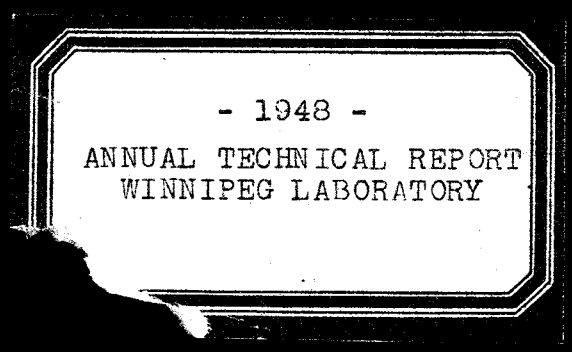

- 1948 -
ANNUAL TECHNICAL REPORT
WINNIPEG LABORATORY

SUBJECT INDEX

1. INTRODUCTION

I. INTRODUCTION

The year 1948 was characterized by intensification and some reorganization of the Forest Insect Survey and expansion of research on the larch sawfly. Projects on the jack-pine budworm, spruce budworm and wood borers were continued and a new project on the pitch nodule maker was initiated.

A standardized method of sampling spruce and jack-pine budworm populations was adopted for the Survey. The spruce budworm has been detected with increasing frequency over a fairly wide range in the forests of southern Manitoba and in order to follow the progress of this insect, it is essential that some quantitative method of sampling be employed.

Another innovation was the establishment of permanent sampling stations in all forest districts. These are not as elaborately defined as permanent sample plots but were designed to provide definite locations which can be re-examined and re-sampled repeatedly to study insect fluctuations at given points.

Larch sawfly research projects were carried out on the following phases: (1) larch sawfly parasites and diseases; (2) relation between sawfly development and water levels, soil acidity and oxygen content of water; (3) general biology; (4) the effect of sawfly activity on tree growth; and (5) estimation of sawfly populations.

Studies were continued on the role of jack-pine staminate flowers on the epidemiology of the jack-pine budworm. In the Spruce Woods Forest Reserve, fluctuations of the spruce budworm in relation to biological and natural control factors were investigated. Deterioration studies on fire-killed jack pine in Fort a la Corne Forest, Saskatchewan, were continued. A new project on the biology and control of Petrova albicapitana was initiated. This insect has become a common pest in pine plantations in Manitoba and Saskatchewan during the last three years.

Progress was made in the matter of providing better field accommodation for research activities and insect rangers. Work was started on the erection of an adequate field station in the Whiteshell Forest Reserve, Manitoba. The building should be completed in May, 1949. This will provide a base for regional field research problems for Saskatchewan and Manitoba. At Prince Albert, Saskatchewan, a double insect ranger cabin was practically completed in 1948. This is to serve as field headquarters for insect rangers working the Meadow Lake, Prince Albert and Northern Forest districts of Saskatchewan.

It was difficult to maintain the necessary degree of continuity in research projects because the scientific field staff was composed largely of University undergraduates, employed on a seasonal basis. For this reason also, it has been impossible to prepare adequate statements on the progress of field projects. The report submitted herewith is confined therefore, chiefly to progress statements on the Forest Insect Survey and Insect Ranger activities. Gradual improvement with respect to progress statements is expected as the majority of student assistants expect to graduate in 1949. Nevertheless, most will wish to commence graduate work immediately and this may cause a further delay in the analysis of completed work and publication of results.

An important re-organization in administration resulted in the establishment of a new Forest Insect Laboratory in Alberta. Heretofore the insect problems of the forests of Alberta, with the exception of the National Parks and certain areas on the east slope of the Rocky Mountains, were administered from Winnipeg but with the facilities now established in Alberta, these problems will henceforth be dealt with by the new laboratory at Calgary.

Respectfully submitted,

R. R. LEJEUNE,
Officer-in-Charge.

R. R. LEJEUNE	Officer-in-Charge, SSE-3202 - Agricultural Scientist Grade 3 (April 1, 1948 to March 31, 1949).
W. C. McGUFFIN	SSE-3341--Agricultural Scientist Grade 2 (On leave without pay from April 1st, 1948; transferred to Calgary June 20, 1948).
R. B. BARKER	SSE-3167 - Senior Agricultural Assistant (April 1, 1948 to March 14, 1949).
H. R. WONG	SSE-3321 - Senior Agricultural Assistant (April 1, 1948 to October 11, 1948 - March 23, 1949 to March 31, 1949). (Leave of absence without pay from October 12, 1948 to March 22, 1949).
H. A. FYFE	SSE-3319 - Senior Agricultural Assistant (April 1, 1948 to October 4, 1948).
W. F. BLACK	SSE-3038 - Student Assistant (Agricultural) Range 3 (April 19, 1948 to September 30, 1948). Extra Labour October 15, 1948, to December 31, 1948).
W. J. TURNOCK	SSE-3320 - Student Assistant (Agricultural) Range 3 (April 19, 1948 to September 30, 1948).
E.A.R. LISCOMBE	SSE-3461 - Student Assistant (Agricultural) Range 3 (April 19 to September 30, 1948).
W. H. FELL	SSE-3322 - Student Assistant (Agricultural) Range 3 (April 26 to September 30, 1948).
J. A. MULDREW	SSE-3372 - Student Assistant (Agricultural) Range 3 (April 26 to September 30, 1948).
G. MYRDAL	SSE-254 - Student Assistant (Agricultural) Range 3 (April 26 to eptember 17, 1948).

G. D. KOLBE	SSE-3462 Student (Agricultural) Range 1 (April 26 to September 30,1948)
A. W. ASKEY	SSE-3395 Student (Agricultural) Range 3 (May 27, 1948 to September 13, 1948).
V. HILDAHL	SSE-3177 - Insect Ranger Grade 2 (April 1, 1948 to March 31, 1949.)
A. E. ANDERSON	SSE-3175 - Insect Ranger Grade 1 (April 1, 1948 to May 5, 1948.) Transferred to Calgary May 6, 1948.
L. L. McDOWALL	SSE-3256 - Insect Ranger Grade 1 (April 1, 1948 to March 31, 1949).
J. A. DROUIN	SSE-3255 - Insect Ranger Grade 1 (April 1, 1948 to March 31, 1949.)
H.A.J. EDMUNDS	SSE-3258 - Insect Ranger Grade 1 (April 1, 1948 to March 31, 1949.)
A. C. KNIGHT	SSE-3257 - Insect Ranger Grade 1 (May 25, 1948 to January 27, 1949).
J. J. LAWRENCE	SSE-3434 - Insect Ranger Grade 1 (August 3, 1948 to March 31, 1949).
R. A. LANG	SSE-3434 - Insect Ranger Grade 1 (April 1, 1948 to July 15, 1948).
J. B. MARTIN	SSE-3176 - Insect Ranger Grade 1 (April 1, 1948 to March 31, 1949).
J. C. E. MELVIN	SSE-3522 - Assistant Technician Grade 1 (June 14, 1948 to March 31, 1949).
M. M. CHERRETT	SSE-3147 - Stenographer Grade 2 (April 1, 1948 to September 18, 1948).
S. I. DOUGALL	SSE-3297 - Stenographer Grade 1 (April 1, 1948 to January 1, 1949).
M. F. HENDERSON	SSE-3147 - Typist Grade 2, (October 1, 1948 to November 13,1948).

E. V. HORN	SSE-3147 - Stenographer Grade 2A (November 22, 1948 to March 31,1949).
C. O. TEMPLIN	SSE-3297 - Stenographer Grade 2A (January 4, 1949 to March 31, 1949).
C. GIBSON	Extra Labour - Caretaker (April 1, 1948 to March 31, 1949).
L. KARP	Extra Labour - Laboratory Assistant, (May 3, 1948 to August 31, 1948).
D. BOUZAN	Extra Labour - Laboratory Assistant, (May 17, 1948 to September 3, 1948)
B. G. MATHERS	Extra Labour - Laboratory Assistant, (June 29, 1948 to August 18, 1948)
H. MEADS	Extra Labour - Foreman Carpenter Prince Albert (April & May, 1948)
C. E. SUMNER	Extra Labour - Bricklayer (Prince Albert)(May 19, 1948 to May 26, 1948)

See 1948 published Annual Report
of the Forest Insect Survey.

A. V. Hildahl

1. Introduction

The following report outlines the activities of forest insect ranger V. Hildahl during the summer season of 1948 and contains observations made throughout various parts of the forested areas of Manitoba and Saskatchewan, for the Forest Insect Survey. No definite itinerary was followed as the season's activities were devoted to supervision of the Insect Rangers in the field and to special trips and investigations.

From May 10th to 17th inclusive the writer was at Prince Albert, Saskatchewan inspecting and assisting with the construction of a forest insect ranger cabin. At the same time several contacts were made with personnel of the Department of Natural Resources and Industrial Development in Prince Albert regarding Forest Insect Survey activities in the forested areas of Saskatchewan during 1948.

On June 1st, the writer proceeded to the Spruce Woods Forest Reserve to instruct Insect Rangers McDowall, Drouin and Edmunds in the detection of budworm in its early stages. June 8th and 9th was spent in the interlake area of Manitoba inspecting field work being carried out by the Insect Rangers and contacting field personnel of the Manitoba Forest Service.

From June 14th to 17th inclusive the writer was in western Manitoba and eastern Saskatchewan assisting insect rangers Drouin and Martin with surveying and mapping the large aspen tortrix (Archips conflictana Wlk.) infestation in the Duck Mountains. This infestation was centered around Madge Lake in Saskatchewan.

A trip was made to Prince Albert, Saskatchewan during the latter part of June (June 24 - 29 inclusive) to contact personnel of the Department of Natural Resources and to inspect the work that the insect rangers were conducting throughout central and northern Saskatchewan.

During the periods July 5th to 7th and July 13th to 15th the writer accompanied Insect Ranger L. McDowall on a general survey throughout the Lac du Bonnet - Pine Falls area of Manitoba. A flight by air with the Manitoba Air Service over part of eastern Manitoba to determine the prevalence of budworm was also undertaken at this time. (The flight covered the following points in Eastern Manitoba: Long Lake, Bissett, Bloodvein River, Sasaginnigak Lake, Obukowin Lake and Oiseau Lake.)

On July 19 the writer proceeded to Saskatchewan to liberate parasites (Mesoleius aulicus) and cultures of a fungous disease (Beauveria sp.) in tamarack stands infested with larch sawfly.

During the period August 3 - 11 inclusive, the writer was engaged in an aerial reconnaissance covering the Manitoba - Ontario border region. The reconnaissance was conducted jointly with insect ranger G. R. Carter from the Forest Insect Laboratory, Sault Ste. Marie, Ontario, and was intended primarily to determine the extent of budworm damage to spruce, balsam fir and jack pine stands throughout the forested areas lying along the Manitoba - Ontario boundary.

On August 23rd, V. Hildahl, accompanied the Manitoba Air Service on a flight from Lac du Bonnet, north to Lake St. George, Winnipegosis and The Pas, Manitoba. The return flight to Lac du Bonnet was made on August 24th. This trip was devoted mainly to larch sawfly reconnaissance.

The periods, August 28 - September 4, and September 16 - 24 respectively, were spent in the Hudson Bay and Prince Albert districts of Saskatchewan inspecting insect ranger work and contacting Provincial Forest Service personnel. Field work by the insect rangers in Saskatchewan was terminated on September 30th.

Construction on the insect ranger cabin at Prince Albert, Saskatchewan was continued during October (October 3-27) by Messrs McDowall, Drouin, Lawrence and Hildahl. Work on the cabin was begun on October 5 and discontinued on October 25.

Two field trips, which involved one day each, were made by the writer during the month of November. November 15th was spent at Stead, Manitoba, accompanied by insect ranger L. McDowall, inspecting budworm damaged jack pine. This inspection was made at the request of the Manitoba Forest Service. November 25th was spent in the Sandilands Forest Reserve inspecting permanent sampling stations which had been established in jack pine stands earlier in the season.

B. Insect Conditions

(a) Larch Sawfly (Pristiphora erichsonii Htg.) This larch feeding insect continued to cause sever defoliation in tamarack stands throughout Manitoba in 1948. An aerial reconnaissance was made in the region of eastern Manitoba lying between Lake Winnipeg and the Manitoba - Ontario boundary extending from the Winnipeg River in the south to the Berens and Assapan rivers in the north. Larch sawfly feeding was general throughout the entire area and all tamarack stands were as heavily defoliated this year as they were in 1947. Heavy attacks again occurred along the southeast end of Lake Winnipeg and around Pine Falls, the Black River Settlement, Hole River and Loon Bay. Small tamarack swamps around Catfish and Round Lakes were also heavily defoliated. Eastward toward the Manitoba - Ontario boundary tamarack stands were moderately to heavily defoliated. Scattered stands in the areas around Family Lake and Sasaginnigak Lake again suffered light to moderate attacks. Around Little Grand Rapids attacks were less severe and defoliation was noticeably lighter. Light defoliation of tamarack also occurred north of Little Grand Rapids

near the following lakes: Fishing, Night Owl, Horseshoe, Carr-Harris, Black Currant, Ewart and Lewis and along the Assapan River to the Manitoba - Ontario boundary.

On the west side of Lake Winnipeg, heavy defoliation was noted in tamarack stands on the peninsulas in Lake Winnipeg between the Grassy Narrows and Fisher Bay. Heavy defoliation also occurred to the north of Fisher Bay along the south shore of Lake Winnipeg and between Lake St. George and Lake St. Martin. Scattered tamarack stands along the east side and north end of Portage Bay, in Lake Manitoba near Gypsumville, were less severely attacked and suffered only light to moderate defoliation. To the west and south of Lake Manitoba, around the Steeprock, Martin, Crane and Claude Lakes, tamarack was heavily defoliated and several stands were completely stripped of foliage. Heavy tamarack defoliation occurred along the west shore of Lake Winnipegosis, from the townsite of Winnipegosis in the south to Dawson Bay in the north. Heavy defoliation was also noted in swamps between Pelican Lake and Swan Lake and along the Shoal River leading into Dawson Bay. Tamarack in the swamps north of Dawson Bay to Kelsey Lake, between The Pas highway on the west and the Saskatchewan River on the east, was heavily defoliated. Tamarack along the southern end of Kelsey Lake was 100 percent defoliated. Tamarack stands between Kelsey Lake and The Pas were less severely attacked and only moderate defoliation was noted in this area.

(b) Jack Pine Budworm (Choristoneura fumiferana Clem.) Activity by this insect increased considerably throughout eastern Manitoba in 1948. An aerial survey was conducted in eastern Manitoba during the early part of August (August 6 - 10) to determine and map the extent of budworm-damaged jack pine. The entire region of Manitoba lying east of Lake Winnipeg from the Winnipeg River in the south to the Berens and Pigeon rivers in the north was covered during the survey. In addition, the area around and to the north of Family Lake was also observed.

Throughout almost the entire region outlined above, the terrain is marked by rock ridges running in an east-west direction. Jack pine predominates throughout this region but there are many good stands of white spruce and some scattered balsam fir growing along the many rivers and bordering the lake shores. Swamps are numerous in this region and are wooded with black spruce and tamarack.

When the 1947 survey of this region was made, only one area of budworm-damaged jack pine was visible from the air and it occurred at Aikens Lake near the Manitoba - Ontario boundary. This year, in the same region, several 'pockets' of budworm-damaged jack pine were visible from the air. In 1947, the closest Ontario infestation occurred at Musclow Lake, nine miles east of the Manitoba boundary. This year it extended into Manitoba at several places along approximately eighty miles of the border (see map.) It is possible that the 'pockets' of infestation now evident in Manitoba will merge into a general attack in 1949. The areas affected are described in some detail below.

The most northerly point where the Ontario infestation extended into Manitoba was at Hobbs Lake where approximately sixteen square miles of jack pine were attacked. Another extension of the Ontario infestation into Manitoba, which involved approximately 80 square miles of jack pine forest crossed the Manitoba border four miles north of Garner Lake and recrossed the border again into Ontario just south of Odd Lake. It extended westward from the Manitoba - Ontario boundary a distance of approximately four miles and then swung south to Garner Lake, from Garner Lake westward about eight miles, thence south past Tooth and Flintstone Lakes and eastward to the Manitoba - Ontario boundary at Odd Lake. A third extension into Manitoba occurred south of McGregor Lake and included the area around Davidson Lake. Covering an area of approximately twenty-five square miles, the outline of this infestation crossed the Manitoba - Ontario boundary at McGregor Lake and continued in a south-westerly direction to Tulabi Lake, thence south to Star and

Summerhill Lakes and eastward to the Manitoba - Ontario boundary, recrossing the border just south of Davidson Lake.

Two small areas of budworm-damaged jack pine were located on the Manitoba - Ontario boundary; one covered an area of about two square miles and was located between Obukowin and Carroll Lakes and the other covered approximately six square miles and was found just south of Ryerson Lake. (Ryerson Lake is at the northwest corner of the Whiteshell Forest Reserve.) Another very small area (about one square mile) of budworm-damaged jack pine was observed from the air on the northern shore of nearby Oiseau Lake.

The infestation observed from the air in 1947 between Aikens and Obukowin Lakes had increased in intensity in 1948. Cut off by a fireburn on the north, it covered an area of approximately twenty-five square miles. A new outbreak of about four square miles was observed this year two miles to the southwest of this infestation.

Several 'pockets' of budworm-damaged jack pine were observed farther west in the same region. The largest 'pocket' covered at least one hundred square miles. Located southeast of Bissett, Manitoba, it was bounded on the north by the Wanipigow River, and on the south by the Manigotagan River. Other infestations occurred to the north and northwest of Bissett. One 'pocket' was located immediately north of the townsite and the other 'pocket' about eighteen miles to the northwest. Each covered about thirty square miles. About eight miles southwest of Bissett evidence of defoliation was noted in about thirty-five square miles of jack pine.

Lightly defoliated jack pine was evident around Sasaginnigak Lake. However, it should be noted that the survey was limited to one flight in the area west of Bissett in the south and Sasaginnigak Lake in the north, between the Wanipigow and Bloodvein Rivers and adverse weather conditions and smoke haze made mapping difficult. There was no complete survey

of the area west of Sasaginnigak and Family Lakes between the Bloodvein and Berens Rivers. The area between the Berens and Assapan Rivers east of Lewis and Horseshoe Lakes was surveyed but no budworm damage was observed.

Jack pine stands in townships 17 and 18, rge. 8, E.P.M., north of Stead were examined in November for damage resulting from budworm attacks which occurred in the spring of 1948. According to Mr. Gilmore, Forest Ranger, about 12 square miles are affected. Jack pine throughout the area range in size from about 3 inches in d.b.h. to about 11 inches in d.b.h. (Trees under 3 inches in d.b.h. were disregarded for this report.) The age of the stand ranged from 30-35 years for trees 7 inches in d.b.h. to about 65-70 years for trees 11 inches in d.b.h. The majority of the jack pine throughout the area are mature and some regeneration was noted in the more open stands.

Moderate budworm damage was observed throughout all jack pine stands examined. Defoliation was not uniform over the entire area and varied considerably on individual trees. However, at least 90% of the trees were defoliated to some degree. Open growing trees and stands on the higher ground suffered the greatest damage. Trees growing on slopes and on lower ground where growth was more vigorous were less severely attacked.

Owing to the time at which the inspection was made, it was difficult to estimate the degree of defoliation, particularly current damage. However, it was estimated that accumulated defoliation--which takes into account feeding which took place during 1948 and possibly feeding in previous years--averaged approximately 30% with a range of 0 to 70%. Since the past history of the budworm in this area is not known, it cannot be stated definitely that it caused all the defoliation.

About 5% of the trees had dead tops. These occurred mainly on high ground where growth conditions were poor and here again it is difficult to decide whether the budworm or other causes were responsible. Only a few dead trees were found in the area.

In the interlake area of Manitoba, a moderate infestation of jack pine budworm between Riverton and Hodgson was surveyed from the air. This infestation occurred in an isolated stand of jack pine and covered an area of approximately forty square miles. It was bounded on the north and west by swamps wooded with black spruce and tamarack on the south by agricultural land.

(c) Forest Tent Caterpillar (Malacosoma disstria Hbn.) Two small infestations of this aspen-feeding insect were noted in eastern Manitoba in 1948. Both were observed during aerial surveys conducted throughout the region. One infestation, covering approximately two square miles, occurred north of the Berens River near Moar Lake. Inspected from the air on August 5th it was noted that defoliation was quite severe and most of the aspen in the area affected was completely stripped of foliage. The other infestation occurred in the interlake area, between Lake St. George and Lake St. Andrew. It was quite extensive and covered approximately four square miles. At the time of examination (August 23) refoliation was in progress. However, there was evidence to indicate that the forest tent caterpillar had completely stripped the trees earlier in the season.

In the western district of Manitoba, a small infestation of the forest tent caterpillar occurred south of Duck Bay in Lake Winnipegosis. Duck Bay is about ten miles north of Camperville. Of medium intensity, it covered approximately two square miles. This infestation was inspected from the air on August 23rd.

3. Special Investigations

(a) Budworm Survey--1948--Eastern Manitoba: An aerial survey was carried out in eastern Manitoba during the

early part of August to determine and map the extent of budworm-damaged jack pine. Most of the region from the Winnipeg River in the south to the Berens and Pigion Rivers in the north was covered during the survey. The survey was conducted jointly with Insect Ranger C. R. Carter from the Forest Insect Laboratory, Sault Ste. Marie, Ontario. The aircraft used during most of the survey was supplied by the Forest Insect Laboratory, Sault Ste. Marie. The Manitoba Provincial Air Service also assisted greatly by supplying aircraft for aerial reconnaissance of the areas immediately east and west of Lake Winnipeg. For results of the survey refer to Section 2, part (a) of this report.

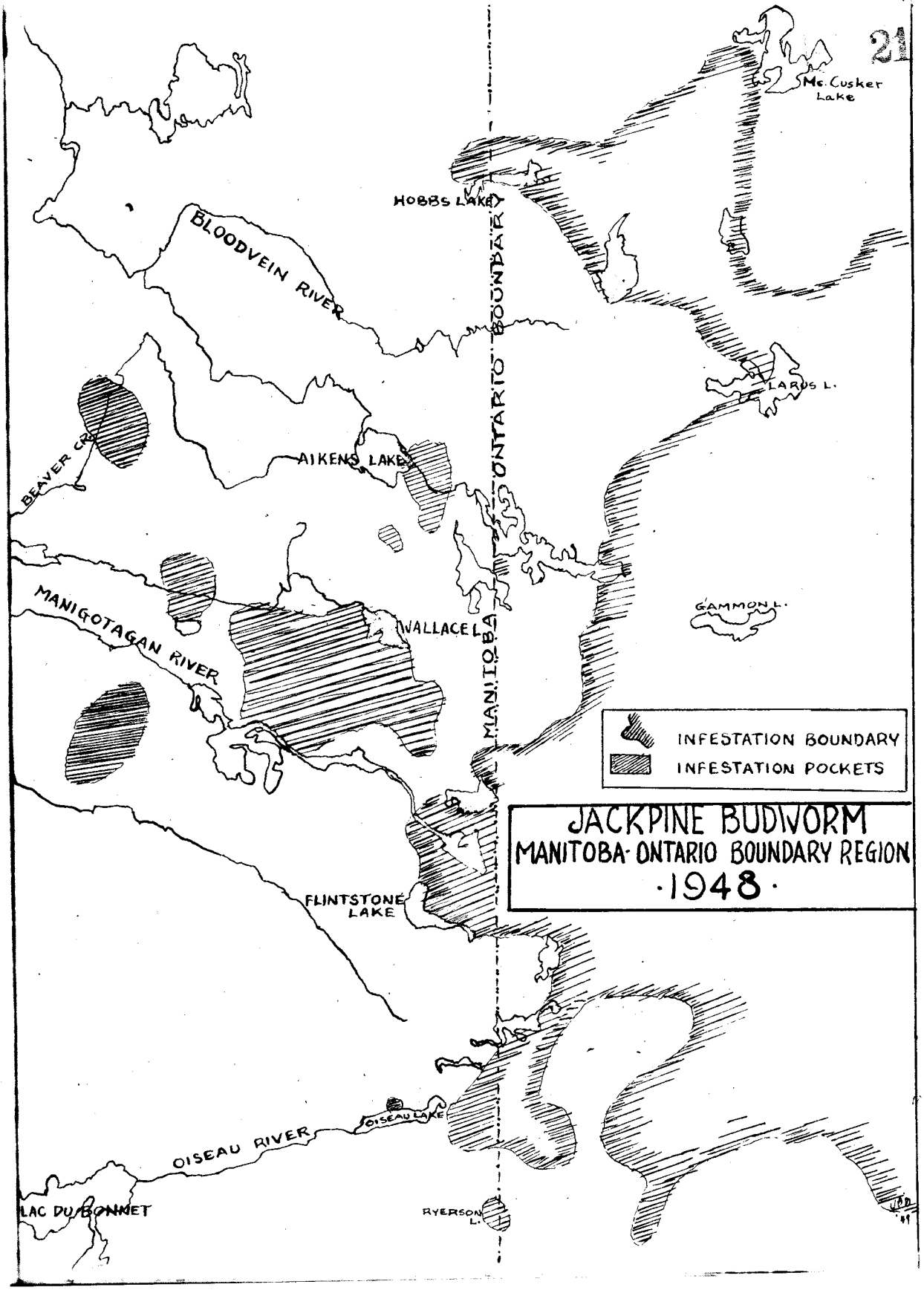
(b) Larch Sawfly Parasite Releases: A single colony of larch sawfly parasites (Mesoleius aulicus) was liberated by the writer in 1948. It was liberated 6½ miles north of Usherville, Saskatchewan (sec. 11, tp. 39, rge. 5, W. 2nd mer.) The colony consisted of 40 males and 39 females and was in excellent condition; one male and one female was recorded as dead at the time of liberation. The liberation date was July 20, 1948.

(c) Larch Sawfly Disease: Four cultures of a fungous disease (Beauveria sp.) were released in tamarack stands infested with the larch sawfly in three widely seperated points in Saskatchewan in 1948. One culture of the fungus was released four miles north of Pelly (sec. 15, tp. 34, rge. 32, W. 1st mer.); two cultures were released 2/10 of a mile south of the Crutwell corner on No. 3 highway (sec. 23, tp. 49, rge. 1, W. 3rd mer.) The latter two releases were made on July 22, and the former on July 24.

(d) Jack Pine Budworm - Stead, Manitoba: At the request of the Manitoba Forest Service, jack pine stands in townships 17 and 18, rge. 3, E.P.M., north of Stead, were examined for budworm damage. Inspected in November, it was found to be well established. About 30 percent of the trees were defoliated to some degree and 5 percent were dead topped. There were only a few dead trees in the area.

4. Personnel Contacted

NAME	TITLE	PLACE	PROVINCE
Vermilyea, T.B.	District Forester	Winnipeg	Manitoba
Braine, A.W.	District Forester	Winnipeg	Manitoba
Koons, E.A.	District Forester	Dauphin	Manitoba
Cooper, D.E.	Forest Ranger	Marchand	Manitoba
de Delley, F.R.	Forest Ranger	Douglas	Manitoba
Emes, B.C.	Forest Ranger	Richer	Manitoba
Polkowski, E.J.	Forest Ranger	Woodridge	Manitoba
Wright, J.J.	Forest Ranger	Carberry	Manitoba
Clee, H.	Forest Ranger	Minitonas	Manitoba
Gilmore, B.R.	Forest Ranger	Stead	Manitoba
Kendrick, M.L.	Forest Ranger	Whitemouth	Manitoba
Marner, E.	Forest Ranger	Riverton	Manitoba
Nespor, J.E.	Forest Ranger	Lac du Bonnet	Manitoba
Patterson, C.H.	Sr. Forest Ranger	Lac du Bonnet	Manitoba
Wardrop, W.D.	Forest Ranger	Pine Falls	Manitoba
Stanlake, L.J.	Forest Ranger	Hodgson	Manitoba
Norman, J.B.	Forest Ranger	Garland	Manitoba
Ritchey, C.H.	Sr. Ranger-in-Charge	Rennie	Manitoba
Inkster, J.H.	Forest Ranger	Rennie	Manitoba
Marshall, E.J.	Director of Forests	Prince Albert	Saskatchewan
Quandt, A.K.	Ast. Superintendent	Prince Albert	Saskatchewan
Eisler, H.	Forester	Prince Albert	Saskatchewan
Matheson, B.A.	Field Supervisor	Prince Albert	Saskatchewan
Christie, J.	Chief Forester	Prince Albert	Saskatchewan
Brown, J.M.	Field Officer	Prince Albert	Saskatchewan
Schell, C.L.	Field Officer	Pelly	Saskatchewan
Arnold, F.J.	Field Officer	Prince Albert	Saskatchewan
Labey, C.	Jr. Field Officer	Prince Albert	Saskatchewan
Dobie, J.L.	Jr. Field Officer	Somme	Saskatchewan
Bryson, L.F.	Jr. Field Officer	Usherville	Saskatchewan


Mc. Cusker Lake
HOBBS LAKE
BLOODVEIN RIVER
ONTARIO BOUNDARY
LARUS L.
BEAVER CR.
AIKENS LAKE
MANIGOTAGAN RIVER
WALLACE L.
MANITOBA
GAMMON L.
INFESTATION BOUNDARY
INFESTATION POCKETS
JACKPINE BUDWORM
MANITOBA-ONTARIO BOUNDARY REGION
·1948·
FLINTSTONE LAKE
OISEAU LAKE
OISEAU RIVER
LAC DU BONNET
RYERSON L.

B. L. L. McDowall

I. Introduction

Approximately one month, April 27 to May 26, was spent on the construction of a Forest Insect Ranger cabin at Prince Albert, Saskatchewan.

During the month of June, 1948, forest insect rangers A. Knight and L. McDowall, conducted an extensive survey to determine the prevalence of spruce and jack pine budworm in the Province of Saskatchewan.

From the first of July until the latter part of September, a survey of forest insect conditions in eastern and southern Manitoba was carried out by forest insect rangers J. Lawrence and L. McDowall.

During the first three weeks of July, a general insect survey was conducted in the eastern and southern districts of Manitoba. During this period a preliminary larch sawfly survey was also conducted. The areas visited included Lac du Bonnet, Point du Bois, Pine Falls, Seddon's Corner, Piney, Sprague and the Sandilands Forest Reserve. A one day air survey was also made during this period for the purpose of detecting jack pine budworm defoliation in jack pine stands north of Lac du Bonnet.

The last week of July and the first week of August were taken up in a survey of current jack pine budworm defoliation in the Sandilands Forest Reserve.

Two weeks in mid August were spent in a special survey of larch sawfly and birch sawfly. This included a three day air survey north of Lac du Bonnet along the east and west sides of Lake Winnipeg. The balance of August was spent in making larch sawfly cocoon collections. Cocoon collections were continued in the first four days of September. The remainder of the month of September was spent in making a survey of Manitoba Forest Service plantations in the Spruce Woods and Sandilands Forest Reserves.

During October a return trip was made to Prince Albert to continue construction on the Forest Insect Ranger cabin. Work on this project ended on October 25th, completing the season's field activities.

2. Insect Conditions

A. Saskatchewan

(a) Jack Pine Budworm (Choristoneura fumiferana Clem.) During June, an extensive survey for jack pine budworm was carried out in the Prince Albert and Big River Forest districts of Saskatchewan.

Throughout this survey only a single budworm sample was found, and no defoliation was observed. The collection was made in sec. 36., tp. 39., rge. 24., W 2nd, mer. in the Nisbet Provincial Forest and contained one budworm larva.

(b) Spruce Budworm (Choristoneura fumiferana Clem.) A spruce budworm survey was also carried out during June, but no larvae of this insect were found throughout spruce stands in northern Saskatchewan.

(c) Balsam Fir Sawfly (Neodiprion abietis Harr.) This insect was found to be quite generally distributed throughout Big River, Prince Albert National Park and Prince Albert districts.

In the Big River Provincial Forest, sawfly activity appeared very light, and no defoliation was noted. The balsam fir sawfly was found to be quite common in Prince Albert National Park. At the time of examination feeding was in progress and an accurate estimate of damage could not be made, but defoliation at that time appeared quite light. The most heavily infested area was seen in a small stand of white spruce, (approximately sixty trees) adjacent to the administration building at Waskesiu. In the majority of cases where this sawfly was encountered, it was found that the larvae had concentrated on only one or two branches, in the lower part of the tree.

In the Prince Albert district a number of collections were made, but all were very scattered, and no defoliation was observed. One collection was made as far north as Candle Lake, in tp. 55, rge. 23, W 2nd mer., but here again defoliation was negligible.

(d) Yellow-headed Spruce Sawfly (Pikonema alaskensis Roh.) Several collections of this insect were made in the Prince Albert and Big River districts during June. No feeding damage was observed at that time, and in all cases only a few larvae were found.

Last year's infestations on ornamental spruce in the Prince Albert National Park and in the Nisbet Provincial Forest have abated somewhat. Only a few larvae were found in both of these areas.

(e) American Poplar Leaf Beetle (Phytodecta americana Schffr.) This leaf-eating beetle was found to be quite active in all aspen stands examined in areas around Prince Albert and Big River. In some areas only a few trees were being attacked, but in others the majority of trees were suffering from light to heavy defoliation by this insect.

An area of heavy defoliation was seen in a stand fifteen miles north of Big River, in tp. 58, rge. 9, W 3rd mer. Trees in this area were second growth and ranged in height from three to eight feet. It was observed that defoliation was much more severe on the smaller trees. Another area of light to medium defoliation was seen eleven miles west of Prince Albert, in sec. 22, tp. 49, rge. 1, W 3rd mer.

B. Eastern and Southern Manitoba

(a) Larch Sawfly (Pristiphora erichsonii Htg.) This larch-feeding insect continued to infest tamarack stands in south eastern Manitoba during 1948.

