ANNUAL REPORT

Forest Insect and Disease Survey

Alberta-Northwest Territories-Yukon Region

1967

compiled by

H. A. Tripp and J. K. Robins

FOREST RESEARCH LABORATORY

CALGARY, ALBERTA

INFORMATION REPORT A-X-15

FORESTRY BRANCH

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INTRODUCTION

Following is the annual report of the Forest Insect and Disease Survey of the Alberta - Northwest Territories - Yukon Region for 1967. It includes information formerly appearing in the "Annual District Reports" and outlines the activities of all major elements of the Survey Section. This departure from previous practice is in response to a long felt need to present a more comprehensive statement of Survey activities and accomplishments and to report insect and disease conditions on a regional rather than a district basis.

OBJECTIVES

The Forest Insect and Disease Survey is responsible for investigating the occurrence, abundance and damage caused by forest insects and diseases and for observing and recording related biological phenomena. To meet these objectives, annual surveys of the region are conducted, damage appraisals are made, specimens of insects and diseases are collected, identified and catalogued and problems related to Survey objectives are investigated. Much of the data collected is recorded on punch cards and tape for computer analyses. Periodic and annual reports and publications ensure dissemination of information obtained through Survey activities.

ORGANIZATION

The organizational structure of the survey has been modified from time to time to meet changing requirements. At present there are 7 major elements responsible to the Survey Head for the performance of specific functions (see organization chart, page 4). These elements and their duties are as follows:

Detection Group

There are 8 technicians in this group, 7 Rangers assigned to specific districts and a supervisor. They are responsible for the detection, mapping, and reporting of outbreaks, collecting specimens for inventory and study purposes and for gathering biological data where their widespread movements throughout the Region can be utilized. They maintain close contact with others engaged in administering and utilizing the forests and with the general public; they advise on pest problems when required and lecture on forest entomology and pathology to interested organizations.

Appraisal Group

This group consists of a supervisor and 2 technicians with summer assistance from 3 students. They provide services requiring the employment of specialized personnel on intensive damage appraisals and other survey and co-operative projects. The appraisal group is also responsible for the servicing of permanent study plots and for assisting in investigations where continuity of methods is essential.

Insectary Services

The insectary staff is composed of a senior technician, an assistant, and a number of students employed during the summer. They are responsible for rearing, identifying and cataloguing insects submitted from the field. They maintain a reference collection of the insects of the Region and prepare data on insect collections for computer processing.

Herbarium Services

The processing of disease specimens is the responsibility of the herbarium Curator under the general supervision of the Survey Mycologist. Samples received from the field are identified, recorded and catalogued. A comprehensive reference collection is maintained. All records are being coded for storage on punch cards and tape.

Tree Pest Extension Officer

All requests for information on the control of insects and diseases is channelled through the Tree Pest Extension Officer. Depending on their complexity, requests are either handled directly by the officer or referred to an appropriate specialist.

Research Projects

In addition to the Mycologist who is primarily concerned with the taxonomy of forest diseases, there are 2 professional entomologists and one pathologist engaged in research to meet survey objectives. They investigate problems concerning the taxonomy, life histories, distribution, abundance and impact of forest insects and diseases. They also function as advisors to the Survey Head.

OPERATIONS

Favoured by abnormally warm, dry weather, Survey objectives for 1967 were largely met. Detection, appraisal and research elements were active in the field from late April until mid-October. During this period,

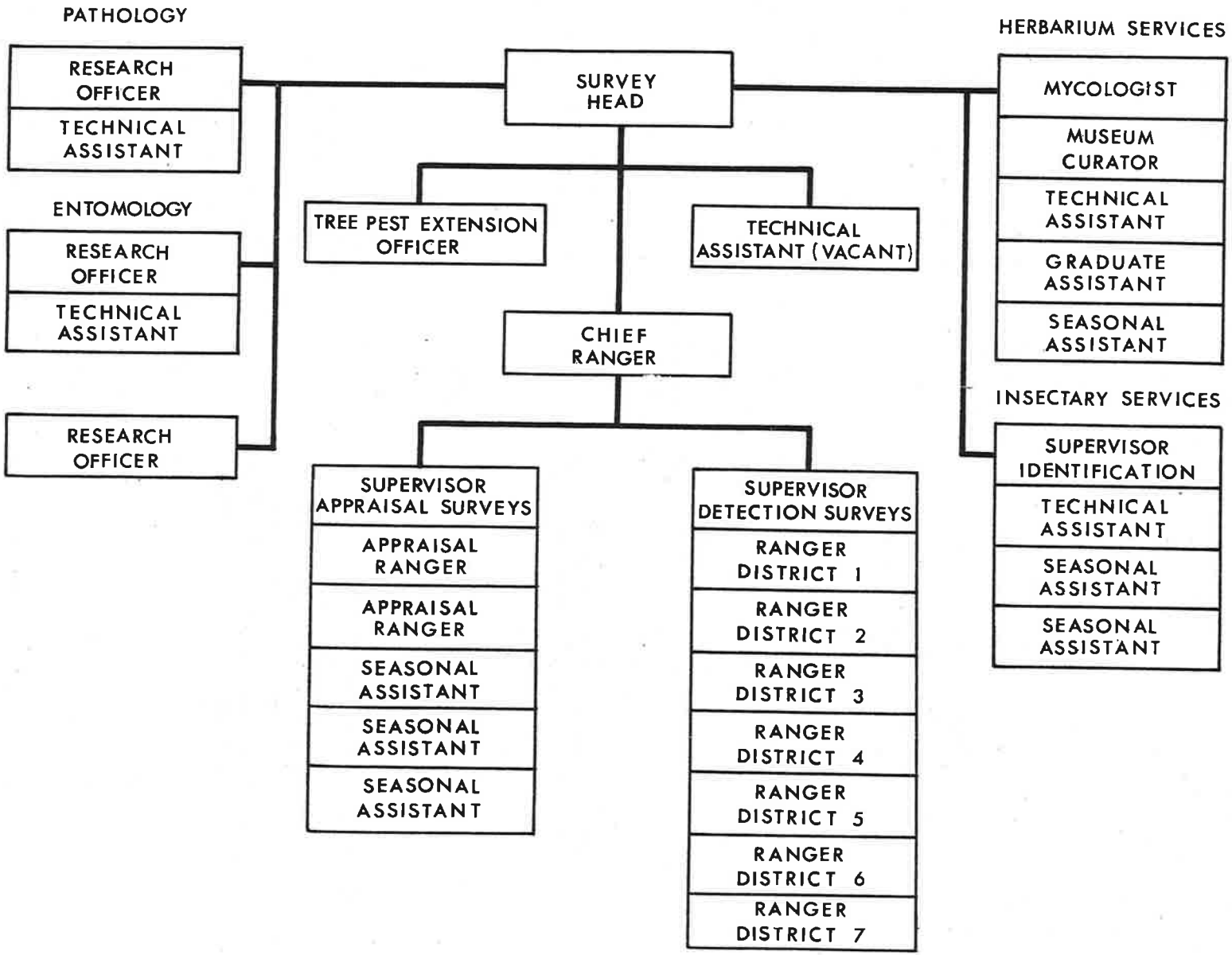
ground and aerial surveys covered most of the Region, a number of damage appraisals were made and research investigations conducted. Major emphasis was placed on studies involving the spruce budw rm, the forest tent caterpillar and foliage diseases of conifers; a total of 1432 insect and 776 disease collections and reports were made and processed.

Winch equipped 1/2 ton panel trucks, a 4-wheel-drive Wagoneer and a 3/4 ton pickup truck provided ground transport for field personnel. A 21 foot cabin cruiser and canoes were used for water travel. Fixed-wing aircraft and helicopters were utilized for aerial surveys and for the transport of personnel and equipment to remote areas under study.

Field establishments at Mount Eisenhower, Crimson Lake, Entrance and Peace River were vacated. Detection Rangers in the 3 southernmost Districts worked out of Headquarters for 10 day periods. Field establishments were maintained at Lac La Biche and Grande Prairie. A trailer was used for accommodation in the Northwest Territories and a truck camper in the Yukon.

The staff of the Forest Insect and Disease Survey gratefully acknowledge the assistance rendered by the Alberta Forest Service, the Provincial Agricultural Services, the Department of Indian Affairs and Northern Development and a number of other co-operating agencies.

ORGANIZATION CHART
FOREST INSECT AND DISEASE SURVEY
ALBERTA-N.W.T.-YUKON



STAFF

SURVEY HEAD

H. A. Tripp, B.S.A., M.Sc.

CHIEF RANGER

J. K. Robins

SURVEYS

DETECTION

Supervisor - J. Petty
Ranger, Dist. 1 - G. C. Bigalow
Ranger, Dist. 2 - G. J. Smith
Ranger, Dist. 3 - J. P. Susut (1)
Ranger, Dist. 4 - G. R. Layton
Ranger, Dist. 5 - F. J. Emond (2)
Ranger, Dist. 6 - E. J. Gautreau
Ranger, Dist. 7 - R. W. Barry (3)

APPRAISAL

Supervisor - V. B. Patterson
Ranger - D. P. Elliott
Ranger - R. M. Caltrell (4)
Student
Student
Student

SERVICES

INSECTARY

Supervisor - D. S. Kusch
Assistant - S. Middleton (Mrs.) (5)
Student
Student

HERBARIUM

Curator - L. E. McArthur (Mrs.)
Student

RESEARCH

ENTOMOLOGY

R. E. Stevenson, B.Sc., M.Sc.
A. G. Raske, B.Sc., M.Sc., Ph.D.
Assistant - B. M. Dahl

PATHOLOGY

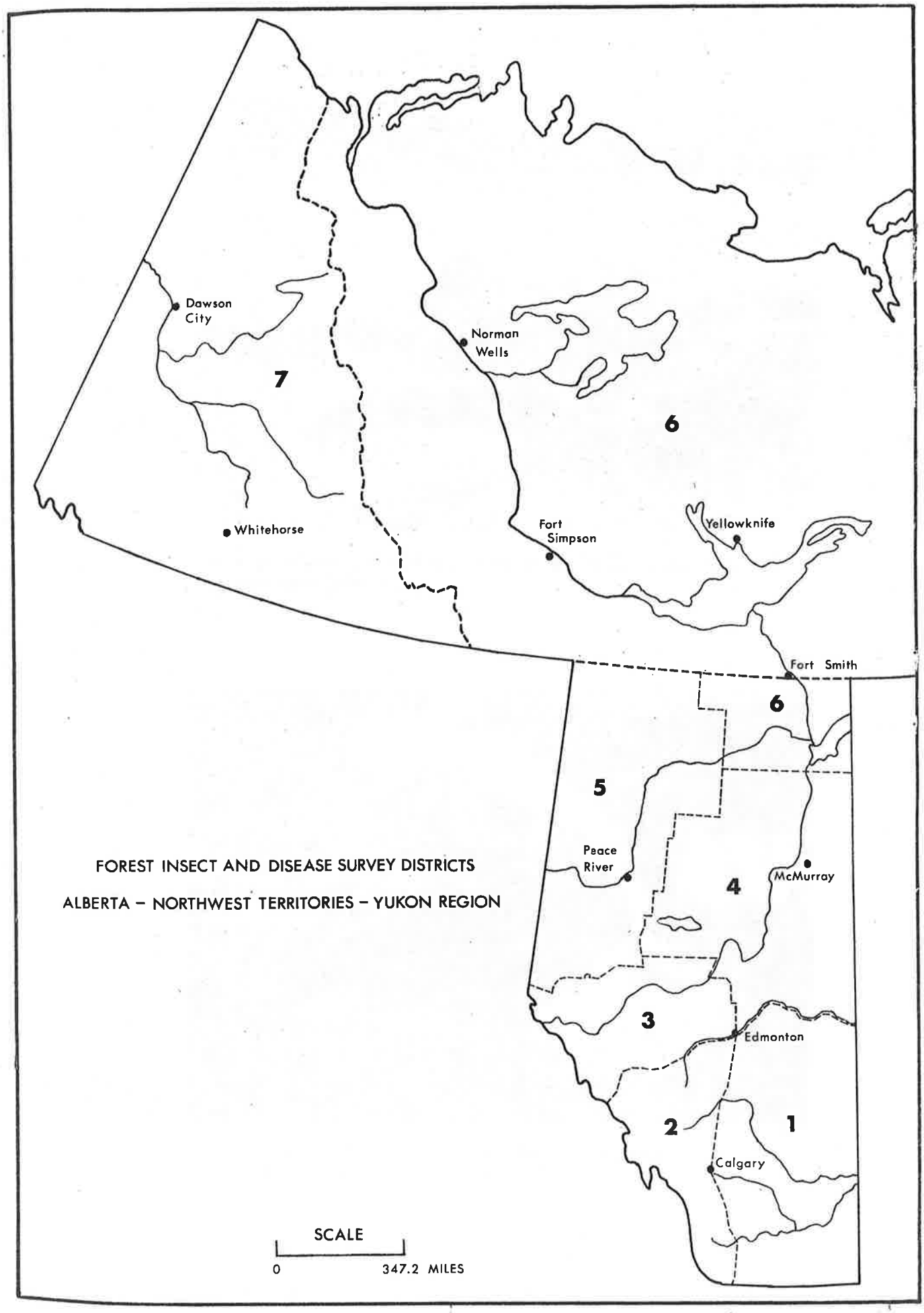
Mycologist - Y. Hiratsuka, B.Sc., M.Sc., Ph.D.
Assistant - P. Maruyama
Graduate Assistant
R. A. Blauel, B.A., M.A.
Assistant - G. R. Stevenson

TREE PEST EXTENSION

N. W. Wilkinson

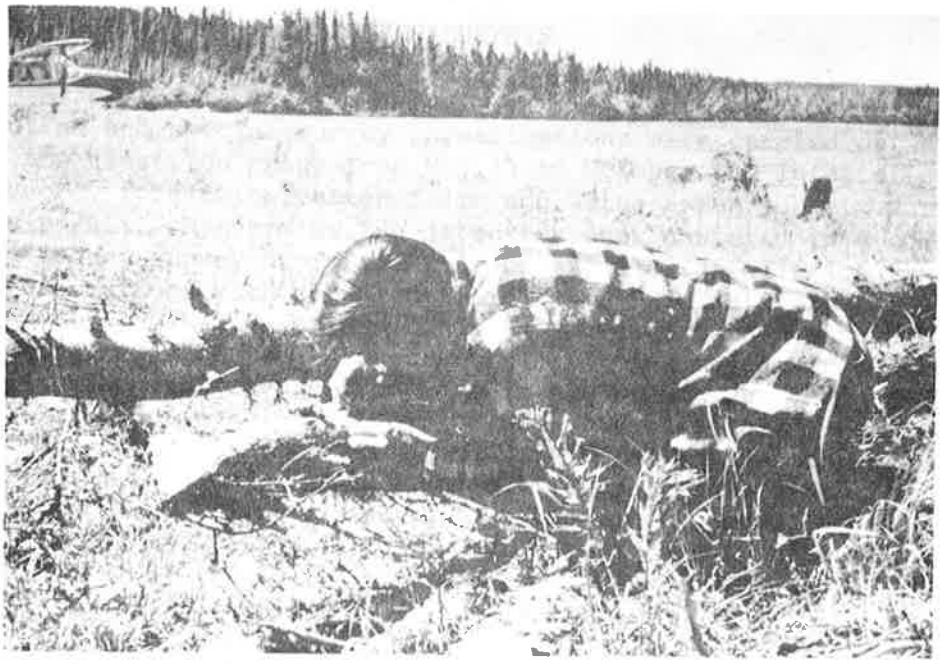
STAFF CHANGES FOR 1968

(1) Transferred to District 7
(2) Transferred to District 3
(3) Resigned - replaced by R. M. Caltrell
(4) Transferred to District 5
(5) Resigned - replaced by R. Moon

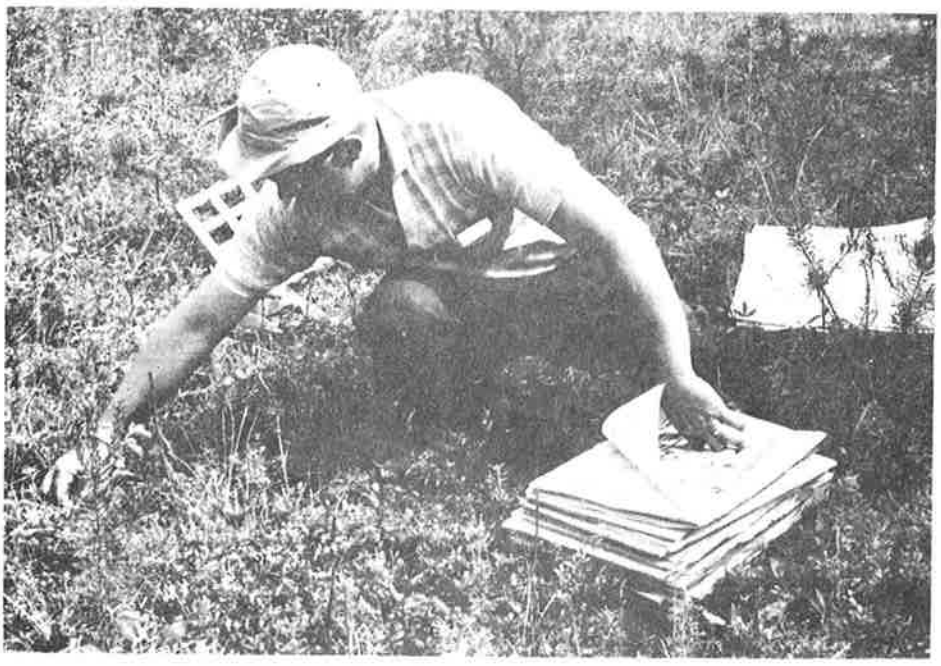


FOREST INSECT AND DISEASE SURVEY DISTRICTS

ALBERTA – NORTHWEST TERRITORIES – YUKON REGION



Survey Ranger collecting bark beetles at Burnt Lake in northern Alberta.



