lakes & Rivers

Roads

National Park Boundary

Tree Mortality

Light

Moderate

Severe

Total

Number of Infestations

223

29

103

355

Area (ha)

16993

12319

17769

47081

Definitions:

LIGHT

10 % or less of stand recently killed

MODERATE

11 - 29 % of stand recently killed

SEVERE

30 % + of stand recently killed

Year	Remarks
1994 (cont.)	in the absence of blowdown or slash; normal preconditions for the development of major infestations. The mild conditions have also promoted a significant amount of one year cycling, further accelerating the rate of population increase. Successive warm dry summers caused trees to fade unusually quickly - as early as 3 months after attack. In addition, drought-stressed trees were more attractive and susceptible to beetle attacks.
1995	<p>Infestations expanded to cover 47 000 ha, 60% of which was within Kluane National Park (Map 2). Most of the remainder was in the Shakwak Valley. Recent mortality was estimated at 1.5 million cubic meters. Major infestations remained concentrated within the Alsek River Valley and tributaries, and in the Kathleen, Bates and Mush lakes areas within the Park. These infestations were continuous with ones in Tatshenshini Provincial Park across the B.C. border to the south. In the Shakwak Valley most of the damage was concentrated in stands between Haines Junction and Kluane Lake, with smaller infestations in the Marshall Creek area to the east, on the west side of the Valley as far south as Dezadeash Lake, and on the east side of the Valley in the Granite Creek area. Current attack levels in four assessed stands were high, averaging 40%. Accumulated attack in many stands has killed nearly all mature trees, and as suitable host has been depleted, trees down to 12 cm diameter have been attacked. Beetle brood survival will be much poorer in the smaller material.</p> <p>An aerial survey of the LaBiche River Valley in the extreme southeast recorded moderate and severe spruce mortality in riverside stands over nearly 4000 ha. Though all of the dead trees were grey, the infestation appears to have occurred within the last five years. During a ground check, a single spruce beetle strip-attack was seen in a riverside tree, and dead trees showed signs of having been attacked by spruce and <i>Ips</i> spp. beetles. Though the fact has not been verified by sampling, it is likely that spruce beetles were responsible for the mortality.</p>

Eastern spruce budworm, Choristoneura fumiferana

Early reports of budworm activity described mostly white spruce bud damage in minor outbreaks throughout southern Yukon. More recently, infestations have occurred in the extreme southeast in spruce, and to a lesser extent, alpine fir, as extensions of infestations in the Liard River drainage in northern B.C. and Northwest Territory, which have covered as much as 400 000 ha.

Year	Remarks
<hr/>	
1952-54	Light defoliation was widespread near Carcross and along the Alcan Highway near Upper Rancheria River. Along the Haines Road, from Km 64 to Km 96, defoliation affected 10-20% of the current year's needles.
1955-59	Low numbers were found in 1957 feeding in buds of white spruce and alpine fir north of Mayo.
1960-62	Trace defoliation occurred in the Kluane Lake area and on the Mayo Road. Seven empty pupal cases were collected at Haines Junction and one larva was collected near Carmacks. Populations increased in 1962. About 200 ha of mature and understory spruce at Km 1707, Alcan Highway, were lightly defoliated. Twenty larvae were collected from a single beating of a white spruce below Sheep Mountain.
1963-64	The infestation at Km 1707 (Sheep Mountain) covered 200 ha and an estimated 30-50% of the new buds were infested. The Sheep Mountain infestation persisted into 1964 with damage to about 38% of the buds.
1965-85	No activity reported.
1986	Light and moderate defoliation occurred over an undetermined area in the La Biche River Valley in the extreme southwest corner of the Territory. No aerial surveys were conducted in Yukon.
1987	Light and moderate defoliation occurred over at least 1000 ha in the La Biche River Valley. Four areas of light totalling 750 ha and two areas of moderate over 250 ha were mapped.
1988	No defoliation was reported in the extreme southeastern corner of the Territory.

Year	Remarks
1989	Defoliation was observed in the La Biche River Valley, but no detailed aerial survey was conducted. A taxonomic and distribution study using pheromone traps was concluded with <u>C. fumiferana</u> occurring throughout the Liard, Pelly and lower Yukon river valleys, in the Watson Lake, Carmacks, Moose Creek, Dawson City areas and south of the North Fork Pass. The occurrence of two other species was confirmed with <u>C. orae</u> south of North Fork Pass and <u>C. biennis</u> near Haines Junction and Atlin Lake.
1990	Defoliation was observed in the La Biche River Valley in the southeast corner of the Yukon.
1991-92	No defoliation was noted within the Territory and only few larvae were collected in standard beatings.
1993	Light defoliation of white spruce at Irons Creek in the extreme southeast; an extension of a much larger infestation in the adjacent area of B.C., along the Liard and Fort Nelson rivers. Very few larvae collected elsewhere in Yukon.
1994	Trace to light defoliation at Irons Creek, less prevalent than last year. Significant defoliation again reported from the LaBiche River area by Forest Resources personnel, but no aerial surveys were conducted.
1995	Mostly light defoliation was mapped over 7200 ha in scattered stands in the LaBiche and Beaver river drainages during an aerial survey of the extreme southeastern part of the Territory. Though budworm defoliation may have played a minor role, it is not thought responsible for extensive recent spruce mortality in stands along the LaBiche River (see spruce beetle). There was ample evidence of prior budworm feeding damage in surviving trees but not sufficient to cause mortality in the understory. Additional trace levels of defoliation were seen in stands near Irons Creek, straddling the B.C.- Yukon border for the third consecutive year.