Very heavy defoliation occurred in tamarack swamps around East Braintree, and McMunn in the south eastern portion of the province. One swamp, ½ mile south of East

Braintree in sec. 33, tp. 7, rge. 14, E.P.M. was from 80 to 100 percent defoliated. Later on in the season when this area was revisited, many dead larvae were found. No tree mortality was noted, and a number of trees showed new needle growth. Feeding damage was found to be very heavy in a large tamarack swamp just north of McMunn. This swamp covers approximately 180 acres, and is located in sec. 2, tp. 8, rge. 13, E.P.M. In the area between East Braintree and Shoal Lake, along the C.N.W.D. Railway, defoliation was heavy in most of the tamarack stands examined.

In the northern part of the Sandilands Forest Reserve, larch sawfly continued to infest tamarack stands along the Dawson Road, between Richer and the eastern boundary of the Reserve. Here defoliation ranged from medium to heavy.

Several small scattered tamarack swamps south of Badger to Piney were found to be lightly infested. Tamarack about one mile east of Piney in sec. 31, tp. 1, rge. 12, E.P.M. was heavily defoliated and at South Junction, light to medium. At Sprague, defoliation appeared much heavier than last season.

In eastern Manitoba, the larch sawfly showed no signs of abating, and in some areas increased activity was observed. The heavy infestation near Seddon's Corner, on the trans-Canada highway continued to flourish. Tamarack stands north and west of Whitemouth suffered light to heavy defoliation. Light to heavy defoliation was noted in the area between Whitemouth and Rennie, nine miles east of Whitemouth, in sec. 9, tp. 11, rge. 13, E.B.M. severe defoliation was observed. This swamp was exceedingly wet, and many drowned larvae were found.

Larch sawfly was again quite active in areas around Lac du Bonnet and Pinawa. Two large swamps along the Pointe du Bois road were heavily defoliated. The first is located in sec. 24, tp. 15, rge. 11, E.P.M., the second in

sec. 21, tp. 15, rge. 12, E.P.M. Defoliation ranged from light to heavy in a large swamp three miles west of Pinawa. Most of the tamarack between Lac Du Bonnet and Pine Falls showed some feeding damage.

An aerial survey, carried out along the east and west sides of Lake Winnipeg as far north as Lake St. George, revealed that larch sawfly was quite generally distributed. A large area of severe defoliation was observed along the east side of Lake Winnipeg. This area extends from Hole River, south as far as Fort Alexander. Farther inland at Little Grand Rapids, Sasaginnigak Lake, and Bissett, light to medium defoliation was noted. Along the west side of the lake tamarack is less abundant, and very scattered. Defoliation appeared much lighter there, and ranged from light to medium in the vicinity of Lake St. George. A small tamarack stand along the north end of Black Island showed medium to heavy defoliation.

In the interlake area sawfly activity appeared much lighter than in 1947. At Riverton, defoliation ranged from negligible to light and was confined to a limited number of trees in each area.

Between Poplarfield and Hodgson, defoliation was very light. Tamarack in this area is small and scattered.

In the district from Ashern to Gypsumville, little or no defoliation was observed. A moderate to medium infestation occurred in a swamp one half mile south east of Gypsumville in sec. 23, tp. 32, rge. 9, W.P.M. Poor foliage production in this area indicated that sawfly damage had been quite heavy in previous years.

In the vicinity of Red Rock Lake in the Whiteshell Forest Reserve tamarack suffered heavy defoliation.

(b) Jack Pine Budworm (Choristoneura fumiferana Clem.) The most severe defoliation by this insect was encountered in the Sandilands Forest Reserve. During July and August, current budworm defoliation was mapped. While some areas

showed heavier defoliation than in preceeding years, other areas were showing a gradual tapering off from heavy to medium intensity. In the southern part of the Reserve, defoliation appeared somewhat lighter than last season, but in the northern portion, new pockets of heavy defoliation were recorded. A light to medium infestation of this insect was found in an area around Badger, in the southern portion of Manitoba. This area is quite extensive and is located in secs. 5, 6, 8, and 9, tp. 3, rge. 12, E.P.M.

In the Lac du Bonnet-Whiteshell area several small infestations were recorded. At Seddon's Corner, budworm still continued to attack jack pine, with defoliation ranging from light to moderate. Light traces of budworm were encountered along the trans-Canada highway between Seddon's Corner and Whitemouth. Several small collections of this insect were made along highway No. 11 between Seddon's Corner and Lac du Bonnet, but no defoliation was seen. Three miles north of Lac du Bonnet, in sec. 4, tp. 16, rge. 11, E.P.M., one budworm larva was found. East of Lac du Bonnet, a light trace of budworm was encountered in sec. 36, tp. 15, rge. 12, E.P.M., along the Point du Bois road. Light defoliation was noted in the area around Sasaginnigak Lake.

At the south west end of Obukowin Lake defoliation ranged from light to medium. Collections were made from both of these areas on July 6. An aerial survey revealed that jack pine budworm was quite active in some areas from Lac du Bonnet north to Bissett and Sasaginnigak Lake. A pocket of heavy defoliation was noted approximately eight miles south west of Bissett. Two other areas of medium to heavy defoliation were seen north of Bissett. The first eighteen miles north west, and the second just north of the town of Bissett. Very light defoliation was seen in the vicinity of Sasaginnigak Lake. Another small area of very light defoli tion was observed from the air approximately 10 miles south east of Berens River. Jack pine here is very scattered and mixed with aspen. No extensive survey was carried out in this area due to a shortage of time.

Jack pine lodgepole pine and Scotchpine plantations in

the Sandilands and Spruce Woods Forest Reserves suffered light attacks by this insect. Although no larvae were found when the plantations were examined during September, empty pupal cases along with webbing and frass were quite noticeable.

(c) Spruce Budworm (Choristoneura fumiferana Clem.) One collection of this insect was made in eastern Manitoba. Two larvae were taken from two black spruce in the vicinity of the forestry cabin at Sasaginnigak Lake.

(d) Birch Sawfly (Arge pectoralis Leach.) This insect continued to attack birch stands in eastern Manitoba during 1948. On the east boundary of the Whiteshell Forest Reserve large populations of the birch sawfly were found, but defoliation was only light to medium. Along the south end of West Hawk Lake the sawfly was quite active in most birch stands examined. North of Falcon Lake in sec. 6, tp. 9, rge. 17, E.P.M., heavy feeding damage was recorded. Birch in this area is very scattered, and mixed with aspen and white spruce.

Several collections of this sawfly were made between East Braintree and Shoal Lake along the G.W.W.D. Railway. Defoliation here appeared very light and was confined, in most cases, to the lower part of the trees.

In the Indian Bay district, on the west side of Shoal Lake sawfly was found to be quite generally distributed. Light to heavy feeding damage was noted throughout this area, which is located in tp. 8, rge. 17, E.P.M. Birch stands along the shore of Shoal Lake appeared to suffer the most severe damage. Farther inland defoliation was much lighter. Trees in the above location range in size from 3 inches to 4 inches d.b.h. and from 20 feet to 25 feet in height.

Two collections of the birch sawfly were made south west of Lac du Bonnet in sections 16 and 22, tp. 14, rge. 10, E.P.M. In both cases only the adults were found, and no defoliation was noted.

One small collection of sawfly feeding on birch, was

made two miles east of Seddon's Corner, in sec. 36, tp. 12, rge. 9, E.P.M. No serious sawfly damage was observed in this area.

Eight miles east of Rennie, in sec. 22, tp. 10, rge. 15, E.P.M., defoliation appeared light with the exception of two trees, which were completely stripped of foliage. Birch in this area is growing on high rocky terrain. The dominant tree species is trembling aspen.

(e) Spruce Sawflies (Pikonema alaskensis Roh. & Pikonema dimmockii Cress.) Collections of these insects were made in practically all spruce areas visited in eastern Manitoba. However, only a few larvae were found in each instance and no serious damage was observed.

The only feeding damage by the yellow-headed spruce sawfly seen in 1948 was in an area adjacent to the lodge at Long Lake in sections 7 & 8, tp. 17, rge. 13, E.P.M. At the time of examination defoliation appeared light, and was confined to a small stand of ornamental white spruce.

(f) Pitch Nodule Maker (Petrova albicapitana Busck.) The most severe attacks by this insect occurred on jack pine and lodgepole pine in plantations. In the Spruce Woods Forest Reserve the nodule maker appeared quite heavy in both lodgepole and jack pine plantations. In most cases where lodgepole and Scotchpine were found together only a few of the Scotchpine were damaged. In some lodgepole plantations, nodules were very abundant and over 80 percent of the trees in these heavily infested plantations had dead or dying branches. Wherever jack pine and lodgepole pine were found together jack pine appeared to be the preferred host.

In the Sandilands Forest Reserve little or no damage by this insect was observed.

(g) Western Willow Leaf Beetle (Galerucella decora Say.) Only two areas of heavy defoliation by this beetle were noted in eastern Manitoba in 1948. The first was located two and

a half miles east of Seddon's Corner (sec. 1, tp. 13, rge. 9, E.P.M.) and covered approximately a quarter of an acre. Defoliation here ranged from 50 to 70 percent. The second was located a quarter of a mile north of Milner Ridge in sec. 18, tp. 14, rge. 9, E.P.M. Defoliation in this area was extremely heavy and ranged from 80 to 100 percent.

Light to medium defoliation was observed in areas north and south of Riverton in the Interlake district.

3. Special Investigations

(a) Larch Sawfly Cocoon Collections: During the last week of August and the first week of September larch sawfly cocoon collections were made in the eastern and interlake districts of Manitoba. Wherever possible two locations in each area were chosen for collections; one as a location for the future liberation of parasites and the other as a check location. Three trees were selected in each location for the purpose of obtaining tree rings. Tree ring sections were taken from the butt, middle, and upper 6 feet of each tree. The first, exactly 12 inches from the base, and the upper, 6 feet from the top.

In Eastern Manitoba one thousand cocoons and the necessary tree ring sections (9) were obtained from each of the following locations:

N.W. ¼ sec. 33, tp. 7, rge. 14, E.P.M., East Braintree (proposed release point)
S.E. ¼ sec. 7, tp. 8, rge. 13, E.P.M., Prawda (check point)
S.E. ¼ sec. 3, tp. 13, rge. 9, E.P.M., Seddon's Corner.
N.W. ¼ sec. 24, tp. 15, rge. 11, E.P.M., Lac du Bonnet (proposed release point)
N.W. ¼ sec. 21, tp. 15, rge. 12, E.P.M., Lac du Bonnet (check point)

All tamarack swamps in the above locations suffered heavy

defoliation. The heaviest defoliation was recorded at East Braintree, where some trees were completely stripped. Swamps in this area were very dry and hard, and many dead larvae were found beneath trees which had been 100 percent defoliated.

In the interlake district, defoliation appeared much lighter. Sufficient cocoons for collections were available in only two areas; one at Gypsumville in sec. 23, tp. 32, rge. 9, W.P.M. (1000 cocoons) and another at Riverton, in sec. 32, tp. 23, rge. 4, E.P.M. (300 cocoons.) Tree ring sections were obtained in each of these areas.

Larch sawfly cocoon collections were made for the purpose of obtaining information on the distribution of parasites. It is planned to release parasites in the liberation areas which were selected during 1948 and to follow their progress by future cocoon collections in these areas.

The tree ring sections obtained during this work are for a study of the effect of larch sawfly defoliation on the growth of tamarack in past years.

(b) Current Budworm Defoliation (Sandilands Forest Reserve): In the latter part of July and the early part of August approximately eight days were spent in the Sandilands Forest Reserve mapping jack pine budworm defoliation. The purpose of this survey was to record the amount of current damage caused by budworm. It is intended that this survey be continued next year in order to obtain some data on the spread and intensity of this insect from year to year. In the southern part of the reserve, where the percentage of dead tops is quite high and would indicate that defoliation was heavy in previous years, now ranges from light to medium, with the exception of a few areas of heavy defoliation. Light defoliation prevails over most of the northern part of the reserve, with the occasional pocket of medium attack. One area of heavy defoliation was observed on the west half of sec. 6, tp. 8, rge. 10, E.P.M.

Wherever possible all trails were covered by truck throughout the reserve. Stops were made at half-mile intervals and at these points an estimate of defoliation on jack

pine was made in each of three d.b.h. classes:

nil to five inches
five inches to ten inches
ten inches and over

The percentage of dead tops at each inspection point was calculated and recorded in the same diameter classes as mentioned above. A description of each stand examined was made, and a record of whether there was a light or heavy crop of staminate flowers. It was noted that wherever medium or heavy defoliation occurred staminate flowers appeared quite heavy. Generally the 5" - 10" diameter class suffered the heaviest defoliation. A few trees in the 0" - 5" d.b.h. class were heavily attacked also, but the average defoliation for this class (0" - 5" d.b.h.) was from 25 to 50 percent. A large scale map has been forwarded to the Manitoba Forest Service, along with a complete set of tables supplying such information as to locations, defoliations, percentage of dead tops, number of dead trees and description of each stand examined. Cutting operations are being carried out in the most severe areas of budworm defoliation. It is hoped that by cutting out the more heavily damaged areas some control of the jack pine budworm may be achieved.

A map is included at the end of this report covering current budworm defoliation in the Sandilands Forest Reserve.

4. Plantation Survey

(a) Spruce Woods Forest Reserve: In September of 1948, Forest Insect Rangers J. Drouin, J. Martin, J. Lawrence, and L. McDowall, spent ten days conducting a survey of Manitoba Forest Service plantations in the Spruce Woods Forest Reserve. A spedial form was used to tally each individual tree examined as well as to record any damage caused by insects or otherwise. Plantations with trees under eighteen inches, and over twenty feet in height were omitted. A count of fifty trees was taken in plots under

two and a half acres, one hundred trees up to five acres, and one hundred and fifty trees over five acres. Later on this plan was abandoned in favor of a count of fifty trees up to five acres, one hundred trees up to ten acres, and one hundred and fifty trees over ten acres. Jack pine was found to be the predominant species; other species in order of their importance are as follows:

Lodgepole pine
Scotchpine
White spruce
Red pine

Plantings consisted of pure and mixed stands. The most serious pest appeared to be the pitch pine nodule maker. Nodules were found to be quite abundant on lodgepole and jack pine, but to a lesser degree on scotchpine.

This survey revealed that jack pine had become quite well established, and in most areas showed very good growth. Survival of scotchpine planted between the years 1905 and 1930 was also very good with trees averaging well over twenty feet in height. More complete details of this survey can be found under a separate section of this report.

(b) Sandilands Forest Reserve: In the latter part of September Forest Insect Rangers J. Lawrence, and L. McDowall spent five days in the Sandilands Forest Reserve on plantation work. The same plan was followed here as in the Spruce Woods Forest Reserve. A number of plantations were found to have a very high mortality rate, especially a series of red pine and lodgepole pine planted in 1932; however, on the whole red pine plantations appear quite healthy, and have shown very good growth in the past ten years.

A large area of the 1948 plantations of mixed and pure stands all under eighteen inches, are well established, and in good condition.

Light jack pine budworm defoliation was observed on some young plantations of scotchpine and lodgepole pine.

5. Personnel Contacted

NAME	POSITION	PLACE	DEMONSTRATION OF SAMPLING
E.J. Marshall	Director of Forests	Prince Albert Sask	No
B.H. Matheson	Field Supervisor	" " "	No
C.A. Otterbein	" Officer	Carrot River "	Yes
J. Cowie	Asst.Fld. "	Big River "	Yes
B.I.M. Strong	Prk. Superintendent	P.A.N.P. "	No
S. Pocock	Warden	" "	Yes
T.B. Vermilyea	District Forester	Winnipeg, Manitoba.	No
J.J. Wright	Forest Ranger	Carberry, "	No
F. de Delley	" "	Spruce Woods F.R."	No
R.J. Harrison	" "	Sprague, Manitoba.	No
D.E. Cooper	" "	Sandilands,F.R. "	Yes
E.J. Polkowski	" "	Woodridge, Man.	Yes
B. Emes	" "	Sandilands F.R. "	No
W. Ruth	" "	East Braintree, "	Yes
W. Braine	District Forester	Winnipeg, Manitoba.	No
E. Marner	Forest Ranger	Riverton, "	No
E. Campbell	" "	Ashern, "	No
W.D. Wardrop	" "	Pine Falls, "	No
C.H. Patterson	Senior "	Lac du Bonnet, "	No
J. Nespor	Forest "	" " " "	No
G.H. Davies	Fire "	Sasaginnigak L."	No
B. Gilmore	Forest "	Stead, Manitoba	No
S. Sveinson	" "	Piney, "	No
Manitoba Pulp & Paper Employees.			
M. McClaglen	Woods Manager	Pine Falls, Man.	No
R. Rigg	" Supervisor	" " "	Yes
G. Bayly	" Department	" " "	Yes
A. Farmer	" "	" " "	No

6. Negative Reports

DATE 1948	HOST	LOCATION
July 22	Black Spruce	One mile east of Piney sec. 31, tp. 1, rge. 12, E.P.M.
July 23	White Spruce	3 miles south of Dawson Cabin sec. 19, tp. 7, rge. 11, E.P.M. S.F.R.
July 23	Black Spruce	1/4 mile north of McMunn sec. 2, tp.8, rge. 13, E.P.M.
August 17	Jack Pine	4 miles east of Seddon's Corner sec. 32, tp. 12, rge. 10, E.P.M.
August 23	White Spruce	4 miles south of Riverton tp. 23, rge. 4, E.P.M.
August 23	White Spruce	5 miles north of Riverton tp. 24, rge. 4, E.P.M.
August 24	White Spruce	6 miles south of Hodgson sec. 6, tp. 25, rge. 1, W.P.M.
August 24	Aspen	3 1/2 miles south of Hodgson sec. 19, tp. 26, rge. 1, W.P.M.
August 24	White Spruce	1 1/2 miles south of Arnes sec. 8, tp. 21, rge. 4, E.P.M.
August 30	White Spruce	1 1/2 miles northwest of Gypsumville tp. 32, rge. 9, W.P.M.
August 31	White Spruce	8 miles south of Gypsumville tp. 31, rge. 9, W.P.M.

C. J. A. Drouin

1. Introduction

Forest Insect Survey sampling and observations were conducted throughout the forested areas of Western Manitoba and Eastern Saskatchewan from June 4 to September 24, 1948, by Forest Insect Rangers, J. Drouin and J.B. Martin.

Work commenced on June 5 in the Riding Mountain National Park and Dauphin area on spruce and jack pine budworm survey and general sampling and observations for forest tent caterpillar. During the period spent in the Riding Mountain National Park, 10 sampling stations were established in various areas of the central part of the park.

On June 14, the poplar infestation in the Madge Lake area of the Duck Mountain Provincial Park was sampled and mapped. This infestation of aspen tortrix and american poplar leaf beetle had been reported three years previously and since then has been mapped and surveyed yearly. This year's results indicated that the infestation was moderating.

After completing the mapping the rangers continued the survey in the southwestern part of the Duck Mountain Forest Reserve in the Bield and Grandview areas. North of Bield to the boundary of the reserve and in tps. 26 and 27, rge. 26, W.P.M., a light infestation of balsam fir sawfly was reported. The rangers proceeded north to Ethelbert along the eastern side of the Duck Mountains into Singoosh Lake and Blue Lakes.

A medium infestation of aspen tortrix and american poplar leaf beetle was surveyed and mapped in this area. Defoliation extended between the Blue Lakes and Singoosh Lake, with the heaviest defoliation recorded east of the Blue Lakes in sec. 26, tp. 30, rge. 25, W.P.M.

The survey was continued along the eastern side of the Duck Mountains north of Pine River, to Sclater, Cowan and Renwer along the pine ridge for the detection of jack pine budworm.

On July 2, the rangers travelled west from Swan River into Saskatchewan, covering the areas around Pelly, west and north to Sturgis, Usherville, Tallpines and north to Hudson Bay where as much area as time allowed was covered in a spruce and jack pine budworm survey. Ten sampling stations were established in the Hudson Bay area.

Returning to Manitoba on July 13 the rangers travelled to Birch River and north to Mafeking, along highway No. 10 to The Pas region. At The Pas, the rangers separated in order to cover more territory to the north along the Manitoba Northern Railways to the Flin Flon, Sherridon and Kississing areas and north via air and railroad to Snow Lake, Wabowden and Thicket Portage.

The rangers left The Pas on July 23 to return to Winnipeg conducting a preliminary larch sawfly survey on the return trip.

At this time the two teams of rangers in the Eastern and Western districts combined on a survey of current budworm defoliation in the Sandilands Forest Reserve, terminating the survey on July 30th.

During the month of August and September the time was devoted mainly to a larch sawfly survey and general sampling.

A plantation survey was undertaken from September 8, to the 20th, in the Spruce Woods Forest Reserve and the Grandview district. After completing this survey, the rangers proceeded north to the Cowan - Renwer and Mafeking districts to collect larch sawfly cocoons and tree ring sections. These were for dissection and examination at a later date.

Field activities ceased on September 24 and the month of October was spent on construction of the Forest Insect Ranger cabin at Prince Albert.

2. Insect Conditions

(a) Larch Sawfly (Pristiphora erichsonii Htg.) This insect

was general in most tamarack stands across western Manitoba and eastern Saskatchewan.

In some cases the growth was retarded and defoliation did not become noticeable until the middle of July; however, in some swamps in Manitoba and Saskatchewan, collections were made before this date with some results but the larvae were in an early stage.

On July 15, the Mafeking area was surveyed and at the time defoliation was advanced considerably in comparison to other stands then encountered. The tamarack stands in this area extend along the road north from Mafeking, to "The Bog", varying in density and defoliation with some 'pockets' showing normal growth. Such 'pockets' occurred at Mile 53 and 2 miles north of the Overflowing River.

At the northern end of Lake Winnipegosis where the highway follows the shore contours, all the tamarack in a 'pocket' approximately 2 chains wide and 4 chains long appeared to be dead. However, a probable cause was the high water level during recent years.

On examination at a later date of the stands between The Pas and Mafeking, it was found that the tamarack was normal for approximately 39 miles south of The Pas. The first signs of defoliation appeared 63 miles north of Mafeking, varied from nil to light in "The Bog" and increased from medium to severe on higher ground. In this district black spruce is the dominant species with mixtures of white spruce, white and black poplar and tamarack.

In The Pas district defoliation was medium, ranging from 50 to 70 percent along the Hudson Bay R.R. to Cormorant after which it decreased from light to negligible. Northeast along the H.B.R. at Thicket Portage only very light defoliation was encountered. Examination of the tamarack in this area showed only a very few curled tips. North to Sherridon along the railroad, defoliation was also light with medium defoliation in some stands at Cranberry Portage and Fay Lake.

The survey in the Northern District was made in the latter part of July and possibly the degree of defoliation

increased somewhat as the season progressed. However, further south in the Mafeking district at this time the larvae had completed feeding and were dropping from the trees. The mortality rate in tamarack stands was light and only a few evidently dead trees were found along The Pas highway from Mafeking and north from The Pas along the M.N.R. to Sherridon.

Mass collections of cocoons were made in late fall at Mile 8.4 and Mile 20 on highway No. 10. The average defoliation in the area travelled was then approximately 75 to 80 percent.

The defoliation of larch stands in the area between Sclater and Renwer had diminished since 1947. On the whole, foliage production was scanty and retarded indicating heavy defoliation in previous years. In general the average defoliation recorded this year was 50 percent. The water level in the swamps was quite high during July and August. This was caused by heavy hail storms and cloudbursts which flooded the lower areas along the eastern slopes of the Duck Mountain Forest Reserve.

Drowned larvae were abundant in the swamps along the eastern slopes of the mountains having surface water, especially in the larger swamp which extends from 2 miles north of Cowan to approximately 1/4 mile from Renwer, covering an area of about 2½ sections. Mass collections of larch sawfly cocoons were made during the summer in this area, another in early July and the final one in late September.

A tamarack stand of approximately 50 acres on privately owned land was encountered 500 yds north (sec. 1, tp. 33, rge. 21, W.P.M.) of Camperville and Pine River junction. The growth was retarded and scanty, giving the stand a heavily defoliated appearance and although a number of trees were examined only very few larvae were found. Of the trees examined, some were free of any insect activity and curled tips were not numerous. Probably this stand had been heavily defoliated in past years but heavy rains and high water levels had reduced

sawfly emergence. This was the only tamarack stand seen between Winnipegosis and Camperville.

On the northwestern side of the Duck Mountain Forest Reserve, several larch stands were surveyed in the Kenville, Durban and Benito areas. Of these, the heaviest defoliation recorded was in sec. 24, tp. 35, rge. 28, W.P.M., in a stand covering approximately one section. Defoliation was estimated at 80 percent when cocoon collections were made. It was found that a high percentage of the cocoons were destroyed by mice. Another swamp surveyed was on Thunderhill Road near Benito (sec. 22, tp. 35, rge. 29, W.P.M.) Here heavy defoliation of approximately 75 percent was recorded.

A survey of tamarack stands was made west from Garland into the Duck Mountain Forest Reserve as far as the Singoosh Lake and Blue Lakes area. Defoliation varied from medium to heavy. A swamp at the western end of Singoosh Lake which extends for 3/4 of a mile in a southerly direction, had an estimated defoliation of 70 percent. (sec. 19, tp. 20, rge. 24, W.P.M.)

Tamarack was scattered along both sides of the road west towards the Blue Lakes, with large stands in sections 23 and 27, tp. 30, rge. 25, W.P.M., and sec. 21, tp. 26, rge. 25, W.P.M. The heaviest defoliation was found in section 27 (mentioned above) in a stand lying between the Blue Lakes where the foliage was completely gone on some trees. At the eastern tip of Singoosh Lake, in sec. 28, tp. 30, rge. 24, W.P.M., defoliation was 65 percent in a swamp which extends along the "valley" bottom running in an east - west direction.

In the southern section of the Duck Mountain Forest Reserve defoliation varied from medium to heavy. One stand in sec. 23, tp. 26, rge. 25, W.P.M., east of the Parrot Tower along the boundary, suffered 80 percent defoliation as an average but the more mature trees were as high as 100 percent defoliated.

In a privately owned stand of approximately 1/2 section in the same district (sec. 13, tp. 26, rge. 25, W.P.M. defoliation reached about 40 percent. It was nearly complete at the time of the survey. As in sec. 23 (mentioned above) the mature trees suffered more defoliation

than younger trees.

In the western part of the Riding Mountain, tamarack defoliation was generally quite heavy. The major swamps extend along the valley bottom from Tillson Lake and join the stands along the Deep Lake Creek in a 'Y' shape. To the north the swamps follow Tillson Creek to form a crescent shape. A stand of approximately 10 acres running north and south along Bobhill Creek was 45 percent defoliated with light tree mortality recorded; farther south, in sections 3 and 10, tp. 22, rge. 25, W.P.M., large numbers of larvae were found drowned in the surface water. In this stand defoliation averaged about 40 percent. Smaller stands were surveyed in sections 2, 12, 17, and 24, tp. 22, rge. 25, W.P.M. In sec. 12 the drowned larvae at the base of trees were very numerous.

In the central portion of Riding Mountain National Park, most stands were affected by a medium infestation of larch sawfly. In a swamp on the Whitewater Lake trail, 1/4 mile south of the old P.O.W. camp in sec. 17, tp. 21, rge. 21, W.P.M., the foliage was sparse and retarded. Judging from the water level in the swamp at the time of the inspection, the larvae had little chance of survival unless the water level dropped considerably before cocooning time. Other swamps surveyed, were located in sec. 14, tp. 21, rge. 22, W.P.M., and sections 18, 19, and 20, tp. 21, rge. 21, W.P.M. In some cases parasitized and diseased larvae were collected at these locations.

Tamarack stands in the Madge Lake district of Saskatchewan and Manitoba suffered medium defoliation. Heavy defoliation was recorded 1/4 mile south of the junction of Madge Lake road and highway No. 31, in tp. 31, rge. 29, W.P.M., in a stand covering about 15 acres. At Madge Lake in sec. 35, tp. 30, rge. 30, W.P.M., a stand surveyed was 50 percent defoliated with the degree of defoliation running slightly higher on the outside margins of the stand.

In the Pelly district, medium defoliation was encountered in most swamps surveyed. North of the Shell River in sec. 15, tp. 34, rge. 32, W.P.M., larch sawfly disease (Beauveria sp.) was released on July 24, 1948. This stand

is rather unusual owing to the fact that it is located on a fairly high elevation and fed by underground springs with the result that the swamp is saturated throughout the season. At the time of examination, defoliation had just begun. Curled tips were numerous and larvae plentiful. It was examined and mass collections of cocoons were made to determine the effectiveness of the disease. These mass collections were made in the latter part of September and defoliation had increased to medium by this time.

West of Pelly along highway No. 49, a large swamp in sec. 36, tp. 33, rge. 1, W. 2nd mer., extends 3 miles north and south, along the valley bottom. It is ½ mile in width. Defoliation reached 50 percent in some 'pockets' of this stand.

A survey was made of a tamarack stand 4 miles northwest of Sturgis in sec. 34, tp. 34, rge. 5, W. 2nd mer. This stand is completely surrounded by agricultural land. Defoliation was higher on the outer margins of the swamp, averaging about 90 percent.

North along highway No. 9 to Hudson Bay, tamarack defoliation was generally heavy, particularly between Usherville and Tallpines. Stands examined were located in sections 8 and 10, tp. 38, rge. 5, W. 2nd mer., and sections 22 and 21, tp. 38, rge. 5, W. 2nd mer., in the Usherville district; and in sec. 35, tp. 38, rge. 5, W. 2nd mer., and sec. 11, tp. 39, rge. 5, W. 2nd mer., in the Ushta area. Other stands were located 6 miles south of Reserve in sec. 23, tp. 39, rge. 5, W. 2nd mer., and in the Tallpines area in sec. 2, tp. 39, rge. 5, W. 2nd mer.

A special survey was made into McBride Lake in the Porcupine Provincial Forest. This area is accessible only by water. Medium defoliation was observed in the stands surveyed, except for one swamp at the south end of McBride Lake, at the mouth of the stream connecting Ellridge Lake and McBride Lake. This stand, which is nearly pure, suffered very little defoliation and growth appeared normal. It extends along the river, to Ellridge Lake with the land level fairly low and surface water general. In general, the condition of tamarack in nearly all areas not accessible for sampling indicated that defoliation had been low in past years as the stands had normal foliage growth. Defoliation during the current season also appeared light.

At Hudson Bay, infested areas were heavily attacked except for one stand 4½ miles from Vollardville on the Tower Trail (sec. 24, tp. 45, rge. 5, W. 2nd mer.) where no larvae or cocoons could be found although foliage was retarded and scanty, indicating that the stand had suffered heavy defoliation last year. The entire swamp was covered with water to an approximate depth of 16 inches. This flooding was the probable cause of the absence of larch sawfly. Flooding may also be responsible for the retarded growth of tamarack.

In a smaller stand of tamarack located in sec. 34, tp. 50, rge. 5, W. 2nd mer., a mass collection of cocoons was made as a check point for future parasite releases.

South of Hudson Bay, tamarack stands extend south and east along what is called the Ridge Road for approximately 31 miles. A medium infestation occurred in this area. A mass collection of cocoons was made 8.9 miles from Hudson Bay along this Ridge Road (sec. 6, tp. 44, rge. 3, W. 2nd mer.) as a probable area for future parasite releases.

To summarize, larch sawfly was generally distributed throughout the western district of Manitoba and eastern Saskatchewan.

In various instances parasites were seen at work and numerous parasitized larvae were collected during the summer. Several areas were found to have a small percentage of possibly diseased larvae which were forwarded to Sault Ste. Marie for examination.

COLLECTIONS OF

PARASITIZED AND POSSIBLY DISEASED LARVAE 1948.

PLACE	SEC	TP	RGE	MER	
Whitewater Lake	14	21	22	W.P.	Aug.9-48 enc No.Y9 - 2 diseased larvae
Whitewater Lake	3	21	22	W.P.	Aug.9-48 enc No.Y5 - 1 diseased
1/4 mile W. of P.O.W. camp	17	21	21	W.P.	Aug.9-48 enc No.Y7 - 1 parasite hymenoptera.1 diseased
Cowan	11	35	23	W.P.	Aug.17-48 enc.770-a number of parasitized larvae - some diseased
Selater	28	33	23	W.P.	Aug.17-48 enc.773-some parasitized.
Cowan	15	35	23	W.P.	Aug.17-48 enc.776-some parasitized and diseased.
Durban	22	35	29	W.P.	Aug.20-48 enc.795-some diseased or fungoid
Selater	33	33	23	W.P.	Aug.17-48 enc.772-some diseased larvae
Minitonas	15	35	23	W.P.	Aug.17-48 enc.766-sick and dead larvae found diseased.
Winnipegosis	1	33	21	W.P.	Aug.16-48 enc.763-a number of diseased larvae
Singoosh Lake	33	30	29-	W.P.	Aug.18-48 enc.782-several diseased larvae.

(b) Jack Pine Budworm (Choristoneura fumiferana Clem.) This insect was found only in limited numbers. Although extensive jack pine sampling was done throughout the western district

of Manitoba and eastern Saskatchewan actually only a few larvae were collected and only slight damage was encountered.

The area in which most of the activity occurred was in the Cowan - Renwer districts in sections 2, 15, and 17, tp. 36, rge. 23, W.P.M.

Where budworm was found, 18 inch terminal counts on 10 trees were undertaken in an effort to determine the intensity of infestation. In one area 2 miles north of Cowan in sec. 2, tp. 36, rge. 23, W.P.M. 8 larvae were obtained on these terminal counts:

No.1 - 2 larvae	No.6 - 1 larva
No.2 - 0	No.7 - 0
No.3 - 0	No.8 - 0
No.4 - 0	No.9 - 3 larvae
No.5 - 1 larva	No.10- 1 larva

Another 18" terminal 10-tree-count was taken in an area along the Cowan - Renwer road in sec. 17, tp. 36, rge. 23, W.P.M. The results were as follows:

No.1 - 1 larva	No.6 - 0
No.2 - 3 larvae	No.7 - 0
No.3 - 1 larva	No.8 - 0
No.4 - 1 larva	No.9 - 0
No.5 - 1 larva	No.10- 0

In section 15, tp. 36, rge. 23, W.P.M. a final count was made:

No.1 - 1 larva	No.6 - 0
No.2 - 0	No.7 - 0
No.3 - 1 larva	No.8 - 0
No.4 - 1 larva	No.9 - 0
No.5 - 0	No.10- 1 larva

In general the infestation in the Cowan - Renwer district was considered light as numerous other areas along this jack pine ridge were examined for budworm larvae with no success.