Survey Ranger collecting rust specimens from alternate hosts.

DETECTION SURVEYS

Routine and special survey investigations were carried out by personnel of the detection group from May 14 to October 6. Infestations of spruce budworm, forest tent caterpillar and large aspen tortrix were mapped from aircraft. Members of the detection crew assisted in a combined air and ground survey of forest tent caterpillar defoliation to compare aerial observations with actual defoliation. Defoliation was estimated and sequential sampling of egg bands was carried out in a number of plots in west-central Alberta. A program to determine the distribution and relative abundance of spruce bud midge in the Region was conducted. Field technicians made detailed surveys of the 40 provincial parks in Alberta. Marmot Basin, Streeter Basin and Deer Creek Watersheds were examined twice during the season in a co-operative project with Watershed Management. A survey of timber stands along the lower Mackenzie River was made for the Mackenzie Forest Service. Lectures on forest entomology and forest pathology were given to Junior Forest Wardens, Junior Forest Rangers and in schools in various parts of the Regions.

The following collections of specific organisms were made on behalf of persons outside the Region.

(a)	Operophtera bruceata (Hulst)	Dr. D. M. Wood
(b)	Choristoneura fumiferama (Clem.)	Dr. G. T. Harvey
		Dr. G. W. Stehr
		Mr. C. J. Sanders
(c)	Pissodes sp.	Dr. G. Smith
(d)	Lithocolletis spp.	Dr. T. N. Freeman
(e)	Dendroctonus simplex Lec.	Mr. M. H. Furniss
(f)	Puccinia coronata Cda.	Dr. G. Fleishman
(g)	Cones of alpine and balsam fir	Mr. D. W. McLean

Notable changes in the populations of many insect species and in the incidence of several disease organisms were recorded in 1967. The hot dry summer experienced throughout the region was probably partially responsible for these changes. Several new outbreaks of spruce budworm were recorded in northern Alberta and an increase in the degree of defoliation was noted in outbreaks previously reported; in the Northwest Territories, the areas in which defoliation occurred were much the same as in 1966 but defoliation increased. The forest tent caterpillar again caused moderate to severe defoliation south and west of Edmonton, with minor changes in

boundaries, and was present in a number of widely separated points in central Alberta. The large aspen tortrix was responsible for notable defoliation in aspen stands in southern Alberta and in the Yukon Territory. The yellow-headed spruce sawfly, fall cankerworm and some species of aphids caused appreciable damage in shelterbelts throughout the Province. Infections of spruce needle rusts were markedly lower than in the previous year although needle loss from severe infections in 1966 was observed in several locations. Several species of needle cast on lodgepole pine were present in western Alberta and caused considerable stand discoloration and needle drop.

INSECT CONDITIONS

Black-headed Budworm, Acleris variana (Fern.)

High populations of black-headed budworm were present on white spruce near the Shunda Ranger Station east of Nordegg and along the Celestine Lake Road in Jasper National Park. In the Athabasca Forest, low populations were present in white spruce stands near Birch Mountain Tower and along the Clearwater River east of McMurray. Elsewhere, low populations were observed in the Lac La Biche Forest along the House River, in the Slave Lake Forest near Loon Lake and Red Earth Tower and in the Grande Prairie Forest between Goodwin and Little Smoky.

In the Northwest Territories, populations of this budworm increased in 1967. Light defoliation of white spruce was noted near the mouths of the Gilles, Gossage, Ontaratue and Arctic Red rivers. Light damage was also evident from Point Separation along the East Channel to Inuvik. Approximately 10 square miles of moderate defoliation occurred at the confluence of the Rabbit Hay and the Mackenzie rivers.

Cooley Spruce Gall, Adelges cooleyi (Gill.)

Low populations of these aphids were present on native and planted white spruce throughout the Region. Moderate damage to white spruce occurred near Pocahontas in Jasper National Park and at several widely scattered areas in the Peace River and Grande Prairie forests. Considerable discoloration of Douglas fir foliage by the monomorphic form of this aphid was reported along the eastern slopes of the Rocky Mountains south of the Bow River, and near Radium in Kootenay National Park.

Fall Cankerworm, Alsophila pometaria (Harr.)

This defoliator was widely distributed on Manitoba maple, elm and green ash shelterbelts in the southern agricultural area of Alberta.

Population levels were the highest reported since 1964. Severe defoliation of Manitoba maple was again evident along Ross Creek between Pashley and Irvine. Widely separated pockets of severe damage occurred between Granum and Nobleford, and in the Milk River, Warner and New Dayton areas. Moderate damage was observed in the Taber area and between Seven Persons and Medicine Hat. Population levels remained low in shelterbelts between Medicine Hat to Acadia Valley.

Aphidae

Medium to high populations of open-feeding aphids were observed on poplars throughout most of the Region. Extensive discoloration and premature leaf drop was a common occurrence. High populations of the box-elder aphid, Periphyllus negundinis (Thomas), caused extensive browning and early foliage loss in Manitoba maple shelterbelts and ornamental plantings in central and southern Alberta. The woolly elm aphid, Eriosoma americanum (Riley) was responsible for severe curling and drying of leaves on American elm in the central and southern part of the Province. High populations of aphids were also evident on green ash, particularly in the east-central prairie region from Castor to Consort and from Hanna east to the Saskatchewan Border.

Ugly-nest Caterpillar, Archips cerasivoranus (Fitch)

Chokecherry and pincherry in the southeastern portion of the Province between Empress and Irvine sustained moderate to severe defoliation by these caterpillars. Low populations were found in the Milk River area. In the north-central part of the Province, low populations were found at Victoria Park in Edmonton and medium populations were noted in the Smokey Lake, Goodridge and Lac La Biche areas. Medium populations were also present near Dunvegan and 5 miles south of Grande Prairie.

Birch Skeletonizer, Bucculatrix canadensisella Chamb.

An increase in populations of the birch skeletonizer was evident in northern Alberta during 1967. Severe skeletonizing of birch foliage was noted along Highway 43 between Whitecourt and Little Smoky. Moderate skeletonizing was observed along the south shore of Lesser Slave Lake, near Sturgeon Lake, 8 miles south of Grande Prairie and 27 miles south of Valleyview. Light damage occurred in the Wabamun Lake and Edmonton areas.

Large Aspen Tortrix, Choristoneura conflictana (Wlk.)

Defoliation of aspen by the large aspen tortrix in southern Alberta occurred in approximately the same areas as in 1966. In the foothills area defoliation occurred in a 5 mile wide belt from a point 7 miles north of Burmis southeast to the United States Border. Within this area damage was predominately moderate to severe. The largest pockets of

severe defoliation occurred between Beauvais Lake and Drywood Creek and along the east side of the Waterton River. (see map 1 page 29). In Cypress Hills Provincial Park, a general buildup from the 1966 population level was evident. Throughout the Park, defoliation ranged from light to moderate although some scattered pockets of severe damage were evident.

Outbreaks of this insect occurred in 3 general areas in the Yukon Territory. In the Dezadeash Valley between Champagne and Haines Junction, an area of approximately 80 square miles was defoliated; fifty per cent of the aspen in this area was severely defoliated, while in the remaining 50 per cent, defoliation ranged from light to moderate. Along the Klondike Highway, patchy moderate to severe defoliation was observed from Fox Lake north to Mile 45. Light defoliation was evident at Mile 103, gradually increasing to severe at Mile 105. Large patches of severe defoliation were evident in the Yukon River Valley from 2 miles north of Carmacks to Five Finger Rapids; from this point to Minto, moderate defoliation was present. Between Minto and Stewart Crossing, small patches of light to severe defoliation were noted. Along the Dawson Highway, approximately 25 square miles of severe defoliation occurred immediately to the west and north of Mayo. Spotty, light defoliation occurred from a point 7 miles west of Mayo to Mile 44. Severe defoliation was present from this point through to Mile 52; intermittant light damage was evident from Mile 52 to Dawson City (see map 10 page 30).

Spruce Budworm, Choristoneura fumiferana (Clem.)

Outbreaks of the spruce budworm increased in size in 1967 and several new outbreaks were recorded. Results of aerial surveys showed that some degree of defoliation occurred over 2,041 square miles. Special surveys for this insect were conducted in mature spruce stands along the Mackenzie River north of Fort Good Hope. Larvae were found at 4 locations between Fort Good Hope and the Gossage River. This was the first record of this insect north of the Arctic Circle. The status of the spruce budworm in northern Alberta and the Northwest Territories is as follows:

NORTHWESTERN ALBERTA

Surveys for the spruce budworm were intensified in northwestern Alberta and were conducted for the first time in the Rainbow Lake and Cameron Hills areas. Aerial surveys along the Chinchaga River revealed that moderate to severe defoliation occurred along both sides of the River and extended from the mouth of Faria Creek to the confluence of the Chinchaga and Hay rivers. Approximately 328 square miles of defoliation occurred in the area, an increase over that reported in 1966. West of the Chinchaga River new outbreaks were recorded near Assumption, Rainbow Lake and the headwaters of the Hay River. In these outbreak areas, which encompassed approximately 282 square miles, defoliation was predominately light except near the headwaters of the Hay River where moderate to severe

defoliation occurred. North of Hay Lake, 27 square miles of light to severe defoliation occurred in the vicinity of Amber Tower. East of this area, along the south-east slopes of the Cameron Hills, 156 square miles of moderate to severe defoliation occurred. Southwest of High Level, budworm populations increased in the Melito River Timber Berth where an area of 72 square miles was moderately to severely defoliated, an increase over that reported in 1966. Along the southeast slopes of Watt Mountain, light defoliation occurred in a 12 square mile area. Near the headwaters of the Meander River, 24 square miles of light to moderate defoliation was detected. Along the Hay River between Steen River and Indian Cabins, 38 square miles of moderate to severe defoliation occurred (see map 2 page 31).

WABASCA RIVER

In the Wabasca River drainage the spruce budworm infestation increased in 1967. Moderate to severe damage was evident over an area of approximately 192 square miles along the Wabasca and Muddy rivers north of the Slave Lake Forest Boundary. The extent of the outbreak remained relatively unchanged from that reported in 1966 but there was a pronounced increase in the amount of defoliation.

The spruce budworm infestation along the Wabasca River in the Slave Lake Forest increased in 1967. Defoliation was severe from the northwest corner of Township 95, Range 8, west of the 5th Meridian, north to the top of Township 97, Range 8, west of the 5th Meridian. A infestation affecting about 120 square miles of spruce was detected near the mouth of the Panny River. Defoliation in this area varied from moderate to severe. Elsewhere, light defoliation occurred near the mouth of the Loon River and extended north along both sides of the Wabasca River for 7 miles. The small outbreak near Loon Lake persisted in 1967 (see map 3 page 32).

ATHABASCA FOREST

An increase in spruce budworm populations was evident in the McMurray area of the Athabasca Forest. Pockets of light, moderate and severe defoliation were present along the Athabasca River from Crooked Rapids to Furlough Island. The areas of defoliation were slightly larger than in 1966 and totalled approximately 93 square miles. West of the Athabasca River the budworm defoliated 21.6 square miles along Eymundson Creek and 69 square miles along the east slopes of the Birch Mountains west of Bitumount. The degree of defoliation in both areas was moderate. An outbreak was located 24 miles east of Waterways along the Clearwater River where light defoliation was evident in an 8.6 square mile area (see map 4, page 33).

LOWER PEACE-SLAVE RIVER

The infestation along the Peace River in Wood Buffalo National Park reported in 1966 continued unabated. Defoliation in 1967 was mostly light and occurred in widely separated pockets from 4 miles north of Big Slough to Carlson Landing. Approximately 67 square miles of defoliation was evident as compared to 71 square miles in 1966.

Budworm populations declined in spruce stands along the Little Buffalo River. The infestation extended north along the River from near Little Buffalo Falls to Lobstick Creek. Defoliation was generally light except at Little Buffalo Falls where moderate damage occurred. Some tree mortality was noted in this area.

An increase in the size of the spruce budworm outbreak was noted along the Slave River north of Fort Smith. A total of 51.5 square miles of light defoliation occurred in scattered pockets from Bell Rock to Brule Point. In 1966, 16.4 square miles of light defoliation occurred in this area (see map 5 page 34).

MACKENZIE RIVER

Spruce budworm defoliation occurred at widely separated points along the Mackenzie River from Cache Creek to the Dahadinni River. A new outbreak was detected 4 miles north of the Willow Lake River near Highland Lake; defoliation ranged from light to moderate in a 14.4 square mile area. The infestation along the south and east slopes of the Ebbutt Hills continued to cause light defoliation over an area of approximately 20 square miles. Populations of spruce budworm in the Martin Hills declined and only 1.7 square miles of light defoliation was evident. The size of the infestation along the slopes of the Horn Plateau south of Mustard Lake increased in 1967. Light defoliation was evident in a 41.8 square mile area. Tamarack along the Spence and Rabbitskin rivers was severely defoliated (see maps 6&7 pages 35&36).

Leaf Beetles, Chrysomela spp.

Chrysomela aeneicollis Schffr., was responsible for severe skeletonizing of willow and alpine shrubs in Snow Creek Pass, near Hector Lake, in the Cascade River Valley and along the upper Saskatchewan River in Banff National Park. Small patches of willow were also severely skeletonized along the Vermilion River Valley in Kootenay National Park and along the Amiskwi River Valley in Yoho National Park. South of Valleyview, small patches of severe damage were noted along Deep Valley Creek and near Little Smoky. Light to moderate damage was evident in O'Brien Provincial Park south of Grande Prairie, along the Simonette River south of Goodwin and along the Smoky River east of Bezanson and near Watino.

Chrysomela falsa Brown, severely skeletonized large willow along Ross Creek near Irvine.

Chrysomela scripta Fab., caused severe defoliation on balsam poplar regeneration near Waterton. Low populations were present in many areas of southern Alberta.

Chrysomela semota Brown, was the most serious skeletonizer of regeneration poplar throughout the Region. In southern Alberta this species severely skeletonized poplar on the flats along the Brazeau River near the Trunk Road Crossing. In northern Alberta, moderate to severe skeletonizing was evident in the following areas: 62 miles southwest of Valleyview along Deep Valley Creek, 18 miles south of Valleyview along the House River, 20 miles east of Grande Prairie and 5 miles south of Goodwin. Moderate foliage damage was observed near Dunvegan, Watino, 24 miles southwest of Wapiti and in O'Brien Provincial Park south of Grande Prairie. Light skeletonizing was present near Dixonville, Grimshaw, Saskatoon Lake, Tangent, High Level, Hinton, Edson and Whitecourt.

Cone and Seed Insects

Considerable damage to the cones and seeds of white spruce was caused by several species of insects. The principal damage in 1967 was caused by a cone worm, Laspeyresia youngana (Kft.) and a dipterous cone maggot, Pegohylemyia sp. Forty-seven per cent of the cones examined were damaged by these insects (see table 1 page 14).

Other damaging insects reared from white spruce cones were:

Cone moths:

(1) Dioryctria reniculella (Grote)
(2) Choristoneura fumiferana (Clem.)

Gall midges:

(1) Dasyneura canadensis Felt
(2) Dasyneura rachiphaga Tripp
(3) Phytophaga sp.

Seed chalcids:

(1) Megastigmus sp.

American Aspen Beetle, Gonioctena americana (Schaeff.)