OTHER SPRUCE* PESTS

Pest	Location	Year	Remarks
Cooley spruce gall adelgid, <u>Adelges cooleyi</u>	Aishihik Lake	1987	low incidence, light intensity of non gall-forming life stage
Engraver beetle, <u>Ips tridens</u>	Watson Lake	1987	moderate attack on windthrown trees
False spruce looper, <u>Syngrapha selecta</u>	Watson Lake	1957	light defoliation
	Haines Junction	1960	trace defoliation
	Km 26 Tagish Rd.	1961	trace defoliation
	Km 85 Dawson Rd.	1962	light defoliation
Four-eyed spruce beetle, <u>Polygraphis rufipennis</u>	Carcross Rd.	1957	light girdling of branches on lower part of tree
	Annie Lake and Carmacks roads, Dawson	1960	light damage
Greenheaded spruce sawfly, <u>Pikonema dimmockii</u>	Throughout southern Yukon	chronic	trace-to-light defoliation
Inland spruce cone rust, <u>Chrysomyxa pirolata</u>	Hyland River Valley	1985	common on alternate host (<u>Pyrola</u> spp.)
Inonotus root disease, <u>Inonotus tomentosus</u>	Sheep Mtn. to Congdon Creek	1984	33% of the semi-mature and mature spruce along Kluane Lake in several 5-ha spots infected
Pine leaf chermid, <u>Pineus pinifoliae</u>	Watson Lake	1986	30% of the branch tips on 80% of the young spruce over 2 ha were infested
	Stewart Crossing		5% branch tips on 100% of trees were infested

* white spruce unless otherwise specified

OTHER SPRUCE* PESTS (cont.)

Pest	Location	Year	Remarks
Round-headed woodborer, <u>Cerambycidae</u>	Bear Flats and Yukon Pacific Forest Products	1990	larvae boring into fallen trees and decked logs
A secondary bark beetle, <u>Dryocoetes affaber</u>	Aishihik Road, Mayo	1957	light
Spruce broom rust, host range <u>Chrysomyxa arctostaphyli</u>		chronic	brooms in mature white spruce common throughout host range
Spruce gall midge <u>Rhabdophaga swaini</u>	Alcan Hwy. south of Whitehorse	1957	moderate to severe damage to black and white spruce
		1958-1960	light defoliation in southern Yukon, trace defoliation at Carmacks
Spruce needle blight, <u>Lirula macrospora</u>	Tagish, Nordenskiöld River	1987	lightly infected most of the older foliage
A spruce tip moth, <u>Epinotia radicana</u>	Aishihik Road, Mayo	1957	light
	Sheep Mountain, Alcan Highway, Km 200 Haines Rd.	1962	light defoliation
Yellowheaded spruce sawfly, <u>Pikonema alaskensis</u>	throughout southern Yukon	chronic	trace-to-light defoliation
Yellow spruce budworm <u>Zeiraphera fortunana</u>	Watson Lake to Aishihik River	1957	light bud damage
	Watson Lake	1988	trace bud damage

* white spruce unless specified otherwise

LODGEPOLE PINE PESTS

Lodgepole pine beetle, Dendroctonus murrayanae

Lodgepole pine beetle is found in overmature, injured, stressed trees, windfalls and in fresh stumps. It is usually non-aggressive but occasionally kills residual trees left after logging. It may take two or more generations to girdle and kill a tree. Trees can survive attacks.

Year	Remarks
1952-59	Low populations.
1960-61	Pine at the Annie Lake, McClintock Lake, and Canyon Mountain roads were lightly attacked in 1960; expanding to near Whitehorse in 1961.
1962-67	No recorded activity
1968	Tree mortality recorded in a localized area near Teslin.
1969	Low populations in weakened trees at Km 116 S. Canol Road.
1970-74	No recorded activity.
1975	An undetermined number of pine attacked near Ethel Lake.
1976-84	No recorded activity
1985	Twenty pine at Rusty Creek near Mayo, felled for cone collecting were attacked. All infested trees were removed.
1986	A single stressed lodgepole pine was attacked by pine beetle at Rusty Creek near Mayo.
1986-88	No recorded activity
1989	Infested individual trees were recorded in Whitehorse.
1990-92	No recorded activity
1993	Five flood-stressed trees attacked at Km 26 South Canol Rd.
1994-95	No recorded activity