In Saskatchewan only one collection was made and this on the Tower Road in sec. 31, tp. 45, rge. 4, W. 2nd mer. No 18" terminal count was undertaken in this area as one larva was all that could be found.

The area was examined at approximately every ½ mile but no further evidence of the insect could be found.

From Hudson Bay a sandy ridge extends southwards for 3 miles swinging east for approximately 28 miles forming what is called the Ridge Road. The dominant host along the top of this ridge is jack pine, varying in density, age and composition. At various intervals samples were made on the jack pine, particularly in the mature, open-growing staminate trees but no defoliation or budworm activity was detected.

(c) Spruce Budworm (Choristoneura fumiferana Clem.) Very few larvae of this spruce feeding insect were obtained during this summer's survey in the Western district of Manitoba and eastern portion of Saskatchewan.

Only two larvae were found by the rangers. These were collected in the Riding Mountain National Park in sec. 14, tp. 20, rge. 19, W.P.M., approximately 7/10 mile north of the junction of Dauphin Road and Lake Audy Road. Defoliation in this case was negligible and upon further examination of the immediate area no other sign of this insect was found. In general, sampling and examination of spruce was conducted with budworm detection uppermost in mind but nothing more of this insect could be found during the period spent there.

One and one half miles north of Grandview in sec. 36, tp. 25, rge. 24, W.P.M., about 20 white spruce surrounding a small cemetery were lightly infested with budworm. Indications were that the balsam fir sawfly had caused the most damage and at the time of examination the sawfly were in the cocoon stage.

Defoliation was estimated at 25 percent and control measures were forwarded to the caretaker.

(d) Large Aspen Tortrix (Archips conflictana Wlk.)
American Poplar Leaf Beetle (Phytodecta americana Schffr.)
Infestations of both these insects appeared to have increased in intensity during the summer of 1948. They were found commonly in most areas throughout the western district of Manitoba and Hudson Bay district of Saskatchewan.

Three infestations were surveyed and mapped in 1948. Of these, the Madge-Lake infestation had been reported on, in previous years. These reports indicated that the defoliation was lighter in 1948.

The first of these infestations to be examined was located in the Duck Mountain Provincial Park in the Madge Lake area (see map.) The most heavily infested areas occurred along the Pelly Beach road where the defoliation varied from light to medium with 'pockets' of heavy defoliation of approximately 75 to 90 percent. Although some smaller trees of 8 to 10 feet were totally defoliated, these were comparatively few in number since the whole forested area around Madge Lake is comprised of a dense, solid stand of mature trembling aspen with a light scattering of spruce and black poplar.

Northwest from Pelly Beach along the trails, the infestation thinned out and appeared light to nil, particularly along highway No. 57 south towards Kamsack. South from the highway on various trails, defoliation was generally light except on a few ridges where 'pockets', ranging from 2 to 4 acres in size where somewhat heavier defoliation occurred. According to information gathered locally, the foliage in various areas appeared later than others possibly owing to the growth being retarded from repeated attacks during the past four years.

In the Manitoba section of the Duck Mountain Forest Reserve, little defoliation was found past the junction of highway No. 57 to highway No. 31, in Manitoba. Defoliation decreased to very light going east along highway No. 57 to Benito Beach junction and no defoliation was observed along the road going north to Benito or south towards Makaroff.

A survey along trails in tp. 30, rge. 29, W.P.M., showed only very light defoliation although some small open-growing trees approximately 3 inches in d.b.h. and 6 to 8 feet in height were 85 to 95 percent defoliated. It was found in most cases that the leaf roller (large aspen tortrix) had caused most of this damage.

A parasite was observed in action on the pupae of leaf rollers; one larva collected had been parasitized and a number of larval parasites had emerged and were still attached to the larva (ens. No. 62).

As a whole this infestation, also mapped last year, showed a decrease over the last year. This was possibly due to an earlier examination this year (see map).

The Singoosh-Blue Lakes infestation covered a distance of approximately 6 miles along the main road and shores of Blue Lakes. The heaviest defoliation centered between Singoosh and Blue Lakes. The defoliated area was situated in sections 16, 21, 22, 23, 24, 26, 27, 28, tp.30, rge. 25, W.P.M., with the heaviest defoliation in sections 23, 26, 27. However, some 'pockets' of defoliation along the shore of Blue Lakes averaged as high as 85 to 95 percent.

At different points in the Singoosh-Blue Lakes area, examinations were made on trees felled and no foliage could be found except on the topmost branches where the tree had put out new leaves.

Most examination points yielded poor results since only a few larvae or pupae could be found on what little foliage was present, but below the trees, on willow, particularly, larvae and pupae were abundant.

The heaviest defoliation seemed to be concentrated in "patches" or 'pockets' whilst alongside these, the poplar was in some cases only lightly defoliated. (see map).

White poplar is the dominant species in this area with small stands of white spruce, black poplar, jack

pine, tamarack and black spruce, scattered throughout.

East of the forestry cabin on Singoosh Lake, defoliation was light to nil except for one 'pocket' in sec. 33, tp. 30, rge. 24, W.P.M., which was lightly defoliated. (see map)

An infestation of the large apsen tortrix was reported north of The Pas, Manitoba, and was investigated on June 30th, 1948. Adult moths on the railway tracks had hindered gas car movements and attracted much attention.

The infestation extended from Mile 18 to Mile 42 on the Manitoba Northern Railway. It varied in intensity with defoliation ranging from 5 to 30 percent. The heaviest defoliation, 15 to 30 percent, was seen between Miles 24 - 27 and Miles 36 - 38. The remainder of the area had defoliation of from 5 to 15 percent.

By June 30th, the insects had all reached the adult stage. There were no larvae remaining and only empty pupal cases of the large apsen tortrix could be found. However, many adults were observed and some collected from white poplar and the rails.

Collections were made at Miles 6, 12, 18, 26, and 38, north of The Pas, Manitoba.

The stand composition in this area is mixed including white spruce, white poplar, black poplar, jack pine and tamarack.

(e) Bronze Birch Borer (Agrilus anxius Say.) Infestations of this insect were reported from two areas, but neither area could be covered adequately due to lack of time and transportation.

The larger of these two infestations was found in northern Manitoba in the Cranberry Portage, Channing, Flin Flon, and Sherridon districts, along the Manitoba Northern Railways.

North of The Pas along the H.B.R. a light, infestation was observed between Wekusko and Paterson.

No pure stands of birch were encountered at Cranberry Portage and surrounding district, but was generally scattered throughout a mixture of white poplar and white spruce. Dead or dying branches were evident on approximately 80% of the birch examined and showed definite signs of the bronze birch borer. This heavy attack decreased to medium along the railroad to Flin Flon. There it increased to heavy. However, infestation was light in the Beaver Lake area. Between Sherridon and Cranberry Portage the infestation was light. Collections of the bronze birch borer were made from the Kississing section in two areas where yellow tops were lightly scattered: (four miles west of Cranberry Portage and four miles south of Channing.)

The districts around Ellridge and McBride lakes in the Porcupine Provincial Forest were examined for birch borer and it seemed relatively free of both borer and dieback. This district is only accessible by water and travel is difficult. Growth conditions were good, some birch reaching 18 to 20 inches in d.b.h. along the shoreline of McBride Lake. On the hill flats on the south side of the lake the birch was considerably smaller and appeared to be more susceptible to attack from dieback and the bronze birch borer. In sections 8 and 17, tp. 40, rge. 5, W. 2nd mer., a number of trees examined produced the larvae of which collections were made.

At Cowam, in sec. 2, tp. 36, rge. 23, W.P.M., one tree was examined, which was infested with the bronze birch borer. Single infested trees were also examined 6 miles south of Mafeking near Novra in sec. 1, tp. 42, rge. 26, W.P.M., and north of Hudson Bay on the Tower Trail.

(f) Spruce Sawflies (Pikonema alaskensis Roh.) & (Pikonema dimmockii Cress.) A light infestation of yellow-headed spruce sawfly was examined near Thicket Portage in tp. 73, rge. 1, W.P.M., on ornamental spruce at the Landing Lake portage. About 32 trees had been left on an abandoned homestead clearing. These were found to be

infested with sawfly which had caused an average defoliation of approximately 40 percent on 10 trees. The amount of defoliation probably increased as the season progressed since at the time of sampling (July 19) larvae in all stages were collected. The clearing is surrounded by a mature stand of white poplar, black spruce and some jack pine.

A light scattering of both sawflies was noted in the Pelly and Whitefish Lake areas in Saskatchewan. East of Norquay, a light concentration of yellow-headed sawfly was observed on black spruce. This stand is located in an agricultural area in sec. 1, tp. 33, rge. 1, W 2nd mer.

(g) Balsam Fir Sawfly (Neodiprion abietis Harr.) Several infestations of this sawfly were found in the western district of Manitoba, particularly in the southern part of the Duck Mountain Forest Reserve. This insect was prevalent throughout tps. 26 and 27, rges. 26 and 27, W.P.M., with concentrations in sec. 15, tp. 26, rge. 26, W.P.M., and sections 20 and 22, tp. 27, rge. 26, W.P.M. In sec. 15, tp. 26, rge. 26, W.P.M., the defoliation on the outer edges of a white spruce stand was noted as 20 percent, decreasing towards the middle of the stand from 15 percent to negligible. A survey was made in a lumbering area in tp. 26, rge. 26, W.P.M. (Timber berth 1120 - 2) and vicinity. Examinations revealed only very light defoliation in the various areas where sawfly was detected.

A light infestation was reported from the Grandview cemetery (sec. 36, tp. 25, rge. 23, W.P.M.) on approximately 20 ornamental trees surrounding this cemetery. Some of the defoliation which was approximately 25 percent had been caused by the spruce budworm. However, it was presumed that the sawfly had caused most of the damage.

This sawfly also caused light defoliation in ornamental trees at the Greenwater Lake forestry cabin (sec. 40, tp. 41, rge. 11, W. 2nd mer.) Collections were also made north of Pelly in sec. 31, tp. 45, rge. 4, W. 2nd mer., and sec. 17, tp. 36, rge. 32, W.P.M. No damage was observed at either of these locations.

(h) Red Pine Sawfly (Neodiprion nanulus Schedl.) No infestations of this insect were encountered during the summer survey although some samples were obtained in various areas.

Samples were collected in the pine ridge north of Cowan in sections 2 and 17, tp. 26, rge. 23, W.P.M., but little defoliation was noted.

Along the Tower Road, north of Hudson Bay (sec. 31, tp. 45, rge. 31, W.P.M.) samples were obtained but again defoliation was very light.

(i) Poplar Borer (Saperda calcarata Say.) Very little borer damage was encountered during this summer's work and where detected the borer activity was negligible.

Some light activity was noticed in sec. 25, tp. 19, rge. 18, W.P.M., along the Norgate Road in the Riding Mountain National Park. Borer damage was evident from the frass holes and bleeding appearance of areas on the trees tunnelled by the larvae. No collections were made. The trees attacked were of a mature, semi open-growing type. Too few trees had been attacked to warrant an infestation report.

(j) White Pine Weevil (Pissodes strobi Peck.) This insect was found to be fairly general in spruce throughout the areas traversed although no concentration reaching infestation proportions was observed.

Possibly the most noticeable areas were in the western and central districts of Riding Mountain National Park. This applied particularly to the white spruce regeneration on the Lake Audy Road. Several collections were taken from this area. In the western district, although weevilled trees were common, no concentrated damage was observed since the spruce was scattered. Throughout tp. 22, rges. 24 and 25, W.P.M., the attacks were generally light.

Light weevil damage was also observed in the Duck Mountain Forest Reserve along highway No. 31, 7 miles south of the junction of highways 57 and 31.

In Saskatchewan, light damage was observed near Hudson Bay.

In other areas, such as near the Blue Lakes in the Duck Mountain Forest Reserve and north at Landing Lake (tp. 37, rge. 1, W.P.M.) a few trees had been attacked. At Landing Lake the damage had been caused in previous years.

In one instance only was the weevil found attacking pine and this occurred in the Spruce Woods Forest Reserve, southeast of Camp Hughes in sec. 24, tp. 24, rge. 16, W.P.M., where a collection was made from lodgepole pine.

(k) Western Willow Leaf Beetle (Galerucella decora Say.) This insect was found to be general with heavy infestations centered in the western part of the Riding Mountain National Park, Garland area and along the eastern side of Lake Dauphin.

The Toutes Aides district on the eastern side of Lake Dauphin was examined in early June and it was too early to determine the extent of damage. This whole area is mainly low lying farmlands and hay meadows, with some small poplar bluffs and willow as the dominant tree species. On examination, the willow supported extremely heavy populations of adults. At the time of examination the defoliation was slight.

In the Riding Mountains, defoliation which was observed in August was severe and spread over tp. 22, rges. 24, 25 and 26, W.P.M. Very few willow clumps had been left untouched and in general the whole area had a scorched, burned-over appearance. Heavy defoliation was also observed in the central area of the Riding Mountains.

Severe attacks also occurred in the Garland area along the road into Singoosh Lake in the Duck Mountain Forest Reserve, (tps. 30 and 31, rges. 22 and 23, W.P.M.)

Other points of medium defoliation were centered around Grandview and Mafeking in Manitoba. In Saskatchewan, medium defoliation occurred south of Whitefish Lake, in tp. 38, rge. 30, W.P.M., and north of Reserve on highway No. 9.

(1) Pitch Pine Nodule Maker (Petrova albicapitana Busck.) The nodule maker was active to some degree in most areas containing second-growth jack pine but in most cases the attacks were light.

The most noticeably infested areas in Manitoba were in the Cowan-Renwer district (tp. 36, rge. 23, W.P.M.) on what is known as the jack pine ridge. This ridge is composed of a dry sandy belt extending north and south between Cowan and Renwer for approximately 8 miles. Its stand composition is composed mainly of jack pine with a light scattering of spruce and tamarack stands throughout the area.

According to information gathered in the area from Forest Ranger R. R. Ross (now Senior Ranger, Dauphin district) the major part of this jack pine stand is of a mature and stagnant nature due possibly to soil conditions or to the fact that in general the trees are of the orchard open-growing type. Very little jack pine regeneration was observed in the stand. The nodules occurred in large numbers in regeneration. Some deformities were noted in trees along this ridge and on investigation they were found to have been caused by the pitch nodule maker. In some cases the nodule maker had burrowed at the base of the leader and weakened it to such an extent as to cause it to break off during windy days and in other cases to shrivel and dry up. In addition, some witch's broom (possibly Razoumofskya sp.) was noted in sec. 2, tp. 36, rge. 23, W.P.M., but no collections were made.

Near Birch River, in tp. 39, rge. 25, W.P.M., in the dry and sandy hills south and west of the town, nodule maker was encountered on the regeneration jack pine but the area was considered only lightly infested.

In the Hudson Bay district of Saskatchewan this insect was prevalent in the jack pine area south of the town. Nodules were particularly noticeable from the town-

site south for 3½ miles. Here again soil composition is of a sandy-clay nature.

Samples of the nodule maker were also obtained east of Cranberry Portage, in the Shell River area (sec. 34, tp. 30, rge. 28, W.P.M.) and in the Singoosh Lake district in Manitoba, but in all cases infestations were reported as light.

(m) Forest Tent Caterpillar (Malacosoma disstria Hbn.) Only one larva of this species was observed and collected during the summer and no damage was found in the area.

The collections was made from chokecherry in the Madge Lake area of the Duck Mountain Provincial Forest along highway No. 10 to Kamsack within the park boundaries (sec. 20, tp. 30, rge. 30, W.P.M.)

(n) A Tent Caterpillar (Malacosoma lutescens N.&D.) This insect was found to be quite common over a fairly large area of the Riding Mountain National Park. It was also abundant along highway No. 5 between Dauphin and Ochre River and along the east side of Lake Dauphin in the Rorketon district.

In the Riding Mountains, the heaviest concentration was found to be along Lake Audy Road, in the more open prairie or flats near the buffalo enclosure, and occurred on stunted chokecherry bushes. In a two mile area centering around the junction of the Lake Audy and Elphinstone Roads, 16 tents were reported. These occurred mostly along the roadside on chokecherry. Defoliation was light.

Along highway No. 5 between Dauphin and Ochre River, tents were common on chokecherry and rose bushes, 6 tents were counted between Mile 66 and 67.

In the Rorketon area numerous tents were observed and one of these taken off willow proved to be M. lutescens.

Another collection of M. lutescens was made along the boundary road near Grandview in sec. 18, tp. 26, rge. 25, W.P.M., on rosebush. Two other tents were seen in the immediate area.

(c) Ugly Nest Caterpillar (Archips cerasivorana Fitch.) On the whole this insect was prevalent throughout the western district of Manitoba with only light defoliation observed in all cases.

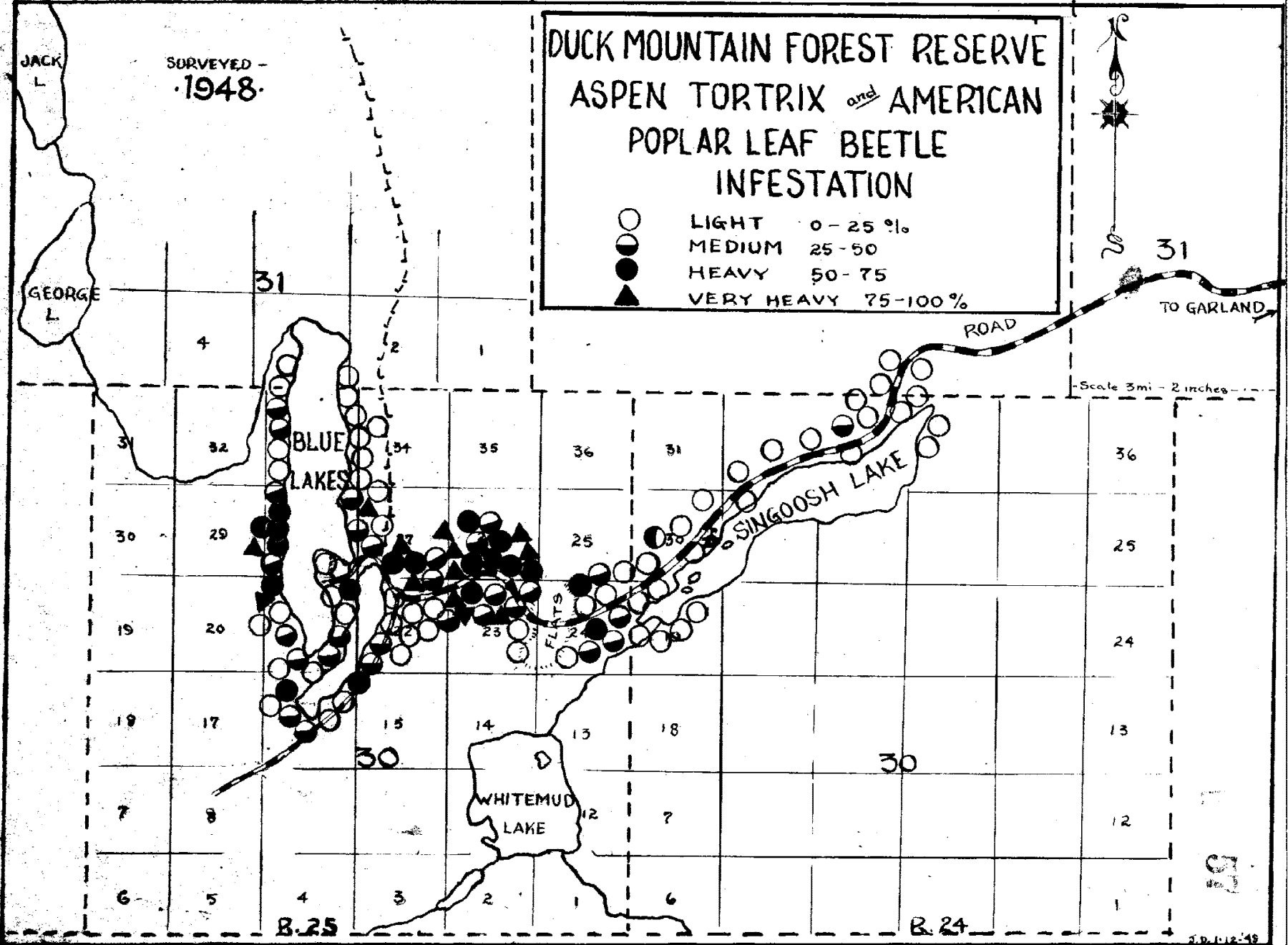
It was found mainly on scattered shrubs or on groups of shrubs spread out in a small area. However, particularly heavy concentrations were seen in various areas. Of these the Bellsite-Novra district was the heaviest. This infestation extended for approximately 6 miles along highway No. 10, with most of the chokecherry infested. A few nests were observed on willow and small poplar. The tents seemed grouped mostly along the roadside and in the more open areas.

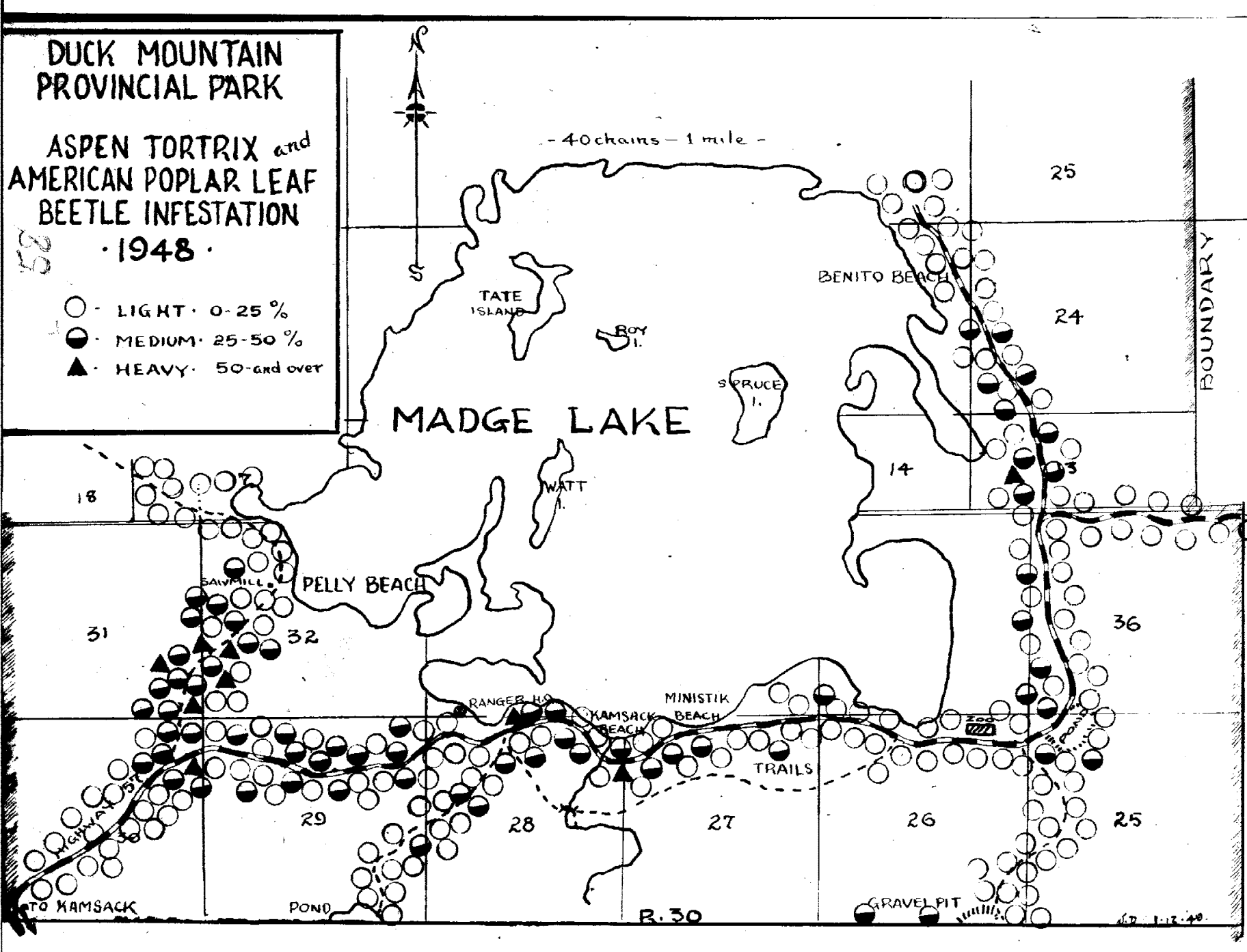
Another infestation was reported from the Cowan-Renwer district where conditions were much the same as in the district mentioned previously. Both of these infestations were located on hilly, sandy, ridges on which chokecherry seems to thrive.

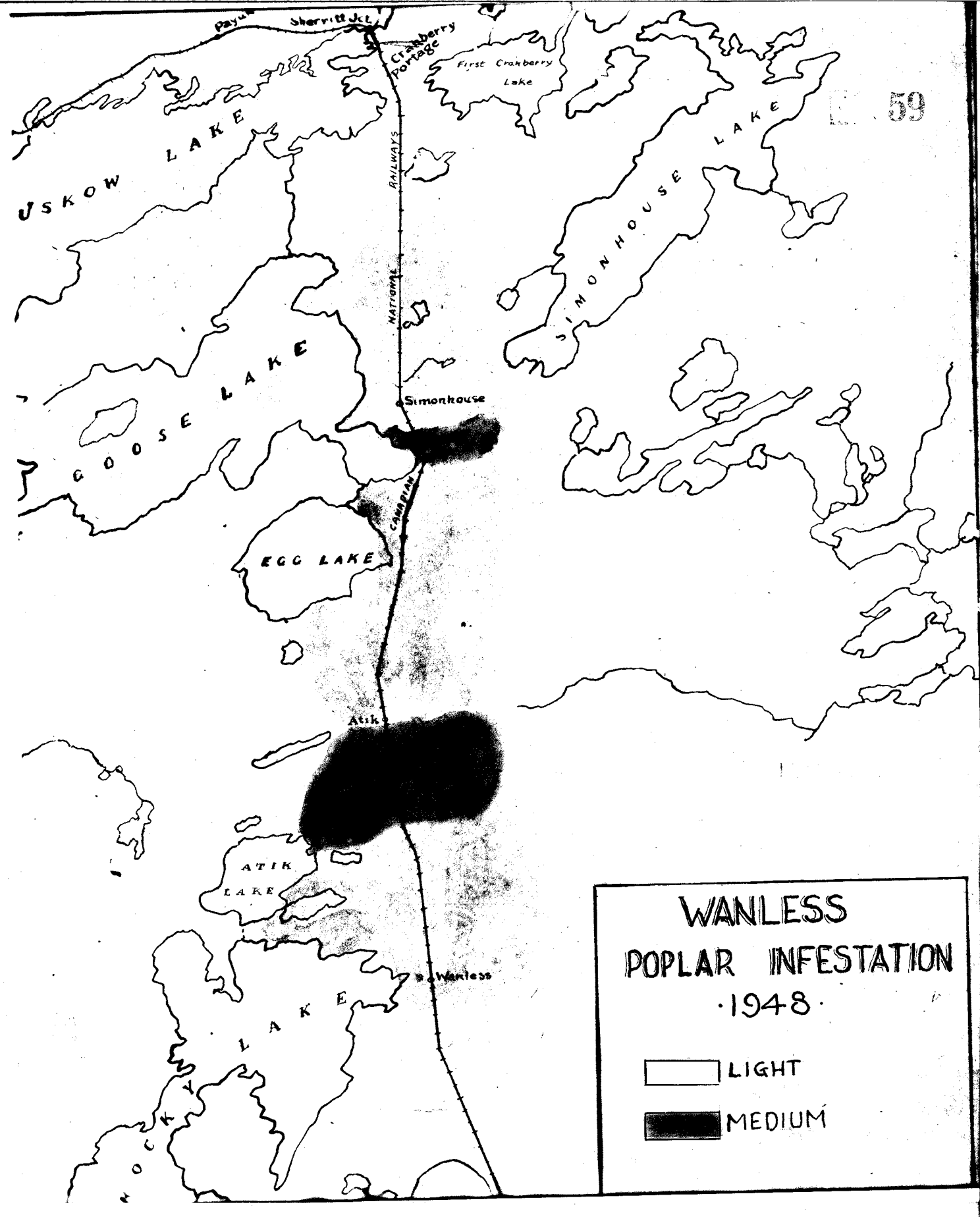
The caterpillar was general in the western and central districts of Riding Mountain National Park with infestations varying from light to medium.

Other concentrations of this insect were noted in Saskatchewan at White Beach, north of Pelly, sec. 2, tp. 36, rge. 30, W.P.M., and also along the road going north from Arran (tp. 34, rge. 30, W.P.M.) It was common in the burned-over and agricultural areas along the Woody River in tp. 38, rge. 30, W.P.M.

Light distributions were observed north of Pelly (sec. 2, tp. 35, rge. 32, W.P.M.) and in the Glen Elder, Stennen, Hudson Bay and Greenwater Lake areas.


DUCK MOUNTAIN FOREST RESERVE
ASPEN TORTRIX and AMERICAN POPLAR LEAF BEETLE INFESTATION
LIGHT 0 - 25 %
MEDIUM 25 - 50
HEAVY 50 - 75
VERY HEAVY 75 - 100 %
SURVEYED - 1948
JACK L.
GEORGE L.
BLUE LAKES
SINGOOSH LAKE
WHITEMUD LAKE
FLATS
ROAD
TO GARLAND
Scale 3 mi - 2 inches
31
30
20
B. 25
B. 24


DUCK MOUNTAIN PROVINCIAL PARK
ASPEN TORTRIX and AMERICAN POPLAR LEAF BEETLE INFESTATION
·1948·
○ - LIGHT · 0-25 %
◒ - MEDIUM · 25-50 %
▲ - HEAVY · 50-and over
N
S
- 40 chains - 1 mile -
MADGE LAKE
TATE ISLAND
BOY I.
SPRUCE I.
WATT I.
BENITO BEACH
BOUNDARY
PELLY BEACH
SAWMILL
RANGER H.Q.
KAMSACK BEACH
MINISTIK BEACH
TRAILS
POINT
HIGHWAY 15
TO KAMSACK
POND
GRAVEL PIT
R. 30
25
24
14
18
31
32
29
28
27
26
25
36
3


Sherritt Jct.
Cranberry Portage
First Cranberry Lake
USKOW LAKE
RAILWAYS
NATIONAL
SIMONHOUSE LAKE
GOOSE LAKE
Simonhouse
CANADIAN
EGG LAKE
Atik
ATIK LAKE
Wanless
LAKE
WANLESS
POPLAR INFESTATION
·1948·
LIGHT
MEDIUM

3. Special Investigations

(a) Larch Sawfly Cocoon Collections and Tree Ring Sections: During the latter part of September, mass collections of larch sawfly cocoons were made in various areas of the western district of Manitoba and the Hudson Bay district of Saskatchewan. The mass collections were made in areas selected for future larch sawfly parasite releases. Two points were selected in each area, one as a parasite release point and the other as a check point. The cocoons were returned to the laboratory and put in cold storage for rearing and dissecting purposes during the winter to determine the number and species of parasites present. A series of tree ring sections were taken from the same locations where mass collections of larch sawfly cocoons were collected in Manitoba. The tree ring sections will be used in the studies to trace if possible, through tree ring growth, the history of past and present larch sawfly outbreaks.

The exact locations where mass collections of larch sawfly cocoons and tree ring sections were made are shown in the following table:

TABLE A

TREE RINGS AND LARCH SAWFLY MASS COLLECTIONS

DATE	PROV.	PLACE	SEC.	TP.	RGE. & MER.	NO. OF COCOONS	TREE RINGS	CHECK OR RELEASE POINT
Sept. 1	Sask.	2.0 miles south of Tallpines	2	39	5-W2	1000	-----	par. release point
Sept. 1	Sask.	½ mile north of Usherville	9-10	38	5-W2	1000	-----	check point
Aug. 30	Sask.	½ mile east of Hudson Bay along R.R.	34	38	5-W2	1036	-----	check point
Sept. 1	Sask.	8.9 miles southeast of Hudson Bay on Ridge Road	16	44	2-W2	1021	-----	par. release point
Sept. 1	Sask.	About 5 miles north of the Town of Pelly	22	34	32-W.P.	250		disease release point
Sept. 23	Man.	20 miles north of Mafeking	16	46	25-W.P.	1000	3	par. release point
Sept. 22	Man.	8.4 miles north of Mafeking	19	44	25-W.P.	1000	3	check point
Sept. 22	Man.	Renwer - mile 253.2 No. 10 Highway	15	36	23-W.P.	500	3	par. release point
Sept. 21	Man.	Renwer between miles 242-245, No. 10 Highway	11	35	23-W.P.	500	3	check point

4. Plantation Survey

During the month of September, 11 days were spent on a plantation survey in the Spruce Woods Forest Reserve. A one day survey of the plantations at the Grandview Ranger Station was also carried out.

All plantations in these areas with tree growth under 30 feet in height were examined and the following information recorded; percentage of each tree species, year planted and restocked, plantation acreage, estimated tree heights, under-growth conditions, ground cover and soil type.

Individual trees were examined and the results recorded for each tree. In plantations up to 2½ acres, 50 trees were examined; up to 5 acres 100 trees; and over 5 acres, 150 trees.

In the Spruce Woods Forest Reserve the dominant tree species in the plantations was jack pine with mixtures of lodgepole, red and Scotch pine. There were also some plantations of white spruce, in pure stands or mixed with pines.

Particular attention was paid to the pine nodule maker in pine plantations and white pine weevil in spruce plantations although any evidence of damage by other insects and disease, was noted. Growth conditions and tree deformities were also recorded.

A complete summary of results of the plantation survey will appear in a separate section of this Report.

5. Permanent Sample Plots

No permanent sample plots were established this year and none had been established previously in the western district of Manitoba and eastern part of Saskatchewan.