In southern Alberta, this insect caused severe defoliation of small patches of aspen in the Bow River Forest, along the Red Deer and Little Red Deer rivers, along Stud and Old Fort creeks and near the High-

TABLE I

PERCENTAGE OF WHITE SPRUCE CONES DAMAGED BY
PEGOHYLEMYIA SP. AND LASPEYRESIA YOUNGANA (Kft.)

1967

Location	Number of cones examined	Percentage damaged by Pegohylemyia sp.	Percentage damaged by Laspeyresia youngana (Kft.)	Percentage of cones not damaged
Grande Detour N. W. T.	25	0.0	0.0	100.0
Peace River	66	83.0	5.0	7.6
Wandering River	23	21.7	0.0	78.3
Fox Creek	25	64.0	20.0	28.0
Whitecourt	30	96.6	16.6	3.3
Hinton	20	5.0	95.0	0.0
Cooking Lake	57	42.8	5.3	22.8
Elk Island Nat. Park	52	46.1	1.9	51.9
Ryley	21	4.8	38.0	57.1
Duhamel	52	21.1	40.4	38.5
Gwynne	54	12.9	55.5	29.6
Morningside	50	30.0	32.0	40.0
Menaik	72	27.8	26.4	47.2
Red Deer	23	4.3	8.7	86.9
Castor	25	36.0	40.0	24.0
Jumping Pound	57	63.1	12.3	54.4
Sheep Ranger Stn.	59	32.2	0.0	62.7
Cypress Hills Prov. Park	235	16.6	8.0	69.8

wood Ranger Station. In the Crowsnest Forest infestations were recorded near the Willow Creek and Skyline Ranger stations, in Streeter Basin, and near the headwaters of Drywood and Pincher creeks.

In northern Alberta, patches of moderate to severe damage to aspen foliage were evident in the Slave Lake Forest near Hondo, Doucette Tower and Red Earth Tower. Moderate to severe damage was prevalent in the Lac La Biche Forest near Goodridge, Frog Lake and 30 miles north of Lac La Biche.

Although this beetle was present in many other areas of the Region, populations were low and no defoliation was recorded.

Willow Leaf Miner, Lyonetia sp.

An increase in the populations of the willow leaf miner occurred in the Region in 1967. Severe damage to willow foliage occurred along the Peace River in Wood Buffalo National Park, along the Slave River and along the Mackenzie River between Fort Providence and Inuvik. Moderate foliage damage was common in the High Level, McMurray, Anzac and Loon Lake areas. Light damage was observed in scattered areas between Hythe and Demmitt, near Dixonville, along the Mackenzie Highway between Meander River and Hay River, and along the Great Slave Lake Highway between Fort Providence and Yellowknife.

Forest Tent Caterpillar, Malacosoma disstria Hbn.

The outbreak of these caterpillars west and south of Edmonton remained much the same as that reported in 1966. Although some increases in the area of defoliated aspen were noted along the south and southeast edges, these were generally offset by decreases in the older portion of the outbreak further north.

In 1967, the majority of defoliation occurred west and south of Edmonton within an area bounded by an irregular line as follows: from Falun northwest to Lac Ste. Anne, southwest from this point through Moon Lake to Drayton Valley, then southeast to Buck Lake and east to Falun. Within this area, patches of moderate to severe defoliation were present in the following general areas: on the north side of Lac Ste. Anne between Gunn and Glenevis, north and south of Lake Wabamun, around Moon Lake, in the Genesee-Lindale-Telfordville triangle, and north of Highway 19 between Winfield and Lakedell to an approximate line between Breton and Wizard Lake. The total area of moderate to severe defoliation encompassed approximately 380 square miles. In the remainder of the outbreak area, defoliation varied from light to a trace (see map 8 page 37).

A small area of moderate defoliation occurred in the town of Whitecourt. Individual larval colonies were located at Peers, Vega, Law-

rence Lake, Stettler, Bottrel, Gibbons, Egremont, Warspite, Carseland and Medicine Hat. Larval populations continued to decline in the isolated outbreak that has persisted for several years in the Vilna area and no noticeable defoliation occurred.

Parasites and diseases were responsible for high larval mortality in the Wabamun Lake area. Counts of pupae carried out in 6 areas revealed a mortality of approximately 91 per cent; 69 per cent were parasitized and 22 per cent were killed by disease. Many of the latter were also parasitized. Counts of eggbands in the fall revealed that sufficient eggs were present to maintain high populations in the area in 1968. Table II indicates the potential defoliation for 1968 at a number of localities in or near the 1967 outbreak area.

TABLE II

RESULTS OF SEQUENTIAL SAMPLING AND DEFOLIATION ESTIMATES FOREST TENT CATERPILLAR, 1967

Location	Defoliation 1967	Predicted defoliation for 1968
Whitecourt	moderate	moderate
Gunn	moderate	severe
Edmonton	light	moderate
Seba Beach	moderate	severe
Horen	moderate	moderate
Cold Creek	nil	light
Lodgepole	nil	light
Fern Creek	severe	severe
Winfield	severe	severe
Ma-Me-O Beach	severe	severe
Homeglen	nil	light

Spruce Spider Mite, Oligonychus ununguis (Jac.)

High populations of spruce spider mite on ornamental spruce were observed in the Calgary, Red Deer and Lacombe areas and on balsam fir regeneration near Touchwood Lake. Medium populations were present in most shelterbelts inspected in the vicinities of Grande Prairie, Peace River and Valleyview. In the remainder of the Region, population levels were low. Light damage was noted on lodgepole pine at several locations in Cypress Hills Provincial Park.

Bruce Spanworm, Operophtera bruceata (Hulst)

A marked increase in the distribution and abundance of this

defoliator was reported from several areas in the Grande Prairie, Peace River and Bow River forests. Moderate defoliation was evident in the Grande Prairie Forest in the following areas: 6 miles southwest of Beaverlodge, between Rio Grande and Halcourt, 8 miles west of Valleyview along Highway 34, near Sexsmith and Wembley, and between Grande Prairie and the Smoky River Bridge. Light defoliation was common in the Bow River Forest near Fish Creek, Sarcee, Priddis and Scott Lake; in the Peace River Forest near Dixonville, Grimshaw, Tangent and Watino; and in the Grande Prairie Forest near Saskatoon Lake and Grande Prairie.

Yellow-headed Spruce Sawfly, Pikonema alaskensis (Roh.)

An increase in population levels, and a more widespread distribution of this insect was reported in the Region in 1967.

Higher populations than in previous years were observed on planted spruce in the Ft. Smith, Hay River and Ft. Simpson areas in the Northwest Territories although only light defoliation occurred.

In Alberta, severe damage to spruce used as ornamentals and shelterbelts occurred in the following areas: Manning, Grimshaw, Grande Prairie, Valleyview, High Prairie, Lac La Biche, St. Paul, the Westlock - Edmonton area, the Rocky Mountain House - Calgary area, and near Bassano. Populations were generally low and damage light in the agricultural region east of Highway 2.

Light to moderate defoliation of native white spruce occurred in some areas of the Peace River and Grande Prairie forests. Severe damage to open grown white spruce regeneration was reported near Celestine Lake in Jasper National Park.

Larch Sawfly, Pristiphora erichsonii (Htg.)

This sawfly was again reported throughout most of the Region but in lower numbers than in 1966. The severe infestation that was reported in 1966 between McLellan and Taber lakes in the Northwest Territories collapsed in 1967. Within this area only widely scattered pockets of light damage were evident. Elsewhere in the Northwest Territories pockets of light defoliation of tamarack occurred along the Yellowknife Highway between Fort Providence and Rae, at Fort Smith, and in Wood Buffalo National Park. In Alberta, low populations were recorded in the following areas: Slave Lake, Edson, Hinton, Brazeau Reservoir and near Stolberg.

Leaf Tier, Pseudexentera improbana oregonana Wlshm.

Population levels of this insect remained low throughout most of the Region in 1967 and defoliation was generally light. An exception

occurred in the Footner Lake Forest where numbers increased sharply over those reported in 1966. Moderate to severe defoliation of aspen was observed over an area of approximately 856,000 acres between High Level and Fort Vermilion, and in an area of approximately 13,000 acres along the northwest slopes of the Bassett Hills (see map 9 page 38).

Spruce Bud Midge, Rhabdophaga swainei Felt

The presence of this bud midge on both black and white spruce was reported throughout most parts of the Region. Damage extended from Carbondale in southern Alberta to Blackwater Lake in the Northwest Territories and to Dawson City in the Yukon Territory.

Severe bud damage to spruce regeneration occurred throughout the Rocky Mountain House, Edson, Hinton and Whitecourt areas and 18 miles north of Wandering River. Medium populations were commonly found along the McMurray Highway and in the Lesser Slave Lake area. Low to medium populations were observed throughout the Grande Prairie, Peace River and Footner Lake forests in northwestern Alberta. In the Northwest Territories and the Yukon Territory, damage was light.

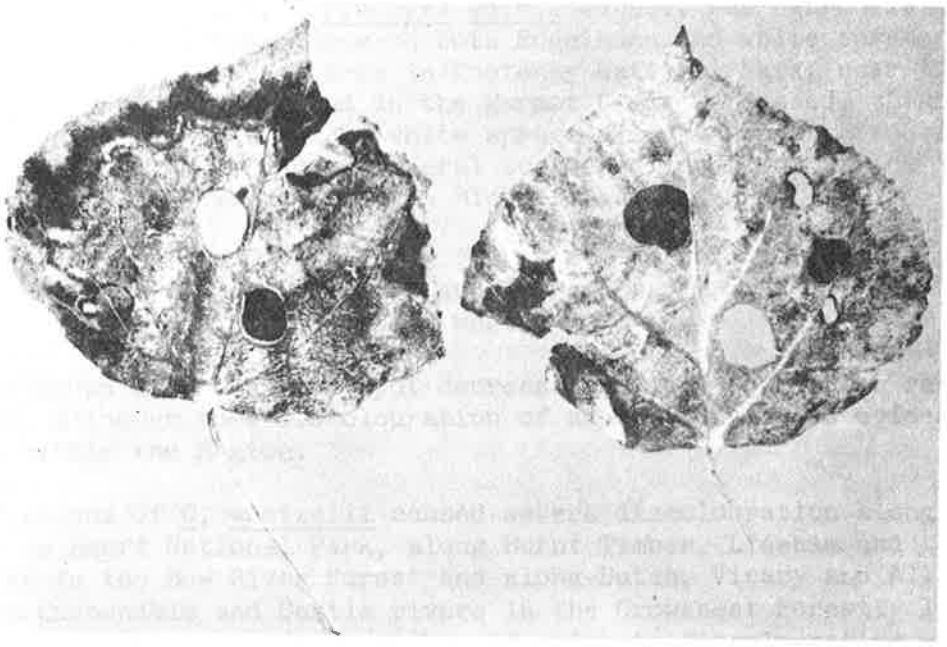
DISEASE CONDITIONS

Spruce Needle Rusts, Chrysomyxa spp.

Due to the unusually dry weather experienced throughout most of the Region in 1967, a general decline in the occurrence of needle rusts was reported in all Districts. Although some small, isolated areas of moderate and severe infections were reported in the Yukon Territory, the Peace River - Grande Prairie Block and in southwest Alberta, infections in the remainder of the Region were generally light.

One species of needle rust, probably Chrysomyxa ledicola Lagerh., caused moderate to severe damage to native white spruce near Nose Creek Bridge southwest of Grande Prairie and north of Whitelaw. Moderate damage was evident 4 miles west of Triangle, between Drayton Valley and Lodgepole and along the Alaska Highway from Beaver Creek to the Alaska - Yukon Border. Light infections were common in the majority of spruce stands inspected throughout the remainder of the Region.

Considerable needle loss, resulting from the severe infections reported in 1966, was evident in the following areas; along the Trunk Road between Goodwin and Entrance, along the Two Lakes Road southwest of Wapiti, north of Edson in the Mayberne Tower area and between Whitecourt and Swan Hills along the Mobil Oil Road.



Sclerotia of poplar ink spot, Ciborinia whetzelii (Seaver) Seaver (asexual form).

Cup shaped fruiting bodies of poplar ink spot (sexual form).

Another needle rust, Chrysomyxa weirii Jacks., was responsible for moderate and severe foliage loss on both Engelmann and white spruce on Mt. Wardle and in the Daer Creek area in Kootenay National Park, near the West Gate of Yoho National Park and in the Marmot Creek Watershed. Light to moderate foliage loss occurred on white spruce along Bauerman Brook in Waterton Lakes National Park and at several scattered locations in the Rocky - Clearwater, Bow River and Lac La Biche forests.

Poplar Ink Spot, Ciborinia whetzelii (Seaver) Seaver
Ciborinia pseudobifrons Whet.

Infections of poplar ink spot decreased in 1967 from those reported in 1966, although some discolouration of aspen foliage was evident in many areas within the Region.

Infections of C. whetzelii caused severe discolouration along Coleman Creek in Banff National Park, along Burnt Timber, Lineham and Cataract creeks in the Bow River Forest and along Dutch, Vicary and Allison creeks and the Carbondale and Castle rivers in the Crowsnest Forest. In west-central and northern Alberta, patches of moderate discolouration were noted north and west of Entrance, along the Torrens River south of Grande Prairie, in the Sturgeon Lake-Valleyview area, along the Smoky River Valley near Watino and Bad Heart, and in the Worsley - Clear Prairie area. Light discolouration was noted near Drayton Valley and Edson.

C. pseudobifrons caused patchy, light discolouration in aspen stands along the north end of the Porcupine Hills.

Climatic Damage to Spruce and Fir

Damage to new shoots of white spruce and alpine fir throughout the Hinton area was attributed to late frosts and was most noticeable in areas where frost pockets were most likely to occur. A similar type of damage was also found northwest of Cochrane in the Wildcat Hills, along the Little Red Deer River in the Bow River Forest and along the Spray River Valley in Banff National Park.

Dead tops of dominant white spruce west of Hinton between the Overlander Lodge and the Jasper National Park Boundary and also 10 miles north of Edson, has been attributed to frost or winter drying. The amount of top mortality ranged from a few inches on some trees to 6 feet on others.

Pine Needle Rust, Coleosporium asterum (Diet.) Syd.

Pine needle rust caused severe damage to pine foliage near the West Gate of Yoho National Park, in the Deer Creek Watershed, in the Kananaskis River Valley and along the York Creek Road south of Coleman.

Moderate damage was observed along the Spray River Valley in Banff National Park and along the Settlers Road in Kootenay National Park. Light damage was evident west of Granada and in the Smith area.

Aster and goldenrod, alternate hosts of this rust, were moderately infected throughout northeastern Alberta.

Spruce Needle Cast, Isthmiella crepidiformis (Darker) Darker
(Bifusella crepidiformis Darker)

This needle cast was common in spruce stands in the Northwest Territories, the Yukon Territory, and in the foothills area of Alberta.

Engelmann and white spruce in some areas in southwest and west-central Alberta suffered extensive needle drop as a result of infections of this needle cast. In northwestern Alberta severe damage was recorded south of Valleyview and east of Harmon Valley. In the Northwest Territories light infections were recorded at Blackwater Lake and at Campbell Lake near Inuvik. Several collections of this needle cast were made throughout the accessible portions of the Yukon Territory in 1967. The intensity of infections in this area was generally low.

Leaf Blight of Balsam Poplar, Linospora tetraspora Thompson

The known distribution of this leaf blight of balsam poplar was extended northward in 1967. Severe damage to balsam poplar foliage was observed along the Slave River near Fort Fitzgerald. Moderate damage was evident in the Fort Smith area and in Wood Buffalo National Park. Light to moderate damage to foliage of regeneration poplar was observed in most poplar stands throughout northern Alberta. In southern Alberta this fungus caused severe discolouration to poplar stands between the Clearwater and Brazeau rivers.

Pine Needle Casts

Several species of pine needle casts caused severe stand discolouration and needle loss in many areas of the Region.

Elytroderma deformans (Weir) Darker, was responsible for severe loss of lodgepole pine foliage in the Bragg Creek, Seebe and Strachan areas in southwest Alberta, at Kootenay Crossing in Kootenay National Park and at Athabasca Falls in Jasper National Park. Light damage was noted in the Entrance, Edson and Whitecourt areas in west-central Alberta and near Watson Lake, Yukon Territory.

Two species of needle cast, Hendersonia pinicola Wehm. and Lophodermella concolor (Dearn.) Darker, usually found in the same needles,

caused notable stand discolouration and needle loss to lodgepole pine in the mountains and along the eastern slopes from Waterton Lakes National Park north to the Athabasca River drainage. Light damage by L. concolor was also noted in Cypress Hills Provincial Park and at several locations in the central Yukon Territory.