Pine needle cast, Lophodermella concolor

Year	Remarks
1984	Scattered areas of light damage to year-old needles near Watson Lake and Whitehorse.
1985	No recorded infections
1986	Infected 50% of the older needles of lodgepole pine at Km 432 of the Robert Campbell Highway. At Takhini Forest Reserve 30% of older foliage on 50% of the lodgepole pine were discolored.
1987	Discoloration of 30% of year-old foliage on 25% of the young pine 10 km north of Watson Lake and a light infection, low incidence at Takhini Forest Reserve.
1988-90	No recorded infections
1991	Average of 80% of year-old foliage killed on 90% of understory lodgepole pine near Watson Lake.
1992	Average of 30% of year-old foliage lost on 90% of pine in Watson Lake area, as far west as Rancheria and north to Km 150 of the Robert Campbell Highway.
1993	Up to 80% of year-old needles discolored in scattered pockets near Watson Lake, along the Robert Campbell Highway as far as Km 210, and near Lower Sheep Creek at Km 138 of the South Canol Road.
1994	Up to 90% year-old needles discolored in scattered pockets of mostly young roadside pine near Watson Lake. Less severe discoloration affected up to 60% of 1993 needles in scattered pockets as far north as Km 250 along the Robert Campbell Highway, and in stands between Faro and Carmacks.
1995	Up to 80% of year-old needles were discolored in scattered pockets of mostly young pine, throughout the Watson Lake area.

Lodgepole terminal weevil, Pissodes terminalis

Larvae of this weevil feed in the cambium of young lodgepole pine terminals, killing them down to the first branch whorl. Though damage was first reported in 1990, low populations of this weevil are suspected to have long been part of the indigenous fauna of Yukon forests.

Year	Remarks
1990-91	Single infested terminals were found for the first time in Yukon on young roadside trees just north of Watson Lake.
1992	Attacks affected <1 to 5% of trees in scattered stands along the Alcan Highway from Watson Lake to Whitehorse, and along the Takhini Hot Springs and Atlin roads.
1993-95	Up to 10% terminals were attacked in a stand at Km 34 of the Atlin Road, just north of the B.C. border. Scattered trace attack levels were seen throughout much of southern Yukon in pure young pine stands.

OTHER LODGEPOLE PINE PESTS

Pest	Location	Year	Remarks
Pinewood nematode <u>Bursaphelenchus</u> <u>xylophilus</u>	Watson Lake	1990	found for the first time in Yukon in woodborer-attacked spruce logs
Comandra blister rust, <u>Cronartium</u> <u>comandrae</u>	Carcross and Hyland River Valley	1985	infected stems and branches of sapling and young-growth pine
	Takhini Forest Reserve	1986	infected 1% of stems of saplings
	Watson Lake and Takhini Forest Reserve	1987	infected about 1% of the trees
	Whitehorse to Johnsons Crossing	1988	infected 1% of the stands
	Teslin	1989	infected 5% of the stand

OTHER LODGEPOLE PINE PESTS (cont.)

Pest	Location	Year	Remarks
Comandra blister rust <u>Cronartium</u> <u>comandrae</u> (cont.)	Takhini Forest Reserve	1993	infected 18 planted pine in Svenska Trial
	Takhini Forest Reserve	1994	infected 28 planted pine in Svenska Trial
A needle cast <u>Davisomycella</u> <u>montana</u>	Gravel Creek, Rancheria	1988	about 15% of the foliage infected on 100% of the trees
Western gall rust <u>Endocronartium</u> <u>harknessii</u>	Takhini Forest Reserve	1985	less than 1% branches and 3% stems infected
		1986	infected 1% of the stems of sapling lodgepole pine
	Rancheria	1987	less than 5% of stand with branch and stem galls
	Watson Lake	1990	moderate incidence
Pine engraver, <u>Ips pini</u>	Whitehorse	1994	heavy attack of some decked logs
Smaller western pine engraver, <u>Ips latidens</u>	Whitehorse, Annie and McClintock lake roads	1960	scattered attacks
A needle cast <u>Lophodermella</u> <u>montivaga</u>	Robert Campbell Highway	1989	common on foliage near Money Creek
Northern pitch twig moth <u>Petrova</u> sp.	Watson Lake	1957	moderate
	Takhini Forest Reserve	1985	about 4% of the stems infested
A pine weevil, <u>Pissodes</u> sp.	Whitehorse and Km 16 Atlin Road	1959	light in regeneration, very low elsewhere
	Annie Lake Road, Km 3 Mayo Road	1962	two larvae in regeneration

FIR-SPRUCE PEST

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

Although not a serious pest of white spruce and alpine fir, these two closely related budworms have, at times, lightly defoliated small patches of trees, primarily white spruce, throughout the Territory. In B.C. and Alberta, the Rocky Mountains are the geographic dividing line between the two species; eastern blackheaded budworm prevailing to the east and western to the west. In the Yukon, the Rockies are reduced to foothills, and consequently the division between the two populations is less distinct. Past collections have shown A. variana in the Watson Lake area and from Carmacks north, and A. gloverana in the southwest, including Whitehorse and the Haines Road.