6. Permanent Sampling Stations

Permanent sampling stations were established in the earlier part of the season in the western district of Manitoba and Hudson Bay districts of Saskatchewan.

In all, 32 stations were established: 10 in the Riding Mountain National Park, central area; 12 in the Duck Mountain Forest Reserve in the Blue Lakes-Singoosh district and 10 in the Hudson Bay district.

All sites were selected for accessibility and freedom from interference. The plots were marked with an orange-painted galvanized tin marker which was numbered according to district. Complete descriptions of the stations were filled out on forms provided.

In all cases after establishing a plot, a collection was made and compass bearing recorded to indicate the exact location of the collection point.

7. Personnel Contacted

NAME	RANK	PLACE	DEMONSTRATION OF SAMPLING
Phelps, V.H.	Dist. Offr. I/C	Wasagaming, RMNP	No
Pike, R.	Forest Tech.	Wasagaming, RMNP	No
Rowe, J.S.	Forest Engr.	Wasagaming, RMNP	No
Koons, E.A.	Dist. Forester	Court House, Dauphin	No
Machuk, A.	Forest Ranger	Grandview, P.O.	Yes
Heron, J.	Ast.F. Officer	Madge Lake, Sask.	No
Presloski, W.	Forest Ranger	Bield, Manitoba.	Yes
Feusi, A.	Field Officer	Madge Lake, Sask.	Yes
Norman, J.B.	Forest Ranger	Garland, Manitoba	No
Bell, R.	Sr. F. Ranger	Court House, Dauphin	No
Clee, H.	Forest Ranger	Winnitonas, Manitoba.	Yes
Kokindovich, J.	Sr. Ranger	Swan River, Manitoba.	Yes

Personnel Contacted (cont'd)

NAME	RANK	PLACE	DEMONSTRATION OF SAMPLING
McKinnon, J.	Asst. Ranger	Swan River, Man.	Yes
Harvey, R.	Dist. Forester	The Pas, Man.	No
Guymer, W.	Dist. Game Guardian	The Pas, Man.	Yes
Reeder, P.	Game Guardian	The Pas, Man.	No
Robinson, T.	Game Warden	Cranberry Portage	Yes
Gill, W.	Forest Ranger	Cranberry Portage	Yes
Warburton, F.	Dist. Supt.	Hudson Bay, Sask.	Yes
Schell, C.	Field Officer	Hudson Bay, Sask.	No
Randall, M.	Jr.Fld.Officer	Hudson Bay, Sask.	Yes
Benson, A.	Forester	Hudson Bay, Sask.	No
Doble, F.	Field Officer	Somme, Sask.	Yes
Bacon, J.	Ast.Fld.Offr.	Somme, Sask.	No
Schell, C.L.	Field Officer	Pelly, Sask.	Yes
Dalzeal, F.	Timber Cruiser	Sturgis, Sask.	Yes
Ross, R.	Forest Ranger	Mafeking, Man.	No
Bates, G.	Forest Ranger	The Pas, Man.	No
Parkins, R.	M.C.A.S. Pilot	The Pas, Man.	No
Nash, B.	Beaver Research Game Branch	Thicket Portage	Yes
Evans, G.	Fire Ranger	Thicket Portage	Yes
Hislop, W.	Forest Ranger	Kississing, Man.	Yes
Dawson, C.	Forest Ranger	Channing, Man.	Yes
Gallie, A.E.	Superintendent Lynn L. Div.	Sherritt Gordon Mines, Sherridon, Man.	No
Fitzpatrick,R.	Fire Ranger	Wabowden, Man.	No
Hyska, J.	Warden	Rossburn, Man., R.M.N.P.	Yes
Brodie, P.	Sup. Warden	Clear Lake, RMNP	No
Binkley, D.	Warden	Clear Lake, RMNP	Yes
Armstrong, B.	Warden	Wasagaming, RMNP	No
Lintott, C.G.	Forest Ranger	Winnipegosis, Man.	No
Bryson, L.	Field Officer	Usherville, Sask.	Yes
Wright, J.	Forest Ranger	Carberry, Man.	No
Depelley, F.	Forest Ranger	Spruce Woods For.Res.	No
Britcher, Bros.	Logging operators	Timberton P.O., Man.	Yes

Personnel Contacted (cont'd)

NAME	RANK	PLACE	DEMONSTRATION OF SAMPLING
Mawdsley, W.	Forest Ranger	Grandview, Man.	No
Green, J.	For.Ins.Ranger	Indianhead, Sask.	--

NOTE:
Quite a few of the personnel in Manitoba have been transferred, such as:

Ross, R.	Sr. Ranger	Court House, Dauphin	
Presloski, W.	Forest Ranger	Mafeking, Man.	
Machak, A.	Forest Ranger	Garland, Man.	
Mawdsley, W.	Forest Ranger	Grandview, Man.	
McKinnon, J.	Ast. Ranger	The Pas, Man.	
Bell, R.	Sr. Ranger	Turtle Mountain P.R.	
Norman, J.B.	Forest Ranger	Birch River Ranger Stn.	

8. Negative Reports

DATE	HOST	LOCATION
June 8	White Spruce	White spruce plot No. 9 RMNP sec.30, tp. 19, rge. 17, W.P.M. enc. No. 25.
June 23	Black Spruce	Singcosh Lake - D.M.F.R. sec. 24, tp. 30, rge. 35, W.P.M. enc. No. 110
July 19	Jack Pine	1 mile west of Sherridon on road - unorganized territory. enc. No. 653
Aug. 28	Tamarack	4½ miles from Veillardville, Sask., on Tower Trail, sec. 24, tp. 45, rge. 5, W.2nd mer., (on larch sawfly report)(Sask)

D. H. A. Edmunds

1. Introduction

Forest Insect Rangers, H. A. Edmunds and R. Lang commenced field activities in Manitoba on June 5, 1948. Approximately three weeks were spent by R. Lang and the writer conducting Forest Insect Survey sampling and observations in the eastern and southern forest districts in Manitoba. The first week (June 5-12) was spent on a general survey of spruce, balsam and jack pine stands, in the interlake area of Manitoba, to determine the distribution and extent of the spruce and jack pine budworm. In addition several permanent sample stations were established in spruce and jack pine stands at various points throughout the area traversed. Insect collections were made at these points and random sampling conducted throughout the remainder of the area. The period June 13-18 was spent in the Sandilands Forest Reserve making budworm population counts on jack pine. Nineteen permanent sample stations were established at points in the reseve where the population counts were made.

On June 25th, the writer proceeded to Prince Albert where he continued Forest Insect Survey activities in western and northern Saskatchewan with Forest Insect Ranger A.C. Knight. Mr. Knight had accompanied Forest Insect Ranger L. McDowall to Saskatchewan at the beginning of the season.

During the latter part of June and during the month of July the insect rangers devoted their time mainly to budworm detection in northern and western Saskatchewan. At the same time random sampling was continued throughout the areas visited. The period from June 28th to July 4th was spent on a survey for the detection of budworm and other insect activity in jack pine and spruce stands from Prince Albert, north through Prince Albert National Park to Lac la Ronge. A moderate infestation of the balsam fir sawfly was observed in balsam and white spruce stands in the area lying between Bigstone Lake and Lac la Ronge. Collections of the insect were made and the extent of the infested area was mapped. Random

sampling was also conducted throughout the area traversed during the survey.

From July 5 to 10, A.C. Knight and the writer conducted a budworm survey in the southern portion of the Prince Albert National Park and thence westward to Big River and north as far as Doré Lake. All accessible areas around Doré Lake were examined but very little insect activity was observed. Random sampling which was conducted in white spruce stands along the road between Big River and Green Lake produced negative results. Budworm detection was continued and the period July 12-14 was spent in the Fort à la Corne Provincial Forest examining jack pine stands. Four plots in the Nisbet Provincial Forest were also sampled at this time but no trace of budworm was found. Two days (July 19-20) were spent in the Christopher and Angling Lakes district where budworm detection and random sampling were continued.

July 22 was spent in the vicinity of Prince Albert assisting V. Hildahl in the release of a fungous disease (Beauveria sp.) in tamarack swamps infested with larch sawfly. Two separate releases of this fungus were made in the Prince Albert district.

On July 26 Mr. Knight and the writer made a trip to the Pasquia Provincial Forest, but owing to heavy rains, roads in the district were impassable. The period July 27-31 was spent in the Big River Provincial Forest where jack pine stands were examined for budworm activity. General sampling was also conducted throughout Big River Provincial Forest.

Insect Rangers Knight and Edmunds spent August 2nd to August 6th inclusive in the Prince Albert National Park. Several infestations of the Bronze Birch Borer and Birch Dieback were mapped and a survey was made of all accessible larch swamps in the park.

During the period August 16-25, larch sawfly reconnaissance was conducted throughout all accessible areas in the Bronson, Meadow Lake and Waterhen Provincial Forests. Only a small portion of the Bronson Provincial Forest was covered owing to the lack of roads and heavy rains in the district.

From September 1-17 the Insect Rangers were engaged in a survey of the Department of Natural Resources plantations in the Nisbet Provincial Forest. Six days (September 18-23) were spent painting the Forest Insect Ranger cabin at Prince Albert. During the remainder of September Knight and Edmunds were engaged in collecting larch sawfly cocoons in the Fort à la Corne, Nisbet and Meadow Lake Provincial Forests and examining the permanent Forest Insect Survey sample plots in the Nisbet Provincial Forest. The season's work in northern Saskatchewan was terminated on September 29 and the insect rangers returned to Headquarters at Winnipeg, Manitoba, on September 30th.

Ten days in October (October 5-15) were spent by the writer, accompanied by insect rangers Knight and Martin, making mass collections of larch sawfly cocoons and examining permanent sample plots in Manitoba. During this period a total of 2050 larch sawfly cocoons were collected. The cocoon collections were made at various points in the Riding Mountain National Park.

2. Insect Conditions

A. Saskatchewan

(a) Larch Sawfly (Pristiphora erichsonii Htg.) During the summer of 1948 an intensive survey of all accessible larch stands in Saskatchewan was made and reports turned in on all locations. The larch sawfly seems to be general in tamarack throughout the entire part

of the province that was covered during the survey. Reports indicated that it had spread considerably since 1947. Collections were made this year in areas where sawfly was not found last year. In other areas, where only light infestations were evident in 1947, sawfly activity increased considerably and defoliation was much heavier this year.

The infestation 1 mile north of the bridge at Prince Albert (sec. 8, tp. 49, rge. 26, W 2nd mer.) still continued to flourish and tamarack suffered heavy defoliation. This infestation was the heaviest recorded in the western part of the Province. Covering an area of approximately 8 acres, the tamarack was completely defoliated by July 30 and the trees had already started to put forth a second growth of foliage. A fungus disease (Beauveria sp.) was released in this swamp on July 22nd, during the feeding period of the larch sawfly. It is believed that traces of this disease were recovered later on in the season on dead larvae that were sent to Sault Ste. Marie for examination. A mass collection of larch sawfly cocoons was made at this point in the fall. The cocoons will be dissected during the winter to determine what parasites are present in the area.

A culture of a fungus (Beauveria sp.) was also released in a swamp in sec. 23, tp. 49, rge. 1, W 3rd mer. At the time of the release larch sawfly larvae were very active on most trees examined, but as the season progressed, the sawfly populations decreased rapidly from some unknown cause, until at the end of the feeding season only a few larvae remained. An attempt was made to make a mass collection of larch sawfly cocoons in this swamp but owing to their scarcity it was impossible to complete the collection. This swamp will be closely watched next year for the re-appearance of larch sawfly larvae and an attempt will be made to determine the cause of the disappearance of the larvae in 1948. In sec. 16, tp. 49, rge. 26, W 2nd mer., 1/4 mile north of the Field Officer's Headquarters in the Nisbet Provincial Forest, sawfly was attacking larch in a swamp covering approximately 1/2 square mile. Defoliation here was very light and no serious damage to the trees was observed.

In the Steep Creek Block of the Nisbet Provincial Forest a larch sawfly infestation was found in a stand of approximately 3 acres in sec. 6, tp. 49, rge. 23, W 2nd mer. At the time of examination the defoliation in this swamp was approximately 40 percent but when the stand was re-examined in the latter part of the season, most trees had been completely stripped and a second growth of foliage put forth. Cocoons were collected from this point to obtain information on the parasites present.

In the Red Rock Block of the Nisbet Provincial Forest a light infestation of the larch sawfly was found in a swamp in sec. 22, tp. 49, rge. 25, W 2nd mer. Here defoliation was estimated at 20 percent over an area of approximately 3 acres of larch and black spruce. In the MacDowall Block of the Nisbet Provincial Forest in sec. 34, tp. 47, rge. 1, W 3rd mer., a medium infestation of this insect was found in a swamp which comprised 40 percent larch and covered approximately two acres. Defoliation in this swamp was estimated at 35 percent. At the time of examination, feeding was still in progress and the defoliation was noticeable from a distance. In the Fort à la Corne Provincial Forest a few light infestations were found in tamarack swamps in sec. 9, tp. 50, rge. 22, W 2nd mer. A ground fire passed through this stand during the summer and larch sawfly cocoons were very difficult to find. However, a few were obtained for dissection purposes. When dissected, part of these cocoons were found to be damaged, some were found to be filled with water and others were decomposed. It is believed that these conditions were caused by the fire. No fire damage to the trees was noted indicating that the fire had not been too severe. Undoubtedly this will have some effect on next year's attacks.

In a second location in sec. 33, tp. 50, rge. 19, W 2nd mer., defoliation was estimated at 10 percent for the stand which covered an area of approximately 1½ miles in length and 1/4 mile in width bordering an old creek bed. At the time of examination the sawfly was quite active but on a later visit in

the fall no cocoons could be found and defoliation had not increased to any extent. In the Candle Lake Provincial Forest two swamps were examined. In sec. 15, tp. 53, rge. 23, W 2nd mer., defoliation was very light and the sawfly was confined to only a few trees and in sec. 14, tp. 54, rge. 23, W 2nd mer., no trace of sawfly was found. One very light infestation was found in the Emma Lake Provincial Forest (sections 33 and 34, tp. 53, rge. 26, W 2nd mer.) Here feeding was very light and damage negligible.

The larch sawfly was generally distributed throughout Prince Albert National Park and nearly all larch stands in the park showed some signs of the presence of larch sawfly. However, in most cases feeding was light and in some instances only curled tips were found. In sec. 3, tp. 56, rge. 1, W 3rd mer., very few larvae were found and only light feeding damage was noticeable. Along the road in the direction of the Narrows another stand that covered an area of approximately 3 acres in sec. 4, tp. 57, rge. 1, W 3rd mer., was examined but no insect activity was noted. Again in sec. 5, tp. 57, rge. 1, W 3rd mer., another stand covering nearly 5 acres was examined and no insect activity or damage was observed. In the western part of the Park, 4 miles from Rabbit Cabin in sec. 5, tp. 54, rge. 46, W 3rd mer., a medium population of larch sawfly was attacking larch in a swamp covering approximately 8 acres. At the time of examination the defoliation was estimated at 25 percent. Another infestation of medium intensity was found in sec. 15, tp. 53, rge. 3, W 3rd mer., on the road to Rabbit Cabin. This swamp covered approximately 15 acres and defoliation was estimated at 35 percent. At a point 10½ miles west of the Buffalo Paddock on the southern border of the Park (sec. 2, tp. 53, rge. 2, W 3rd mer.) a light infestation of larch sawfly was found in a swamp covering approximately 5 acres. Defoliation for the stand was estimated to be 20 percent but feeding was still in progress. On the eastern side of the Park, 1/5 of a mile east of the Bittern Creek Ranger Station (sec. 6, tp. 58, rge. 26, W 2nd mer.)

a light infestation covering approximately 10 acres was found. At the time of examination the larvae were very scarce and feeding damage was hardly noticeable.

In sec. 33, tp. 54, rge. 7, W 3rd mer., 1½ miles north of Dumble in the Big River district a very light attack by this insect was recorded in a swamp covering approximately 5 acres. On the road to Flotten Lake, 1 mile from the boundary of the Waterhen Provincial Forest, in sec. 6, tp. 63, rge. 17, W 3rd mer., a very light infestation of larch sawfly was found in a tamarack stand covering approximately 9 acres. Damage was not noticeable in this swamp. In another stand of approximately 35 acres in sec. 30, tp. 63, rge. 17, W 3rd mer., no larvae could be found on the trees examined.

In the Bronson Provincial Forest on the road to Fishing Lakes in sec. 9, tp. 56, rge. 24, W 3rd mer., a light infestation of larch sawfly was found in a swamp covering approximately one acre. At the time of the examination, feeding damage was very light and only a few clusters of larvae were found.

(b) Yellow-headed Spruce Sawfly. (Pikonema alaskensis Roh.) In the Green Lake district this insect was found on a private planting of ornamental white spruce at the Hudson Bay Company store (sec. 18, tp. 61, rge. 12, W 3rd mer.) Here the foliage was severely attacked by this insect, but as only a few trees were involved, control of this insect could be easily undertaken. Only one larva of this insect was found in the Meadow Lake Provincial Forest. The collection was made one mile east of highway No. 4 in sec. 7, tp. 58, rge. 16, W 3rd mer. No damage was noticeable in the area. On the section line between sections 28 and 29, tp. 70, rge. 22, W 2nd mer., larvae were again found attacking white spruce but very little damage was noticeable on the trees. Another sample of this insect was collected on white spruce eight miles south of Lac la Ronge along the highway in sec. 15, tp. 69, rge. 23, W 2nd mer., but no feeding damage was observed.

Near Christopher Lake, in sec. 4, tp. 53, rge. 26, W 2nd mer., a stand of white spruce was attacked by this insect. At the time of examination damage was very light although some of the insects were still feeding. No larvae of this sawfly were found this year in the area of the Prince Albert National Park where parasites (Sturmia sp.) were released in 1947. At another of last year's parasite release points in the MacDowall block of the Nisbet Provincial Forest sec. 34, tp. 47, rge. 1, W 3rd mer., a few sawfly larvae were found on spruce in this plantation but new damage was not serious at the time of examination.

(c) Ugly Nest Tortrix (Archips cerasivorana Fitch.) This insect was generally distributed over the central and western parts of Saskatchewan. It did not appear to be attacking trees of commercial value but was usually found on young cherry trees and other shrubs. In the Nisbet Provincial Forest along highway No. 3 (sec. 21, tp. 49, rge. 1, W 3rd mer.) nests of the larvae were found on young cherry trees. In the Red Rock Block of the Nisbet Provincial Forest near the tower in sec. 26, tp. 49, rge. 24, W 2nd mer., another infestation of this pest was found. It did not appear to be very heavy as only a few nests were observed. In the Fort à la Corne Provincial Forest another very light outbreak was found on young cherry trees in sec. 22, tp. 50, rge. 20, W 2nd mer. Here nests were scattered and very little damage was being done.

In the Big River Provincial Forest a slightly heavier infestation was found in sec. 5, tp. 56, rge. 8, W 3rd mer. Here a considerable number of dried tents were found. A few nests were also found which contained active larvae. No reason could be found for the nests of dead insects. Defoliation was only partial in most cases. In the northern part of the Big River Provincial Forest, 1½ miles north of Big River in sec. 10, tp. 58, rge. 9, W 3rd mer., a few nests were found at intervals along the road allowance on young cherry trees. Little damage was done other than to the trees on which the nests were found.

(d) Balsam Fir Sawfly (Neodiprion abietis Harr.) An infestation of this insect was general over the entire area around the Lac la Ronge settlement. Very little of this area is accessible by car, therefore investigations were made on foot and by boat. The heaviest part of the infestation was centered in sections 28 and 29, tp. 70, rge. 22, W 2nd mer., between Bigstone Lake and Lac la Ronge. The infestation covered an area of about 1½ miles in length and ½ mile in width. Larvae of this insect were found on nearly all white spruce and balsam fir examined in the above mentioned area. Balsam fir sawfly was also encountered in the Fort à la Corne Provincial Forest (sec. 10, tp. 51, rge. 19, W 2nd mer.) It was causing some defoliation in white spruce stands in this area but the infestation was somewhat lighter than that in the Lac la Ronge district.

(e) Pitch Pine Nodule Maker (Petrova albicapitana Busck.) This insect was found in all young jack pine stands examined. One of the heaviest infestations occurred in the Big River Provincial Forest (sec. 18, tp. 57, rge. 8, W 3rd mer. The nodule maker appeared to be general throughout this stand which consisted mainly of second growth jack pine growing in an old burn of approximately 1000 acres. In the Fort à la Corne Provincial Forest nodules were found on young jack pine as well as on mature trees. The young growth seemed to be more heavily infested at this point (sec. 22, tp. 50, rge. 20, W 2nd mer.) Random collections of this insect were made throughout the Nisbet Provincial Forest and nodules were found on most young trees examined. In the Candle Lake Provincial Forest nodules were found affecting jack pine in sec. 27, tp. 53, rge. 23, W 2nd mer. This area had been burned over and regeneration consisted of a mixed stand of poplar and jack pine. Between Montreal Lake and Lac la Ronge nodules were found attacking dense stands of jack pine regeneration in old burns. In the Waterhen Provincial Forest the nodule maker was prevalent throughout stands of second growth jack pine. Collections of the nodule maker were made in sec. 30, tp. 63, rge. 17, W 3rd mer.

One mile south of Flotten Lake (sec. 6, tp. 63, rge. 17, W 3rd mer.) nodules were again found on young jack pine. This stand of jack pine was mixed with white poplar and black spruce and covered an old fire burn. In sec. 32, tp. 64, rge. 17, W 3rd mer., in the Waterhen Provincial Forest, another collection was made on young jack pine. In this area nodules were evident on most trees. Owing to poor roads entry into the Bronson Provincial Forest was almost impossible. Jack pine was examined along the road to Fishing Lake in sec. 9, tp. 56, rge. 24, W 3rd mer. This stand of young jack pine covered a burned over area and nodules were found on some trees. In sec. 4, tp. 56, rge. 24, W 3rd mer., jack pine was examined and nodules were found throughout most of the stand. Eight miles northwest of Loon Lake nodules were found on young jack pine growing in an old burn.

(f) Bronze Birch Borer (Agrilus anxius Gory.) This insect was found to be attacking weakened and dying birch in the northern and western parts of the Province of Saskatchewan. In Prince Albert National Park in sec. 26, tp. 57, rge. 1, W 3rd mer., on the road to Hanging Heart Lakes, birch was examined for borers. In each case where examinations were made one tree was cut down and the bark was removed from portions of it to determine the presence of the bronze birch borer. Where trees were examined by this method borers were found to be present at the base of nearly every branch and in some cases had penetrated deep into the wood. Dieback of birch was observed in the immediate area surrounding the trees which had been felled and examined specifically for borers. At the forks of the roads to the Narrows and Waskesiu, in sec. 34, tp. 55, rge. 1, W 3rd mer., birch was again examined in the above mentioned way and borers were found in the tree that was examined. Dieback was also noticed on some of the surrounding trees. Upon examination of birch at the junction of roads to Montreal Lake and Waskesiu borers were again found. The bronze birch borer was general in birch stands throughout Prince Albert National Park.

Birch was examined in the Loon Lake area, 5 miles north of the town in sec. 1, tp. 59, rge. 22, W 3rd mer., on highway No. 26. This stand consisted of approximately 70 percent white birch and 30 percent trembling aspen and black poplar. Approximately 20 percent of the mature birch was dead while others were in a weakened and dying condition. Two trees were felled in this area for examination. Both trees contained larvae which were found under the bark of the branches and trunk. The stand covered an area ½ mile in length along the road and extended back from the road for approximately ½ mile. In the Meadow Lake Provincial Forest bronze birch borer was found upon the examination of 2 trees along highway No. 4 in sec. 35, tp. 56, rge. 17, W 3rd mer. Borers were found under the bark on the trees examined and trees surrounding these were in a weakened or dying condition possibly due to birch dieback and borers. This stand covered an area ¼ of a mile along the highway and back approximately 1/4 of a mile, and was a mixture of birch and white poplar.

(g) Jack Pine Budworm (Choristoneura fumiferana Clem.) During the month of July only one pupa of this insect was found and that was in the MacDowall Block of the Nisbet Provincial Forest Reserve in sec. 5, tp. 47, rge. 1, W 3rd mer. No reports of this insect were received from the northern or western districts.

(h) Spruce Budworm (Choristoneura fumiferana Clem.) No trace of this insect was found in the parts of the northern and western districts of Saskatchewan that were examined during the 1948 season.

(i) Western Willow Leaf Beetle (Galerucella decora Say.) This insect was found commonly on willow wherever it was examined throughout the western and northern parts of the province of Saskatchewan, and in most cases was causing severe defoliation. In the Prince Albert National Park it was found to be seriously defoliating willow in sec. 24, tp. 57, rge. 1, W 3rd mer., 2 miles south of Waskesiu. Here willow had a a burned-over appearance owing to heavy attacks by this insect. All clumps of willow along the road to Waskesiu were examined and this insect was found to be

present. Western willow leaf beetle was evident in sec. 11, tp. 57, rge. 2, W 3rd mer. The willow attacked was mixed with larch and growing in a swamp. Willow clumps showing the burned-over effect usually caused by this insect were noticed on the road from the Buffalo Paddock in the Park to Rabbit Cabin Ranger Station and west to Big River. A sample of this insect was sent in from a point 6½ miles northwest of Rabbit Cabin in sec. 12, tp. 54, rge. 5, W 3rd mer. Clumps of willow scattered along the trail to Big River showed signs of heavy defoliation. Signs of this insect were also noticed in the Meadow Lake Provincial Forest along highway No. 4 north of the Forestry tower.

Defoliated willow was also noted in the Nisbet Provincial Forest east of Shellbrook along No. 3 highway. Throughout this area, willow was brown in color and exhibited a burned-over appearance.

B. Manitoba

(a) Jack Pine Budworm (Choristoneura fumiferana Clem.) This jack pine feeding insect increased considerably during the 1948 season in the interlake area of Manitoba. A medium infestation was observed about 18 miles northwest of Riverton and covered an area of approximately 40 square miles. The jack pine stands in this area are found growing on a ridge running north and west and are bordered on both sides by black spruce and tamarack swamps. Collections of this insect were made 1/10 of a mile north of the Riverton tower in sec. 1, tp. 25, rge. 2, E.P.M., and in sec. 11, tp. 25, rge. 2, E.P.M. No population counts were made at these locations owing to the shortage of time and the extent of the area that had to be covered during the survey. No serious feeding was noted at the time of examination (June) as most of the larvae were still in the buds. In the Gypsumville area, jack pine budworm was found attacking jack pine 4/10 of a mile north of the town of Gypsumville but damage was very light and only a few larvae were found.

A population count was made at sample stations established in the Sandilands Forest Reserve during the period June 15 - 18. Budworm activity was medium to heavy over the central and southern parts of the reserve and light in the northern part. For further information regarding jack pine budworm population counts in the Sandilands Forest Reserve refer to section of the annual report devoted to "jack pine budworm population counts."

(b) Spruce Budworm (Choristoneura fumiferana Clem.) Several samples of this insect were found throughout the interlake area of Manitoba but no heavy outbreaks were observed. At Arnes, in sec. 9, tp. 21, rge. 4, E.P.M., a light infestation was found on white spruce in a private woodlot. Signs of past budworm damage were noticed at this point, with old defoliation up to 15 percent. The woodlot covered an area of approximately 2 acres. At the time of examination (June) the larvae were feeding on the new foliage as well as in the buds. Another collection was made on white spruce at Riverton in sec. 20, tp. 23, rge. 4, E.P.M. Spruce budworm was also found in a small spruce bluff privately owned near Finns (sec. 5, tp. 22, rge. 4, E.P.M.) This stand covered approximately 2 acres and budworm damage was very light. At a point 3 1/10 miles south of Camper (sec. 27, tp. 23, rge. 6, W.P.M.) budworm was again encountered but only a few larvae were found although there were signs of past budworm damage. This stand consisted mainly of second growth white spruce and was on privately owned land. Another collection was made in the Gypsumville area sec. 11, tp. 25, rge. 5, W.P.M., but only one larva was found. No population counts were made at the time of examination as these spruce stands were all on privately owned land and only a few trees were involved in each case.

TABLE SHOWING NO. OF NEGATIVE AND POSITIVE SAMPLES ON SPRUCE BUDWORM

DATE	PLACE			NEGATIVE OR POSITIVE	NO. OF TREES EXAMINED	NO. SPRUCE BUDWORM LARVAE
	SEC.	TP.	RGE.			
June 7/48	20	23	4 E.P.M.	Positive	10	1
June 8/48	9	21	4 E.P.M.	Positive	5	22
June 8/48	5	22	4 E.P.M.	Positive	5	1
June 11/48	27	23	6 W.P.M.	Positive	6	1
June 10/48	11	25	8 W.P.M.	Positive	9	1

(c) American Poplar Leaf Beetle (Phytodecta americana Schffr.) Only one serious outbreak of this insect was found by the writer during the month of June and that was 8/10 of a mile north of the forestry tower at Riverton. The infestation covered an area of approximately 35 acres and was in a stand of young poplar ranging from 5 to 10 years in age and mixed with a few scattered jack pine. At the time of examination defoliation was estimated at 15 to 20 percent but larvae were very active and feeding was still in progress. There were also large numbers of leaf chaffer adults (Dichelonyx sp.) present at the time and some of the defoliation could be attributed to the leaf chaffer. Foliage production throughout the stand was not complete. Another collection of this insect was made 2½ miles north of Camp Morton (sec. 29, tp. 4, rge. 20, E.P.M.) This was just a random collection made in a dense stand of white and black poplar and no signs of an infestation were evident at the time of examination.

(d) Balsam Fir Sawfly (Neodiprion abietis Harr.) No serious outbreaks of this insect were found during the period spent in the interlake region. The only collection made was on white spruce 11 miles west of Arborg in sec. 13, tp. 22, rge. 1, W.P.M.

(e) Pine Tortoise Scale (Toumeyella sp.) Only one sample of this insect was found in the Riverton district (sec. 26, tp. 24, rge. 2, E.P.M.) This appeared to be a new development and at the time of examination it was found on only a few young trees.

(f) Red Pine Sawfly (Neodiprion nanulus Schedle.) This insect was found to be seriously damaging jack pine south of Gypsumville in sec. 24, tp. 31, rge. 10, W.P.M. The infestation covered an area of approximately 3 square miles. Samples have been sent in from this location for the past two seasons but this was the first time an infestation had been reported. Another collection of this insect was obtained in sec. 36, tp. 5, rge. 9, E.P.M., in the Sandilands Forest Reserve but no serious outbreak was evident.

3. Special Investigations

(a) Larch Sawfly Cocoon Collections: During the latter part of September and first part of October, mass collections of larch sawfly cocoons were made in several areas in western and central Saskatchewan and in the Riding Mountain National Park in Manitoba. The mass collections were made in areas where heavy infestations existed and the collections consisted of 150 to 1000 cocoons. The cocoons were returned to the laboratory and put in cold storage for rearing and dissecting purposes to determine the number and kind of parasites present. The parasitism studies will be conducted during the winter season at the laboratory.

The following table (Table A) gives the locations of the points where mass collections of larch sawfly cocoons were made:

TABLE A

MASS COLLECTIONS - LARCH SAWFLY COCOONS

DATE	NO. OF COCOONS	PROV.	LOCATION				DETAILED LOCATIONS
			SEC.	TP.	RGE.	MER.	
Aug. 23	1000	Sask.	8	49	26	W 2nd	Nisbet Prov.Forest
Sept. 26	1000	Sask.	6	49	23	W 2nd	Steep Creek Block, N.P.F.
Sept. 24	150	Sask.	9	50	22	W 2nd	Fort à la Corne Prov. Forest
Oct. 6	150	Man.	34	19	17	W.P.M.	Mile 7, Norgate Road, R.M.N.P.
Oct. 6	300	Man.	5	20	17	W.P.M.	Mile 1.3, Whirlpool Lake Rd.,RMNP
Oct. 7	150	Man.	11	21	19	W.P.M.	Mile 145, Dauphin Road, R.M.N.P.
Oct. 7	150	Man.	29	20	19	W.P.M.	Mile 13, Lake Audy Road, R.M.N.P.
Oct. 8	1300	Man.	12.	21	21	W.P.M.	P.O.W. Camp Road, R.M.N.P.

(b) Tree Ring Sections: In conjunction with the larch sawfly parasitism studies, a series of tamarack tree rings were taken from the same locations where the mass cocoon collections were made. Studies will be conducted during the winter to trace, if possible, through tree ring growth the history of present and past larch sawfly outbreaks. A series of three tree rings were taken from each of three trees in the areas selected for these studies; one ring was taken from the lower part of the tree trunk, 12 inches from the ground level, the second was taken from the mid portion of the tree; and the third was taken 6 feet from the top.

For locations of areas where tree rings were made in Saskatchewan refer to the accompanying Table: (Table B):

TABLE B

TREE RING SECTIONS

DATE	NO. TREE RINGS	PROV.	LOCATION				DETAILED LOCATION
			SEC.	TP.	RGE.	MER.	
Aug. 23	9	Sask.	8	49	26	W 2nd	Nisbet Prov.Forest
Sept. 26	9	Sask.	6	49	23	W 2nd	Steep Creek Block, N.P.F.
Sept. 25	9	Sask.	22	49	1	W 3rd	No. 3 Hgwy., Crutwall Corner, NPF
Sept. 24	9	Sask.	9	50	22	W 2nd	Fort à la Corne, Provincial Forest
Sept. 28	9	Sask.	15	55	17	W 3rd	Meadow Lake Prov. Forest

(c) Larch Sawfly Larval Collections: Several collections of larch sawfly larvae were made during July and August in the Prince Albert district where cultures of a fungus (Beauveria sp.) had been released. The collections contained living and dead larvae, which were found on and around the sprayed trees, and were forwarded to the Forest Insect Laboratory, Sault Ste. Marie, Ontario. The collections were made at intervals of about one week as follows: July 22, July 31, August 7-9, and August 21. An additional three hundred cocoons were collected in this swamp on October 24th by Messrs. McDowall, Lawrence, Drouin and Hildahl. This collection of larch sawfly cocoons was forwarded to the Sault Ste. Marie laboratory.