Davisomycella montana (Darker) Darker, was responsible for severe loss of lodgepole pine needles in the following areas of southwestern Alberta: along Blakiston Brook in Waterton Lakes National Park, in Beauvais Lake Provincial Park, along the Livingstone River, on the west slope of Hailstone Butte, along Catarack Creek, Smith - Dorien Creek and along the upper Elbow River. Light damage occurred in the Whitehorse area of the Yukon Territory.

Aspen shoot blight, Venturia tremulae Aderh.

The characteristic "shepherds crook" caused by this disease was common on regeneration aspen in many parts of the Region in 1967. Severe damage occurred near Wapiti, Grovedale, Sturgeon Lake, Little Smoky, Valleyview and Two Lakes in the Grande Prairie Forest. In west-central Alberta, severe damage occurred in the Hinton-Robb area, the Bearberry-James Ranger Station area, and at Miette Hot Springs in Jasper National Park. Severe damage occurred in southern Alberta along the Highwood River and in the Streeter Basin Watershed.

Winter Drying of Conifers

Severe red belt occurred in several lodgepole pine stands in southwestern Alberta in 1967. Damaged stands were noted at Marble Mountain, Corkscrew Mountain, and near Baseline Lookout in the Rocky - Clearwater Forest. Similar damage was found near Cadomin in the Edson Forest and near the forest reserve boundary east of the Willow Creek Ranger Station in the Crowsnest Forest.

Further mortality of white spruce and lodgepole pine in Cypress Hills Provincial Park was evident in 1967 as a result of the severe winter drying experienced in that area during 1965 and 1966.

The severe red belt damage to lodgepole pine in the Bow River and the Rocky - Clearwater forests described in the 1966 report was still evident during the 1967 season. Although heavy mortality was predicted, investigations revealed that not more than one per cent actually occurred.

TABLE III

OTHER NOTEWORTHY INSECTS AND DISEASES, 1967

Causal Agent	Host	Remarks
Insect		
Bud-gall mite, *Aceria neoessigi* (K.)	Hybrid poplar	High populations at Brooks Horticultural Station and in the Purple Springs - Bow Island area. Light damage in the Peace River District and near Whitehorse, Y. T.
Poplar bud-gall mite, *Aceria parapopuli* (Kiefer)	Hybrid poplar	Light infestation in shelterbelts in southern Alberta and along the Bow and Elbow rivers in Calgary.
Pear slug, *Caliroa cerasi* (L.)	Hawthorn Cottoneaster M. maple	Damage generally light in Edmonton. Some individual hedges severely skeletonized. Severe damage to hawthorn and cottoneaster in Calgary.
Budworm, *Choristoneura lambertiana* Bsk.	Limber pine	Defoliation noticeable along the foothills between Maycroft and Waterton.
Jackpine budworm, *Choristoneura pinus* Freeman	Lp. pine	Light damage in the York Creek area south of Coleman.
Needle miner, *Coleotechnites starki* Freeman	Lp. pine	Medium-high populations in B.N.P. at Mt. Norquay and Johnston Canyon. Low populations at Lake Minnewanka and Mt. Eisenhower, B.N.P. and Hawk Creek, K.N.P.
Leaf tier, *Compsolechia niveopulvella* Cham.	T. aspen	Light and moderate damage in Yukon Territory. Light damage common throughout northern Alberta.

TABLE III -Other Noteworthy Insects and Diseases - Cont'd.

Causal Agent	Host	Remarks
Spruce bark beetle, *Dendroctonus obesus* (Mann.)	W. spruce	Low populations in weakened and decadent trees in West Castle River area, near Lost Lake in W.L.N.P. and at the mouth of the Muddy River.
Allegheny spruce beetle, *Dendroctonus punctatus* Lec.	W. spruce	Collected near Lady Evelyn Falls, Mills Lake and Yellowknife, N. W. T.
Eastern larch beetle, *Dendroctonus simplex* Lec.	Tamarack	Low populations in the Grassland, Chisholm Tower and Dixonville areas.
Spruce coneworm, *Dioryctria reniculella* (Grote)	W. spruce	An increase in populations noted in the Fort Smith area.
An olethreutid, *Epinotia solandriana* Linn.	T. aspen Birch Alder	High populations present in the Northwest Territories.
Linden looper, *Erannis tiliaria* (Harr.)	M. maple A. elm G. ash	Low populations associated with fall cankerworm in southern Alberta.
A willow sawfly, *Euura atra* (Jur)	Golden willow	Damage reported from Brooks Horticultural Station and near Vauxhall and Three Hills.
Lilac leaf miner, *Gracillaria syringella* (F.)	Lilac	High populations in Calgary. Low to medium populations in urban areas in central and southern Alberta.
Leaf miner, *Gracilariidae*	Alder T. aspen B. poplar	Moderate and severe damage to alder in northern half of the Region. Light damage to poplar in all areas.
Grasshopper Damage	W. spruce	Damage to planted spruce seedlings in reforested area northwest of Ricinus.

TABLE III - Other Noteworthy Insects and Diseases - Cont'd.

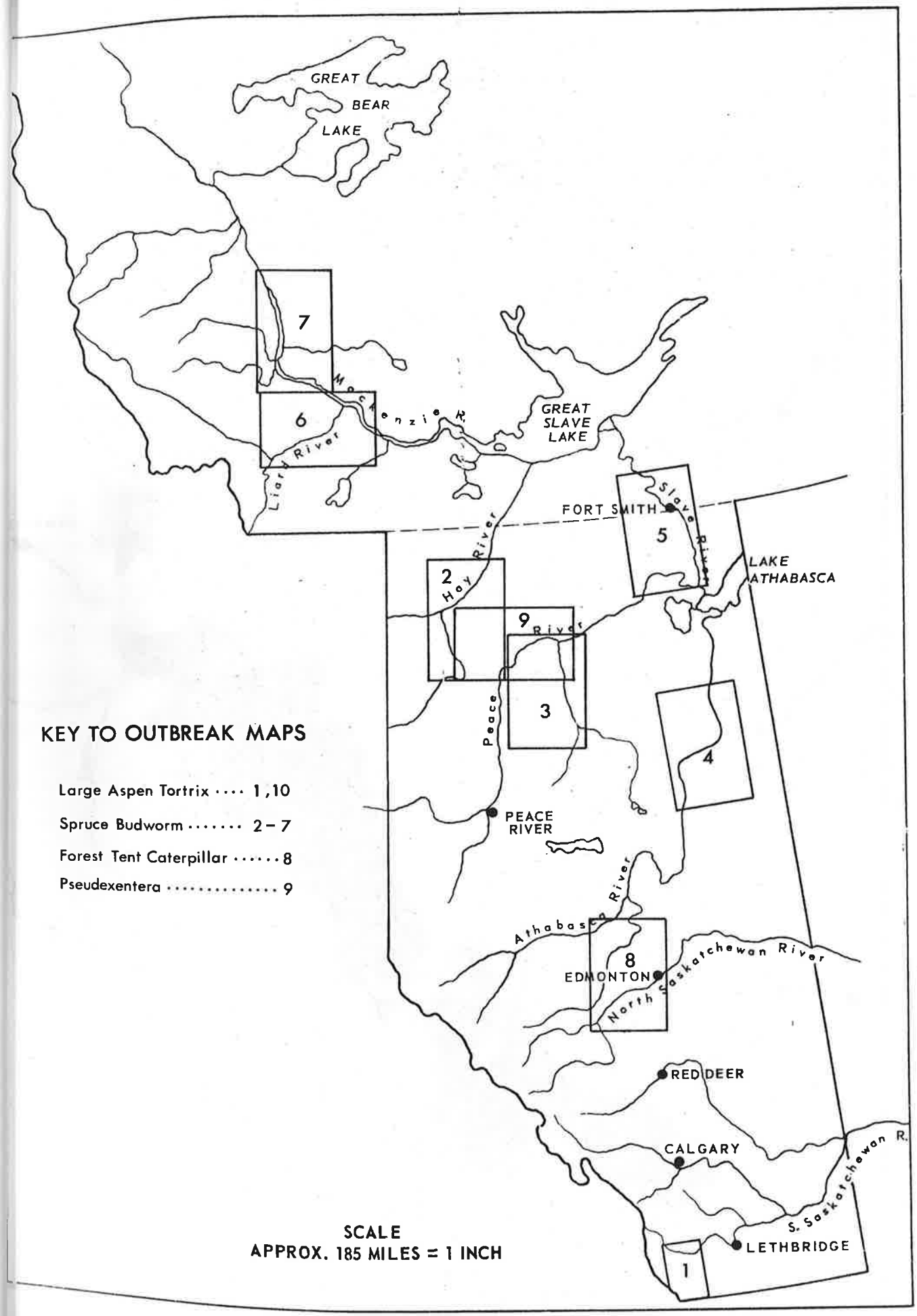
Causal Agent	Host	Remarks
Cecropia moth, *Hyalophora cecropia* (L.)	M. maple	Moderate damage in one shelterbelt near Turin.
Pine root collar weevil, *Hylobius warreni* Wood	Lp. pine	Known distribution in the foothills extended southward to the Sheep River west of Turner Valley.
Poplar leaf miner, *Lithocolletis* spp.	B. poplar T. aspen	Common in the Region.
A blister beetle, *Lytta sphaericollis* Say	Caragana Honeysuckle	High populations in some shelterbelts from Sibbald south to Milk River.
Western tent caterpillar, *Malacosoma pluviale* (Dyar)	Choke cherry Saskatoon Birch	High populations in Waterton Lakes National Park and Crowsnest Pass. Low populations near Chisholm Tower.
Poplar vagabond aphid, *Mordwilkoja vagabunda* (Walsh)	Plains cottonwood	Observed in Kinbrook, Dinosaur, and Little Bow provincial parks.
Balsam-fir sawfly, *Neodiprion abietis* (Harr.)	W. spruce	Severe damage in a few shelterbelts near Trochu. Medium-high populations along the Little Red Deer River west of Innisfail and in Big Knife P. P. Light damage along Mackenzie River from Fort Good Hope to Arctic Red River.
Rusty tussock moth, *Orgyia antiqua* (L.)	Cottoneaster	Some severe damage in Edmonton. Moderate damage in Calgary.
Poplar serpentine miner, *Phyllocnistis populiella* Cham.	T. aspen	Severe discolouration in Kootenay, Yoho and Banff national parks, at high elevations between the Red Deer and Bow rivers, at several locations in the Footner Lake Forest, near Wrigley and in the Ebbutt

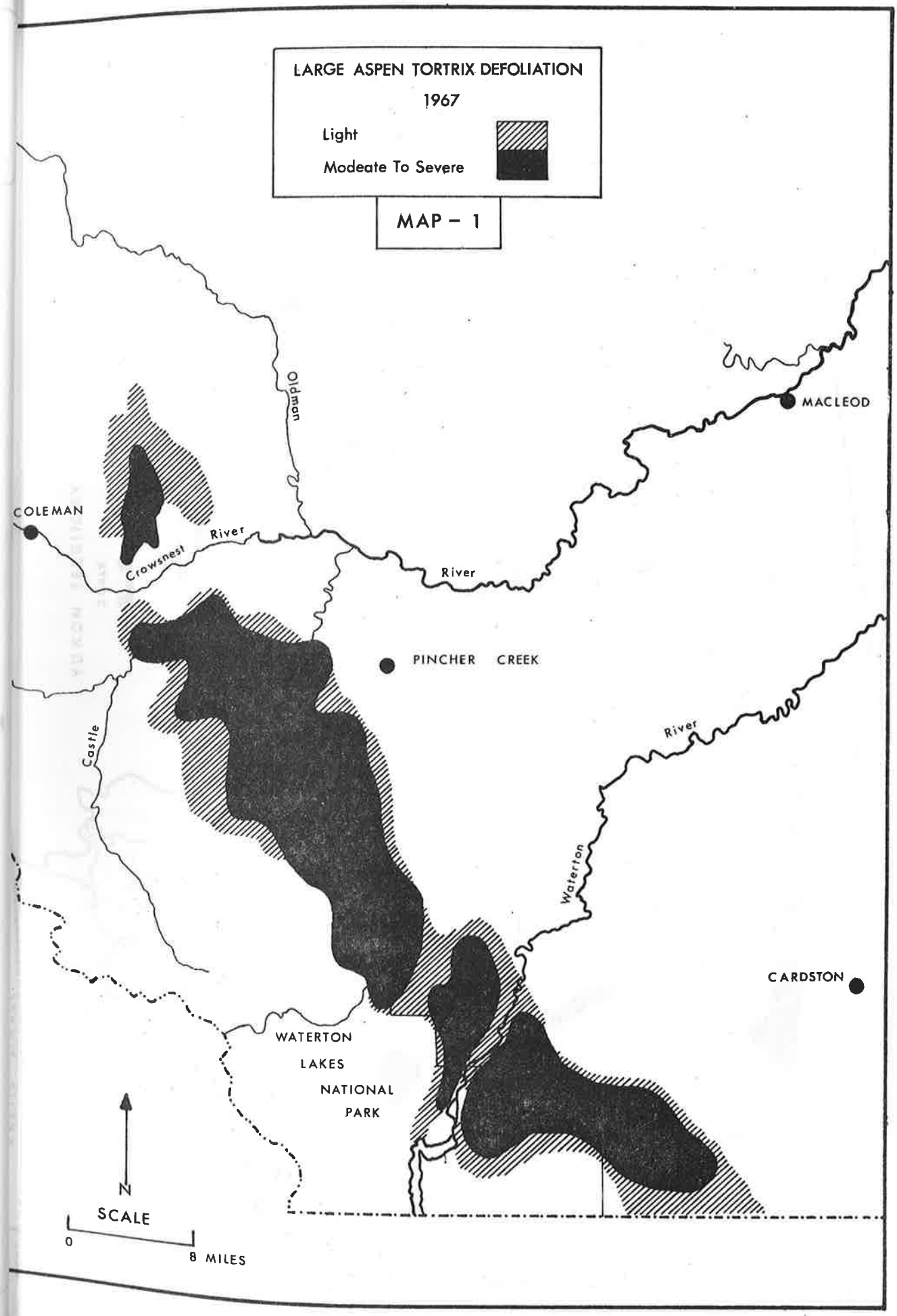
TABLE III - Other Noteworthy Insects and Diseases - Cont'd.