Year	Remarks
1952-57	Low populations, (5-10 larvae) collected throughout the Territory most notably along the Aishihik Road.
1958	An average of five larvae were collected in standard beating samples at Watson Lake, Whitehorse and Haines Junction and adults and pupae were collected in mid-July near Carmacks. Few were evident throughout the rest of the Yukon.
1959-62	Low populations.
1963	White spruce were lightly defoliated at Km 1674 Alcan Highway. Throughout the rest of the Territory, single larvae were commonly collected.
1964	Populations declined. An average of 4 larvae collected from beating samples throughout the Territory; the highest was 25, at Km 346 Mayo Road.
1965-74	Low populations.
1975	Populations increased throughout the Territory with 38% positive standard beatings in susceptible species yielding an average of 7.4 larvae. New areas of activity included: from Haines Junction north to Beaver Creek; along Highway #2 from Carmacks to Mayo and Km 35-294 Dempster Highway.
1976	Populations declined with 21% positive beatings averaging 3.9 larvae. The highest population was at Liard River.

Year	Remarks
1977-78	Low populations.
1979	Light defoliation occurred at Marshall Creek, Aishihik River and Haines Junction. An average of 10 larvae per sample were collected.
1980-92	Low populations.
1993	Budworm larvae were collected in 12 of 71 standard beatings throughout southern Yukon. Trace defoliation of current growth was seen at Million Dollar Falls and Klukshu, where 99 and 45 larvae were collected respectively.
1994	Low populations.
1995	Not sampled

EASTERN LARCH PESTS

Larch budmoth, Zeiraphera improbana

Year	Remarks
1974	Several hectares lightly defoliated 48 km north of Watson Lake
1975	Populations increased lightly defoliating eastern larch stands throughout the host range in southeastern Yukon. Small patches were moderately to severely defoliated at Km 1808 Alcan Highway and along the Hyland River north to Km 133 on the Cantung Road.
1976	Moderate to severe defoliation continued for the second year in the Frances and Hyland river valleys along Highway 10 and along Highway 9 from north of Watson Lake to Km 160. Light defoliation occurred from there through to Finlayson Lake.
1977	Infestations continued in the Hyland River Valley. Moderate to severe defoliation occurred along Highway 10 from Km 80 to 128 where standard beating collections contained an average of 282 larvae. Light defoliation occurred from Km 10 to 80, and along Highway 9 between Watson Lake and Frances Lake, where defoliation was most extensive in 1976.

Year	Remarks
1978	Populations declined in the Hyland River Valley and elsewhere, and only 12 larvae were collected in the previous outbreak areas. The cause of the collapse was not determined.
1979-94	No recorded activity.
1995	Not sampled

Larch sawfly, Pristiphora erichsonii

Year	Remarks
1984	Light and moderate defoliation of eastern larch along the Robert Campbell Highway, particularly in the Simpson Lake area, and from Km 16 to Km 80 on the Tungsten Road.
1985	No recorded activity.
1986	Light to moderate defoliation in scattered larch stands recorded west of Watson Lake.
1987-89	Populations increased in the Finlayson-Frances lakes area, and Tuchitua, Tungsten Road areas causing light-moderate defoliation.
1990	Populations declined.
1991-95	Low populations with less than 1% of needles with egg niches, and trace levels of defoliation north and south of Watson Lake.

Conifer-aspen rust, Melampsora medusae

Year	Remarks
1984	About 10% of the needles were infected on most eastern larch for 10 km along the Tungsten Road north of Watson Lake.
1985-95	Not collected.

Larch-willow rust, Melampsora paradoxa

Year	Remarks
1989	Finlayson Lake area; low incidence. Only the second collection on larch in the Yukon.
1990	About 20% of the foliage on 20% of the larch was infected along the Campbell Highway near Finlayson and Frances lakes.
1991-95	None collected.

MULTIPLE HOST PESTS

Roundheaded woodborers, Monochamus spp.

Woodborers commonly attack standing dead trees, logs in decks and (less commonly) green lumber, all of which can result in a lumber degrade. The best protection against woodborer damage is milling logs soon after they are felled. Much attention was focused on woodborers in recent years since they were shown to be the primary vector of the Pinewood nematode. The European Community in the early 1990s instituted bans against the importation of selected green wood products from North America, to ensure against accidental introduction into European forests.