(d) Jack Pine Budworm Population Counts: Nineteen sites were selected in the Sandilands Forest Reserve for permanent

sample stations at which jack pine budworm population counts will be made annually over an indefinite period. The sample stations were established in areas of the reserve where cutting operations were in progress, or will be in the near future, and are intended primarily to determine whether or not selective cutting will tend to reduce budworm populations. A complete summary of the population counts will appear in a separate section of this annual report dealing with jack pine budworm population counts.

4. Plantation Survey

A complete survey of forest plantations in the Nisbet Provincial Forest in Saskatchewan was carried out during the first two weeks of September, 1948. The survey was intended mainly to determine the extent of pitch nodule maker (Petrova albicapitana Busck.) and white pine weevil (Pissodes strobi Peck.) damage. Ten plantations, ranging in size from 1/4 acre to 13 acres and with a total acreage of 26.34 acres, were examined during the survey. Nine of the plantations examined were in the MacDowall Block and the remaining one in the Home Block of the Nisbet Provincial Forest.

Five of the plantations examined were pure stands of jack pine and in addition there was one pure stand of each of the following species: lodgepole pine, Englemann spruce and white spruce. The remaining two plantations were mixed stands in which jack pine was the dominant species. The latter two plantations mentioned had been restocked with the following species in order of abundance: red pine, lodgepole pine, scotch pine and yellow pine.

A total of 650 individual trees, selected at random throughout the ten plantations, were examined for insect damage. The number of trees examined per plantation varied according to area. In plantations

up to 2½ acres, 50 trees were examined; over 2½ acres and up to 5 acres, 100 trees were examined; and in plantations over 5 acres, 150 trees were examined. For a complete summary of the plantation survey refer to section "Plantation Survey" of the annual report.

5. Permanent Sample Plots

The permanent sample plots in Saskatchewan were examined in September of this year for insect defoliation and damage records. Insect activity in the plots had been relatively light throughout the season and no noticeable damage was observed. Owing to lack of time, only four of the permanent plots were sampled during the season. The plots sampled were as follows:

No. 1 - white spruce
No. 5 - jack pine
No. 10 - jack pine
No. 14 - jack pine

The permanent sample plots in Manitoba were also examined this year. The examination of the plots was conducted during the first two weeks of October and insect defoliation and damage were recorded. The heights of the marked trees in the permanent plots were taken this year with an Abney level. (Tree heights were omitted in last year's records.) None of the permanent plots were sampled at the time these examinations were carried out.

6. Permanent Sample Stations

During the field season in 1948 several permanent sample stations were established in the northern and western districts of Saskatchewan and in the eastern district of Manitoba. All the sample stations were sampled and inspected only one time during the 1948 season and that was carried out at the time the stations were established. This year the sample stations were established mainly in stands of larch, black spruce, white spruce and jack pine. For a complete summary of sample stations refer to section of the annual report devoted to sample stations.

The locations and species of the sample stations established in 1948 are listed in tabular form below:

TABLE NO. 1

SAMPLE STATIONS
-SASKATCHEWAN-

DATE	PLOT NO.	LOCATION				SPECIES	DETAILED LOCATION
		SEC.	TP.	RGE.	MER.		
July 21	P.A. 3	13	48	23	W 2nd	Jack pine	Steep Creek Block, Nisbet Prov. Forest Plot Line 30° S.ofE.
Aug. 13	P.A. 4	8	49	26	W 2nd		Swamp one mile N. of Prince Albert, NPF, Plot Line 50° S.ofW.
Sept. 26	P.A. 5	6	49	23	W 2nd	Larch	On right hand side of road, Steep Creek Blk N.P.F. Plot line 60° S. of W.
July 14	P.A. 6	31	49	24	W 2nd	Jack pine	On main trail in Red Rock Blk. in NPF, Plot line 20° S.ofW.
Sept. 24	P.A. 7	21	50	22	W 2nd	Larch	On Elk Creek Trail 3/10 mi. from boundary Fort à la Corne P.F. Plot line 10° W.ofS.
Aug. 4	N. 1	9	58	26	W 2nd	Jack pine	On right hand side of road from Bittern Creek to Montreal Lk. Plot Line due S.(180°)

TABLE NO. 2

SAMPLE STATIONS
-MANITOBA-

DATE	PLOT NO.	LOCATION				SPECIES	DETAILED LOCATION
		SEC.	TP.	RGE.	MER.		
7 June 48	1 E.	26	24	2	E.P.M.	Jackpine	½ mile north of Rosenburg School
7 June 48	2 E.	1	25	2	E.P.M.	W.Poplar	1/10 mile north of Ranger Tower
8 June 48	3 E.	11	25	2	E.P.M.	Jackpine	3/5 mile north of tower
15 June 48	4 E.	35	5	9	E.P.M.	Jackpine	2/10 mi.S. of Reserve H.Q. Sandilands Forest Reserve.
15 June 48	5 E.	30	5	10	E.P.M.	"	1/10 mi.S. of Sundown Lumber Mill East side.
15 June 48	6 E.	30	5	10	E.P.M.	"	1/5 mile South of Sundown Lumber Mill, West side.
16 June 48	8 E.	29	5	10	E.P.M.	"	
16 June 48	9 E.	29	5	10	E.P.M.	"	
16 June 48	10 E.	3	6	10	E.P.M.	"	
17 June 48	11 E.	6	6	10	E.P.M.	"	
17 June 48	12 E.	3	6	10	E.P.M.	"	
17 June 48	13 E.	10	5	10	E.P.M.	"	
17 June 48	14 E.	10	5	10	E.P.M.	"	
18 June 48	15 E.	29	5	10	E.P.M.	"	
18 June 48	16 E.	36	5	9	E.P.M.	"	
18 June 48	17 E.	36	5	9	E.P.M.	"	
19 June 48	18 E.	35	5	9	E.P.M.	"	
19 June 48	19 E.	29	5	10	E.P.M.	"	
24 June 48	20 E.	31	5	10	E.P.M.	"	
25 June 48	21 E.	30	5	9	E.P.M.	"	
25 June 48	22 E.	30	5	10	E.P.M.	"	
26 June 48	23 E.	30	5	10	E.P.M.	"	

7. Personnel Contacted - 1948

NAME	TITLE	PLACE	PROV.	DEMONSTRATION OF SAMPLING
E.J. Marshall	Director of Forests	Prince Albert	Sask.	No
C.R. Christie	Forester	Prince Albert	Sask.	No
H.P. Elaler	Forester	Prince Albert	Sask.	No
W. MacNeill	Forester	Meadow Lake	Sask.	No
A. Hansen	District Superintendent	Meadow Lake	Sask.	No
A.K. Quandt	Asst. Superintendent	Prince Albert	Sask.	No
J.M. Brown	Field Officer (Resigned)	Prince Albert	Sask.	No
F.J. Arnold	Field Officer	Prince Albert	Sask.	No
V.P. Honig	Field Officer	St. Walburg	Sask.	No
A.C. Towell	Field Officer	MacDowall	Sask.	No
O.M. Linton	Field Officer	La Ronge	Sask.	Yes
W. MacDonald	Field Officer	Christopher Lake	Sask.	No
J. Cowie	Cruiser	Big River	Sask.	Yes
C. Labey	Jr. Field Officer	Meadow Lake	Sask.	No
S. Pocock	Park Warden	Prince Albert NP	Sask.	No
A.W. Brain	District Forester	Winnipeg	Man.	No
E. Campbell	Forest Ranger	Ashern	Man.	Yes
D. Cooper	Forest Ranger	Marchand	Man.	No
E. Marner	Forest Ranger	Riverton	Man.	No
L.J. Stanlake	Forest Ranger	Hodgson	Man.	No

8. Negative Reports - 1948

DATE	HOST	LOCATION				DETAILED LOCATION
		SEC.	TP.	RGE.	MER.	
July3	B. Spruce	32	68	23	W2nd	South of Lac la Ronge, Saskatchewan.
July 3	W. Spruce	35	66	23	W2nd	South of Lac la Ronge, Saskatchewan.
July 3	Jack Pine	33	64	24	W2nd	On road south of Lac la Ronge.
July 3	Jack Pine	14	62	24	W2nd	Vicinity of Lac la Ronge, Saskatchewan.
July 3	B. Spruce	14	62	24	W2nd	Vicinity of Lac la Ronge, Saskatchewan.
July 6	B. Spruce	24	65	10	W3rd	South Bay of Doré Lake, Saskatchewan.
July 6	B. Spruce	25	65	10	W3rd	Vicinity of Doré Lake, Saskatchewan.
July 6	B. Spruce	12	65	10	W3rd	1 mile south of Doré Lake, Saskatchewan.
July 6	B. Spruce	17	65	9	W3rd	5½ miles south of Doré Lake, Saskatchewan.
July 6	Jack Pine	9	65	9	W3rd	7 miles south of Doré Lake, Saskatchewan.
July 6	W. Spruce	9	64	9	W3rd	1 mile south of Beaupre Cabin, Sask.
July 6	Tamarack & B. Spruce	3	64	9	W3rd	3 miles south of Beaupre Cabin, Sask.
July 7	W. Spruce	17	60	10	W3rd	Green Lake Road, Saskatchewan.
July 8	W. Spruce	17	58	17	W3rd	Meadow Lake P.F. 4 miles west along boundary from No. 4 Highway, Saskatchewan.
July 8	W. Spruce	25	57	17	W3rd	On No. 4 Highway, 4 miles from Meadow Lake Prov. Forest boundary, Saskatchewan.
July 8	Jack Pine	36	56	17	W3rd	1 mile east of Meadow Lake P.F. Tower, Sask.
July 8	Jack Pine	36	56-	17	W3rd	½ mile east of Meadow Lake PF Tower, Sask.
July 8	W. Spruce	36	53	17	W3rd	4½ miles north of Midnight Cabin, Meadow Lake Provincial Forest, Saskatchewan.
July 8	W. Spruce	24	53	17	W3rd	2½ miles north of Midnight Cabin, Meadow Lake Provincial Forest, Saskatchewan.
July 9	W. Spruce	11	63	13	W3rd	1 mile north of Beaver River near Green Lake, Saskatchewan.
July 9	Tamarack	27	63	13	W3rd	Vicinity of Green Lake, Saskatchewan.
July 9	W. Spruce	7	61	12	W3rd	1 mile south of Green Lake, Saskatchewan.
July 9	W. Spruce	31	60	12	W3rd	3½ miles south of Green Lake, Sask.
July 9	W. Spruce	16	61	12	W3rd	3 miles east of Green Lake, Saskatchewan.

8. Negative Reports - 1948 (cont'd)

DATE	HOST	LOCATION SEC.	TP.	RGE.	MER.	DETAILED LOCATION
July 9	W. Spruce	22	60	10	W3rd	1 mile north of junction of Green Lake & Doré Lake Road, Saskatchewan.
July 9	W. Spruce	32	58	9	W3rd	9½ miles south of Beaver Dam on road to Big River, Saskatchewan.
July 12	Jack Pine	10	50	21	W2nd	Fort à la Corne, 1 mile from Prov. Forest boundary on Elk Creek Trail, Saskatchewan.
July 12	Jack Pine	14	50	22	W2nd	On Elk Creek Trail, Fort à la Corne, Sask.
July 13	Jack Pine	33	50	17	W2nd	Fort à la Corne, 3 miles south of boundary English Cabin Trail, Saskatchewan.
July 13	Jack Pine	5	50	19	W2nd	½ miles west of English Cabin, Fort à la Corne, Saskatchewan.
July 14	W. Spruce	21	49	24	W2nd	Red Rock Cabin, Nisbet Prov. Forest, Sask.
July 19	W. Spruce	28	53	26	W2nd	3 miles north of Ranger Station at Emma Lake, Saskatchewan.
July 19	W. Spruce	4	53	26	W2nd	100 yards north of S.E. boundary, Emma Lake Provincial Forest, Saskatchewan.
July 20	Jack Pine	30	54	27	W2nd	1 mile east of dam at Angling Lake, Emma Lake Provincial Forest, Saskatchewan.
July 20	B. Spruce	12	54	26	W2nd	North east end of Angling Lake, Emma Lake Provincial Forest, Saskatchewan.

III (O) SPECIAL REPORTS

1. LARCH SAWFLY - 1948

by L. McDowall and V. Hildahl

INTRODUCTION

The following report contains full information regarding the status of the larch sawfly (Pristiphora erichsonii Htg.) throughout larch stands in the forested areas of Manitoba and Saskatchewan that were covered by the Forest Insect Survey in 1948. Complete coverage of all forested areas in the two provinces was impossible as the time alloted for the survey of larch stands was limited. For this reason examination of some of the more inaccessible stands was omitted. This report also contains information regarding the distribution of larch sawfly, submitted to the Forest Insect Survey by personnel employed by the Provincial Forest Services and private cooperators connected with the lumbering industry.

Except for part of eastern Manitoba, all the information contained in this report is based on ground inspections of the stands. Information on the status and distribution of the larch sawfly in eastern Manitoba from the Winnipeg River in the south to the Berens and Assapan Rivers in the north, was derived chiefly from aerial reconnaissance.

A complete survey of the Northern District of Saskatchewan was not attempted owing to restricted travel and the inaccessibility of the areas concerned. There are few roads in the district and the only means of transportation thus far is by aircraft. For the same reasons many parts of northern Manitoba were not covered during the survey, particularly areas lying north of Lake Winnipeg. Fair coverage was achieved in areas around and north of The Pas in northwestern Manitoba.

(1) Larch Sawfly Distribution - 1948:

This larch feeding insect continued to infest tamarack stands in the provinces of Manitoba and Saskatchewan during 1948.

Very heavy defoliation was noted in the south-eastern portion of Manitoba around East Braintree and McMunn. Along the C.N.W.D. Railway between East Braintree and Shoal Lake, heavy defoliation occurred in most of the tamarack stands examined. Larch sawfly continued to infest tamarack swamps along the Dawson Road, in the northern part of the Sandilands Forest Reserve. In the vicinity of Piney and Sprague in the southern part of the province, defoliation appeared much heavier than last season. In eastern Manitoba larch sawfly showed no sign of abating. The heavy infestation near Seddon's Corner, on the trans-Canada Highway continued to flourish. Tamarack stands east and west of Whitemouth suffered light to heavy defoliation.

Larch sawfly was found to be generally distributed in areas around Lac du Bonnet, Pinawa and Pine Falls, with defoliation ranging from light to heavy. An aerial reconnaissance revealed that larch sawfly feeding was common throughout the area between Lake Winnipeg and the Manitoba-Ontario boundary. Heavy defoliation occurred along the east side of Lake Winnipeg from Hole River south as far as Fort Alexander. Scattered tamarack stands in the areas around Family Lake and Sasaginnigak Lake again suffered light to moderate attacks. Around Little Grand Rapids attacks were noticeably lighter and tamarack was only lightly defoliated.

On the west side of Lake Winnipeg heavy defoliation was noted in tamarack stands on peninsulas in Lake Winnipeg between Grassy Narrows and Fisher Bay. Heavy tamarack defoliation occurred along the western shore of Lake Winnipegosis from the Winnipegosis townsite in the south to Dawson Bay in the north.

Heavy defoliation was also noted on swamps between Pelican Lake and Swan Lake and along the Shoal River leading into Dawson Bay. In the interlake area sawfly activity appeared much lighter than in 1947. At Riverton defoliation ranged from negligible to light. Between Poplarfield and Hodgson, defoliation was very light. Tamarack in this area is small and scattered. In the district from Ashern to Gypsumville, little or no defoliation was observed. A moderate to medium infestation occurred in a swamp one half mile east of Gypsumville. Poor foliage production in this area indicated that sawfly damage had been quite heavy in previous years.

Information derived from reports made during the summer indicated that larch sawfly was quite active in most tamarack stands across western Manitoba.

Tamarack stands between Mafeking and The Pas showed light to heavy defoliation. North of The Pas to Cormorant and Thicket Portage only light defoliation was encountered. Defoliation in the area between Solater and Renwer was seen as medium, and had diminished somewhat since 1947. Several swamps were examined in the Kenville, Durban and Benito area, on the northwest side of the Duck Mountain Forest Reserve, where defoliation was recorded as heavy.

In areas around Singoosh Lake and Blue Lakes defoliation ranged from medium to heavy. Medium to heavy defoliation occurred in the southern section of the Duck Mountain Forest Reserve. One swamp east of the Parrot Tower, along the boundary, suffered the heaviest defoliation. In the western part of the Riding Mountain National Park tamarack defoliation was generally quite heavy. Light tree mortality was recorded, and large numbers of drowned larvae were observed. An infestation of medium proportion was found to exist in the central portion of Riding Mountain National Park. Swamps in this area were exceedingly wet.

Larch sawfly continued to defoliate tamarack stands in the province of Saskatchewan and its westerly spread had greatly increased over that of 1947. In the eastern part of the province defoliation ranged from medium to heavy. Tamarack stands in the Madge Lake area suffered medium to heavy defoliation. North and west of Pelly medium defoliation was recorded. North along Highway No. 9 to Hudson Bay tamarack, in general, suffered heavy defoliation, with the most severe defoliation occurring between Usherville and Tallpines. At McBride Lake in the Porcupine Provincial Forest medium defoliation was observed. In the vicinity of Hudson Bay tamarack was heavily defoliated.

The heaviest defoliation in the western part of the province occurred in a small swamp north of Prince Albert. In the Steep Creek and Red Rock Blocks of the Nisbet Provincial Forest, two small infestations were recorded, both showing only light defoliation. Light attacks of larch sawfly occurred in swamps ten miles west of Prince Albert along highway No. 3. Only light defoliation was noted in the Fort à la Corne Provincial Forest. In the Candle Lake Provincial Forest only a few larvae were found and defoliation was negligible. Larch sawfly was found to be quite general throughout the scattered tamarack stands of Prince Albert National Park. However, only small numbers of this insect were collected and all defoliation noted, appeared very light. Very little sawfly damage was observed in the Big River and Bronson Provincial Forests. A few larvae were found in both places, but only the Bronson Provincial Forest showed any signs of feeding damage.

(ii) Special Stand Inspections:

During the latter part of July and the month of August 1948, an extensive survey of larch swamps was conducted in the provinces of Manitoba and Saskatchewan. In all 109 tamarack swamps were examined, involving approximately 18,000 acres. Swamps were picked at random and a special larch sawfly report was made out for each individual swamp. These reports have been carefully checked in an effort to acquire some information on larch sawfly damage under existing conditions. Out of the total number of swamps examined 18.6 percent were pure stands (80-100% tamarack.) The heaviest defoliation was observed in mixed stands of 80-79 and 20-49 percent tamarack, with the pure stands showing lighter defoliation. Trees in the 3" to 6" diameter class suffered the heaviest defoliation, followed next by those in the 0 to 3" class. Records show that the lightest defoliation occurred on trees over 6" in diameter. Stands of medium density showed the highest percent of defoliation. In stands of light and heavy density defoliation was fairly evenly distributed.

A fair degree of correlation was found between number of curled tips and degree of defoliation. In areas where many curled tips were observed defoliation appeared heavy, with common, occasional and no curled tips, in that order, showing lighter defoliation. Saturated swamps were found to be the most heavily defoliated, with dry swamps showing only light defoliation. However, in the majority of areas where wet swamps occurred, recent rains had been reported a few days previous to examination.

Approximately one third of the total stands contained drowned larvae. Mouse tunnels were observed in almost two thirds of the stands.

% TAMARACK IN EACH DISTRICT

100-80	No. of Plots	79-50	No. of Plots	49-20	No. of Plots	∠ 20	No. of Plots
S - nil	nil	S - 67	2	S - 33	1	S - nil	nil
E - 47	7	E - 47	7	E - 7	1	E - nil	nil
W - 3	1	W - 22	9	W - 75	26	W - nil	nil
N - 33	1	N - nil	nil	N - 67	2	N - nil	nil
HB- 21	4	HB- 37	7	HB- 36	7	HB- 5	1
PA- 17	4	PA- 35	8	PA- 48	11	PA- nil	nil
ML- 33	3	ML- 33	3	ML- 22	1	ML- 11	1

% DEFOLIATION OF TAMARACK IN EACH DISTRICT

100-80	79-50	49-20	∠ 20
S - nil	S - 88	S - 35	S - nil
E - 28	E - 23	E - 50	E - nil
W - 80	W - 47	W - 62	W - nil
N - 15	N - nil	N - 6	N - nil
H.B. - 44	H.B. - 44	H.B. - 60	H.B. - 15
P.A. - 11	P.A. - 11	P.A. - 11	P.A. - nil

RELATION BETWEEN DEFOLIATION AND STAND DENSITY IN EACH DISTRICT

LIGHT		MEDIUM		HEAVY	
S - nil	nil	S - 62	2	S - 85	1
E - 6	4	E - 38	10	E - 70	1
W - 58	12	W - 59	22	W - 65	2
N - 11	2	N - 5	1	N - nil	nil
H.B. - 47	5	H.B. - 56	12	H.B. - 80	2
P.A. - 1	2	P.A. - 20	12	P.A. - 22	9

(iii) Larch Sawfly Questionnaires:

The following is a complete summary of the data contained in the larch sawfly questionnaires. A total of 109 specific reports were submitted in 1948. Wherever possible the data contained in these reports were summarized on the basis of the 109 reports. Where less than 109 were used the actual number of reports involved is shown.

(a) Summary:

Number of reports submitted	-	109
Approximate total acreage of tamarack involved	-	18,000
Average d.b.h. of tamarack	-	4 inches
Range in d.b.h.	-	½ to 10 inches
Average height of tamarack	-	28 feet
Range in height	-	10 to 48 feet
Average defoliation (based on 109)	-	38 percent
Average defoliation (based on 101)	-	41 percent
Percentage of plots showing mortality	-	31 percent
Percentage of stands in which drowned larvae were observed	-	29 percent
Percentage of stands in which mouse tunnels were observed	-	61 percent

Average defoliation was calculated in two different ways. In the first instance where the average defoliation was 38 percent, the calculation was based on the 109 reports. In the second instance where the average defoliation was 41 percent calculation was based on the total number of reports showing evidence of defoliation. One hundred and one reports showed evidence of defoliation. Thirty one percent of the 109 reports showed evidence of some mortality, but for the most part, actual mortality was relatively low and in no instance did it exceed 20 percent.

(b) Relation between Stand Composition and Defoliation: For the analysis of the relationship between stand composition and percentage defoliation in the larch stands examined, stand composition was divided into four classes. The four classes are as follows:

stands composed of;
80-100 percent tamarack
50-79 percent tamarack
20-49 percent tamarack and
< 20 percent tamarack

The results of the data compiled are shown in the following table, (Table A):

- TABLE A -

Relation Between Stand Composition and Percentage Defoliation

No. of Stands in Each Class	% of Total Stands in Each Class	Total No. of Stands Used in Calculations	Stands Composition %	Average Defoliation %
20	19	108	80-100	29
36	33	107	50-79	32
49	47	107	20-49	46
2	2	109	< 20	25

From the table, it appears that very little correlation is evident between stand composition and percentage defoliation; however, owing to the lack of comparable stands and the extreme variation in the degree of infestation in different localities no definite conclusions can be derived. Considering all the stands examined and disregarding their distribution the table indicates that the average defoliation increases as the percentage of tamarack in the stand decreases.

Very little importance can be attached to the less than 20 percent class, as only two widely separated stands were examined. One stand occurred in the Duck Mountain Provincial Forest and the other in the Waterhen Provincial Forest. The first stand, occurring in the Duck Mountain Provincial Forest, suffered 50 percent defoliation, while in the latter, defoliation was negligible, thereby reducing the average defoliation in that class to 25 percent.

For further analysis of the relation between stand composition and percentage defoliation the stands were summarized by districts but the results were again inconclusive, generally speaking. The results of the analysis appear in the table on the following page (Table B).

It is evident from the table that the percentage defoliation in any particular class varies considerably according to district. It may also be noted that if percentage defoliation is classified into four classes:

0-25 percent
26-50 percent
51-75 percent and
76-100 percent

less than 3 percent of the total number of stands were 76-100 percent defoliated; 31 percent were 51 - 75 percent defoliated; 33 percent were 26-50 percent defoliated; and 33 percent were 0 - 25 percent defoliated. An essential point to remember, however, is the fact that the stands involved were examined at different times of the season. Therefore, it is reasonable to assume that had all stands been examined at the same time, the ratio may have been quite different.

- TABLE B -

DISTRICT	STAND COMPOSITION PERCENT							
	80-100		50-79		20-49		< 20	
	No. of Stands	Average Defol. %	No. of Stands	Average Defol. %	No. of Stands	Average Defol. %	No. of Stands	Average Defol. %
Southern	Nil	---	2	88	1	35	Nil	---
Eastern	7	29	7	23	1	50	Nil	---
Western	1	80	9	47	26	63	Nil	---
Northern	1	15	Nil	---	2	6	Nil	---
Hudson Bay	4	44	7	44	7	60	1	15
Prince Albert	4	11	8	11	11	11	Nil	---
Meadow Lake	3	---	3	---	1	---	1	---

(c) Relation between Stand-Density and Defoliation and between Diameter and Defoliation:

-TABLE C-

Relation Between Diameter and Average Defoliation			& Relation Between Stand Density and Average Defoliation		
Diameter Class d.b.h.-inches	No. of Stands in Class	Average Defoliation %	Density Class	No. of Stands in Class	Average Defoliation %
-3	38	16	Heavy	16	32
3.1 - 6	64	35	Medium	61	43
6.1 - 9	5	10	Light	31	32

Stand density was classified as light, medium and heavy. Very little relationship was evident between stand density and average defoliation but it was noted that the heaviest defoliation seemed to occur in stands of medium density with no noteable difference in defoliation in stands of light and heavy densities.
For classification of the relation between tree diameters and average defoliation the stands were divided into three diameter classes (i.e., -3 inches d.b.h.; 3.1-6 inches d.b.h; and 6.1 - 9 inches d.b.h.). In this classification, 35 percent defoliation occurred in the 3.1 - 6 inch d.b.h. class as compared to 16 percent defoliation in the - 3 inch d.b.h. class and 10 percent defoliation in the 6.1 - 9 inch d.b.h. class.

(d) Relation between Curled Tips and Defoliation:

- TABLE D -

CURLED TIPS	NO. OF STANDS INVOLVED	AVERAGE DEFOLIATION %	STANDARD DEVIATION %
Many	43	63	± 22
Common	29	37	± 25
Occassional	19	12	± 12

In most cases standard deviation is relatively high indicating that there is considerable variability in the estimated number of curled tips in relation to defoliation class. However, it is obvious that there is some relation between the number of curled tips and the average defoliation. The heaviest defoliation occurred in stands where many curled tips were observed and less defoliation occurred in the stands where curled tips were common and occassional.

(e) Relation between Defoliation and Moisture: Owing to the lack of complete weather records for the season no definite conclusimm could be derived, therefore, this section was omitted for this year.

(iv) Larch Sawfly Disease (Beauveria sp.) - 1948.

Ten Roux culture flasks which had been seeded with Beauveria spores were received from the Forest Insect Laboratory, Sault Ste. Marie, Ontario, on July 14th. This material was released at various places in larch stands infested with larch sawfly in Manitoba and Saskatchewan. The contents of each flask were first mixed with a small amount of water and additional water was added to make two gallons of suspension. No mixer or blender was used but the preparation was shaken thoroughly in the spray tank. Dobbins Field Sprayers were used to apply the Beauveria culture.

The cultures were released in three locations in Saskatchewan:

(1) Nisbet Provincial Forest (sec. 8, tp. 49, rge. 26, W 2nd mer.)
(2) Nisbet Provincial Forest (sec. 23, tp. 49, rge. 1, W 3rd mer.)
(3) Pelly, Saskatchewan (sec. 15, tp. 34, rge. 32, W 1st mer.)

In Manitoba, two tamarack swamps near Red Rock Lake, in the Whiteshell Forest Reserve were selected as release areas.

Details on Releases:

(1) Nisbet Provincial Forest (sec. 8, tp. 49, rge. 26, W 2nd mer.) 1 mile north of Prince Albert along Highway No. 2.

Release date: July 22, 1948. Time: 10:30 A.M.
Weather: Warm, bright sunlight.
Wind: Southeast at 5 miles per hour.

A clump of three trees was selected and all foliage sprayed. The trees were approximately 20 - 25 feet in height. Defoliation by larch sawfly was extremely heavy in this area with some trees almost completely stripped of foliage. The larvae were well advanced, having almost completed their growth. Two flasks of the culture were released in this area.

Collections of larvae were made on the following dates:

July 31: A collection of larvae was made from the sprayed trees and those in the immediate area. A second collection was made from trees growing several hundred yards away.

August 7: Two collections of larvae were made, one from the sprayed area and one from an area several hundred yards distant.

August 13: Dead, discolored larvae and some with fungus were found at the base of trees which had been sprayed. One collection contained these larvae along with a number of living larvae. A second collection was made less than ¼ mile distant.

August 21: One collection of larvae was made.

October 24: Two collections of cocoons were made. One under the sprayed trees and the other approximately 200 yards east of the sprayed trees in the same stand.

(2) Nisbet Provincial Forest (sec. 23, tp. 49, rge. 1, W 3rd mer.) 2/10 mile south of Orutwell Corner on Highway No. 3.

Release date: July 22, 1948. Time: 3:00 P.M.
Weather: Warm, bright sunlight.
Wind: Southeast at 10 miles per hour.

A group of three trees were selected for spraying. The trees were approximately 20 - 25 feet in height. Defoliation in this area was light on July 22 and the stand was in vigorous condition. At this time larval populations were very high and severe defoliation was expected to occur. The severe attack did not take place, but the reason for the heavy mortality of larch sawfly was not determined. One flask of the culture was released in this area.

Check collections of larvae were made on the following dates:

July 31: Two collections were made; one from the sprayed area and the other at a distance of several hundred yards from the sprayed area.

August 7: One collection of larvae was made from the area immediately surrounding the sprayed area.

August 13: No larvae found in the sprayed area.

(3) Pelly, Saskatchewan (sec. 15, tp. 34, rge. 32, W 1st mer.) 4 miles north of Pelly.

Release date: July 24, 1948. Time: 10:00 A.M.
Weather: Damp, raining at times, no direct sunlight.
Wind: Southeast at 10 miles per hour.

A group of three trees 20 - 25 feet in height was selected for spraying. Defoliation had just commenced but curled tips were numerous and larvae plentiful.

Check collections of larvae were made on the following dates:

August 9: A collection of larvae was made from one of the sprayed trees and from others within 75 feet of the sprayed trees.

August 24: A collection of larvae was made about one mile north of the release area, (sec. 22, tp. 34, rge. 32, W 1st mer.)

(4) Whiteshell Forest Reserve - Red Rock Lake.

Swamp No. 1:
Check collections of larvae were made on the following dates:

August 12: A collection of larvae was made from one sprayed tree. A second collection was made from two trees in a nearby check area.
August 17: A collection of 5 larvae was made from three trees in the sprayed area. A second collection of 23 larvae was made from three trees in the check area.

(5) Red Rock Lake.

Swamp No. 2:
Check collections of larvae were made on the following dates:

August 10: A collection of 74 larvae was made from one sprayed tree. A second collection of 31 larvae was made from one tree in a nearby check area.
August 17: 2 dead larvae were collected from 3 trees examined in the sprayed area. 1 dead larva was collected from 2 trees examined in the check area.

(6) On July 9, 1948, 1.9395 gms. of Beauveria powder and 6 gms. of intramine y. were received from the Forest Insect Laboratory, Sault Ste. Marie. This material was released in the Riding Mountain National Park on the east side of Highway No. 10 near Mile 145 (sec. 26, tp. 21, rge. 19, W.P.mer.)

The Beauveria powder and intramine y. were mixed in 6 gallons of water. The spray was applied to the tree until droplets began to run off the foliage. About 20 trees were selected for spraying and ranged from 5 - 20 feet in height.

The sprayed trees were examined on July 26th, August 4th and August 11th, but no diseased larvae were found.

(v) Larch Sawfly Cocoon Collections and Dissections - 1948:

Dissections by: L. McDowall
J. Lawrence
J. Martin
H. Edmunds
A. Knight

Object

The object was to determine the mortality rate and proportionate cause among overwintering larch sawfly cocoons. Determination of the incidence and spread of larch sawfly parasites, disease and fungi was also sought.

Methods

(i) Collecting was done between the 23rd of August, 1948 and the 8th of October, 1948, and 17,350 larch sawfly cocoons were collected. They were hand-picked from the moss and litter at the base of tamarack trees. Only apparently sound cocoons were picked. One thousand cocoons were sought in each location, but it was not feasible to collect this number in every case. For example, three locations in Riding Mountain National Park yielded only 150 cocoons each. At Riverton, Manitoba; Pelly, Saskatchewan; and in the Fort a la Corne Provincial Forest, 300 or less were obtained.

(ii) Storage: The cocoons were packed in damp moss and placed in screen frames 12" x 12" x 3". No more than 1000 cocoons were placed in each frame. Upon reaching Winnipeg, the frames were stored in an open root cellar. Here the temperature varied with the atmospheric temperature. From +60°F to -40°F would be the approximate temperature range.

(iii) Dissections were begun November 3, 1948 and completed by January 8, 1949. Dissecting was done under the low power lens of binocular microscopes. The larvae were decapitated, inverted with forceps and a blunt needle and the viscera were scraped from the exoskeleton. Then the viscera and exoskeleton were examined for parasites, disease, fungus, etc. Three thousand eight hundred and fifty or 22 per cent of the cocoons were dissected.

(iv) Recording was done according to the headings described below. (See Table A following.)

(a) Origin of Cocoons: gives nearest town, section, township, range and meridian. Sites intended for experimental parasite releases are marked with an asterisk.

(b) Number dissected: gives the number of cocoons dissected from each area.

(c) Living Larvae: gives the number of sawfly larvae which were living and including those which contained only parasite eggs and larvae.

(d) Number Hym. Eggs Only: gives the number of sawfly larvae in which hymenopterous eggs were the only foreign bodies.