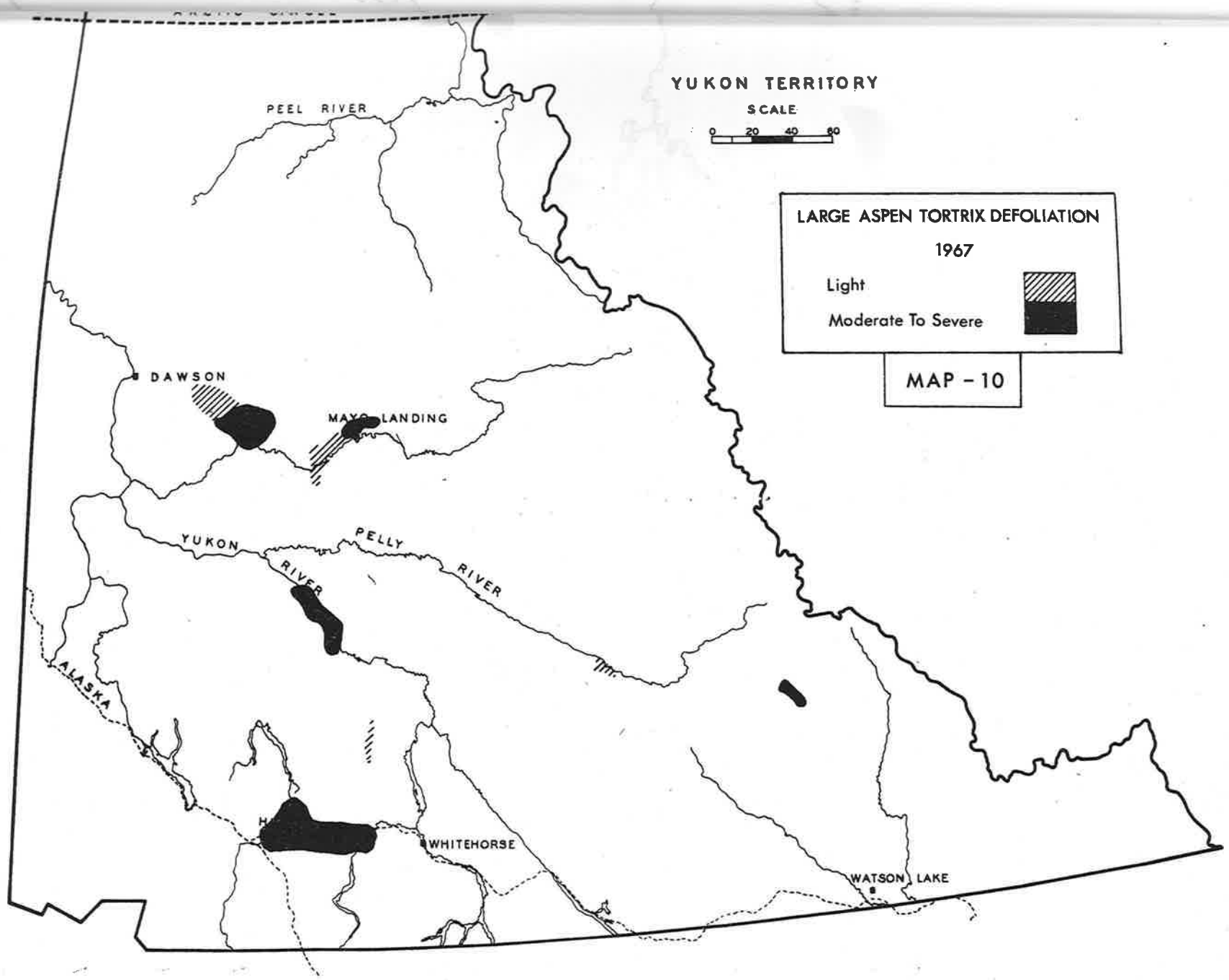
Causal Agent	Host	Remarks
		Hills, N. W. T. and in the Watson Lake and Beaver Creek areas, Y. T.
Root collar weevil, *Pissodes* sp.	Lp. pine W. spruce	Collected in the foothills area of the Region. Severe infestations present in the upper Kananaskis Lake and Barrier Lakes areas.
Lodgepole terminal weevil, *Pissodes terminalis* Hopping	Lp. pine J. pine	Common in stands of regeneration pine throughout the Region.
Boxelder twig borer, *Proteoteras willingana* (Kearfott)	M. maple	Medium to high populations present in shelterbelts in southern Alberta.
Disease		
Dwarf mistletoe, *Arceuthobium americanum* Nutt. ex. Engelm.	Lp. pine J. pine	Additional outbreaks recorded near Marshybank Lake and near the confluence of the Panny and Wabasca rivers.
Spruce cone rust, *Chrysomyxa pirolata* Wint.	W. spruce Wintergreen, one-sided	Light infection throughout the Region. Some seed loss reported in the Bow River Forest and Waterton Lakes National Park.
Cytospora canker, *Valsa sordida* Nits. (*Cytospora chrysosperma*) (Pers. ex Fr.)	T. aspen	Widespread in shelterbelts and aspen groves throughout the agricultural area.
Fire blight, *Erwinia amylovora* (Burr.) Winsl. et al.	Apple Mtn. ash Mayday	Still active in central and southern Alberta.

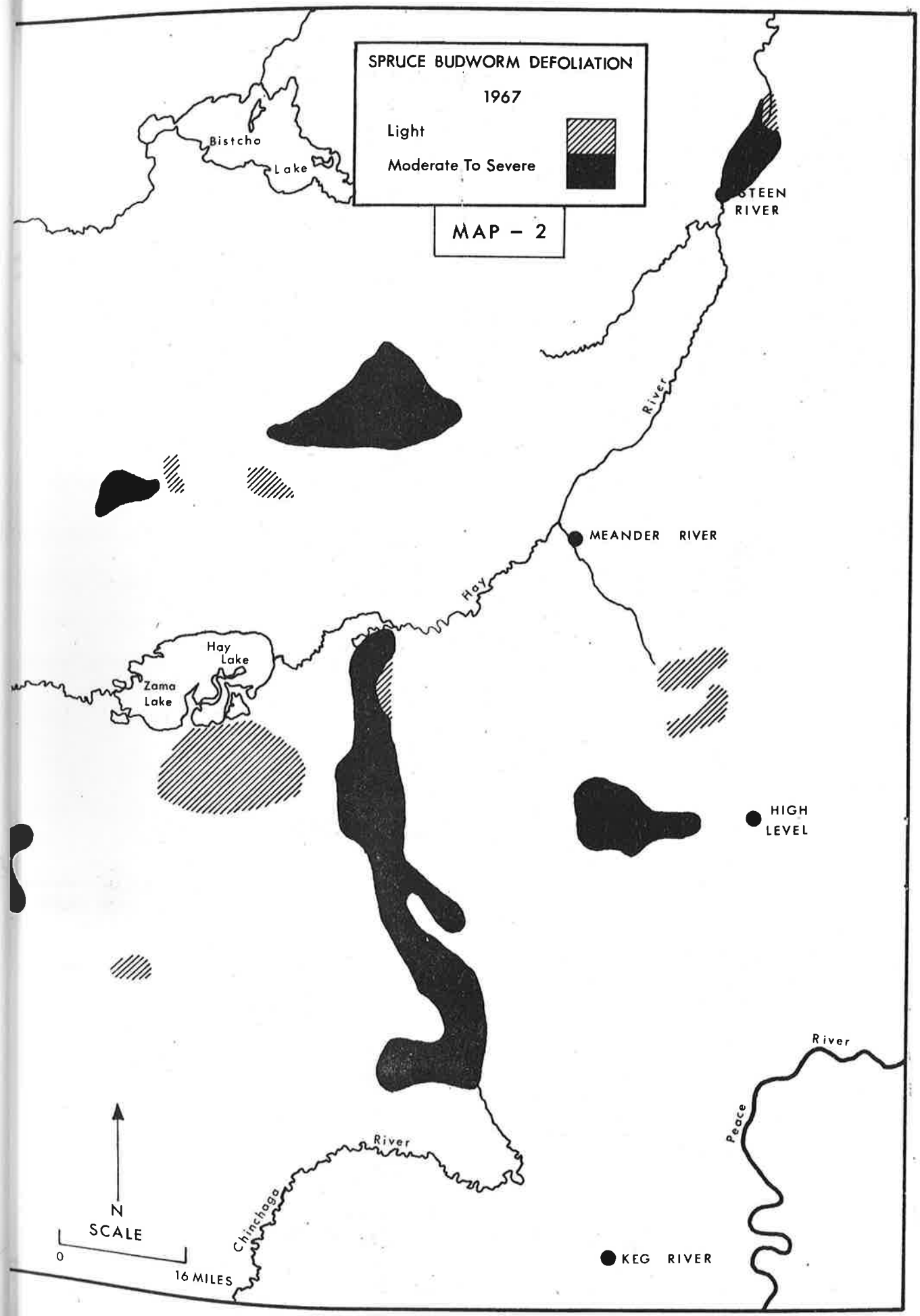
TABLE III - Other Noteworthy Insects and Diseases - Cont'd.

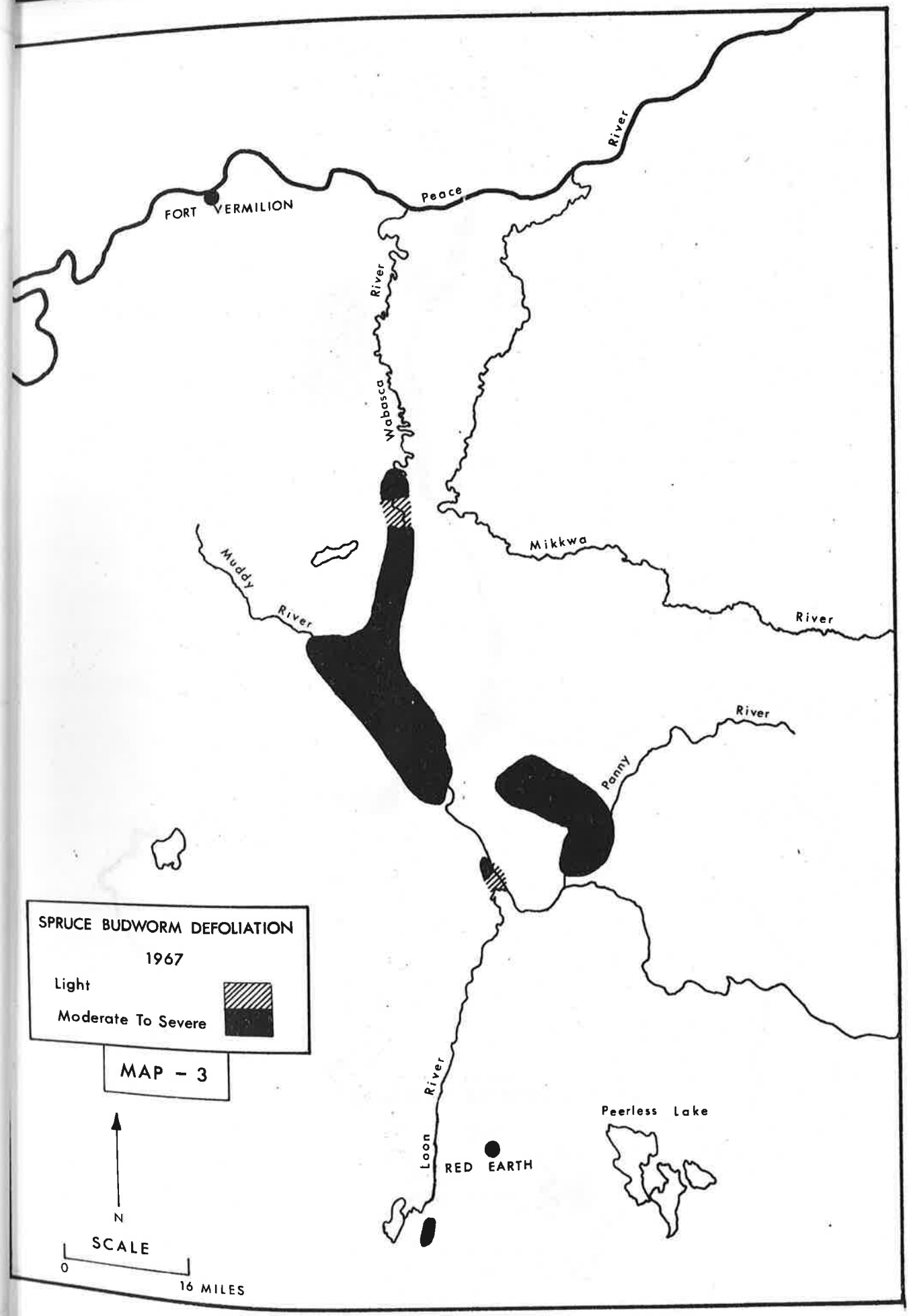
Causal Agent	Host	Remarks
Pine needle cast, *Gloeocoryneum cinereum* (Dearn.) Weindlmayr	Lp. pine	Caused discolouration and needle loss along Congon Creek, Spray River, North Ram River and Brown Creek. Found in Yukon Territory 93 miles east of Ross River and north of Watson Lake.
Hypoxylon canker, *Hypoxylon pruinatum* (Klotzche) Cke.	T. aspen	Present throughout the aspen grove section of Alberta.
Snow blight, *Lophophacidum hyperboreum* Lager.	W. spruce B. spruce E. spruce	Severe damage to regeneration spruce along Brown Creek, on Mt. Wilson, on Mt. Murchison and along the Castle River. Light damage along Alaska Highway. New regional record.
Pine needle cast, *Lophodermella montivaga* Petr.	Lp. pine	Caused discolouration and needle loss near Noyes Creek in B.N.P. Noted near Mile 62, Canol Road, Y. T.
Spruce needle cast, *Lophomerum darkeri* Ouellette	W. spruce	Caused needle loss along Dry Creek Mill Road in the Clearwater Forest. New regional record.
Pine needle cast, *Lophodermium pinastri* (Schrad. ex Hook.) Chev.	Lp. pine J. pine	Common on lodgepole pine along the Castle River.
Poplar leaf spot, *Marssonina tremuloidis* (Ell. & Ev.) Kleb.	T. aspen B. poplar	A significant decrease in the infection ratio throughout the Region.
Poplar leaf rust, *Melampsora medusae* Thuem.	Tamarack T. aspen	Light infections to aspen throughout central and northern Alberta and on tamarack in the Touchwood Lake area.

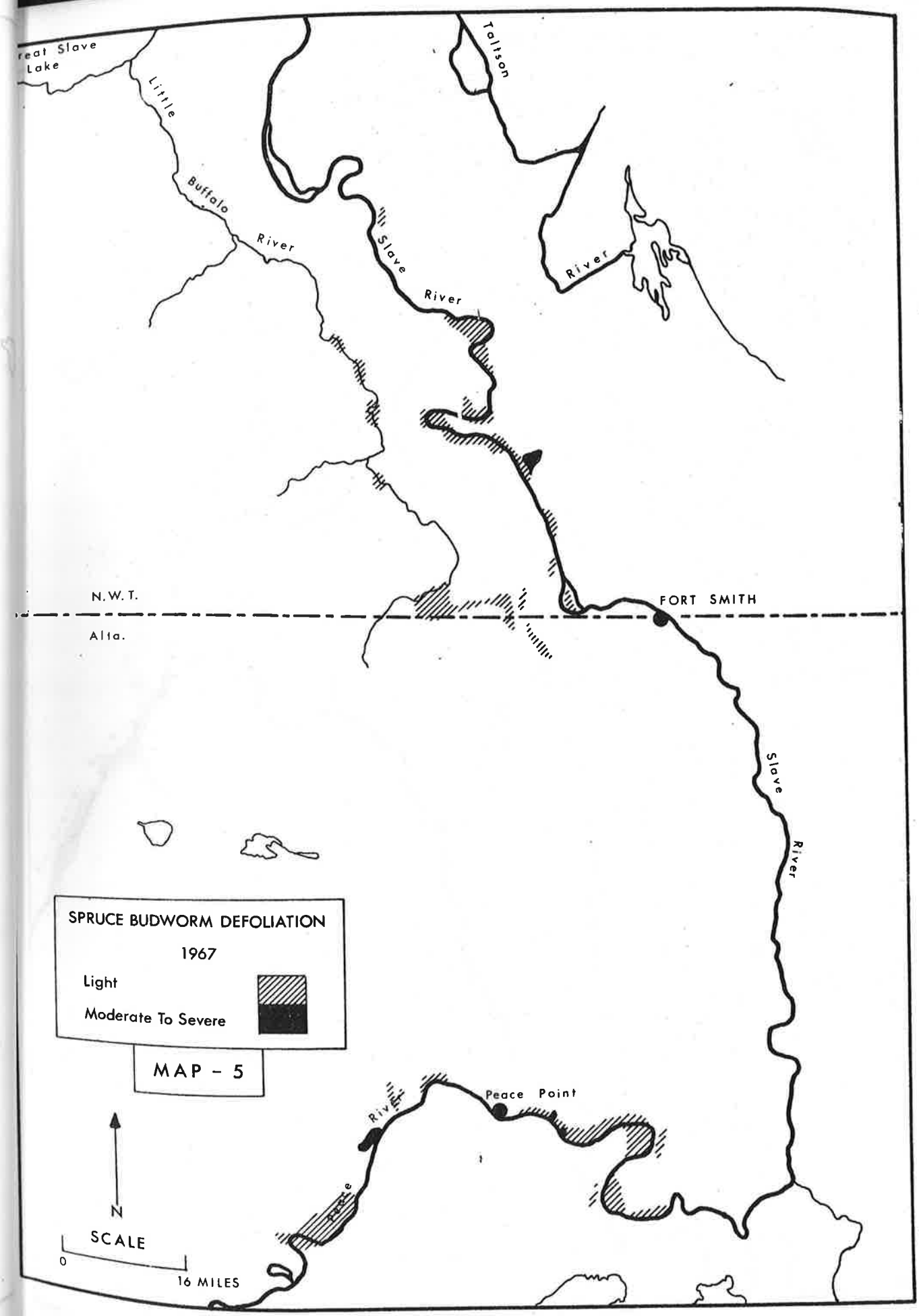

GREAT
BEAR
LAKE
7
6
Mackenzie R.
Liard River
GREAT
SLAVE
LAKE
FORT SMITH
Slave River
5
LAKE
ATHABASCA
2
Hay River
9
River
3
Peace
4
PEACE
RIVER
Athabasca River
8
EDMONTON
North Saskatchewan River
RED DEER
CALGARY
S. Saskatchewan R.
LETHBRIDGE
1
KEY TO OUTBREAK MAPS
Large Aspen Tortrix 1,10
Spruce Budworm 2-7
Forest Tent Caterpillar 8
Pseudexentera 9
SCALE
APPROX. 185 MILES = 1 INCH