Year	Remarks
1959/60	Damage not recorded but three beetles taken in flight on the Mayo-Dawson Road in 1960.
1961/62	Numerous adult <u>M. scutellatus</u> on deck logs at Ewing's mill site, Km 351 Mayo Road, and at Dawson and Watson Lake, but no damage reported.
1963-73	Few records of activity or damage to decked logs.
1974	Up to 200 bore holes/square meter in some decked logs at a millsite in Watson Lake, with lesser damage at Teslin.
1975-86	No damage reported.
1987	Eighteen adult <u>M. scutellatus</u> were collected in the Hyland Forest Products log yard in Watson Lake.

Year	Remarks
1988	None collected
1990	Woodborers attacked white spruce log decks at Watson Lake. Pinewood nematode, <u>Bursaphelenchus xylophilus</u> extracted from one on the wood samples from an attacked log.
1991-95	None collected

OTHER MULTIPLE HOST PESTS

Pest	Host	Location	Year	Remarks
Tamarack beetle, <u>Dendroctonus simplex</u>	eastern larch	Km 1096 Alcan Hwy	1962	Low populations
Engraver beetle, <u>Ips</u> spp.	white spruce, lodgepole pine	McQuesten, Minto	1951 -1955	light-moderate attacks to both spp. in log decks
A looper, <u>Itame</u> sp.	aspen, willow	Kluane Watson Lake	1957 1960	light damage trace
Sequoia pitch moth <u>Synanthedon sequoiae</u>	Sitka spruce lodgepole pine	Haines Rd.	1957	light damage
Swallowtail butterfly, <u>Papilio rutulus</u>	aspen, alder	Dawson City	1957	light larval feeding damage
Yellow spruce budmoth, <u>Zeiraphera fortunana</u>	alpine fir, white spruce	Watson Lake to Aishihik River	1957	light damage

CONE AND SEED PESTS

Spruce seed moth, Cydia youngana

This moth infests spruce cones, destroying both seeds and scales.

Year	Remarks
1952	Severe damage in the Lewes Creek Valley near Whitehorse.
1956	From 45-95% of cones infested at Whitehorse and Km 1743.
1957	Moderate damage to spruce cones along Haines Road.
1958	Repeat of damage along the Haines Road, as well as at Aishihik Road, Km 1392-1743 Alcan Highway and at Carcross.
1959-61	In 1959/60 severe infestation of cones near Km 1395 and 1570 Alcan Highway and 42% of cones were infested near Carcross. In 1961, 92% of the cones were damaged at Km 1395, Km 1570, and at Carcross.
1962-63	Damage declined to 55% in areas infested in 1961, increasing to 75% at Carcross in 1963.
1964-67	Little damage recorded.
1968	Up to 67% of cones infested at several locations.
1969-89	Scattered light damage. Surveys discontinued in 1989.

A cone maggot, Strobilomyia neanthracina

Year	Remarks
1960	36% of 150 white spruce cones were infested at four localities in the Territory.
1961/62	10 and 25% of 320 white spruce cones infested at four locations in the two respective years.
1963	25% of 160 cones collected at Km 1571 Alcan Highway and 42% at Km 1395 Alaska Highway infested.
1964-89	Not recorded. Cone and seed surveys discontinued in 1989.

DECIDUOUS TREE PESTS

Large aspen tortrix, Choristoneura conflictana

Large aspen tortrix is the most common and destructive deciduous defoliator in Yukon forests, with populations repeatedly reaching epidemic levels in the numerous stands of pure trembling aspen. During epidemics the insect also feeds on other broad-leaved trees and shrubs, and when these food sources are exhausted, they will attack available conifer species. They are, however, unable to complete their life cycle in the absence of aspen. Even severely defoliated trees normally refoliate later in the same growing season and recover quickly. Repeated severe defoliation has caused some tree mortality but more commonly damage has been limited to increment loss and branch and terminal dieback.

From the gold rush until the middle of this century, commercial river, and lake transportation in the Yukon was largely steam powered, and nearly all stands of lodgepole pine and spruce within miles of the main transportation corridors were harvested for fuel. Large pure stands of trembling aspen subsequently succeeded the harvested conifers, providing vast new resources for the large aspen tortrix. Human activity, therefore, has indirectly promoted and sustained tortrix infestations in these areas.

Year	Remarks
1958-63	In 1958 162 ha, was severely defoliated, 5 km north of Carmacks. This increased to 200 ha in 1959 and '60 with light to moderate defoliation at Km 1939, Alcan Highway. The Carmacks infestation declined to light defoliation in 1961 but expanded slightly toward the north, while populations on the Alcan Highway collapsed. Light defoliation persisted in the Carmacks infestation in 1962. Populations collapsed in 1963.
1964-67	No damage recorded.
1968	Light-to-severe defoliation at many locations including: between Champagne and Haines Junction, 60 km southeast of Beaver Creek, near Fox Lake, at Carmacks, Pelly Crossing, Stewart Crossing, Mayo, Elsa, from McQuesten to Dawson City, and Frances Lake to Ross River.
1969-70	Populations declined causing only light defoliation throughout the 1968-infested areas. In 1970 only trace to light defoliation was seen at widely scattered locations.