(e) Hym. Larvae; gives the number of sawfly larvae which contained hymenopterous larvae.

(f) Dip. Larvae: gives the number of sawfly larvae which contained dipterous larvae.

(h) Fungus: gives the number of sawfly larvae which were affected by either mold or fungus.

(i) Disease: gives the number of sawfly larvae which were apparently diseased.

(j) Miscellaneous: gives the number of sawfly larvae which were dead from mechanical injury, predators, etc.

(k) Cause Unknown: gives the number of sawfly larvae where the apparent cause of death could not be determined.

Table B, which is appended hereto, shows the percentage parasitism by Mesoleius tenthredinis and Bessa harveyi in each area examined in 1942.

TABLE A

Results of Larch Sawfly Larval Dissections Manitoba and Saskatchewan - 1948.

Origin of Cocoons		Parasitism Determined by Dissecting				Dead Larvae				
Place and Location	No. Cocoons Dissected	Living Larvae	Hym. Eggs (Only)	Hym. Larvae	Dip. Larvae	Total Parasitism	Fungus	Disease	Misc.	Unknown Cause	Total Dead
East Braintree, Man., Sec.33,tp.7,rge.14,E.P.mer.	100	87	3	3	1	4	2	2	0	9	13
Prawda, Man., Sec.7,tp.8,rge.13,E.P.mer.	100	78	15	0	1	1	15	0	1	6	22
Seddon's Corner,Man., Sec.3,tp.13,rge.9,E.P.mer.	200	167	7	0	16	16	18	0	4	11	33
Lac du Bonnet,Man., Sec.21,tp.15,rge.12,E.P.mer.	200	101	2	1	16	16	48	1	0	50	99
Lac du Bonnet,Man.,Sec.24,tp.15,rge.11,E.P.mer.	200	159	11	0	15	15	31	0	0	10	41
Riverton,Manitoba.,Sec.32,tp.23,rge.4,E.P.mer.	100	69	1	0	29	29	21	0	1	9	31
Gypsumville, Man., Sec.23,tp.32,rge.9,W.P.mer.	100	81	8	1	14	15	3	0	0	16	19
Mi.245,Dauphin Road,Man.,Sec.11,tp.35,rge.23,W.P.mer.	150	143	18	4	6	10	5	0	2	0	7
Mi.253.2,Dauphin Road,Man.,Sec.15,tp.36,rge.23,W.P.mer.	150	96	16	5	1	6	20	0	3	31	54
Whirlpool Lake Road,Man.,Sec.5,tp.20,rge.17,W.P.mer.	100	67	15	2	11	13	9	0	1	23	33
Dauphin Road, Man., Sec.35,tp.21,rge.19, W.P.mer.	50	43	23	1	3	4	3	0	0	4	7
Morgate Road, Man., Sec.31,tp.19,rge.17,W.P.mer.	50	48	7	1	23	24	0	0	0	2	2
Lake Audy Road,Man., Sec.1,tp.21,rge.20,W.P.mer.	50	41	3	3	3	6	3	0	2	4	9
P.O.W. Road, Man., Sec.12,tp.21,rge.21,W.P.mer.	200	182	39	2	0	2	6	0	1	11	18
Mafeking, Manitoba, Sec.19,tp.44,rge.25,W.P.mer.	200	186	4	2	0	2	3	1	2	8	14
Mafeking, Manitoba, Sec.16,tp.46,rge.25,W.P.mer.	200	189	27	5	9	14	2	0	1	8	11
Pelly, Sask., Sec. 22, tp. 34, rge. 32, W. P. mer.	50	44	23	2	1	3	4	0	0	2	6
Usherville, Sask., Sec.9 & 10, tp.38,rge.5, W.2nd mer.	200	175	10	2	4	6	6	0	0	19	25
Tallpines, Sask., Sec. 2, tp. 39, rge. 5, W. 2nd mer.	200	193	5	0	1	1	1	0	0	6	7
Hudson Bay, Sask., Sec. 9, tp. 45, rge. 3, W. 2nd mer.	200	187	12	4	3	7	12	0	0	1	13
Hudson Bay, Sask., Sec. 6, tp. 44, rge. 2, W. 2nd mer.	200	189	40	6	3	9	7	0	0	4	11
Fort a la Corne,Sask., Sec. 9, tp. 50, rge. 22, W.2nd mer.	100	70	0	1	0	1	6	0	0	24	30
Nisbet Prov.For.,Sask.,Sec.8,tp.49,rge.26,W.2nd mer.	200	191	41	4	3	7	2	0	1	6	9
Nisbet Prov.For.,Sask.,Sec.6,tp.49,rge.23,W.2nd mer.	200	195	13	1	1	2	3	0	0	2	5

TABLE B

Larch Sawfly Parasitism as Determined by Dissections
Manitoba and Saskatchewan - 1948

Origin of Cocoons	% Parasitism			
Place and Location	Mesoleius Eggs (Only)	Mesoleius tenthredinis	Bessa harveyi	Total Parasitism
East Braintree,Man.,Sec.33,tp.7,rge.14,E.P.mer.	3.4	3.4	1.1	4.6
Prawda,Man.,Sec.7,tp.8,rge.13,E.P.mer.	19.2	0	1.3	1.3
Seddon's Corner,Man.,Sec.3,tp.13,rge.8,E.P.mer.	4.2	0	9.6	9.6
Lac du Bonnet,Man.,Sec.21,tp.15,rge.12,E.P.mer.	2.0	1.0	15.8	16.8
Lac du Bonnet,Man.,Sec.24,tp.15,rge.11,E.P.mer.	6.9	0	9.4	9.4
Riverton,Man.,Sec.32,tp.23,rge.4,E.P.mer.	1.4	0	42.0	42.0
Gypsumville,Man.,Sec.23,tp.32,rge.9,E.P.mer.	9.9	1.2	17.3	18.5
Mi.245 Renwer,Man.,Sec.11,tp.36,rge.23,W.P.mer.	12.6	2.8	[illegible]	7.0
Mi.253.2 Renwer,Man.,Sec.15,tp.36,rge.23,W.P.mer.	16.7	5.2	[illegible]	6.2
Whirlpool Lake,R.M.N.P.,Man.,Sec.5,tp.20,rge.17,W.P.mer.	22.4	3.0	[illegible]	19.4
Mi.145 Dauphin Road,Man.,Sec.26,tp.21,rge.19,W.P.mer.	53.5	2.3	7.0	9.3
Norgate Road,R.M.N.P.,Man.,Sec.31,tp.19,rge.17,W.P.mer.	14.6	2.1	47.9	50.0
Lake Audy Road,R.M.N.P.,Man.,Sec.1,tp.21,rge.20,W.P.mer.	7.3	7.3	7.3	14.6
B.C.N. Road,R.M.N.P.,Man.,Sec.12,tp.21,rge.21,W.P.mer.	21.4	1.1	0	1.1
Mafeking,Man.,Mi.8.4, Sec.19,tp.44,rge.25,W.P.mer.	2.2	1.1	0	1.1
Mi.20,Mafeking,Man.,Sec.16,tp.46,rge.25,W.P.mer.	14.3	2.6	4.8	7.4
5 miles N. Pelly,Sask.,Sec.22,tp.34,rge.32,W.P.mer.	52.3	4.5	2.3	6.8
½ mi. N. Usherville,Sask.,Sec.9,tp.38,rge.5,W.2nd mer.	5.7	1.1	2.3	3.4
2 miles S. Tallpines,Sask.,Sec.2,tp.39,rge.5,W.2nd mer.	2.6	0	.6	.6
½ mi. E. Hudson Bay,Sask.,Sec.9,tp.45,rge.3,W. 2nd mer.	6.4	2.1	1.6	3.7
8.9 miles S.E. Hudson Bay,Sask.,Sec.6,tp.44,rge.2,W.2nd mer.	21.2	3.2	1.6	4.8
Fort a la Corne Prov.For.,Sask.,Sec.9,tp.50,rge.22,W.2ndmer.	0	1.4	0	1.4
Nisbet Prov.For.,Sask.,Sec.8,tp.49,rge.26,W.2ndmer.	21.5	2.1	1.6	3.7
Nisbet Prov.For.,Sask.,Sec.6,tp.49,rge.23,W.2nd mer.	6.7	.5	.5	1.0

(vi) Larch Sawfly Rearings:

During the early part of 1949, several thousand larch sawfly cocoons which were collected in the fall of 1948 were reared in an incubator to determine larch sawfly parasitism based on actual emergents.

The cocoons were reared on moist cotton in jelly jars; 20 cocoons per jar. The cocoons were placed in the incubator on January 26. The initial temperature in the incubator was 45° F. Prior to the date of incubation, the cocoons had been stored in a root-cellar for approximately three months where temperatures ranged from + 60° F. to - 40° F. During the first part of the incubation period, the temperature in the incubator was increased gradually until a maximum of 70° F., was reached about three weeks after the date of incubation. During this period, the relative humidity averaged 90 per cent.

Mould and fungus, which developed readily owing to the humid conditions in the incubator, caused considerable mortality in the cocoons, during incubation. The cocoons were treated with a one per cent solution of copper sulphate but it was ineffective. All cocoons which were affected by mould and fungus were discarded during the period of incubation.

Parasites commenced emerging twenty days after date of incubation. Larch sawfly emergents were somewhat later and did not commence until 30 days after date of incubation.

At the end of 70 days, all remaining unemerged cocoons were dissected and the stage of development and condition of the larvae recorded.

Results of the rearings were summarized and are shown in Tables A and B which are appended hereto. The percentage parasitism shown in Table B is based only on the number of adult emergents plus the number of living larvae, pupae and adults which were determined by dissection.

TABLE A

Summary of Larch Sawfly Rearings Manitoba and Saskatchewan - 1948.

Origin of Cocoons	No. of Cocoons Reared	No. of Emergents				No. of Living in Cocoons (Unemerged)						No. of Dead Unemerged						
		Sawfly Adults		Parasites		Sawflies			Parasites			Unemerged			No. of Discards			
									Hym.		Dip.							
		Female	Male	Dip.	Hym.	Larvae	Pupae	Adults	E.	L.	Larvae	Larvae	Pupae	Adult	Mould Fungus	Disease	Mech. Damage	Misc.
East Braintree, Man.	300	69	1	0	0	17	6	0	0	0	3	0	1	4	154	25	19	1
Prawda, Man.	300	135	1	0	1	19	23	0	1	0	0	0	3	5	102	3	7	0
Seddon's Corner, Man.	300	93	0	15	2	52	28	0	0	0	6	0	5	3	55	18	22	1
Cypsumville, Man.	300	34	1	5	0	18	12	0	1	0	1	0	1	2	194	17	11	3
Riverton, Man.	180	20	0	11	0	19	2	6	0	0	0	0	0	0	78	18	12	14
Lac du Bonnet, Man.	280	22	0	0	0	18	6	10	1	0	0	0	0	0	162	46	13	2
Lac du Bonnet, Man.	200	8	0	1	0	11	0	2	0	0	0	1	0	0	108	42	25	2
P.O.W.Rd, R.M.N.P., Man.	375	165	1	0	4	18	23	8	4	2	1	4	3	3	77	29	5	23
Mi.145, Dauphin Rd., Man.	50	14	0	2	1	1	0	2	0	1	0	1	0	1	14	11	0	2
Mi.7, Norgate Rd., Man.	75	18	0	11	1	10	4	0	0	0	0	0	0	0	26	3	0	2
Whirlpool Lk., R.M.N.P., Man.	200	27	1	9	1	15	8	6	0	0	0	0	0	2	73	30	3	25
Mi.13, Lake Audy Rd., Man.	100	30	0	0	1	9	5	9	0	0	0	1	4	1	38	7	5	5
Mi.245, Renwer, Man.	220	43	1	0	0	16	8	0	1	0	0	3	3	2	85	19	22	2
Mi.253.2, Renwer, Man.	200	31	0	0	0	11	6	0	1	0	0	5	0	0	96	10	20	20
Mi.8.4, Mafeking, Man.	300	108	4	0	1	38	17	0	1	0	0	8	6	3	30	21	43	0
Mi.20, Mafeking, Man.	280	131	0	2	3	27	16	9	0	0	0	0	1	9	45	30	16	0
5 mi.N., Pelly, Sask.	170	31	1	0	2	16	6	2	2	1	0	0	0	1	43	45	8	12
8.9 mi.S.E.Hudson Bay, Sask.	300	80	0	4	3	80	20	33	2	0	0	1	1	1	42	22	4	7
½ mi.E., Hudson Bay, Sask.	300	96	0	7	0	34	17	0	0	0	0	2	5	4	60	56	19	0
½ mi.N., Usherville, Sask.	300	82	1	1	1	50	15	0	0	0	3	1	6	9	61	40	29	1
2 mi.S., Tallpines, Sask.	300	137	2	1	1	21	13	5	0	0	0	0	0	1	83	30	0	6
Fort a la Corne, P.F., Sask.	75	32	0	0	0	19	2	4	0	0	0	0	0	0	13	1	1	3
Nisbet Prov.For., Sask.	475	196	4	0	2	28	7	7	2	0	0	1	4	2	113	61	43	5
Steep Creek Blk., Sask.	375	178	4	0	1	22	3	3	0	0	0	2	6	3	74	71	7	1

TABLE B

Larch Sawfly Parasitism Determined by Rearings
Manitoba and Saskatchewan - 1948

Origin of Cocoons	% Parasitism		
Place and Location	Hym.	Dip.	Total Parasitism
East Braintree,Man.,Sec.33,tp.7,rge.14,E.P.mer.	0	0	0
Prawda,Man.,Sec.7,tp.8,rge.13,E.P.mer.	.6	0	.6
Seddon's Corner,Man.,Sec.3,tp.13,rge.9,E.P.mer.	1.0	7.9	8.9
Gypsumville,Man.,Sec.23,tp.32,rge.9,W.P.mer.	0	7.1	7.1
Riverton,Man.,Sec.32,tp.23,rge.4,E.P.mer.	0	19.0	19.0
Lac du Bonnet,Man.,Sec.24,tp.15,rge.11,E.P.mer.	0	0	0
Lac du Bonnet,Man.,Sec.21,tp.15,rge.12,E.P.mer.	0	4.5	4.5
P.O.W. Rd.,R.M.N.P.,Man.,Sec.12,tp.21,rge.21,W.P.mer.	1.8	0	1.8
Mi.145,Dauphin Rd.,Man.,Sec.25,tp.21,rge.19,W.P.mer.	5.0	10.0	15.0
Mi.7,Norgate Rd.,Man.,Sec.31,tp.19,rge.17,W.P.mer.	2.3	25.0	27.3
Whirlpool Lk.Rd.,R.M.N.P.,Man.Sec.5,tp.20,rge.17,W.P.mer.	1.5	13.4	14.9
Mi.13,Lake Audy Rd.,Man.,Sec.1,tp.21,rge.20,W.P.mer.	2.2	0	2.2
Mi.245,Renwer,Man.,Sec.11,tp.35,rge.23,W.P.mer.	0	0	0
Mi.253.2,Renwer,Man.,Sec.15,tp.36,rge.23,W.P.mer.	0	0	0
Mi.8.4,Mafeking,Man.,Sec.19,tp.44,rge.25,W.P.mer.	.6	0	.6
Mi.20,Mafeking,Man.,Sec.16,tp.46,rge.25,W.P.mer.	1.7	1.1	2.8
5 mi.N.,Pelly,Sask.,Sec.22,tp.34,rge.32,W.P.mer.	1.7	0	1.7
8.9 mi.S.E.,Hudson Bay,Sask.,Sec.6,tp.44,rge.2,W.2nd mer.	1.4	1.8	3.2
½ mi.E.,Hudson Bay,Sask.,Sec.9,tp.45,rge.3,W.2nd mer.	0	4.5	4.5
½ mi.N.,Usherville,Sask.,Sec.9,tp.38,rge.5,W.2nd mer.	.7	.7	1.3
2 mi.S.,Tallpines,Sask.,Sec.2,tp.39,rge.5,W.2nd mer.	.6	.6	1.1
Fort a la Corne P.F.,Sask.,Sec.9,tp.50,rge.22,W.2nd mer.	0	0	0
Nisbet Prov.For.,Sask.,Sec.8,tp.49,rge.26,W.2nd mer.	.8	0	.8
Steep Creek Blk.,Sask.,Sec.6,tp.49,rge.23,W.2nd mer.	.5	0	.5

2. JACK PINE AND SPRUCE BUDWORM

By J. Lawrence, L. L. McDowall
and V. Hildahl

INTRODUCTION

The following report contains complete information regarding the status of jack pine and spruce budworm (Choristoneura fumiferana Clem.) in the jack pine and spruce stands examined throughout Manitoba and Saskatchewan during 1948. Both aerial and ground surveys were carried out to determine the extent of infestation.

In addition this report contains complete data on population counts which were made at the following places in Manitoba:

Sandilands Forest Reserve,
Seddon's Corner and along the
Cowan-Renwer road.

It also contains information on a budworm defoliation survey carried out in the Sandilands Forest Reserve. Maps and tables covering the defoliation survey are also included.

A. Jack Pine Budworm (Choristoneura fumiferana Clem.)

(1) Distribution:

Severe defoliation by this insect was encountered in the Sandilands Forest Reserve. During July and August, current budworm defoliation was mapped. While some areas showed heavier defoliation than in preceeding years, other areas were showing a gradual tapering off from heavy to medium intensity. In the southern part of the Reserve, defoliation appeared somewhat lighter than last season, but in the northern portion, new 'pockets' of heavy defoliation were recorded. A light to medium infestation of this insect was found in an area around Badger, in the southern portion of Manitoba. This area is quite extensive and is located in sections 5, 6, 8 and 9, tp. 3, rge. 12, E.P.mer.

A survey of the Whiteshell Forest Reserve in Manitoba south of Betula and Whiteshell Lakes indicated that the jack pine budworm infestation was very light or negligible, except near Red Rock Lake where it had increased in severity and is from moderate to heavy.

In the Lac du Bonnet-Whiteshell area, several small infestations were recorded. At Seddon's Corner budworm still continued to attack jack pine, with defoliation ranging from light to moderate. Light traces of budworm were encountered along the Trans-Canada highway between Seddon's Corner and Whitemouth. Several small collections of this insect were made along highway No. 11, between Seddon's Corner and Lac du Bonnet, but no defoliation was observed. Three miles north of Lac du Bonnet in sec. 4, tp. 16, rge. 11, E.P.mer., one budworm larva was found east of Lac du Bonnet, a light trace of budworm was encountered in sec. 36, tp. 15, rge. 12, E.P.mer., along the Point du Bois road. Light defoliation was noted in the area around Sasaginnigak Lake.

Activity by this insect increased considerably throughout eastern Manitoba in 1948. An aerial survey was conducted in eastern Manitoba during the early part of August (August 6 - 10) to determine and map the extent of budworm damaged jack pine. The entire region of Manitoba lying east of Lake Winnipeg from the Winnipeg River in the south to the Berens and Pigeon Rivers in the north was covered during this survey. In addition the area around and to the north of Family Lake was also observed.

Throughout almost the entire region outlined above the terrain is marked by rock ridges running in an east-west direction. Jack pine predominates in this region, but there are many good stands of white spruce and some scattered balsam fir growing along the many rivers and bordering the lake shores. Swamps are also numerous and are wooded with black spruce and tamarack.

When the 1947 survey of this region was made, only one area of budworm damaged jack pine was visible from the air and it occurred at Aikens Lake near the Manitoba-Ontario boundary. This year in the same region, several 'pockets' of budworm damaged jack pine were visible from the air. In 1947 the closest Ontario infestation occurred at Musclow Lake, nine miles east of the Manitoba boundary. This year it extneded into Manitoba at several places along approximately eighty miles of the border. It is possible that the 'pockets' of infestation now evident in Manitoba may merge into a general attack in 1949. The areas affected are described in some detail below.

The most northerly point where the Ontario infestation extended into Manitoba was at Hobb Lake where approximately sixteen square miles of jack pine were attacked. Another extension of the Ontario infestation into Manitoba, which involved approximately 80

square miles of jack pine forest, crossed the Manitoba border four miles north of Garner Lake and recrossed the border into Ontario just south of Odd Lake. It extended westward from the Manitoba-Ontario boundary a distance of approximately four miles and then swung south to Garner Lake, from there westward about eight miles, thence south past Tooth and Flintstone Lakes and eastward to the Manitoba-Ontario boundary at Odd Lake.

Another infested area covering approximately 25 square miles crossed the Manitoba-Ontario boundary at McGregor Lake and continued in a south westerly direction to Tulabi Lake, thence south to Star and Summerhill Lakes and eastward to the Manitoba-Ontario boundary, recrossing the border just south of Davidson Lake.

Two small areas of budworm damaged jack pine were located on the Manitoba-Ontario boundary one covering an area of about two square miles located between Obukowin and Carroll Lakes and the other covering approximately six square miles just south of Ryerson Lake. (Ryerson Lake is located at the north west corner of the Whiteshell Forest Reserve.) Another very small area (about one square mile) of budworm damaged jack pine was observed from the air on the northern shore of nearby Oiseau Lake.

The infestation observed from the air in 1947 between Aikens and Obukowin Lakes had increased in intensity in 1948. Cut off by a fire burn at the north, it covered an area of approximately 25 square miles. A new outbreak of about four square miles was observed this year two miles to the south-west of this larger infestation.

Several 'pockets' of budworm damaged jack pine

were observed farther west in the same region. The largest 'pocket' covered at least one hundred square miles. Located south-east of Bisset Manitoba, it was bounded on the north by the Wanipigow River and on the south by the Manigotagan River. Other infestations occurred to the north and northwest of Bissett. One 'pocket' was located immediately north of the town site of Bissett, and the other 'pocket' about eighteen miles to the northwest. Each covered about thirty square miles. About eight miles south west of Bissett evidence of defoliation was noted in about 35 square miles of jack pine.

Lightly defoliated jack pine was evident around Sasaginnigak Lake. However, it should be noted that the survey was limited to one flight in the area west of Bissett in the south, and Sasaginnigak Lake in the north, between the Wanipigow and Bloodvein Rivers. Adverse weather conditions and smoke haze made mapping difficult. There was no complete survey of the area west of Sasaginnigak and Family Lakes between the Bloodvein and Berens Rivers. The area between the Berens and Assapan Rivers east of Lewis and Horseshoe Lakes was surveyed but no budworm damage was observed.

Jack pine stands in tp. 17 and 18, rge. 8, E.P. mer., north of Stead were examined in November for damage resulting from budworm attacks which occurred in the spring of 1948. According to Mr. Gilmore, Forest Ranger, about 12 square miles are affected. The majority of the jack pine in the area is mature and some regeneration was noted in the more open stands.

Moderate budworm damage was observed throughout all jack pine stands examined north of Stead. Defoliation was not uniform over the entire area and varied considerably on individual trees. Open growing trees and stands on the higher ground suffered the heaviest damage. Trees growing on slopes and on lower ground where growth was more vigorous were less

severely attacked. Owing to the time at which the inspection was made it was difficult to estimate the degree of defoliation, particularly current damage. However, it was estimated that accumulated defoliation --which takes into account feeding which took place during 1948 and possibly feeding in previous years-- averaged approximately 30% with a range of 0 to 70%. Since the past history of the budworm in this area is not known, it cannot be stated definitely that it caused all the defoliation.

Jack pine budworm populations increased considerably during the 1948 season in the interlake district of Manitoba. A medium infestation was observed about 12 miles north west of Riverton and covered approximately 40 square miles. The jack pine stands in this area are found growing on a ridge running north and west and are bordered on both sides by black spruce and tamarack swamps. Collections of this insect were made 1/10 of a mile north of the Riverton fire tower in sec. 1, tp. 25, rge. 2, E.P.mer., and in sec. 11, tp. 25, rge. 2, E.P.mer. No serious feeding was noted at the time of examination (June) as most of the larvae were still in the buds. In the Gypsumville area, jack pine budworm was found attacking jack pine 4/10 of a mile north of the town of Gypsumville but damage was very light and only a few larvae were found.

Although extensive sampling of jack pine was carried out through the western district of Manitoba and the eastern district of Saskatchewan only a few larvae were collected and only slight damage was noted.

The area in which most of the activity occurred was in the Cowan-Renwer district in sections 2, 15,

and 17, tp. 36, rge. 23, W.P.mer. In general the infestation in this district was considered light, as numberous other areas along this jack pine ridge were examined for budworm larvae with no success.

In eastern Saskatchewan only one collection was made and this along the Tower Road in sec. 31, tp. 45, rge. 4, W. 2nd mer. The area was examined at approximately every ½ mile but no further evidence of this insect could be found.

From Hudson Bay a sandy ridge extends southward for three miles swinging east for approximately 28 miles forming what is call the Ridge Road. The dominant host along the top of this ridge is jack pine. At various intervals samples were made on the jack pine, particularly in the mature, open growing staminate trees, but no defoliation or budworm activity was detected.

During June, an extensive survey for jack pine budworm was carried out in the Prince Albert and Big River Forest districts of Saskatchewan.

Throughout this survey only a single budworm sample was found and no defoliation was observed. The collection was made in sec. 36, tp. 39, rge. 24, W. 2nd mer., in the Nisbet Provincial Forest.

Again in July this survey was continued and only one pupa of the jack pine budworm was found and this was in the MacDowall Block of the Nisbet Provincial Forest, sec. 35, tp. 47, rge. 1, W. 3rd mer. No reports of this insect were received from the northern and western districts of Saskatchewan.

(ii) Negative Reports:

The following table contains a complete list of all jack pine samples received from the start of the season to July 31st, that were negative for jack pine budworm. Samples which were entirely negative and contained no insects are also shown in the table as negative reports.

TABLE A

JACK PINE SAMPLES NEGATIVE FOR JACK PINE BUDWORM

Start of Season to July 31st, 1948

F.I.S. NO.	COLL. DATE	DIST. (FOREST)	EXACT LOCATION
129	7-6-48	Eastern	N.W. of Riverton at First Sample Stn. 26-24-2 E.P.M.
160	8-6-48	Western	RMNP, Norgate Rd., 100 yrds W of mi. 14. 33-19-17 W.P.M.
211	9-6-48	P.A.	15 mi. north of White Fox along Flin Flon Hwy. W 2 mer.
229	11-6-48	Eastern	Near Gypsumville, Man. 24-31-10 W.P.M.
243	11-6-48	P.A.	Nisbet P.F. 3½ mi. west of P.A. tp.49-27 W 2 mer.
257	10-6-48	Eastern	In jack pine stand near lake (Lee Lk.?) 23-26-1 E.P.M.
374	16-6-48	P.A.	16 miles south of Big River tp. 55-7-W 3 mer.
388	17-6-48	Western	Ranger Stn-Shell River 34-30-28 W 1 mer
391	17-6-48	Western	Ranger Stn-Shell River 34-30-28 W 1 mer
427	18-6-48	Southern	Sandilands F. R. 29-5-9 E.P.M.
492	21-6-48	P.A.	North of Sanitarium along little Red River tp. 49-26 W 2 mer.
493	22-6-48	P.A.	Nisbet P.F. NE of Red Rock Tower 36-49-24 W 2 mer.
589	24-6-48	Western	2 miles north of Cowan, Man. 2-36-23-W 1 mer.
607	28-6-48	Eastern	Whitemouth Tower 35-12-9 E.P.M.
611	28-6-48	Western	North of Cowan, Man. 2-36-23 W 1 mer.
614	28-6-48	Western	3 miles north of Cowan, Man. 10-36-23 W 1 mer.
618	28-6-48	Eastern	Whitemouth Tower 35-12-9 E.P.M.
709	5-7-48	H.B. No. 12	Pasquia F.R. Tower Road 6-46-4 W 2 mer
717	5-7-48	H.B. No. 12	Pasquia F.R. Tower Road 6-46-4 W 2 mer.
753	5-7-48	Eastern	Seddon's Corner - Whitemouth Tower Road 35-12-9 E.P.M.
776	6-7-48	H.B. No. 11	3 mi. south of H.B. at start of Pine Ridge 26-44-3 W 2 mer.

JACK PINE SAMPLES NEGATIVE FOR JACK PINE BUDWORM (CONT'D)

F.I.S. NO.	COLL. DATE	DIST. (FOREST)	EXACT LOCATION
779	6-7-48-	H.B.	Mi. 3 Spruce Products Rd. 22-45-4 W 2 mer.
780	6-7-48-	H.B.	2½ mi. south of Hudson Bay, Sask. 34-44-3 W 2 mer.
782	6-7-48	H.B. No. 11	3 mi. south of Hudson Bay, Sask. 26-44-3 W 2 mer.
794	7-7-48	B.R.-P.A.	6 miles south of Beauprè Cabin 6-63-9 W 3 mer.
803	8-7-48	M.L.	M.L.F.R. West side of Hwy. No. 4 23-56-17 W 3 mer.
862	12-7-48	P.A.	Ft. à la Corne-Elk Creek Trail 22-50-20 W 2 mer.
902	13-7-48	P.A.	Ft. à la Corne 2 mi south of N border of Reserve 3-51-19 W 2mer.
912	14-7-48	Western	½ mile W of Novra 7-41-26 W 1 mer.
918	14-7-48	Western	1 mile N of Novra 18-41-25 W 1 mer.
923	14-7-48	Western	½ mile W of Novra 7-41-26 W 1 mer.
935	14-7-48	P.A.	Nisbet P.F. at Sample Plot No. 14 18-48-27 W 2 mer.
936	14-7-48	P.A.	Nisbet P.F. Sample Plot No. 5 22-49-24 W 2 mer.
949	14-7-48	P.A.	Nisbet P.F. Sample Plot No. 6 31-49-24 W 2 mer.
951	15-7-48	Eastern	2 miles W of Point Du Bois 6-16-14 E.P.M.
977	16-7-48	Eastern	2 miles E of Whitemouth Tower 28-13-10 E.P.M.
1004	19-7-49	P.A.	Emma Lake P.F. 9-53-26 W 2 mer.
1040	20-7-48	P.A.	Emma Lake P.F. NE end of Angling Lake 12-54-26 W 2 mer.
1045	20-7-48	Southern	1½ miles SE of Reynolds 21-8-12 E.P.M.
1050	20-7-48	Southern	1½ miles SE of Reynolds 21-8-12 E.P.M.
1065	21-7-48	P.A.	Nisbet P.F. Sample Stn. No. 10 16-48-25 W 2 mer.
1067	21-7-48	P.A.	Nisbet P.F. 1/4 mile North of Sanitarium Rd. 16-48-25 W 2 mer.
1068	21-7-48	P.A.	Nisbet P.F. ¼ mile North of Sanitarium Rd. 16-48-25 W 2 mer.
1109	22-7-48	Northern	Mi. 63 Pas Hwy. tp.49-25 W 1 mer.
1144	23-7-48	Southern	Sandilands F.R. 1 mi. W of E boundary 15-7-11 E.P.M.

JACK PINE SAMPLES NEGATIVE FOR JACK PINE BUDWORM (CONT'D)

F.I.S. NO.	COLL. DATE	DIST. (FOREST)	EXACT LOCATION
1145	23-7-48	Southern	One mile W of Dawson Ranger Cabin 36-7-10 E.P.M.
1152	22-7-48	Southern	3 miles E of S Junction 18-1-14 E.P.M.
1166	24-7-48	P.A.	Nisbet P.F. 2½ miles N of MacDowall Ranger H.Q. 5-47-1 W 3 mer.
1264	28-7-48	B.R.	B.R.P.F. 6½ mi. from junction on Otter Hill Tower Rd. 2-57-8 W 3 mer.
1266	28-7-48	B.R.	B.R.P.F. 3 mi. NW of Otter Hill Tower 18-57-8 W 3 mer.
1267	28-7-48	B.R.	B.R.P.F. 1 mi from junction on Otter Hill Tower Rd. 14-56-8 W 3 mer.
1278	29-7-48	B.R.	B.R.P.F. On road to Caribou Hill 29-56-8 W 3 mer.
1281	29-7-48	B.R.	B.R.P.F. on road to Caribou Hill 30-56-8 W 3 mer.
coop neg.	10-6-48	Western	R.M.N.P. Clear Lake
coop neg.	19-6-48	Western	R.M.N.P. Clear Lake
neg.	6-7-48	B.R.-PA	7 miles south of Doré Lake 8-65-9 W 3 mer.
neg.	8-7-48	M.L.	M.L.P.F. ½ mile E of Tower 36-56-17- W 3 mer.
neg.	8-7-48	M.L.	M.L.P.F. 1 mile east of Tower 36-56-17-W 3 mer.
neg.	12-7-48	P.A.	Ft à la Corne-Elk Creek Trail 10-50-21 W 2 mer.
neg.	12-7-48	P.A.	Ft à la Corne-Elk Creek Trail 14-50-22 W 2 mer.
neg.	13-7-48	P.A.	Ft à la Corne-½ mi. W of English Cabin 5-50-19 W 2 mer.
neg.	13-7-48	P.A.	Ft à la Corne 3 miles S of N border 35-50-19 W 2 mer.
neg.	19-7-48	Northern	1 mile N of Sherridon, Man.
neg.	20-7-48	P.A.	Emma Lake P.F. 1 mi E of Angling Lake 30-54-27 W 2 mer.
neg.	21-7-48	P.A.	Nisbet F.R.-Steep Creek Block 13-48-23 W 2 mer.
neg.(686)	3-7-48	Northern	South of Lac la Ronge 33-64-24 W 2 mer.
neg.(686)	3-7-48	Northern	South of Lac la Ronge 14-63-24 W 2 mer.

(iii) Defoliation Survey - Sandilands Forest Reserve.

The following maps and tables comprise complete information on the survey of current jack pine budworm defoliation made in the Sandilands Forest Reserve during 1948. This survey of approximately eight days duration was carried out during the last week of July and in the first week of August.

Wherever possible all trails were covered by truck throughout the reserve. Stops were made at half mile intervals and at these points an estimate of defoliation on jack pine was made in each of three diameter classes:

0 - 5 inches
5 inches - 10 inches
10 inches and over

The percentage of dead tops at each inspection point was recorded in the same diameter classes as mentioned above. The number of dead trees was also tallied. This was based on a count of 50 trees at each inspection point. A description of each stand examined was made, and a record of whether a light or heavy crop of staminate flowers existed. An estimated average of trees d.b.h. in each location was tabulated.