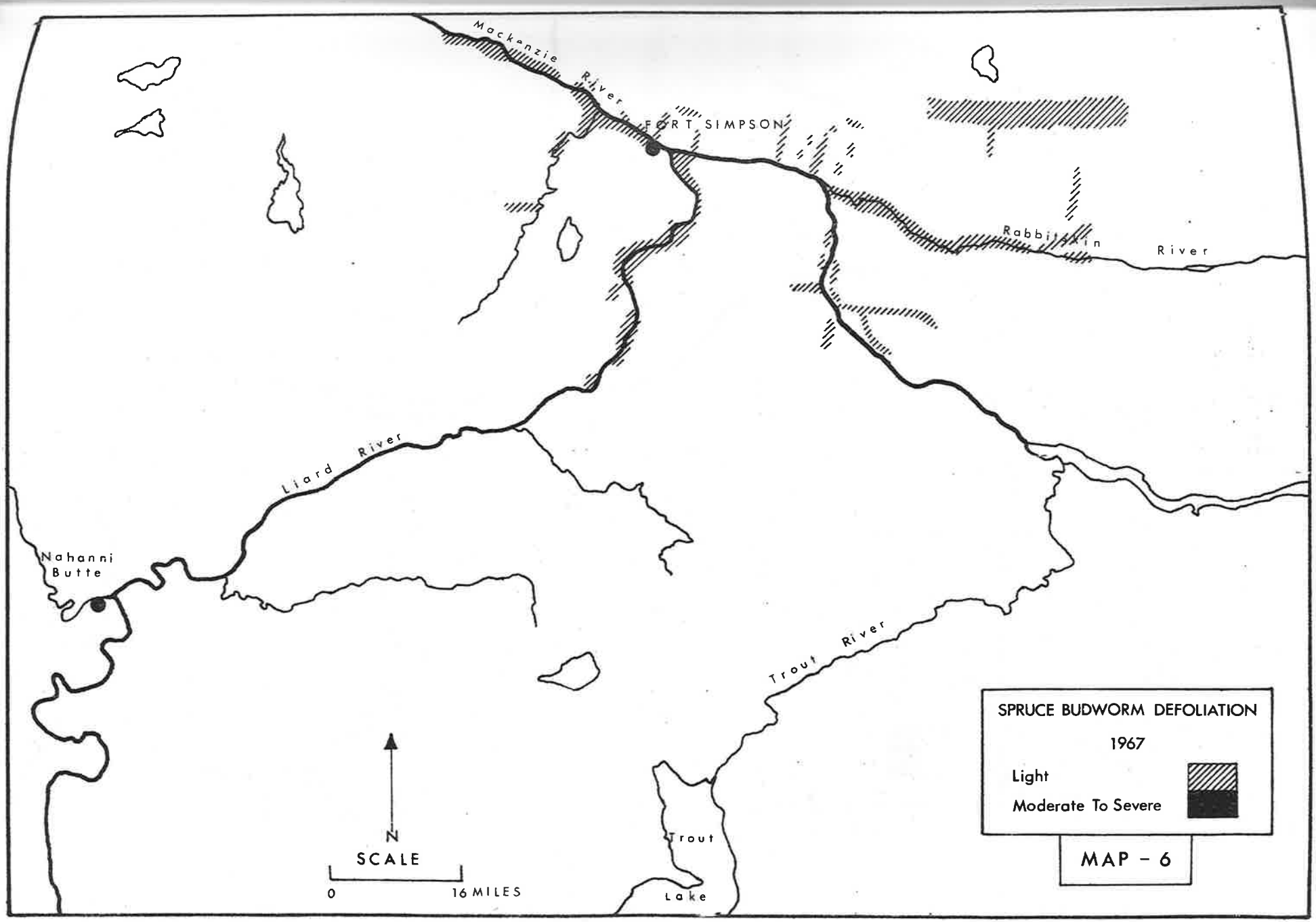

LARGE ASPEN TORTRIX DEFOLIATION
1967
Light
Modeate To Severe
MAP – 1
Oldman
River
MACLEOD
COLEMAN
Crowsnest
River
River
PINCHER CREEK
Castle
River
Waterton
CARDSTON
WATERTON
LAKES
NATIONAL
PARK
N
SCALE
0
8 MILES

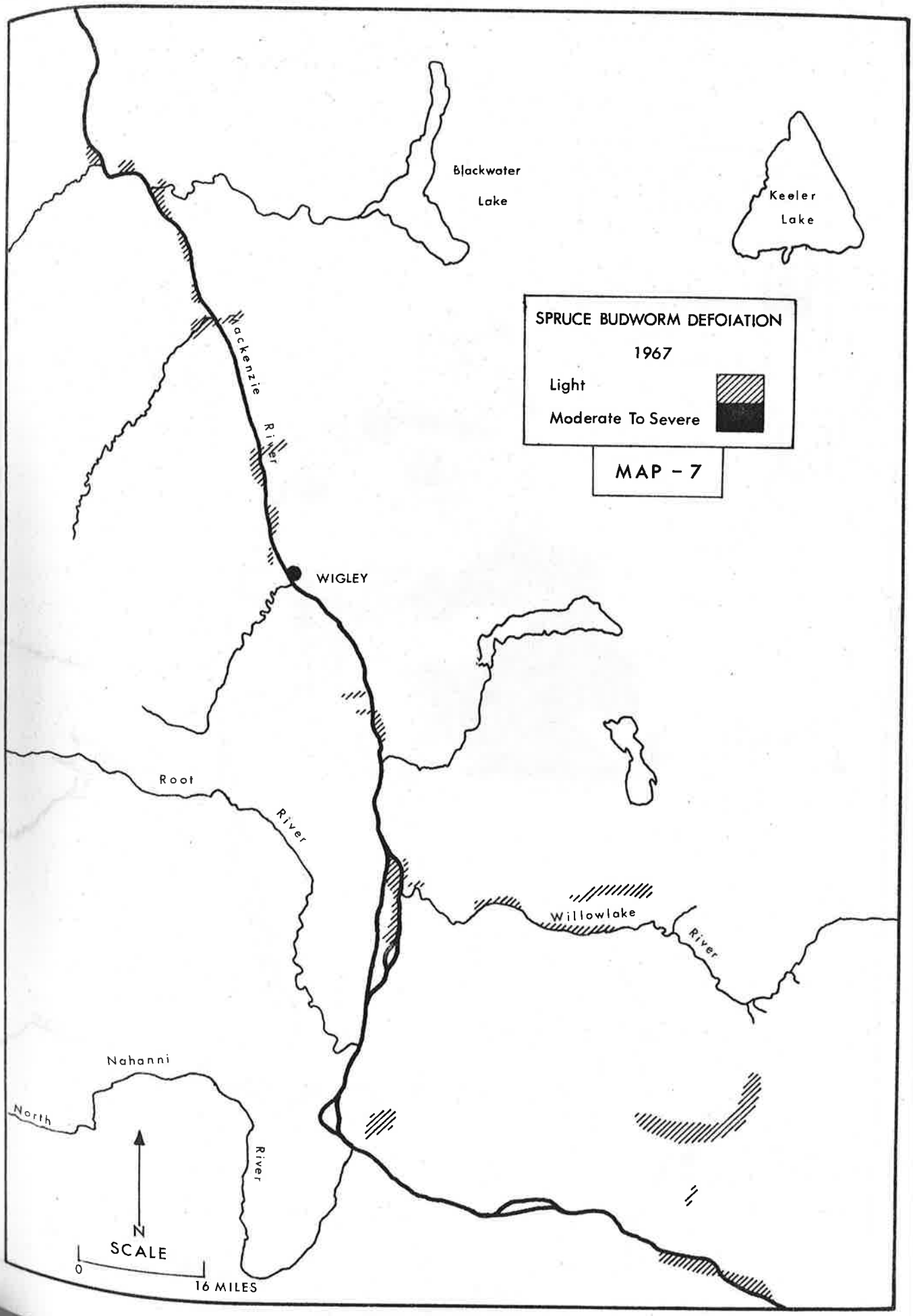

YUKON TERRITORY
SCALE
0 20 40 60
LARGE ASPEN TORTRIX DEFOLIATION
1967
Light
Moderate To Severe
MAP - 10
PEEL RIVER
DAWSON
MAYO LANDING
YUKON
RIVER
PELLY
RIVER
ALASKA
WHITEHORSE
WATSON LAKE

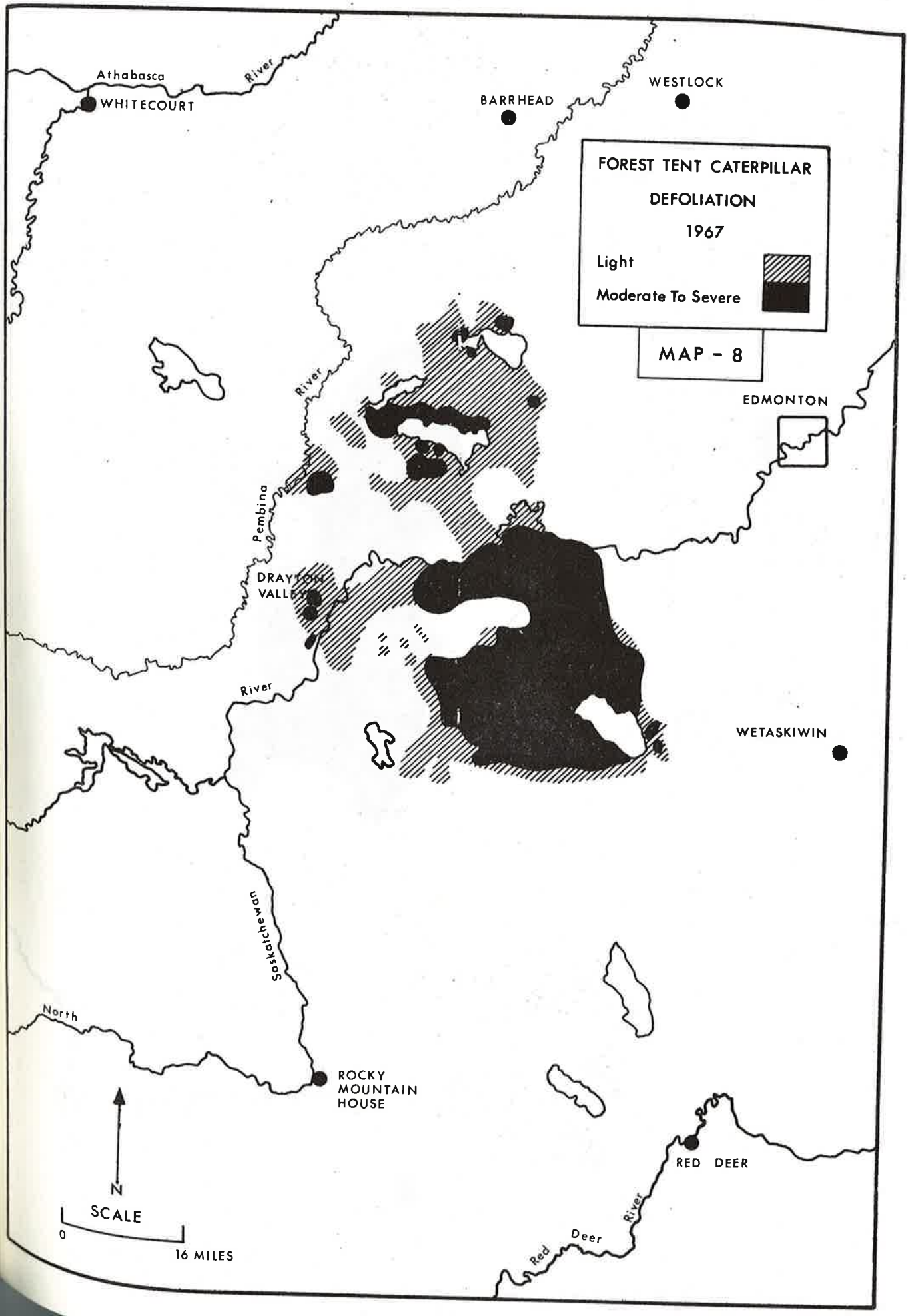

SPRUCE BUDWORM DEFOLIATION
1967
Light
Moderate To Severe
MAP – 2
Bistcho
Lake
STEEN
RIVER
River
MEANDER RIVER
Hay
Hay
Lake
Zama
Lake
HIGH
LEVEL
River
Peace
River
Chinchaga
N
SCALE
0
16 MILES
KEG RIVER


FORT VERMILION
Peace River
Wabasca River
Muddy River
Mikkwa River
River
Panny River
Loon River
RED EARTH
Peerless Lake
SPRUCE BUDWORM DEFOLIATION
1967
Light
Moderate To Severe
MAP - 3
N
SCALE
0
16 MILES


reat Slave
Lake
Little
Buffalo
River
Tallson
River
Slave
River
N.W.T.
Alta.
FORT SMITH
Slave
River
SPRUCE BUDWORM DEFOLIATION
1967
Light
Moderate To Severe
MAP - 5
Peace Point
N
SCALE
0
16 MILES


Mackenzie River
FORT SIMPSON
Rabbitskin River
Liard River
Nahanni Butte
Trout River
Trout Lake
N
SCALE
0
16 MILES
SPRUCE BUDWORM DEFOLIATION
1967
Light
Moderate To Severe
MAP - 6


Blackwater
Lake
Keeler
Lake
SPRUCE BUDWORM DEFOIATION
1967
Light
Moderate To Severe
MAP - 7
Mackenzie River
WIGLEY
Root
River
Willowlake
River
Nahanni
North
River
N
SCALE
0
16 MILES


FOREST TENT CATERPILLAR
DEFOLIATION
1967
Light
Moderate To Severe
MAP - 8
Athabasca
River
WHITECOURT
BARRHEAD
WESTLOCK
River
EDMONTON
Pembina
DRAYTON
VALLEY
River
WETASKIWIN
Saskatchewan
North
ROCKY
MOUNTAIN
HOUSE
RED DEER
Red Deer River
N
SCALE
0
16 MILES

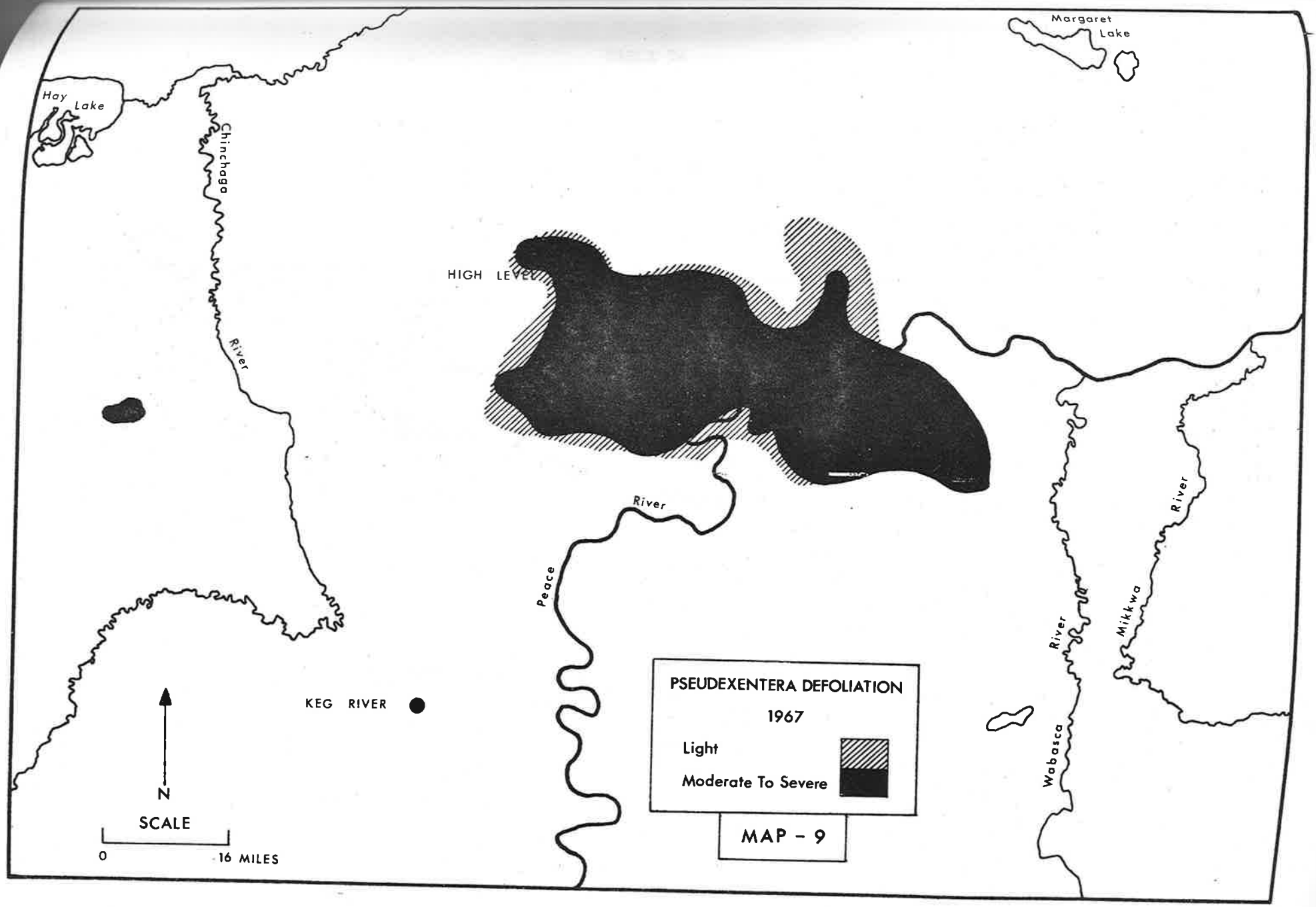

Margaret Lake
Hay Lake
Chinchaga River
HIGH LEVEL
Peace River
Wabasca River
Mikkwa River
KEG RIVER
N
SCALE
0
16 MILES
PSEUDEXENTERA DEFOLIATION
1967
Light
Moderate To Severe
MAP - 9