Year	Remarks
1971-74	No damage recorded.
1975-77	Light defoliation of trembling aspen, balsam poplar and birch was widespread in 1975 with pockets of moderate defoliation between Carmacks and McQuesten and the lower portions of the Pelly River Valley. In 1976, light defoliation occurred in the McQuesten River Valley. In 1977 at Carmacks, aspen was totally defoliated at Carmacks and light defoliation was evident between Km 345 and 352 along Highway 2.
1978	Infestations continued with severe defoliation along the Alcan Highway from Km 1534 to 1536, along the Haines Road, from Km 74-80 between Dawson City and Stewart Crossing, and farther south along Highway 2 between Km 224 and 226.
1979	Light defoliation occurred at Carmacks, Dawson City, McQuesten and Mayo.
1980	Moderate and severe defoliation was seen in patches of 200 to 1000 ha in stands along the Yukon River at Carmacks, from Stewart Crossing to McQuesten, near Pelly Crossing and north of Mayo. Light defoliation occurred west of Whitehorse, near Beaver Creek and Teslin.
1981	Aspen stands were severely defoliated in 50-1000 ha areas at 13 locations, totalling over 50 000 ha at Teslin Lake, Snag Road, Dawson City, Little Salmon Lake and Aishihik Lake and River. Populations at Snag Airport showed a high incidence of parasitism by the parasitic wasp <u>Glypta</u> sp.
1982	Near Teslin Lake, Aishihik, Snag Road, Dawson City, Little Salmon Lake and Little Atlin Lake, populations declined dramatically from more than 50 000 ha to small pockets of between 1-50 ha and only trace and light defoliation was recorded. At Aishihik River, where defoliation had been recorded since 1979, there was no new defoliation. The decline was attributed to larval parasites, winter mortality and depletion of host material.
1983	Trace to light defoliation occurred in localized 3-5 ha patches, west of Teslin, southwest of Tagish towards Carcross, from Aishihik River to Snag Airport and from Haines Junction south along the Haines Road to the B.C./Alcan border.

Year	Remarks
1984	Moderate to severe defoliation of trembling aspen occurred over 6 400 ha between Km 90 and Km 147 on Highway 2 south of Carmacks. Trace defoliation of scattered trembling aspen groves occurred west of Teslin and southwest of Tagish toward Carcross.
1985	Declining populations very lightly defoliated aspen stands south of Carmacks.
1986	Light to moderate defoliation for 10 km on Highway 2, north of Stewart Crossing. Patches totalling over 1 000 ha were lightly defoliated on south-facing slopes above the east side of Little Atlin Lake.
1987	Scattered immature trembling aspen stands were lightly defoliated for 10 km between Faro and Ross River.
1988	Severe defoliation over 800 ha and light to moderate defoliation over 200 ha occurred for approximately 10 km along the Alcan Highway, from the Takhini River Bridge to the Klondike Highway junction.
1989	About 4 910 ha of severe, 2 830 ha of moderate and 2 460 ha of light defoliation occurred along the Alcan Highway and Takhini River from 8 km west of the Ibex River to east of Takhini Hotsprings. Defoliation was also recorded between Flat Mountain and the south end of Lake Laberge. Larval parasitism averaged 76%, with <u>Glypta conflictanae</u> , <u>Agathis</u> sp. and <u>Phytodietus</u> sp. being the most common. An additional 21% of pupae were parasitized.
1990	About 4 365 ha of severe, 1 775 ha of moderate and 2 960 ha of light defoliation was recorded during aerial surveys along the Alcan Highway and Takhini River from west of Arkell Creek to east of Takhini Hotsprings, and between Flat Mountain and Lake Laberge.
1991	Severe defoliation was seen in two patches totalling about 30 ha, just east of Tagish along Highway 8, and along the Alcan Highway at Marsh Lake. Primarily light defoliation with some patches of moderate, occurred over a broad area between Carcross and Tagish, along the Alcan Highway between Jakes Corner and Whitehorse, and from the Takhini River crossing to beyond Fox Lake. Small patches of light damage were seen farther west near Champagne and Haines Junction, and from Dezadeash Lake south to the B.C. border.