SUPERIOR NATIONAL FOREST
SUPERIOR NATIONAL FOREST RESERVE
1 9 4 8

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stem.	Est. Av. of D.B.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
S.E.-33-5-9	-	M	-	-	None	-	None	H	8"	Mature, density light
S.E.-26-5-9	L	L	L	None	2%	None	None	L	7"	Mature, density light
S.W.-25-5-9	M	-	-	None	-	-	None	H	3"	Very light regeneration, 2nd growth density medium
S.W.-24-5-9	M	-	-	10%	-	-	None	L	3"	2nd growth density light
S.E.-24-5-9	L	-	-	None	-	-	None	L	3"	Scattered 2nd growth density light
S.E.-10-5-9	L	-	-	None	-	-	4	L	3"	Very scattered 2nd growth
N.E.-16-5-10	L	-	-	None	-	-	1	L	4"	2nd growth density medium to heavy
S.E.-16-5-10	L	L	-	None	None	-	None	L	5"	Mixed mature & 2nd growth density medium
S.E.-8-5-10	L	L	-	None	None	-	5	L	4"	Very scattered 2nd growth density light
S.E.-8-5-10	L	M	-	4%	3%	-	6	L	8"	Mature & 2nd growth density medium
S.W.-8-5-10	M	L	-	None	None	-	1	L	5"	Mature & 2nd growth density medium
N.E.-5-5-10	M	M	-	None	None	-	None	H	8"	Mature & 2nd growth density medium
S.E.-4-5-10	L	-	-	None	-	-	None	L	3"	Cut over density heavy
N.E.-33-4-10	L	-	-	None	-	-	None	L	4"	2nd growth density heavy
S.E.-33-4-10	L	-	-	None	-	-	None	L	3"	2nd growth density heavy
N.E.-28-4-10	M	M	-	None	None	-	None	H	9"	Mature density medium
N.E.-26-5-	L	L	-	None	None	-	None	L	9"	Mature density medium, some trees part dead; cutting operations in this area

(continued)

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stk.	Est. Av. of D.B.H.	Remarks
	0"-5	5"-10	10"+	0"-5	5"-10	10"+				
S.W.-26-5-3	H	H	-	None	6%	-	None	H	6"	Mature & 2nd growth; some cutting operations; density medium
N.W.-23-5-3	M	M	-	None	10%	-	None	H	8"	Mature & 2nd growth; density medium
S.W.-23-5-3	M	M	-	None	12%	-	None	H	5"	Mature & 2nd growth; density medium
S.E.-22-5-3	L	M	-	None	None	-	None	H	5"	Mature & 2nd growth; density medium
S.E.-15-5-3	L	M	-	1%	None	-	2	H	6"	Mature; density medium
N.E.-10-5-3	L	L	-	None	None	-	3	L	5"	Mature; density medium
N.W.-10-5-3	L	-	-	None	-	-	None	L	4"	Mature scattered light
S.W.-10-5-3	L	-	-	None	-	-	None	L	4"	2nd growth density medium
W.E.-1-5-3	L	M	-	None	None	-	1	H	7"	Mature 2nd growth; density light
N.W.-34-4-3	M	M	-	None	None	-	None	L	8"	Mature & 2nd growth open growing; density light
S.E.-34-4-3	L	L	-	None	None	-	None	H	5"	Mature; density light
S.E.-34-4-3	M	M	-	None	None	-	2	H	5"	Mature & 2nd growth; density light
S.W.-26-4-3	L	L	-	6%	None	-	None	L	4"	Mature & 2nd growth; density light
S.E.-35-4-3	L	-	-	4%	-	-	1	L	3"	Many trees showing old scale attack; 2nd growth scattered patchy
N.E.-35-4-3	L	-	-	None	-	-	None	L	4"	2nd growth open growing
S.W.-1-5-3	L	-	-	None	-	-	None	L	3"	Very scattered; 2nd growth very dense
N.W.-1-5-3	L	L	-	None	2%	-	None	L	7"	Mature & some 2nd growth open scattered

(continued)

Location	Defoliation Per Diameter Classes			% Dead Tops Per Diameter Class			No. of Dead Trees	Stem	Est. Av. of D.B.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
E.E.-1-5-9	M	L	-	10%	None	-	None	L	4"	Scattered mature & heavy 2nd growth
N.W.-6-5-10	M	M	-	10%	None	-	4	L	5"	Mature & 2nd growth; open growing density light; some cutting operations in progress
S.E.-6-5-10	L	L	-	None	4%	-	1	L	6"	Mature open-growing scattered
N.E.-24-5-9	-	M	-	-	None	-	None	M	9"	Mature mixed birch & poplar scattered
S.E.-23-5-9	M	M	-	None	4%	-	None	M	6"	Mature & 2nd growth density light; light scattering of birch & poplar
S.W.-23-5-9	M	M	-	None	14%	-	None	M	8"	Mature with light 2nd growth
S.W.-18-5-10	L	-	-	None	-	-	None	L	3"	2nd growth open growing; very scattered
N.E.-13-5-9	L	-	-	8%	-	-	None	L	3"	2nd growth density medium
N.E.-12-5-9	L	-	-	None	-	-	None	L	4"	2nd growth density medium
N.W.-12-5-9	L	L	-	None	None	-	None	L	7"	Mature & 2nd growth open growing
N.E.-11-5-9	L	L	-	None	2%	-	None	L	7"	Mature & 2nd growth open growing; very scattered
N.E.-2-5-9	M	M	-	None	None	-	4	L	6"	Mature & 2nd growth; density medium
N.E.-2-5-9	L	L	-	None	5%	-	4	L	6"	Mature & 2nd growth; density light
N.E.-2-5-9	L	-	-	5%	-	-	1	L	4"	Mature, light 2nd growth very scattered
S.E.-12-5-9	L	-	-	None	-	-	None	L	4"	Mature some light 2nd growth; density medium
N.E.-16-5-10	L	-	-	2%	-	-	None	L	4"	2nd growth open growing scattered

(continued)

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stem	Est. Av. of F.E.R.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
E.E.-20-5-10	L	-	-	5%	-	-	1	L	4"	Mature density medium
N.E.-2[illegible]-5-10	L	L	-	None	10%	-	2	I	7"	Mature & light 2nd growth density light
N.W.-2[illegible]-5-10	M	M	-	5%	2%	-	10	L	8"	Mature & light 2nd growth scattered
S.E.-2[illegible]-5-10	L	M	-	2%	2%	-	3	L	9"	Mature & light 2nd growth density light
S.E.-30-5-10	M	M	-	None	4%	-	None	H	8"	Mature; density medium; new mill site
N.E.-30-5-10	L	L	-	None	10%	-	1	L	7"	Open growing & scattered mature
S.E.-36-5-9	-	M	M	None	10%	10%	None	H	10"	Mature density light; very scattered
N.W.-36-5-9	-	H	-	-	5%	-	None	H	8"	Heavy mature stand
N.W.-36-5-9	L	-	-	None	-	-	None	L	4"	2nd growth; mixed birch & poplar; density light
N.E.-24-5-9	L	-	-	None	-	-	None	L	4"	Open growing scattered 2nd growth
N.W.-10-5-10	M	-	-	None	-	-	3	I	4"	Open growing scattered 2nd growth
N.E.-13-5-10	L	L	-	None	None	-	None	L	8"	Mature & light 2nd growth open; density light
E.E.-29-5-10	-	M	-	-	15%	-	2	L	8"	Mature, density light, some cutting of damaged trees in progress
S.E.-28-5-10	L	L	-	None	2%	-	None	L	6"	Mature, heavy 2nd growth
N.E.-28-5-10	L	-	-	10%	-	-	8	L	4"	Mature, density medium, very tall trees; cutting in progress
S.E.-3[illegible]-5-10	L	-	-	5%	-	-	4	L	5"	2nd growth; very scattered

(continued)

BUDWORM [illegible] (continued)

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stand	Est. Av. of D.B.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
N.E.-33-5-10	M	M	-	None	10%	-	8	L	6"	Mature, 2nd growth; density light
N.W.-33-5-10	L	L	-	None	25%	-	4	[illegible]	7"	Mature, 2nd growth scattered
S.E.-33-5-10	-	M	-	-	None	-	None	H	10"	Mature scattered mixed with poplar
N.E.-20-5-10	[illegible]	L	-	None	5%	-	2	L	6"	Mature some 2nd growth open growing, scattered
S.E.-17-5-10	L	-	-	None	-	-	None	L	3"	2nd growth; density medium
N.E.-17-5-10	L	L	-	None	5%	-	2	L	5"	Mature & 2nd growth
S.W.-16-5-10	L	-	-	2%	-	-	2	L	3"	2nd growth medium density
N.W.-9-5-10	L	-	-	2%	-	-	1	L	3"	2nd growth very light density
S.W.-9-5-10	L	-	-	None	-	-	None	L	3"	2nd growth very scattered
S.W.-21-5-10	-	L	-	-	15%	-	None	L	10"	Mature very scattered
S.W.-28-4-10	L	L	-	2%	None	-	1	L	6"	Mature & 2nd growth density light open growing
N.E.-27-4-10	M	M	-	None	5%	-	None	L	5"	Open growing mostly 2nd growth with light scattering of mature
S.W.-27-4-10	M	M	-	None	15%	-	2	H	6"	Mature with light 2nd growth; density medium
S.W.-34-4-10	[illegible]	-	-	10%	-	-	8	L	3"	2nd growth density heavy
N.W.-34-4-10	L	-	-	5%	-	-	None	L	4"	Heavy 2nd growth
S.W.-3-5-10	L	M	-	None	50%	-	4	L	6"	Mature & 2nd growth density light
N.E.-3-5-10	L	L	-	5%	15%	-	2	L	6"	Mature with light 2nd growth very scattered

(continued)

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stem.	Est. Av. of D.B.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
S.E.-10-5-10	-	M	-	-	50%	-	4	L	8"	Mature density light
S.E.-10-5-10	-	M	-	-	50%	-	4	L	8"	Mature density light
S.E.-11-5-10	L	-	-	None	-	-	4	L	4"	2nd growth very scattered
N.E.-11-5-10	L	-	-	None	-	-	None	L	5"	2nd growth very scattered
N.E.-11-5-10	M	-	-	5%	-	-	1	L	4"	2nd growth density medium
S.E.-11-5-10	-	M	-	-	15%	-	None	L	10"	Mature open growing; very scattered
N.E.-2-5-10	L	M	-	None	None	-	None	L	5"	Mature & 2nd growth density medium
S.E.-2-5-10	-	L	-	-	None	-	None	L	7"	Mature open growing on high ridge scattered
S.E.-2-5-10	L	-	-	None	-	-	None	L	4"	2nd growth mixed with poplar
N.E.-33-4-10	-	L	-	-	None	-	None	L	5"	Mature, scattered, mixed with B. poplar & spruce
S.E.-33-4-10	-	L	-	-	None	-	None	L	5"	Mature, mixed with light poplar density medium
N.E.-26-4-10	M	-	-	None	-	-	None	L	3"	Open growing very scattered 2nd growth
S.E.-1-6-9	-	M	-	-	None	-	None	M	8"	Mature density light
N.E.-1-6-9	M	M	-	None	5%	-	None	L	5"	Mature light 2nd growth density medium
N.E.-1-6-9	M	M	-	None	5%	-	None	L	5"	Mature light 2nd growth density medium
S.E.-12-6-9	M	M	-	None	None	-	None	M	5"	Mature & 2nd growth
N.E.-7-6-10	M	-	-	5%	-	-	None	M	5"	Mature, open growing density light
N.E.-7-6-10	-	M	-	-	None	-	None	M	7"	Mature open growing density light
S.E.-18-6-10	M	M	-	None	None	-	4	L	5"	Mature open growing light 2nd growth
N.E.-17-6-10	M	-	-	None	-	-	None	L	4"	2nd growth density medium

(continued)

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stem	Est. Av. of D.B.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
S.E.-20-6-10	M	M	-	None	None	-	None	L	4"	2nd growth with scattering of mature density light
N.E.-20-6-10	L	L	-	5%	None	-	1	L	4"	Mature & 2nd growth density medium
W.E.-20-6-10	M	-	-	None	-	-	2	M	5"	2nd growth density medium
S.W.-8-5-10	M	-	-	None	-	-	None	L	4"	2nd growth density medium
N.E.-8-5-10	-	M?	-	-	5%	-	1	L	6"	Mature density medium
N.E.-10-5-10	-	M	-	-	25%	-	None	M	7"	Mature very scattered
N.E.-10-5-10	L	L	-	5%	50%	-	None	-	6"	Mature & 2nd growth density light
S.E.-15-5-10	L	-	-	None	-	-	None	L	3"	Heavy 2nd growth
N.E.-15-5-10	L	L	-	None	2%	-	1	L	5"	Mature & 2nd growth very scattered & light
S.E.-22-5-10	-	L	-	-	None	-	2	L	8"	Mature & very sparse
S.W.-22-5-10	L	L	-	None	50%	-	None	L	6"	Mature & 2nd growth very scattered
S.E.-21-5-10	L	-	-	5%	-	-	None	L	3"	2nd growth very small & scattered
N.E.-21-5-10	L	L	-	10%	None	-	6	L	5"	Mature with small 2nd growth very scattered
S.W.-28-6-10	M	M	-	None	None	-	None	M	4"	Mature & 2nd growth density medium; many trees partly dead
N.W.-28-6-10	L	-	-	None	-	-	None	L	3"	2nd growth density medium
N.E.-28-6-10	L	L	-	None	None	-	None	L	5"	Mature open with light 2nd growth
S.E.-33-6-10	-	L	-	-	5%	-	None	M	7"	Mature density light
S.E.-34-6-10	M	M	-	None	None	-	None	M	6"	Mature light 2nd growth density medium

(continued)

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stand	Est. Av. of D.B.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
S.E.-34-6-10	M	-	-	None	-	-	None	L	3"	2nd growth density medium
S.E.-35-6-10	-	M	-	-	15%	-	1	L	4"?	Mature density light
S.E.-36-6-10	L	L	-	None	None	-	None	L	6"	Mature, light 2nd growth density medium
S.W.-[illegible]-10	-	M	-	-	None	-	None	L	6"	Mature regeneration very light
S.E.-2-7-10	-	L	-	-	5%	-	None	L	5"	Mature density light
S.E.-1-7-10	-	L	-	-	5%	-	None	L	6"	Mature open growing
S.E.-1-7-10	L	L	-	None	10%	-	None	L	5"	Mature & 2nd growth; density light
S.W.-6-7-11	-	M	-	-	25%	-	5	L	6"	Mature & very tall trees; density light
S.E.-6-7-11	L	-	-	None	-	-	None	L	3"	2nd growth; density medium
N.E.-6-7-11	-	L	-	-	15%	-	1	L	6"	Mature very scattered
N.W.-5-7-11	L		-	None	30%	-	2	L	5"	Mature, light 2nd growth density light
S.W.-5-7-11	-	L	-	-	2%	-	None	L	6"	Mature open growing density light
S.E.-4-7-11	Very few jack pine, spruce and larch sweep									Defoliation nil
S.E.-3-7-11	L	L	-	5%	10%	-	None	L	5"	Small mixed stand of jack pine & poplar
S.E.-7-11	-	L	-	-	None	-	2	L	6"	Mature tall scattered
S.E.-8-7-11	L	-	-	None	-	-	1	L	2"	2nd growth density medium
S.E.-8-7-11	Spruce and aspen (poplar) stand									
S.W.-17-7-11	-	L	-	-	None	-	1	L	5"	Mature very sparse density light
S.E.-18-7-11	-	L	-	-	None	-	None	L	5"	Mature density light
S.W.-18-7-11	-	L	-	-	10%	-	4	L	6"	Mature sparse regeneration
S.E.-36-7-10	-	L	-	-	None	-	None	L	7"	Mature very tall density light

(continued)

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stem.	Est. Age of D.B.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
S.W.-30-7-11	-	L	-	-	None	-	None	L	6"	Mature sparse mixed with spruce
S.W.-19-7-11	-	L	-	-	None	-	None	L	6"	Mature sparse mixed with spruce
S.W.-36-7-10	-	L	-	-	None	-	None	L	9"	Mature very tall density light
S.W.-35-7-10	-	M	-	-	None	-	None	L	7"	Mature scattered
S.W.-35-7-10	-	M	-	-	None	-	5	L	6"	Mature very scattered
S.E.-34-7-10	-		-	-	2%	-	None	L	7"	Mature scattered tall
S.E.-34-7-10	-	L	-	-	None	-	1	L	7"	Mature scattered aspen
S.W.-[illegible]-7-10	-	L	-	-	2%	-	None	L	7"	Mature scattered aspen
S.E.-5-8-10	Larch and spruce swamp									
S.W.-5-8-10	Aspen and spruce									
N.E.-6-8-10	Light aspen									
S.E.-7-8-10	-	L	-	-	None	-	1	M	7"	Mature density medium
S.W.-7-8-10	L	L	-	None	5%	-	None	M	4"	Heavy 2nd growth, light mature, density medium
S.E.-7-8-10	-	M	-	-	None	-	None	M	6"	Scattered mature very tall
S.W.-6-8-10	M	M	-	None	5%	-	None	M	4"	2nd growth density medium
S.W.-6-8-10	M	M	-	None	5%	-	None	L	5"	Mature & 2nd growth density light heavy rock out crop
S.E.-1-6-9	M	M	-	None	10%	-	None	L	6"	Mature & light 2nd growth density light
S.W.-6-6-10	M	M	-	10%	10%	-	10	M	6"	Mature & light 2nd growth density light
S.W.-6-6-10	-	M	-	None	30%	-	5	M	7"	Mature, scattered density light
S.W.-5-6-10	M	M	-	20%	15%	-	5	L	6"	Mature & light 2nd growth density light

(continued)

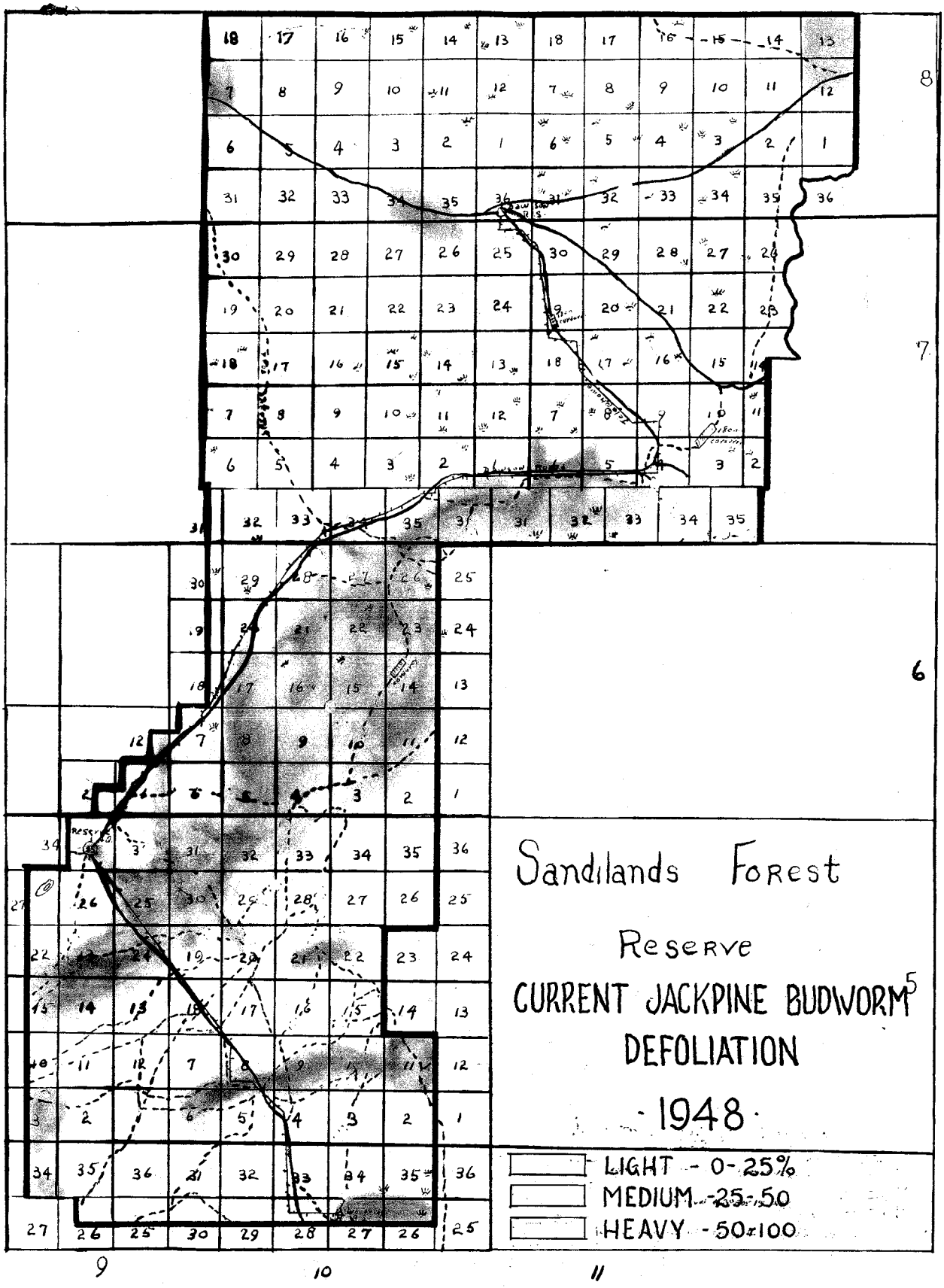
Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stem.	Est. Ht. of D.M.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
S.E.-5-6-10	-	M	-	None	10%	-	4	L	6"	Mature, density light
S.E.-4-6-10	L	M	-	None	5%	-	None	L	5"	Mature & Heavy 2nd growth
W.E.-3-6-10	L	M	-	None	None	-	None	L	5"	Mature & light 2nd growth density light
S.E.-11-6-10	-	L	-	-	None	-	1	L	6"	Mature, very scattered
S.W.-11-6-10	-	M	-	-	5%	-	2	L	7"	Mature, mixed with birch & aspen
N.E.-2-6-10	-	M	-	-	10%	-	None	L	7"	Mature, scattered
S.W.-1-6-10	L	L	-	None	10%	-	None	L	6"	Mature, very light 2nd growth
N.E.-13-6-10	M	M	-	None	30%	-	4	L	4"	Heavy, 2nd growth scattered mature
S.E.-10-6-10	-	M	-	-	5%	-	1	L	5"	Mature, open growing
S.E.-15-6-10	-	L	-	-	5%	-	10	L	5"	Mature, with black spruce & larch
N.E.-36-6-10	-	M	-	-	5%	-	None	L	5"	Mature, scattered
E.E.-36-6-10	L	L	-	None	None	-	None	L	5"	Mature, light 2nd growth very scattered
S.E.-36-6-10	-	M	-	-	50%	-	2	L	6"	Mature & open growing
S.E.-36-6-10	-	M	-	-	5%	-	3	L	7"	Mature & open growing
S.E.-35-6-10	L	L	-	2%	None	-	1	L	4"	Density medium, mature & 2nd growth
E.E.-26-6-10	-	M	-	-	None	-	None	L	5"	Mature density light
S.W.-26-6-10	M	M	-	-	20%	-	None	L	4"	2nd growth & mature density medium
E.E.-23-6-10	L	M	-	None	None	-	None	L	4"	Predominantly 2nd growth scattered mature density medium
S.W.-23-6-10	-	M	M	-	10%	10%	None	L	10"	Mature very tall & scattered growing on sandy ridge bordering swamp

(continued)

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stand	Est. Av. of D.B.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
S.E.-27-6-10	L	M	-	None	10%	-	2	L	6"	Mature very light 2nd growth density medium
S.W.-27-6-10	-	M	-	-	10%	-	3	L	6"	Mature, very tall density light
N.W.-34-6-11	-	M	-	-	20%	-	None	L	5"	Many wind fall trees mature
S.W.-34-6-11	-	M	-	-	20%	-	4	L	5"	Mature density light
S.E.-33-6-11	L	M	-	None	20%	-	7	L-M	6"	Mature, light 2nd growth density light
S.E.-34-6-11	-	L	-	-	None	-	None	L	6"	Mature, scattered very tall
S.W.-35-6-11	-	L	-	-	10%	-	6	L	7"	Mature, tall & straight density light
S.W.-35-6-11	-	L	-	-	None	-	None	L	5"	Mature density light
S.E.-36-7-11	-	L	-	-	None	-	1	L	6"	Mature mixed with light aspen density medium
N.W.-31-7-11	-	L	-	-	None	-	1	L	6"	Mature density medium
N.W.-31-7-11	-	L	-	-	None	-	None	L	6"	Mature & scattering of white spruce
N.E.-32-7-11	-	L	-	-	None	-	None	L	7"	Mature density light
N.W.-32-7-11	-	L	-	-	5%	-	None	L	7"	Mature density light
N.W.-33-7-11	-	L	-	-	None	-	7	L	6"	Mature density light with white spruce
N.W.-33-7-11	L	L	-	None	None	-	None	L	5"	Mature density medium
S.W.-34-7-11	-	L	-	-	5%	-	5	L	6"	Foliage confined to top third of tree, very tall, mixed with white spruce mature density medium
S.W.-3-8-11	-	L	-	-	2%	-	None	L	6"	Mature density medium very tall
N.W.-2-8-11	-	L	-	-	None	-	1	L	5"	Mature very scattered mixed with white spruce
S.W.-11-8-11	-	L	-	-	5%	-	1	L	5"	Mature very scattered
S.W.-12-8-11	-	L	-	-	5%	-	None	L	5"	Mature mixed with aspen & white spruce

(continued)

Location	Defoliation Per Diameter Class			% Dead Tops Per Diameter Class			No. of Dead Trees	Stem.	Est. Av. of D.B.H.	Remarks
	0"-5"	5"-10"	10"+	0"-5"	5"-10"	10"+				
S.E.-12-8-11	-	[illegible]	-	-	5%	-	[illegible]	L	7"	Nature very scattered
N.E.-12-8-11	-	[illegible]	-	-	3%	-	None	L	8"	Nature density medium
S.E.-13-8-11	-	[illegible]	-	-	3%	-	None	L	7"	Nature density medium
S.E.-14-8-11	-	L	-	-	None	-	one	L	5"	Nature very scattered
S.E.-14-8-11	-	[illegible]	-	-	2%	-	1	L	6"	Nature open growing density light
S.E.-15-8-11	-	L	-	-	None	-	None	L	6"	Nature open growing density medium
S.E.-15-8-11	-	[illegible]	-	-	None	-	1	[illegible]	4"	Nature light and growth density light
S.E.-16-8-11	-	[illegible]	-	-	None	-	2	L	5"	Nature [illegible] sparse
N.E.-30-7-11	-	[illegible]	-	-	None	-	None	[illegible]	6"	Nature sparse very tall
S.E.-3[illegible]-7-11		Spruce and Poplar land								
S.E.-30-7-11	-	[illegible]	-	-	2%	-	1	L	7"	Nature very tall & sparse
S.W.-2[illegible]-7-11	-	None	-	-	None	-	1	L	6"	Nature tall & sprse
S.E.-18-8-10	-	L	-	-	2%	-	None	L	6"	Nature density medium
S.E.-17-8-10	-	L	-	-	None	-	1	L	5"	Nature density light
S.E.-16-8-10	-	[illegible]	-	-	None	-	2	L	5"	Nature density light


Sandilands Forest
Reserve
CURRENT JACKPINE BUDWORM
DEFOLIATION
1948
LIGHT - 0-25%
MEDIUM - 25-50
HEAVY - 50-100
8
7
6
5
4
9
10
11

(iv) Jack Pine Budworm Population Counts - Sandilands Forest Reserve:

During June, 1948, nineteen sites were selected for permanent sampling stations in the Sandilands Forest Reserve at which jack pine budworm population counts will be made over an indefinite period. The sampling stations were established in areas where cutting operations were in progress, or will be in the near future, and are intended primarily to determine whether or not the removal of mature and open growing trees from a stand will tend to reduce jack pine budworm populations. The project was planned in co-operation with the Manitoba Forest Service in order to make full use of their cutting program. During the past season they have been directing their cutting operations toward the removal of jack pine which has been damaged from repeated budworm attacks during the past few years.

All the sampling stations were established and sampled in the same manner. The sites selected were, as nearly as possible, representative of the surrounding forest. At each site, a tree was chosen as the centre point and was marked with a metal plaque approximately 8 x 10 inches in size. With the tree as a marker a compass bearing was taken in the direction best suited for the centre line of the sampling station. The centre line extends from the tree a distance of 250 feet along the compass bearing. Twenty trees were selected at random on or near this line for making population counts. From each tree an 18 inch branch was removed from the lower part of the crown and carefully placed on a beating sheet. The larvae were removed from the foliage by vigorously shaking the branch over the beating sheet. The branches were carefully examined for remaining larvae before being discarded. The larvae were then counted and the number recorded for each tree sampled at the sampling station.

Exact locations of the sampling stations are listed in Table A.

Unfortunately, none of the sampling stations were established in areas where cutting operations were in progress, therefore, the difference in budworm populations in cut-over and uncut areas could not be determined this year. The population counts will be continued in 1949 and more complete data on cut-over areas will be obtained. Results of the budworm population counts that were made this year are summarized in Table B, appended to this report.

TABLE A

SAMPLING STATION LOCATIONS SANDILANDS FOREST RESERVE

DATE	PLOT NO.	LOCATION				EXACT LOCATION
		SEC.	TP.	RGE.	MER.	
15 June 48	4E	35	5	9	EPM	2/10 mi. S. of Forest Reserve H.Q. along Piney Road.
15 June 48	5E	30	5	10	EPM	1/10 mi. S. of Sundown Lumber Mill, East side of road.
15 June 48	6E	30	5	10	EPM	1/5 mi. S. of Sundown Lumber Mill, West side of road.
16 June 48	8E	29	5	10	EPM	
16 June 48	9E	29	5	10	EPM	
16 June 48	10E	3	6	10	EPM	
17 June 48	11E	6	6	10	EPM	
17 June 48	12E	3	6	10	EPM	
17 June 48	13E	10	5	10	EPM	
17 June 48	14E	10	5	10	EPM	
18 June 48	15E	29	5	10	EPM	
18 June 48	16E	36	5	9	EPM	

SAMPLING STATION LOCATIONS-SANDILANDS FOREST RESERVE (CONT'D)

DATE	PLOT NO.	LOCATION				EXACT LOCATION
		SEC.	TP.	RGE.	MER.	
18 June 48	17E	36	5	9	EPM	
19 June 48	18E	35	5	9	EPM	
19 June 48	19E	29	5	10	EPM	
24 June 48	20E	31	5	10	EPM	
25 June 48	21E	30	5	9	EPM	
25 June 48	22E	30	5	10	EPM	
26 June 48	23E	30	5	10	EPM	

TABLE B

POPULATION COUNTS - 1948.
SANDILANDS FOREST RESERVE

STATION NO.	NO. TREES EXAMINED	AVERAGE D.B.H. IN.	AVERAGE HEIGHT FEET	AVERAGE DEFOLTN IN AREA %	NO. OF 18" BRANCHES EXAMINED	% BRANCHES STAM.	% BRANCHES NON-	% INFESTED STAM.	% INFESTED NON-	AVERAGE NO. LARVAE PER BRANCH STAM.	AVERAGE NO. LARVAE PER BRANCH NON-STAM.	AVERAGE NO. LARVAE PER BRANCH STAM. & NON-STAM.
4E	20	5.6	26.2	25-50	40	35	65	93	69	14.2	3.3	7.15
5E	20	6.4	28.7	25-50	20	20	80	75	81	4.0	3.7	3.85
6E	20	5.6	29.0	25-50	20	25	75	100	46	4.0	0.9	1.70
8E	20	5.4	25.0	25-50	20	50	50	80	90	4.1	1.9	3.0
9E	20	5.8	28.3	25-50	20	45	55	22	27	0.3	0.3	0.35
10E	20	7.3	29.8	25-50	20	20	80	100	56	13.0	1.5	3.80
11E	20	6.5	27.0	50-100	20	10	90	100	72	2.0	2.8	2.85
12E	20	5.7	26.6	25-50	20	30	70	100	85	7.6	3.2	4.55
13E	20	5.8	25.0	25-50	20	50	50	90	60	21.3	2.0	11.65
14E	20	5.1	29.0	25-50	20	10	90	100	78	12.5	2.8	3.80
15E	20	6.0	28.5	25-50	20	60	40	100	50	4.5	1.8	3.40
16E	20	5.4	34.3	50-100	20	40	60	88	100	6.5	2.3	4.0
17E	20	7.0	31.4	50-100	20	50	50	70	80	4.6	3.4	4.0
18E	20	8.4	37.7	25-50	20	100	--	100	---	14.5	---	14.5
19E	20	5.1	22.2	25-50	20	60	40	90	88	4.5	4.9	4.65
20E	20	6.8	28.5	25-50	20	30	70	100	86	5.7	2.8	3.65
21E	20	4.2	17.4	50-100	20	40	60	75	67	4.0	3.0	3.4
22E	20	6.4	31.2	25-50	20	40	60	62	58	2.5	1.7	2.0
23E	20	4.5	27.6	25-50	20	60	40	92	100	4.1	2.1	6.25

TABLE C

JACK PINE BUDWORM POPULATION COUNTS - JULY 2, 1948
Seddon's Corner Mi. 51 Trans-Canada Highway

TREE NO.	DBH in.	HEIGHT feet	BRANCH NO.	MAIN BRANCH OR LATERAL	NO. OF TERMINALS	NO. OF LARVAE	REMARKS
1	5	25	1	Lateral	29	10	Staminate
			2	Main Branch	37	11	Staminate
2	4	15	1	Main Branch	29	3	Staminate
			2	Main Branch	18	3	Staminate
3	3.5	20	1	Lateral	23	6	Staminate
			2	Main Branch	26	3	Staminate
4	5	25	1	Main Branch	35	4	Staminate
			2	Main Branch	46	3	Staminate

Jack pine budworm population counts on 18" branches were also made in the Cowan-Renwer district and the information recorded as follows:

Area 1: (sec. 2, tp. 36, rge. 23, W.P.mer.)