TABLE IV

SUMMARY OF AERIAL SURVEYS, 1967

DATE	PURPOSE	AREAS	AIRCRAFT	COST PER HOUR	TOTAL HOURS	TOTAL COST
June 13, 14	General	MacKenzie	Beaver (Floats)		**12:00	
June 23	Spruce budworm	Chinchaga	Bell 47 AJ-2 (Helicopter)		* 5:00	
June 27	General	MacKenzie	Beaver (Floats)		**10:00	
July 1	Forest tent caterpillar	Wabamun	Cessna 172	36.00	6:00	216.00
July 5	Large aspen tortrix	Southwestern Alberta	Cessna 172	36.00	3:40	132.00
July 5	General	MacKenzie	Cessna 180		** 1:00	
July 7	Spruce budworm	Wabasca and Chinchaga rivers	Cessna 180	48.0	4:50	232.00
July 10	Spruce budworm	McMurray	Cessna 180 (Floats)	50.00	4:00	200.00

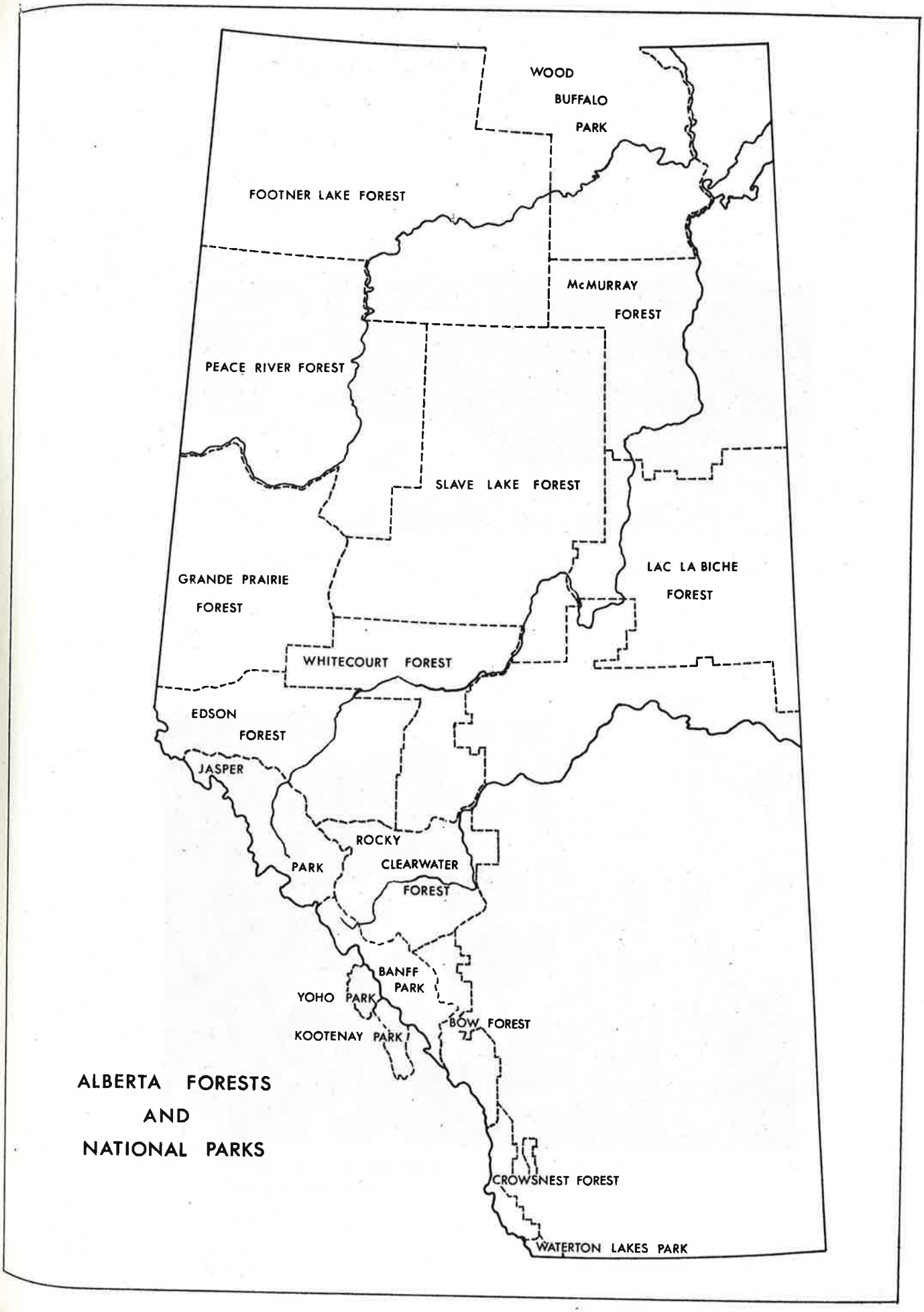
TABLE IV

SUMMARY OF AERIAL SURVEYS, 1967 cont'd.

DATE	PURPOSE	AREAS	AIRCRAFT	COST PER HOUR	TOTAL HOURS	TOTAL COST
July 12 to 14	Spruce budworm	MacKenzie	Found (Floats)	55.00	9:20	523.00
July 16	Spruce budworm	MacKenzie	Cessna 206 (Floats)	55.00	5:10	284.17
July 16	Spruce budworm	Lac La Biche	Dornier		* 4:00	
July 20	Spruce budworm	Rainbow Lake-Amber Tower	Cessna 180	48.00	2.25	116.00
August 22	General	MacKenzie	Cessna 180 (Floats)	60.00	5:15	315.00
October 5	Spruce budworm	Wabasca River	Bell 47 AJ-2 (Helicopter	135.00	4:00	540.00
			TOTALS		76:40	2558.17

*Alberta Forest Service
**MacKenzie Forest Service

Note: Total cost includes pilot expenses



ALBERTA FORESTS
AND
NATIONAL PARKS

DAMAGE APPRAISAL SURVEYS

During 1967, the damage appraisal crew was utilized in several capacities but the main effort was devoted to:

a) an intensive survey for the pine root collar weevil

b) studies relative to growth loss and defoliation caused by the forest tent caterpillar

c) sampling for incidence of Atropellis canker of pine.

d) sampling for incidence of dwarf mistletoe.

Other work included the recording of data relative to exotic tree plantations, disease outbreak areas, shoestring root rot, and the spruce budworm. A résume of the season's activity is recorded below.

Pine Root Collar Weevil, Hylobius warreni Wood

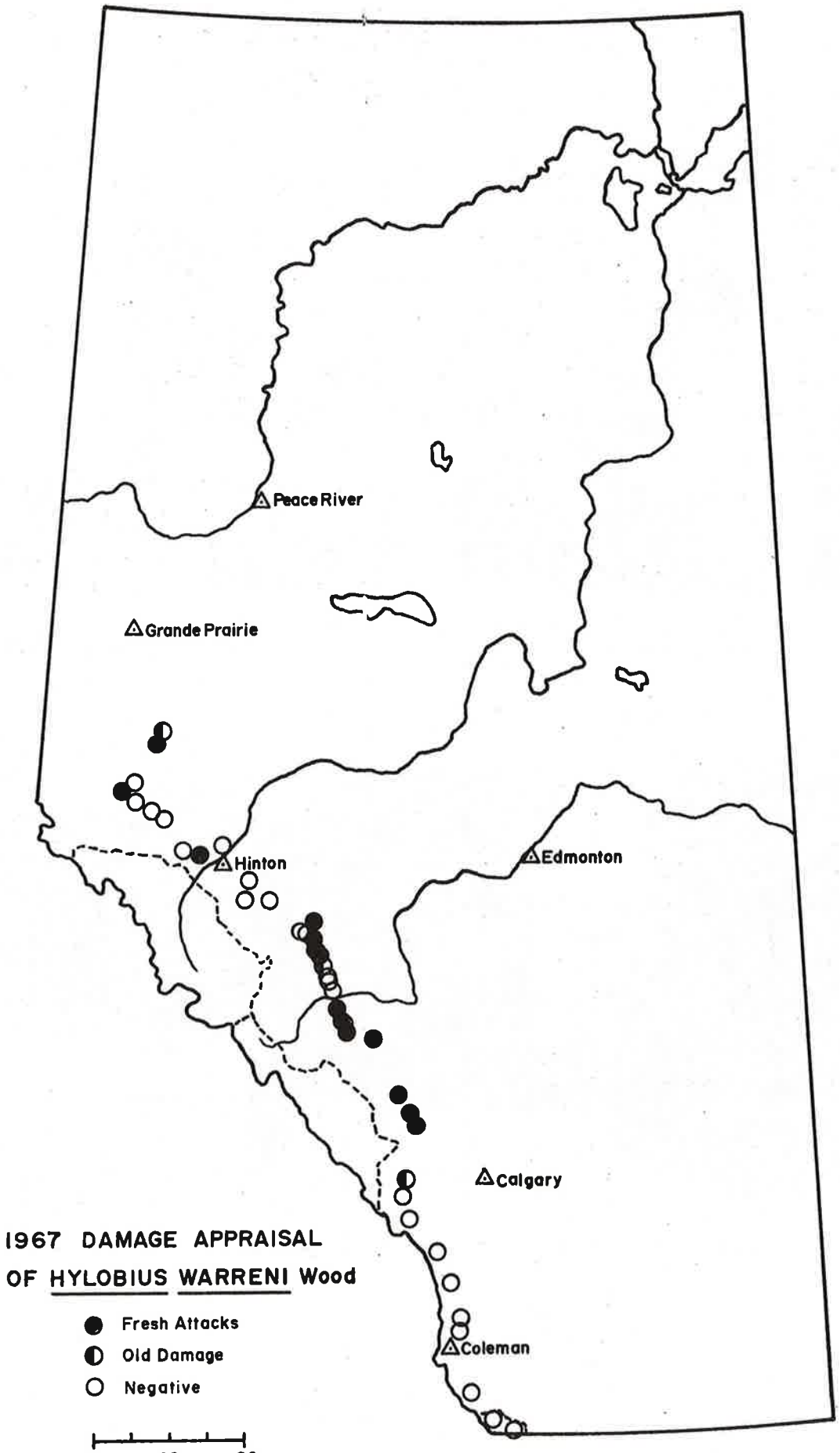
Although the primary objective of this survey was to define more precisely the distribution of the weevils, sampling was conducted in such a manner as to ascertain intensity of weevil attack in a variety of stand types. The data provide a better understanding of the insects which in turn may be applied to improving forest management practices.

Plots of 1/50th or 1/20th of an acre (dependent upon stand density) were established about every 15 miles in the foothills region of Alberta from the International Border to near Grande Prairie. A total of 108 plots, at 44 locations, were utilized (see map on page 45). The root collars and major roots of all the pine in each plot were examined for the presence of adults or larvae.

Forest Tent Caterpillar, Malacosoma disstria Hbn.

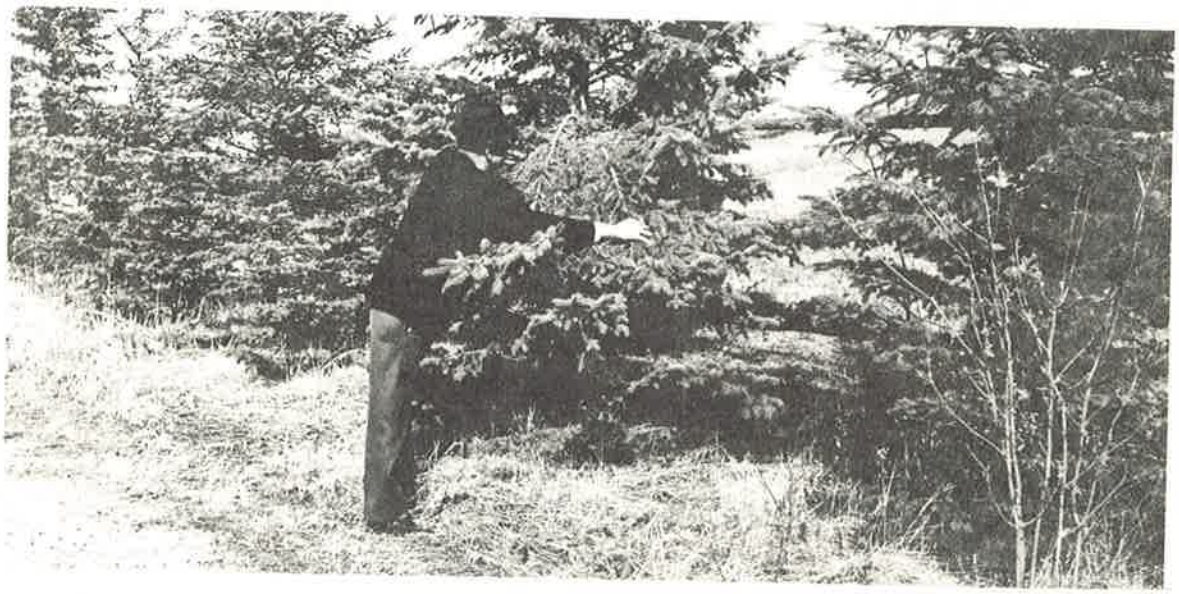
An assessment of damage to aspen by forest tent caterpillar was conducted by the measurement of growth rings using white spruce as the check tree. Ten discs were cut from each of 5 areas where severe defoliation has been recorded for 4, 5, and 6 consecutive years. Measurements were made using Addo X equipment.

A study to compare ground and aerial estimates of defoliation was carried out. During aerial surveys, areas were selected to represent defoliation in each of 3 categories (light, moderate, and severe). The same


Peace River
Grande Prairie
Hinton
Edmonton
Calgary
Coleman
1967 DAMAGE APPRAISAL
OF HYLOBIUS WARRENI Wood
Fresh Attacks
Old Damage
Negative
0
40
80
miles

Insectary Technician examining aspen branches for egg sites.

Herbarium Technician examining disease specimen slide.



Tree Pest Officer on extension call examining spruce shelterbelt.

INSECTARY OPERATIONS

Although the insectary is located in a basement with artificial control of light, temperature, and humidity, satisfactory conditions are maintained for the rearing of insects to identifiable stages. The local reference collection consists of several thousand specimens of which over 1700 species have been catalogued and classified taxonomically.

The insectary operations and maintenance of the reference collection are performed by a senior technician with the assistance of one full time technician and two seasonal employees.

During 1967, a total of 1432 collections and reports involving approximately 25000 insects were processed. Many of these were identified, recorded, and discarded but over 300 were reared to identifiable stages. Material requiring a hibernation period was placed in cold storage and returned to incubating temperatures during January, 1968. All enclosure slips were coded and periodically during the summer sent to Ottawa where the data were transferred to magnetic tape. During the autumn, corrections and additions were prepared and sent to Ottawa to update the records.

Some specific insectary operations included the mass rearing of forest tent caterpillars, spruce budworm, and spruce bud midge for the recovery of parasites. Several black spruce tops were carefully examined and the insect fauna ascertained. About 75 root weevils (Pissodes spp.) were reared to the adult stage for use in genetical studies at Sault Ste. Marie, Ontario. The study of spring defoliators of trembling aspen to determine life histories and to recognize the early instar larvae was continued by the senior insectary technician.

HERBARIUM OPERATIONS

The regional mycological herbarium, designated by international code letters CFB, originated in 1952 to serve as a reference collection of forest diseases. Loans and exchanges with other herbaria are encouraged. Currently, 8000 specimens representing 262 genera and 572 species are on deposit. The rate of annual increase is about 10 per cent.