Year	Remarks
1992	<p>The largest infestation spanned 8 km along both sides of the Tagish Road just east Tagish Village. About 15% of the area was severely defoliated with the remainder light to moderate. Approximately 5 km north of Carcross, light and moderate defoliation occurred along both sides of the Klondike Highway with large patches of severe visible just north of Bennett Lake. Also in the same area, large patches of severe defoliation, bounded by light and moderate occurred on lower south-facing slopes of Caribou Mountain. Intermittent patches of severe defoliation were also seen on south-facing slopes for 10 km along the Alcan Highway west of Jakes Corner, as far as Km 1382.</p>
1993	<p>Three separate patches of severe defoliation totalling about 1 250 ha 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 400 ha patch of severe defoliation at Braeburn. Seven severely infested patches totalling 1 300 ha were seen on hillsides above Teslin Lake from Jakes Corner southeast to Nisutlin Bay. A mass larval collection from one of the Teslin Lake infestations was severely parasitized (71%) by Hymenoptera. An additional 27% either were infected by disease or died of unknown causes. Only 2% emerged.</p>
1994	<p>Infestations occurred in the same general areas as in 1993 but covered three times the area overall totalling 11 400 ha. The increases were due to major expansion of infestations in the Mayo area which stretched, in large intermittent patches, as far north as the confluence of the Yukon and Klondike rivers.</p>
1995	<p>A single 200 ha infestation was seen near Jakes Corner in the same stand infested in 1994. No other defoliation was seen in southern areas of the territory. The Klondike highway was not surveyed.</p>

Aspen serpentine leafminer, Phyllocnistis populiella

Year	Remarks
1953-56	Common throughout the southern part of the Territory and north as far as Mayo, with light defoliation in 1954 and 1955. Low incidence was seen along the Alcan Highway and Carcross Road in 1956.
1957-62	Moderate activity around Watson Lake in 1957 increased slightly in 1958 stretching from the Yukon/B.C. border along the Alcan Highway to Little Rancheria River. Only trace levels of activity were noted in the rest of Yukon. Populations increased to moderate levels in the Watson Lake area in 1959 and spread westward along the Alcan Highway. Unidentified parasites infested an average of 29% of the cocoons at Watson Lake and Rancheria. Infestations increased in 1960 at Watson Lake and Rancheria River but levels of parasitism increased also, affecting an average of 60% of cocoons. In 1961, infestations decreased at Watson Lake and Rancheria River and parasitism of cocoons averaged 28%. Populations decreased sharply in 1962 at the Rancheria River and Watson Lake areas and cocoon parasitism declined to 20%.
1963-65	No damage recorded
1966-70	Common throughout the Territory with severe defoliation along the Canol Road, near Watson Lake and in the Beaver Creek area, and moderate defoliation at Km 1262 and 1854 of the Alcan Hwy., and along the Robert Campbell Hwy., 129 km north of Watson Lake. High populations occurred in 1967 at Beaver Creek and from a point 161 km west of Watson Lake, east to the Beaver River, and north to Frances Lake. In 1969, damage increased in the Watson Lake and Ross River areas but in the Beaver Creek area remained the same. Populations remained high in 1970.
1971-88	No damage recorded.
1989	Light infestations near Stewart Crossing and Dawson City.
1990	No damage recorded.
1991	Found at trace levels in association with large aspen tortrix infestations near Teslin.

Year	Remarks
1992-94	Trembling aspen between Dawson City and Carmacks were infested with very low levels in the extreme northern limit (<5%), increasing steadily to the south until, near Mayo, up to 80% of aspen leaves were infested. Infestation levels decreased again south of Stewart Crossing, declining to trace incidence at Minto. Up to 30% of balsam poplar leaves also infested in the same areas.
1995	North Klondike Highway not surveyed.
Aspen leaf blotch miner, <u>Lithocolletis</u> (<u>Phyllonorycter</u>) sp.	

Year	Remarks
1958	Moderate to severe defoliation of trembling aspen was widespread from 10 km west of Stewart Crossing on the Dawson Road and 8 km east on the Mayo Road. Light defoliation was recorded along the highway between Carmacks and Stewart Crossing. Few mined aspen leaves were seen elsewhere in the Territory.
1960-62	Prevalent on trembling aspen throughout Yukon, especially from Carmacks to Dawson where about 20% of leaves were infested. Common in 1961/62 with light to moderate damage throughout the Territory affecting approximately 28% of the aspen leaves.
1963-95	Uncommon or not found.

OTHER DECIDUOUS TREE PESTS

Pest	Host	Location	Year	Remarks
An alder erineum leaf mite, <u>Acalitus brevitarsus</u>	Sitka alder	Teslin area	1989	light damage to 25% of the foliage
Ambermarked birch leafminer, <u>Profenusa thomsoni</u>	White birch	Whitehorse	1989	new distribution record
Aspen dieback, <u>Tympanis</u> sp.	aspen	Swift River	1987	causing dieback and crown thinning
Aspen leaf spot <u>Pollaccia</u> sp.	aspen	South McQuesten River-Carmacks, Watson Lake	1987	new host and distribution record
Birch-aspen leafroller, <u>Epinotia solandriana</u>	Sitka alder	Albert Creek	1989	light defoliation
	willow sp.	Beaver Creek to Haines Jct.	1989	light defoliation
A birch <u>Rheumaptera</u> sp.	white birch	Dawson City	1957	scattered
	Sitka alder		1958	light-severe defoliation
Black army cutworm <u>Actebia fennica</u>	fireweed	Km 1525 Alcan Hwy.	1961	large numbers of larvae
	spruce, Sitka alder	Whitehorse	1982	small numbers of larvae
A black woolly bear <u>Platarctica parthenos</u>	willow sp.	Watson Lake	1957	light defoliation
Cottonwood leaf beetle <u>Chrysomela</u> sp.	black cottonwood	Haines Jct.	1989	light damage

OTHER DECIDUOUS TREE PESTS (Cont.)