The operations of the herbarium are supervised by the regional mycologist (Dr. Y. Hiratsuka) with a senior herbarium technician (Mrs. L. E. McArthur) performing as assistant curator. Assistance is provided by a clerk-typist during the winter and a student assistant during the field season.

Most of the identifications are made by Dr. Hiratsuka and Mrs. McArthur but some specific identifications are made by specialists in Ottawa or in other research centers. Dr. Y. Hiratsuka renders a national and international service through his specialization in western species of tree rusts.

During 1967 much material was provided through the herbarium services to outside agencies and to local researchers. A total of 776 collections were processed. Amongst these many new pathogens, host and distribution records were obtained as listed in table V page 48 .

TABLE V

NEW HERBARIUM RECORDS, 1967

Organism and Disease	Host(s)	Locality	Remarks
Chrysomyxa arctostaphyli Diet. Yellow witches' broom of spruce	Arctostaphylos uva-ursi Common bearberry Picea glauca White spruce	Campbell Lake, N. W. T.	Range extension far northward.
Chrysomyxa ledicola Lagh. Needle rust	Ledum groenlandicum Common Labrador tea	Campbell Lake, N. W. T.	Range extension far northward.
Chrysomyxa pirolata Wint. Cone rust of spruce	Picea pungens Colorado spruce	4 mi. E. of Faust	New herbarium host record.
	Pyrola secunda One-sided winter-green	Junction of Rabbit Hay and Mackenzie rivers, N. W. T.	Range extension far northward.
Cladosporium sp. Hyperparasite of rust fungi	Chrysomyxa pirolata on Pyrola asarifolia Cone rust of spruce on common pink wintergreen.	2 mi. W. of Pine-hurst Lake	New herbarium host records.
	Melampsora epitea on Salix sp. Leaf rust on willow	4 mi. N. of Smoky Heights	
Coccomyces hiemalis Higgins Leaf spot	Prunus virginiana Choke cherry	6 mi. N.E. of Calais	New herbarium host record. Only conidial state, (Cylindrosporium hiemalis Higgins) was present.
Cronartium comandrae Pk. Comandra blister rust	Pinus banksiana Jack pine	Blackwater Lake, N. W. T.	Range extension far northward.

TABLE V

NEW HERBARIUM RECORDS - Cont'd.

Organism and Disease	Host(s)	Locality	Remarks
Epipolaeum abietis (Dearn.) Shoemaker Sooty mold of fir	Abies lasiocarpa Alpine fir	10 mi. N.E. of Field, Yoho National Park 33 mi. S.W. of Banff, Kootenay National Park	New Regional records and probably first world record on alpine fir. Syn. Dimerosporium abietis Dearn.
Erysiphe polygonia DC. ex Mérat Powdery mildew	Caltha palustris Marsh marigold	15 mi. N.E. of Lac La Biche	New herbarium record.
Exobasidium vaccinii Wor.	Vaccinium myrtillus Low bilberry Vaccinium vitis-idaea var. minus Bog cranberry	30 mi. S.W. of Sundre 12 mi. N.W. of Nordegg	New herbarium records.
Fomes cajanderi Karst. Brown cubical top rot	Picea glauca White spruce	An island, Mackenzie River, 15 mi. N.W. of Ft. Good Hope, N.W.T.	Range extension northward.
Fomes pini (Thore ex Pers.) Lloyd Red ring rot	Picea glauca White spruce	An island, Mackenzie River, 15 mi. N.W. of Ft. Good Hope, N.W.T.	Range extension far northward.
Isthmiella crepidiformis (Darker) Darker Needle cast	Picea glauca White spruce	Campbell Lake, N. W. T.	Range extension far northward. Syn. Bifusella crepidiformis Darker.

TABLE V

NEW HERBARIUM RECORDS - Cont'd.

Organism and Disease	Host(s)	Locality	Remarks
Kriegeria juniperina (Ell.) Seaver On needles	Juniperus communis Common juniper	4 mi. W. of Banff, Banff National Park 4 mi. N.W. of Miette Hotsprings, Jasper National Park King Lake, N.W.T.	New Regional records.
Lenzites saepiaria (Wulf. ex Fr.) Fr. Brown cubical pocket rot	Picea glauca White spruce	The Grand View, N. W. T.	Range extension far northward.
Linospora tetraspora G.E. Thompson Leaf blight	Populus balsamifera Balsam poplar	Ft. Smith, N.W.T.	First record in the Northwest Territories.
Lirula macrospora (Hartig) Darker Needle cast	Picea glauca White spruce	30 mi. S. of Arctic Red River, N.W.T.	Range extension far northward. Syn. Lophodermium macrosporum (Hartig) Rehm.
Lophodermium juniperi (Grev.) Darker Needle cast	Juniperus communis Common juniper Juniperus horizontalis Creeping juniper	Campbell Lake, N.W.T. 8 mi. W. of Ft. Good Hope, N.W.T.	Range extension far northward. Syn. Lophodermium juniperinum (Fr.) de N.
Lophodermium nitens Darker Needle cast	Pinus albicaulis Whitebark pine	Mi. 4, Geraldine Lake Fire Road, Jasper National Park.	New herbarium host record.

TABLE V

NEW HERBARIUM RECORDS - Cont'd.

Organism and Disease	Host(s)	Locality	Remarks
Lophodermium pinastri (Schrad. ex Hook.) Chev. Needle cast	Pinus banksiana Jack pine	Blackwater Lake, N. W. T.	Range extension far northward.
Lophophacidium hyperboreum Lager. Snow-blight	Picea engelmannii, P. glauca and P. mariana Engelmann, white and black spruce	Alberta and Yukon Territory	New Regional records and probably first world host record on Engelmann spruce.
Melampsora epitea Theum. Leaf rust	Salix sp. Willow	Campbell Lake, N. W. T.	Extension of known distribution far northward.
Melampsorella caryophyllacearum Schroet. Yellow witches' broom of fir	Cerastium vulgatum var. hirsutum Chickweed	15 mi. N.W. of Waterton, Waterton Lakes National Park	New herbarium host record.
Puccinia arenariae (Schum.) Wint. Rust	Cerastium beeringianum Chickweed	48 mi. S.W. of Longview	New herbarium host record.
Puccinia jonesii Pk. Rust	Lomatium dissectum var. multifidum Prairie parsley	23 mi. W. of Stavely	New herbarium record.
Puccinia pulsatillae Kalchb. Rust	Anemone patens var. wolfgangiana Prairie crocus	Junction of Travaillant and Mackenzie rivers, N.W.T.	New herbarium record.

TABLE V

NEW HERBARIUM RECORDS - Cont'd.

Organism and Disease	Host(s)	Locality	Remarks
Puccinia symphoricarpi Harkn. Rust	Symphoricarpos albus Snowberry	11 mi. S.W. of Beaver Mines	New herbarium record.
Puccinia treleasiana Paz. Rust	Caltha palustris Marsh marigold	15 mi. N.E. of Lac La Biche	New herbarium record.
Pucciniastrum potentillae Kom. Rust	Potentilla tridentata Three-toothed cinquefoil	20 mi. N.E. of Lac La Biche	New Regional record.
Scirrhia pini Funk & A.K. Parker Needle blight	Pinus contorta Lodgepole pine	Redstreak Campground, Kootenay National Park	New Regional record. Only imperfect state (Dothistroma pini Hulbary) was present.
Seynesiella juniperi (Desm.) Arn. Needle fungus	Juniperus communis Common juniper	1 mi. S. of Sundre	New Regional record.
Sphaerulina taxicola (Pk.) Berl. Leaf and twig blight	Taxus brevifolia Western yew	Emerald Lake, Yoho National Park	New Regional record.
Thyriopsis halepensis (Cke.) Th. & Syd. Needle fungus	Pinus contorta Lodgepole pine	16 mi. S.E. of Strachan	New Regional record.

TABLE V

NEW HERBARIUM RECORDS - Cont'd.

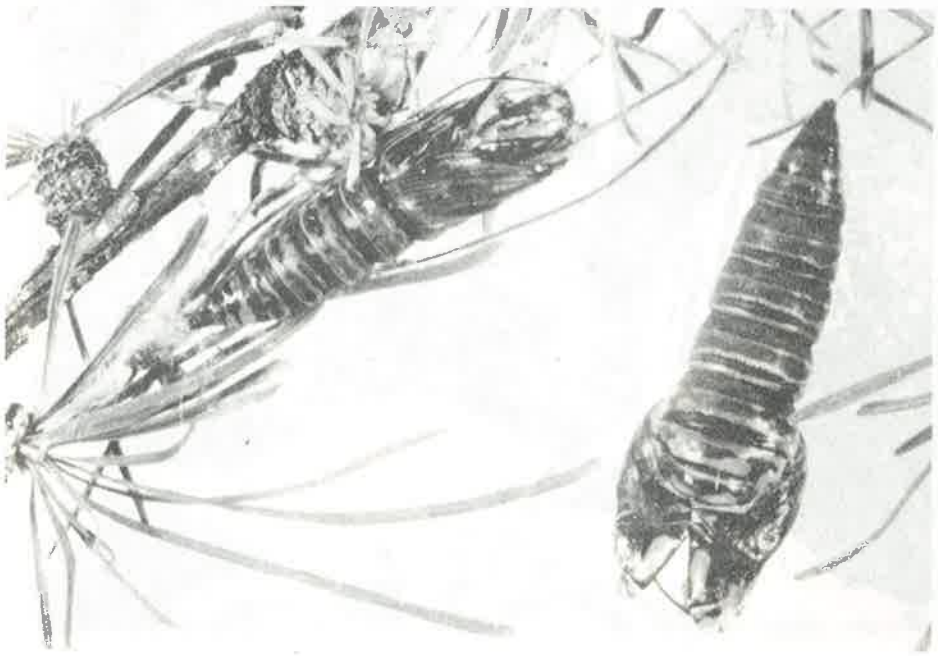
Organism and Disease	Host(s)	Locality	Remarks
Uncinula salicis (DC.) Wint. Powdery mildew	Populus balsamifera Balsam poplar	Lady Evelyn Falls, N. W. T.	First record in the North-west Territories.
Wallrothiella arceuthobii (Pk.) Sacc. Hyperparasite of dwarf mistletoe	Arceuthobium americanum on Pinus banksiana Dwarf mistletoe on jack pine	Peace Point, Wood Buffalo National Park	Range extension.

TREE PEST EXTENSION SERVICES

Under the direction of the Officer-in-Charge of Survey a Tree Pest Extension Service was established in 1967. The appointment of one officer (Mr. N. W. Wilkinson) to administer this office was intended to fill a need for the processing of inquiries from the general public and outside agencies and at the same time relieve other sections within the Department of this growing aspect of public relations. The prime intent was to centralize the extension aspect of replying to requests originating within the City of Calgary and the District of Rockyview for identification of insects and plant diseases and recommend control for various tree and plant pests. However, it became apparent that this service should be available to everyone within the Region. It was suggested that our efforts in this field be directed to processing requests from superintendents and section heads of other departments and junior governments. This would mean that junior governments would be responsible for processing inquiries and requests from the general public with this office acting in an advisory capacity. As a start in this re-organization, a meeting with the City Parks Superintendent and the local District Agriculturist was arranged and as a consequence the City Parks Department accepted the responsibility from requests originating within the limit of the City and the District Agriculturist for requests originating within his area of jurisdiction. This procedure allows adequate attention to requests from divisional heads and field representatives throughout the Region. Further refinement in the system is planned. The following list indicates the agencies requesting information in the 1967 season and the number of requests received from each.

General Public	157
District Agriculturists	29
Alberta Forest Service	12
Canada Department of Agriculture	6
Provincial Parks	1
Federal Parks	3
County of Newell, Agricultural Service Board	3
Calgary Sunbathing Club	1
Provincial Department of Agriculture	1
	213

White spruce stand damaged by spruce budworm, C. fumiferana, Slave River, N.W.T.



Spruce budworm pupae on tamarack, Rabbitskin River, N.W.T.

Survey Ranger examining forest tent caterpillar larvae, M. disstria for hatching study project.

Survey Ranger collecting aspen leaves for forest tent caterpillar defoliation studies.

RESEARCH INVESTIGATIONS

Spruce budworm

In addition to the aerial detection surveys conducted annually by district rangers, investigations were performed on the ground to ascertain the impact of spruce budworm on spruce bordering the Wabasca, Slave, and Mackenzie rivers. These studies were performed by Mr. R. E. Stevenson with assistance from members of the appraisal crew, namely Mr. D. Elliott and Mr. R. Caltrell. Access was accomplished by boat along the Mackenzie and Slave rivers, and by helicopter along the Wabasca River. Data on the current condition of infected stands were collected by recording evidence of deterioration resulting from budworm feeding on all trees in tenth-acre plots. Cross-sectional discs taken from the base and crown of dominant trees were utilized to investigate the effects of past infestations as an aid in predicting impact.

Readily observed characteristics which indicate recent budworm feeding are certain types of mortality, dead tops, excessive adventitious growth, and sparse viable foliage. Recordings of these characteristics in stands of known recent budworm infestation show that even light defoliation as recorded from the air may result in considerable top-killing and mortality to regeneration. Tree mortality in infested stands in the Northwest Territories ranges from about 30 per cent to 77 per cent and in the Wabasca River area where prompt utilization is planned, mortality of merchantable timber ranges from 21 per cent to 63 per cent. In the particular area at the confluence of the Wabasca and Muddy rivers only about 10 per cent of the trees are in an apparent healthy condition. The examination of the growth rings, however, show a pronounced decline in growth commencing around 1937.

Forest tent caterpillar

Although infestations of the forest tent caterpillar have been persistent in some areas of Alberta for several years the normal history of tent caterpillar outbreaks is a sudden and almost complete collapse after a few years. The popular explanation for a sudden collapse has been that delayed leafing of aspen due to a protracted cold period results in mass starvation of the young larvae. However, laboratory experimentation and field observations during 1967 have revealed that young tent caterpillars are capable of withstanding low temperatures far in excess of that even encountered in nature. Starvation experiments indicate that the young larvae can survive without food for two to three weeks at the temperatures normally encountered in Alberta. Dr. Raske, who has been conducting the experiments, contends that the low temperature-starvation phenomenon cannot terminate an infestation by itself but must be coincident with some other factors such as the incidence of disease.

Wood borers

The problem of damage to decked peeler and saw logs by wood boring insects and the resultant devaluation of the products has never been completely resolved by the conventional methods of control. The cost of protecting stored logs by debarking, application of water or repellants is often prohibitive. It is well known, however, that logs are susceptible to attack only when in a specific condition which must coincide with the egg laying period of the beetles. No doubt, this explains the absence of damage in some instances.

During 1967, investigations were initiated by Dr. A. Raske to study the problem from the standpoint of life cycles of the insect species involved and host susceptibility. For this purpose over 200 pine and spruce were felled in the Crowsnest, Whitecourt, and Lac La Biche areas during the months of March, June, July, September, and December. Examination of the logs will follow that period when no further beetle attack is likely. Biological data on the insects was obtained by intensive examination of about 120 decked logs (mostly pine) from Rocky Mountain House. These data are to be employed in developing a sequential sampling system which in turn should provide a relatively easy method of assessing damage.

Mycology of forest fungi

Indentification of forest fungi and supervision of the regional mycological herbarium are the responsibility of the regional mycologist, Dr. Y. Hiratsuka. In addition, Dr. Hiratsuka, with the technical assistance of Mr. P. J. Maruyama and Mrs. L. E. McArthur, is actively engaged in research involving life histories, morphology, cytology, and taxonomy of forest pathogens with particular emphasis on the forest tree rusts of North America. Highlights of his recent research findings have centered around cytological investigations of pine stem rusts, morphological and taxonomic studies of conifer needle rusts, and a new immunofluorescent technique for identification of fungi.

Results of cytological studies of stem rusts in western North America (Peridermium harknessii and P. stalactiforme) prompted an examination of the European rust Peridermium pini (Cronartium flaccidum complex) to determine if it possesses the same autoecius character to intensify in the absence of alternate hosts. During May and June 1967, Dr. Hiratsuka studied at several research centers in Europe (Norway, Sweden, Netherlands and Scotland) and obtained significant results. The results were further proof of the existence of a new type of life cycle in this group of rusts and have major implications in detection and control of this group of fungi.

Major taxonomic revision of genus Pucciniastrum, needle rusts of conifers, is well underway following successful inoculations and morphological studies.

Further study of possible application of immunofluorescent techniques to forest mycology was made during the summer of 1967 with the assistance of a graduate student (Miss Marion Tattersall) and positive results were obtained.

INDEX TO INSECTS AND DISEASES

DISEASE

PAGE

MISCELLANEOUS