Pest	Host	Location	Year	Remarks
Diamond willow disease <u>Valsa</u> (<u>Cytospora</u>) sp. common	willow sp.	throughout Territory	chronic	commonly causes diamond-shaped stem cankers
A gall aphid, <u>Parathecabius</u> sp.	aspen	Haines Junction to Whitehorse	1989	common
A gall mite, <u>Eriophyes</u> <u>parapopuli</u>	aspen	Frenchman Lake	1989	caused galls on 1% the trees
	aspen	Takhini Hot-spring	1990	on 90% of the young aspen over 1 ha
		Stewart Crossing	1991	10% smaller trees killed by girdling
A leaf curl, <u>Taphrina</u> (prob.) <u>occidentalis</u>	Sitka alder	Salmon Lake	1990	low incidence on foliage
A leaf gall mite, <u>Phyllocoptes</u> <u>didelphis</u>	aspen	Snag Jct.-Beaver Creek	1989	common
A leafminer, <u>Coleotechnites</u> <u>atrupictella</u>	aspen	Dawson City	1957	light defoliation
		Carmacks, Dawson City	1960	trace defoliation
A leafminer, <u>Lyonetia</u> sp.	willow sp.	Haines Jct, Kathleen Lakes	1989	20% foliage infested
A leafroller, <u>Archips</u> <u>rosanus</u>	Sitka alder, willow sp.	Whitehorse	1990	common
A leafspot, <u>Marssonina</u> <u>brunnea</u>	aspen	Teslin	1990	trace infection

OTHER DECIDUOUS TREE PESTS (Cont.)

Pest	Host	Location	Year	Remarks
A looper, <u>Hydriomena</u> <u>renunciata</u>	Sitka alder	Mayo, Kluane Lake	1957	light defoliation
Paleheaded aspen leafroller, <u>Anacamptis</u> <u>niveopulvella</u>	aspen	Carmacks Carcross Whitehorse, Motherall Cr.	1960 1991 1992	found in assoc. with <u>C. conflictana</u> 20% leaves rolled
Poplar borer, <u>Saperda</u> <u>calcarata</u>	aspen	Stewart Crossing	1986	severe infestation; 45% current attack, 40% mortality
	aspen	Mayo-Stewart Crossing	1987	occasional infested trees
A poplar leaf spot, <u>Drepanopeziza</u> <u>populorum</u>	aspen	Tatchun Lake	1989	infected 15% of foliage on 50% of the trees
Pseudo-spotted aspen leafroller, <u>Sciaphila duplex</u>	willow sp.	Faro	1986	10% of the leaves rolled and tied
Purple-brown leaf spot, <u>Pollaccia</u> <u>borealis</u>	aspen	Dawson City- Stewart Crossing, Faro-Ross River	1988	discolored foliage
	aspen	Stewart Crossing-Dawson	1989	trace levels
Rusty tussock <u>Orgyia antiqua</u> <u>badia</u>	willow sp.	Haines Jct.	1957	light defoliation
A sawfly, <u>Trichiosoma</u> sp.	Sitka alder, aspen, willow sp.	Kluane Lake	1957, 1960/61	light damage
Snowshoe hare, <u>Lepus</u> sp.	aspen	southern Yukon	1989, 1991	feeding on stems common

OTHER DECIDUOUS TREE PESTS (Cont.)

Pest	Host	Location	Year	Remarks
A spanworm, <u>Itame</u> sp.	aspen	Kluane	1957	light defoliation
	willow sp.	Watson Lake	1960	trace defoliation
A stem galling fly, Agromyzidae	willow	Km 36 Dempster Highway	1990	light damage to 60% of the trees over 1 ha
Tiger swallow- tail butterfly, <u>Papilio rutulus</u>	aspen, Sitka alder	Dawson City, Haines Jct., Mayo	1957	light defoliation
A willow rust, <u>Melampsora epitea</u>	aspen	west of Kluane Lake	1989	light infection on 50% of the foliage
Willow sphinx moth <u>Smerinthus</u> <u>cerisyi</u>	aspen, black cotton- wood	Whitehorse, Mayo, Dawson north Klondike Highway, Alcan Highway	1960 1962	9 larvae in 7 standard beatings low populations