Tree No. 1 -	2 larvae	Tree No. 6 -	1 larva
Tree No. 2 -	0	Tree No. 7 -	0
Tree No. 3 -	0	Tree No. 8 -	0
Tree No. 4 -	0	Tree No. 9 -	3 larvae
Tree No. 5 -	1 larva	Tree No.10 -	1 larva

Area 2: (sec. 17, tp. 36, rge. 23, W.P.mer.)

Tree No. 1 -	1 larva	Tree No. 6 -	0
Tree No. 2 -	3 larvae	Tree No. 7 -	0
Tree No. 3 -	1 larva	Tree No. 8 -	0
Tree No. 4 -	1 larva	Tree No. 9 -	0
Tree No. 5 -	1 larva	Tree No.10 -	0

Area 3: (sec. 15, tp. 36, rge. 23, W.P.mer.)

Tree No. 1 -	1 larva	Tree No. 6 -	0
Tree No. 2 -	0	Tree No. 7 -	0
Tree No. 3 -	1 larva	Tree No. 8 -	0
Tree No. 4 -	1 larva	Tree No. 9 -	0
Tree No. 5 -	0	Tree No.10 -	1 larva

NOTE: In areas 1, 2 and 3, the population counts are based on examination of one 18" branch per tree.

B. Spruce Budworm (Choristoneura fumiferana Clem.)

(1) Distribution:

The infestation of spruce budworm in the Spruce Woods Forest Reserve showed little change since 1947. The heaviest defoliation of white spruce occurred in an area lying southeast of Carberry where infestation was moderate to heavy. In the central part of the reserve (sec. 16, tp. 9, rge. 15, W.P.mer.) current defoliation was light. Damage in this area from the prolonged attacks was evident in thin foliage and dead-topped or dead trees. Throughout other areas spruce growth is scattered and defoliation was general but very light.

One collection of this insect was made in eastern Manitoba. Two larvae were taken from two black spruce in the vicinity of the forestry cabin at Sasaginnigak Lake.

Several samples of spruce budworm were made throughout the Interlake district of Manitoba, but no infestations were observed. At Arnes, in sec. 9, tp. 21, rge. 4, E.P.mer., a light infestation was found on white spruce in a private wood lot. Signs of what may be old budworm damage were noticed at this point with old defoliation showing up to 15 percent. The wood lot covered an area of approximately 2 acres. At the time of examination (June) the larvae were feeding on the new foliage as well as in the buds. Another collection was made on white spruce at Riverton in sec. 2-, tp. 23, rge. 4, E.P.mer. The spruce budworm was also found in a small privately owned spruce bluff near Finns (sec. 5, tp. 22, rge. 4, E.P. mer.). This stand covered approximately 2 acres and budworm damage was very light. At a point 3 1/10 miles south of Camper (sec. 27, tp. 23, rge 6, W.P. mer.) a few larvae were found and there were signs of past budworm damage. This stand consisted mainly of second growth white spruce on privately owned land.

One larva was collected in the Gypsumville area, sec. 11, tp. 25, rge. 8, W.P.mer.

Very few spruce budworm larvae were obtained during the summer in the western district of Manitoba and the eastern portion of Saskatchewan.

Only two larvae were found. These were collected in the Riding Mountain National Park (sec. 14, tp. 20, rge. 19, W.P.mer.) approximately 7/10 of a mile north of Dauphin and Lake Audy Road junction. Defoliation in this case was negligible and upon further examination of the immediate area no further sign of this insect was found.

One and one half miles north of Grandview in sec. 36, tp. 25, rge. 24, W.P.mer., about twenty white spruce surrounding a small cemetery were lightly defoliated by budworm larvae. Indications were that the balsam fir sawfly had caused most of the damage. At the time of examination the sawflies were in the cocoon stage.

No trace of spruce budworm was found in the parts of the northern and western district of Saskatchewan that were examined during the 1948 season.

(ii) Negative Reports:

The following tables (Table A and B) contain complete lists of all spruce and balsam fir samples received from the start of the season to July 31st, that were negative for spruce budworm. Table A lists negative spruce samples and Table B lists negative balsam fir samples.

TABLE A

SPRUCE SAMPLES NEGATIVE FOR SPRUCE BUDWORM
Start of Season to July 31st, 1948

F.I.S. NO.	COLL. DATE	DIST. (FOREST)	EXACT LOCATION
109	5-6-48	R.M.N.P.	R.M.N.P. 12-21-20 W 1 mer.
123	7-6-48	R.M.N.P.	150 yds S of mi. 146 on D road 35-21-19 W.P.mer.
151	9-6-48	Eastern	11 miles West of Arborg 13-22-1 W.P.mer.
155	8-6-48	R.M.N.P.	R.M.N.P. Sample Stn. No. 6 3-21-20 W.P.mer.
231	11-6-48	Inter-lake	1 mile east of Gypsumville 26-31-9 W.P.mer.
235	11-6-48	Eastern	1 mile south of Grahamdale 10-28-8 W.P.mer.
290	14-6-48	D.M.F.R.	D.M.F.R. 33-26-25 W.P.mer.
344	16-6-48	D.M.F.R.	D.M.F.R. 23-31-30 W 1 mer.
346	15-6-48	D.M.F.R.	Along hwy-north of Roblin to Swan River 7 mi. S of Madge Lake Road.
416	18-6-48	D.M.F.R.	D.M.F.R. Sample Stn. No. 12 15-26-26 W.P.mer.
417	18-6-48	D.M.F.R.	D.M.F.R. ¼ mi. N of Camp 25-27-26 W.P.mer.
421	18-6-48	D.M.F.R.	D.M.F.R. Bield Ranger Stn. 15-26-26 W.P.mer.
438	19-6-48	D.M.F.R.	D.M.F.R. Sample Stn. No. 16 1-27-24 W.P.mer.
445	17-6-48	P.A.N.P.	6 mi NW of Waskesiu-PANP tp.57-1 W 3 mer.
448	17-6-48	P.A.N.P.	4 mi S of Waskesiu-PANP tp.57-1 W 3 mer.
452	17-6-48	P.A.N.P.	PANP-along 1st Narrows Rd. tp.57-2 W 3 mer.
457	17-6-48	P.A.N.P.	PANP 4 miles NW of Waskesiu tp.57-1 W 3 mer.
491	21-6-48	P.A.	City property - Prince Albert tp.49-26 W 2 mer.

TABLE A

SPRUCE SAMPLES NEGATIVE FOR SPRUCE BUDWORM (CONT'D)

F.I.S. NO.	COLL. DATE	DIST. (FOREST)	EXACT LOCATION
519	22-6-48	D.M.F.R.	Singoosh Lake-DMFR 30-30-24 W.P.M
523	23-6-48	D.M.F.R.	Singoosh Lake Rd. 24-30-25 W.P.M.
529	22-6-48	P.A.	City property-Prince Albert tp.49 26 W 2 mer.
532	22-6-48	P.A.	City property-Prince Albert tp.49-26 W 2 mer.
534	22-6-48	P.A.	City property-Prince Albert tp.49-26 W 2 mer.
535	22-6-48	P.A.	City property-Prince Albert tp.49-26 W 2 mer.
676	2-7-48	Northern	On Freeman Island-Lac la Ronge 24-71-21 W 2 mer.
677	1-7-48	Northern	On road to Bigstone Lake 29-70-22 W2 mer.
682	3-7-48	Northern	8 miles S. of Lac la Ronge 15-69-23 W 2 mer.
684	1-7-48	Northern	On road to Bigstone Lake 29-70-22 W 2 mer.
690	2-7-48	Northern	Island in Lac la Ronge 20-71-21 W 2 mer.
770	6-7-48	Hudson Bay	Sample Stn.No. HB5 9-47-4 W 2 mer.
774	6-7-48	P.A.	4 miles S of Doré Lake 8-65-9 W3M.
775	6-7-48	Northern-PA	E. shore of South Bay-Doré Lake 13-65-10 W 3 mer.
795	9-7-48	BR-PA	14 miles North of Green Lake 22-63-13 W 3 mer.
797	7-7-48	BR-PA	3 miles N of Dam enroute to Green Lake 19-60-10 W 3 mer.
799	8-7-48	M.L.	M.L.F.R. On hwy. No. 4 7-58-16 W 3 mer.
800	8-7-48	M.L.	M.L.F.R. W. side of hwy. No. 4 24-57-17 W 3 mer.
801	8-7-48	M.L.	M.L.F.R. 2 miles W of hwy. No. 4 10-58-17 W 3 mer.
804	8-7-48	M.L.	M.L.F.R. On section line between Secs. 11 & 14-58-17 W 3 mer.

TABLE A

SPRUCE SAMPLES NEGATIVE FOR SPRUCE BUDWORM (CONT'D)

F.I.S. NO.	COLL. DATE	DIST. (FOREST)	EXACT LOCATION
812	9-7-48	BR-PA	Green Lake Townsite HBC Store 16-61-12 W 3 mer.
832	8-7-48	H.B.	Greenwater Lake Forestry Cabin 16-41-11 W 2 mer.
844	10-7-48	H.B. No.1	Pelly Ranger Stn. 19-36-32 W 1 mer
846	11-7-48	Western	Whitefish Lake,Man. 5-39-29 W1mer.
854	10-7-48	H.B. No.1	Pelly Rngr. Stn. 19-36-32 W 1 mer.
892	13-7-48	Eastern	½ mile S of Trans-Canada Hwy. along Elma Road.
894	13-7-48	Eastern	½ mile S of Trans-Canada Hwy. along Elma Road.
901	13-7-48	P.A.	Fort à la Corne 10-51-19 W 2 mer.
903	13-7-48	P.A.	Fort à la Corne 15-51-19 W 2 mer.
908	13-7-48	H.B.	2½ mi. E.of Norquay,Sask. 1-33-1 W 2 mer.
928	13-7-48	H.B.	3 mi. SE of Glen Elder,Sask. 8-36-2 W 1 mer.
937	14-7-48	Eastern	Along Point du Bois road 11-16-13 E.P.mer.
968	17-7-48	P.A.	Nisbet F.R. at Sample Plot No. 1 22-49-1 W 3 mer.
978	16-7-48	Eastern	1 mile E.of Whitemouth 32-13-10 E. P.mer.
1006	19-7-48	P.A.	Emma Lake P.F. 1 mi.E. of Christopher Lake 4-53-26 W 2 mer.
1024	19-7-48	Northern (Sherridon)	2 mi.S. of Kississing, Man. NW quarter of grid. 34343
1042	20-7-48	Southern	1½ mi.SE of Reynolds 21-8-12EPM
1084	19-7-48	The Pas	4 mi. W of Cranberry Portage,Man. 22-66-27 W.P.mer.
1088	21-7-48	Flin Flon	4 mi.SE.of Channing,Man. 15-66-29 W.P.mer.
1090	19-7-48	Northern (Thicket Portage)	Landing Lake Portage at Narrows tp.73-1 W.P.mer.

TABLE A

SPRUCE SAMPLES NEGATIVE FOR SPRUCE BUDWORM (CONT'D)

F.I.S. NO.	COLL. DATE	DIST. (FOREST)	EXACT LOCATION
1091	19-7-48	Northern (Thicket Portage)	Landing Lake, East Shore tp.73-1 W.P.mer.
1092	21-7-48	Northern	3 mi.SE. of Channing, Man. 16-66-29 W.P.mer.
1098	19-7-48	Northern	West shore of Wintering Lake tp.73-2 W.P.mer.
1146 (Blue Spruce)	24-7-48	P.A.	½ mi. N. of MacDowall Ranger H.Q. 34-47-1 W 3 mer.
1219	26-7-48	P.A.	3 2/5 mi. E of Codette, Sask. 2-50-14 W 2 mer.
neg.	8-6-48	Western	R.M.N.P. W.Spruce Plot No. 9 30-19-17 W.P.mer.
(co-op) neg.	2-7-48	Eastern	Sasaginnigak Lake, Manitoba.
neg.	6-7-48	BR-PA	E.Shore of South Bay-Doré Lake 24-65-10 W 3 mer.
neg.	6-7-48	BR-PA	3 mi.S. of Beaupré Cabin 3-64-9 W. 3 mer.
neg.	6-7-48	BR-PA	1 mi.S. of Beaupré Cabin 9-64-9 W. 3 mer.
neg.	6-7-48	BR-PA	Point of land 2 mi.N. of Doré Settlement 25-65-10 W 3 mer.
neg.	6-7-48	BR-PA	1 mi.S. of Doré Lake 12-65-10 W 3 mer.
neg.	6-7-48	BR-PA	5½ mi.S of Doré Lake 17-65-9 W 3 M
neg.	7-7-48	BR-PA	On road to Green Lake, 1 mile from dam 17-60-10 W 3 mer.
neg.	8-7-48	M.L.F.R.	Hwy. No. 4, 4½ mi. N of Midnight Cabin 36-53-17 W 3 mer.
neg.	8-7-48	M.L.	W. side Hwy. 4, 4 mi. S of Reserve boundary 25-57-17 W 3 mer.
neg.	8-7-48	M.L.	4 mi. W. of Hwy. 4 on game preserve boundary 17-58-17 W 3 mer.
neg.	8-7-48	M.L.F.R.	W side Hwy. 4, 2½ mi. N of Midnight Cabin 24-53-17 W 3 mer.

TABLE A

SPRUCE SAMPLES NEGATIVE FOR SPRUCE BUDWORM (CONT'D)

F.I.S. NO.	COLL. DATE	DIST. (FOREST)	EXACT LOCATION
neg.	9-7-48	M.L.	1 mi.N of bridge on Beaver River (Green Lake) 11-63-13 W 3 mer.
neg.	9-7-48	BR-PA	9½ mi. S. of Beaver Dam 32-58-9 W 3 mer.
neg.	9-7-48	BR-PA	1 mi. from junction of Green Lake & Dore Lake roads 22-60-10 W 3mer
neg.	9-7-48	BR-PA	3 mi. E of Green Lake 16-61-12 W 3 mer.
neg.	9-7-48	BR-PA	3½mi.Nof Green Lake 31-60-12-W.3M.
neg.	9-7-48	BR-PA	1 mi.S of Green Lake 7-61-12 W.3M.
neg.	14-7-48	P.A.	Nisbet F.R. at Red Rock Cabin 21-49-24 W 2 mer.
neg.	20-7-48	P.A.	Emma Lake F.R.(NE end of Angling Lake) 12-54-26 W 2 mer.
neg.	19-7-48	P.A.	Emma Lake F.R. 4-53-26 W 2 mer.
neg.	19-7-48	P.A.	Emma Lake F.R. 3 mi. NW of Ranger Stn. 28-53-26 W 2 mer.
neg.(co-op)	20-7-48	Eastern	Red Rock Lake Campsite
neg.	3-7-48	Northern	32-68-23 W 2 mer.
neg.	3-7-48	Northern	attched to FIS 35-66-23 W 2 mer.
neg.	3-7-48	Northern	686 17-62-24 W 2 mer.

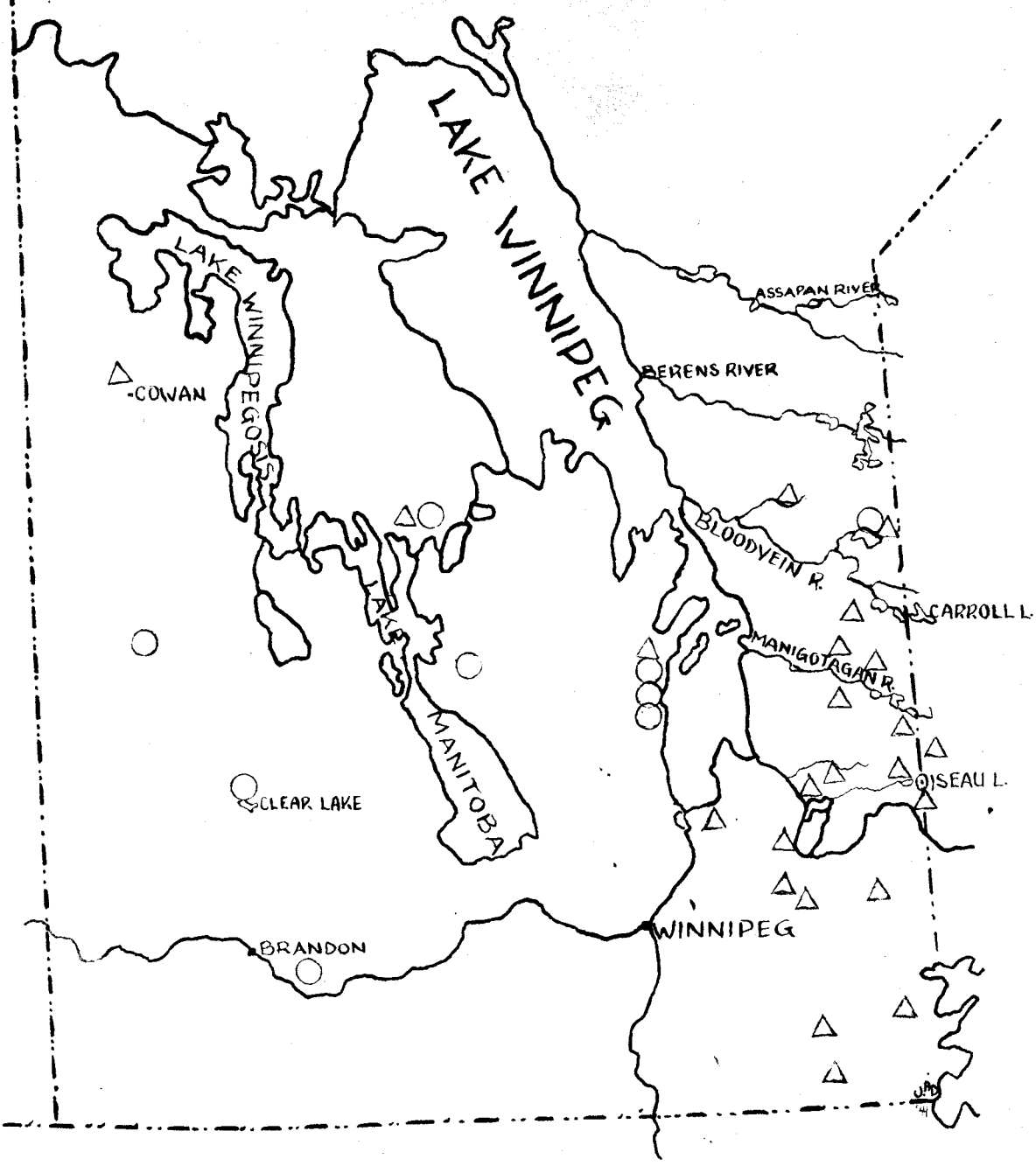
TABLE B

BALSAM FIR SAMPLES NEGATIVE FOR BUDWORM
Start of Season to July 31st, 1948

F.I.S. NO.	COLL. DATE	DIST. (FOREST)	EXACT LOCATION
163	8-6-48	R.M.N.P.	Mi.13 Norgate Rd. 34-19-17 W.P.mer
676	2-7-48	Northern	Freeman Island,Lacla Ronge 24-71-21 W 2 mer.
679	1-7-48	Northern	1/8 mi. from road junction - Lac la Ronge 28-70-22 W 2 mer.
690	2-7-48	Northern	Isle.on Lac la Ronge 20-71-21 W2M.
916	14-7-48	Western	½ mi.W. of Novra 7-41-26 W.P.mer.

DISTRIBUTION OF JACKPINE AND SPRUCE BUDWORM
· MANITOBA 1948 ·

○ SPRUCE BUDWORM △ JACKPINE BUDWORM



3. THE LARGE ASPEN TORTRIX (Archips conflictana Wlk.)

by J. B. Martin

The large aspen tortrix appeared to have increased in intensity in 1948. It was found in most parts of the western district of Manitoba and the Hudson Bay district of Saskatchewan.

Three infestations were surveyed and mapped in 1948. They were located at:

Madge Lake, Duck Mountain Provincial Park, Sask.
Singoosh Lake, Duck Mountain Forest Reserve, Man.
Wanless, Manitoba.

Of these, the Madge Lake infestation had been reported previously. These previous reports indicated that the defoliation was lighter in 1948 than 1947.

The Madge Lake area of the Duck Mountain Provincial Park, Saskatchewan, was the location of the first infestation to be examined in 1948. The heaviest infestation was along the Pelly Beach Road, where the defoliation varied from light to medium with 'pockets' of heavy defoliation ranging from 75 to 90 percent. Although some smaller trees - 8 to 10 inches d.b.h. - were completely defoliated, these were few in number, since the stands in this district are composed of dense, solid, trembling aspen with a few scattered stands of spruce, black poplar and tamarack.

Northwest from Pelly Beach along the wood trails the infestation thinned out and appeared to be very light, particularly along Highway No. 57, south towards Kamsack. South from the highway, on various trails, defoliation was light except for some 2 to 4 acre plots scattered through the area. According to information gathered

locally, the foliage in various areas appeared late. Possibly growth was retarded due to repeated defoliation during the last four years.

In the Duck Mountain Forest Reserve, Manitoba, little defoliation was found east of the junction of Highway No. 57 and Manitoba Highway No. 31. Defoliation decreased to very light proceeding east on Highway No. 57 to Benito Beach junction, and no defoliation was observed on the road north to Benito or south toward Makaroff. A survey along the trails in tp. 30, rge. 29, W.P.mer., showed only very light defoliation although some small, open growing trees up to 3" d.b.h., and up to 8' in height, were defoliated 85 to 95 percent. It was noted, in general, that the large aspen tortrix had caused most of this damage.

A parasite was observed parasitizing the pupae of this leaf roller. One larva had been parasitized and a number of parasites had emerged and were still attached to the larva (e.g. enclosure number 62.)

This infestation was smaller than when it was mapped in 1947, but this may be ude to the fact that mapping in 1948 was done when the insect was in a less advanced stage.

The Singoosh-Blue Lakes infestation covered approximately 6 miles along the main road and along the shores of the Blue Lakes. The heaviest defoliation occurred between Singoosh and the Blue Lakes. Sections 16, 21, 22, 23, 24, 26, 27 and 28, tp. 30, rge. 25, W.P.mer., were heavily defoliated, with the heaviest defoliation occurring in sections 23, 26 and 27. However, stripping averaged from 85-95 percent in some 'pockets' along the shores of the Blue Lakes.

At different points in the Singoosh-Blue Lakes area, examinations were made on felled trees and no foliage could be found except on the uppermost branches where new foliage had appeared.

Most examination points yielded poor results, since only a few larvae or pupae could be found on what little foliage was present, but below the stripped trees, on willow particularly, larvae and pupae were abundant.

The heaviest defoliation seemed to be concentrated in patches, while the poplar nearby was only slightly defoliated, in some cases.

White poplar is the dominant species in this area with small stands of white spruce, black poplar, jack pine, tamarack and black spruce scattered throughout.

East of the forestry cabin at Singoosh Lake defoliation was absent to light, except for one 'pocket' in sec. 33, tp. 30, rge. 24, W.P.mer., which was lightly defoliated.

An infestation of the large aspen tortrix was reported north of The Pas, Manitoba, and was investigated on June 30, 1948. Adult moths had attracted attention by covering railway tracks to such a depth, that they hindered gas car operation.

The infestation extended from Mile 18 to Mile 42 on the Manitoba Northern Railway. It varied in intensity with defoliation ranging from 5 to 30 percent. The heaviest defoliation, 15 to 30 percent, was seen between Miles 24 and 27, and Miles 36 and 38. The remainder of the area was defoliated 5 to 15 percent.

By the 30th of June the insects had all reached the adult stage. No larvae remained and only empty pupal cases of the large aspen tortrix could be found. However, many adults were observed and some specimens were taken from the rails and from white poplar.

Collections were made at miles 6, 12, 18, 26 and 38 on the Manitoba Northern Railway, north of The Pas Manitoba. The stand composition in this area is mixed, including white spruce, white poplar, black poplar, jack pine and tamarack.

Thirty-five collections of the large aspen tortrix were received during 1948. This represents the collections submitted by co-operators and members of the laboratory staff. A complete list of the collections submitted is given in the following table.

TABLE A

COLLECTIONS OF LARGE ASPEN TORTRIX 1948.

NO. OF COLLECTIONS	LOCATION	PROV.	SEC.	TP.	RGE.
2	Glaslyn	Sask.	35	50	16 W 3 mer.
1	Riding Mountain National Park	Man.	14	20	19 W.P.mer.
1	Toutes Aides	Man.	10	20	29 W.P.mer.
1	Riding Mountain National Park	Man.	36	20	19 W.P.mer.
1	Duck Mountain Forest Reserve	Man.	30	26	25 W.P.mer.
1	Carberry	Man.	29	10	15 W.P.mer.
1	Red Rock Lake	Man.	24	12	15 E.P.mer.
2	Madge Lake	Sask.	23	31	30 W.P.mer.
2	Duck Mountain Provincial Park	Sask.	23	30	30 W.P.mer.
3	Duck Mountain Provincial Park	Sask.	20	30	30 W.P.mer.
1	Duck Mountain Provincial Park	Sask.	29	30	30 W.P.mer.
1	Duck Mountain Forest Reserve	Man.	--	30	29 W.P.mer.
1	Duck Mountain Provincial Park	Sask.	17	31	30 W.P.mer.
1	Shell River	Man.	34	30	28 W.P.mer.
1	Bield	Man.	36	26	26 W.P.mer.
1	Grandview	Man.	1	27	24 W.P.mer.
3	Garland	Man.	24	30	25 W.P.mer.
1	Garland	Man.	30	30	25 W.P.mer.
1	Garland	Man.	30	30	24 W.P.mer.
1	Cowan	Man.	2	36	23 W.P.mer.
2	38 miles north of The Pas	Man.	-----unorganized----		
1	26 miles north of The Pas	Man.	-----unorganized----		
1	6½ miles north of The Pas	Man.	-----unorganized----		
1	Birch River	Man.	20	39	25 W.P.mer.
1	Pelly	Sask.	19	36	32 W.P.mer.
1	Novra	Man.	18	41	25 W.P.mer.
1	3 miles southwest of Sherridon	Man.	-----unorganized----		

4. The Spruce Sawflies

(a) Yellow-headed Spruce Sawfly (Pikonema alaskensis Roh.) The yellow-headed spruce sawfly was generally distributed throughout a wide area in Manitoba and Saskatchewan in 1948. Samples of this insect were collected from the Manitoba - Ontario boundary as far west as the Waterhen Provincial Forest in Saskatchewan. In Manitoba, its range extended from the Sandilands Forest Reserve in the south as far north as Cross Lake and Thicket Portage and in Saskatchewan as far north as Lac la Ronge. In most cases, where it was found defoliation was light to negligible, and no serious damage was observed.

During June several collections were made throughout the Prince Albert and Big River districts in Saskatchewan. At Green Lake it was observed on ornamental spruce near the Hudson's Bay Company Store (sec. 18, tp. 61, rge. 12, W. 3rd mer.) Another collection was made in the townsite near the old Dominion Telephone Office. It was also reported at the following locations in the Big River Provincial Forest but no serious damage was observed:

sec. 6, tp. 60, rge. 11, W. 3rd mer. and
sec.22, tp. 60, rge. 12, W. 3rd mer.

Near Chitek Lake (sec. 9, tp. 55, rge. 12, W. 3rd mer.) defoliation was light, but the area affected appeared to be quite extensive. At Leoville (tp. 56, rge. 12, W. 3rd mer.), damage was light and defoliation negligible. One collection was received from Doré Lake (sec. 14, tp. 64, rge. 9, W. 3rd mer.), but no defoliation was observed.

Several collections were received from the Meadow Lake Provincial Forest but in most cases the attacks were very light. Defoliation was reported as heavy in a plantation of white spruce in sec. 16, tp. 59, rge. 18, W. 3rd mer. A collection of this sawfly was also made near Glaslyn, Saskatchewan, south of the Meadow Lake Provincial Forest, but defoliation was negligible and the sawflies were confined mainly to a few open-growing trees.

Several reports of sawfly activity were received from the Waterhen Provincial Forest (sec. 23, tp. 63, rge. 13, W. 3rd mer., sec. 27, tp. 64, rge. 16, W. 3rd mer., and sec. 34, tp. 61, rge. 16, W. 3rd mer.) In all cases sawfly activity was generally light and defoliation negligible.

A collection of the yellow-headed spruce sawfly was made eight miles south of Lac la Ronge (sec. 15, tp. 69, rge. 23, W. 2nd mer.) This was the most northerly point in Saskatchewan where it was found in 1948.

Small numbers of larvae were observed during June at Waskesiu Lake in Prince Albert National Park. (Yellow-headed spruce sawfly parasites, (Sturmia sp.) were released in this area in 1947.) However, no noticeable defoliation was observed when the area was re-examined later in the season.

Light sawfly populations were observed in a spruce plantation in sec. 34, tp. 47, rge. 1, W. 3rd mer., in the MacDowall Block of the Nisbet Provincial Forest (yellow-headed spruce sawfly parasites (Sturmia sp.) were released in this area in 1947.) Sawfly damage was considered light throughout the plantation at the time of examination.

Light sawfly activity was observed in a stand of white spruce near Christopher Lake (sec. 4, tp. 53, rge. 26, W. 2nd mer.) At the time of examination damage was negligible and most of the larvae had completed feeding.

Relatively light populations of this sawfly were observed in the Pelly and Whitefish Lake areas in eastern Saskatchewan. A light concentration was found on black spruce east of Norquay (sec. 1, tp. 33, rge.1, W. 2nd mer.) This stand was located in an agricultural area. One collection was made near the Grassy Lake Headquarters (sec. 15, tp. 54, rge. 15, W. 2nd mer.), in the Torch River district and another at Love in the Torch River Provincial Forest. In both cases defoliation was only very light.

Ornamental spruce at Landing Lake Portage (tp. 73, rge. 1, W.P.M.), near Thicket Portage in Manitoba was

attached. Ten trees were examined in the area and defoliation averaged approximately 40 percent. Samples were received from Herb Lake and Cross Lake (tp. 65, rge. 3, W.P.M.), but no defoliation was reported at either place. At Kississing populations were very light and no defoliation was noted.

Some sawfly activity was observed along the north end of Clear Lake and in the Wasagaming townsite but defoliation was reported as very light. Very light defoliation was also reported at Sasaginnigak Lake in eastern Manitoba. Two collections were made on ornamental spruce near Whitemouth.

Two collections of the sawfly were received from the Whiteshell Forest Reserve. One collection was made at Red Rock Lake and the other near Falcon Lake. In both places defoliation was slight. An attack of medium intensity was reported in sec. 2, tp. 4, rge. 11, E.P.M., and was causing light to moderate defoliation in white spruce. Light sawfly activity was observed in white spruce at East Braintree (sec. 33, tp. 7, rge. 14, E.P.M.), but no defoliation was noted.

(b) Green-headed Spruce Sawfly (Pikonema dimmockii Cress.) This insect was widely distributed throughout Manitoba and Saskatchewan in 1948. Generally, it occurred in the same spruce stands where collections of the yellow-headed spruce sawfly were made. For the most part, populations of the green-headed spruce sawfly were somewhat lighter than the populations of the yellow-headed spruce sawfly and in no instance was it causing noticeable defoliation.

Collections of the green-headed spruce sawfly were made as far west as Pierceland, Saskatchewan (sec. 12, tp. 26, rge. 24, W. 3rd mer.) The larvae occurred only in relatively small numbers on spruce and no defoliation was observed throughout the area. Another collection was made on a single white spruce near the Divide Tower in the Meadow Lake district. It was also reported from Green Lake (sec. 18, tp. 61, rge. 12, W. 3rd mer.), but no defoliation was recorded.

Very light populations of this insect occurred in sections 12, 13 and 28, tp. 60, rge. 12, W. 3rd mer., in the Big River Provincial Forest but in all instances defoliation was negligible.

Several reports of light sawfly activity were received from the Nipawin and Love districts during the season. Random collections were made at the following locations:

sec. 34, tp. 55, rge. 12, W. 2nd mer.
sec. 10, tp. 54, rge. 11, W. 2nd mer. and
sec. 15, tp. 54, rge. 15, W. 2nd mer.

The green-headed spruce sawfly was generally distributed throughout the Pelly and Whitefish Lake districts of Saskatchewan. It was found only in relatively small numbers and defoliation was negligible.

In Manitoba, the sawfly was widely distributed. Collections were made at Thicket Portage, Kississing, Cross Lake, Herb Lake and Sasaginnigak Lake. In all cases it was very light and no defoliation was observed.

Numerous collections were received from personnel employed by the Manitoba Pulp and Paper Company at Pine Falls, Manitoba. These collections were widely distributed and were made in the Company's timber limits throughout eastern Manitoba. One collection was received from East Braintree (sec. 32, tp. 7, rge. 14, E.P.M.), but no defoliation was reported. A private shelter-belt of white spruce near Sidney, Manitoba (sec. 5, tp. 11, rge. 12, W.P.M.), was lightly attacked.

Several collections were made near Red Rock Lake in the Whiteshell Forest Reserve, but no serious defoliation was noted. One collection was received from the Spruce Woods Forest Reserve. Only a few larvae were found and defoliation was negligible.

(c) Balsam Fir Sawfly (Neodiprion abietis Harr.)

The balsam fir sawfly was found commonly in Manitoba and Saskatchewan in 1948. In Saskatchewan, numerous collections were made in the Big River, Lac la Ronge and Prince Albert districts and in areas of Prince Albert National Park. In most cases, the collections were made in widely separated areas and sawfly activity was relatively light. The heaviest attack occurred near the townsite of Lac la Ronge where both balsam fir and white spruce were heavily attacked. The main body of the infestation was centred in sections 28 and 29, tp. 70, rge. 22, W 2nd mer., between Bigstone Lake and Lac la Ronge. Light sawfly activity was reported from two places in the Big River district (sec. 6, tp. 60, rge. 11, W 3rd mer.) and (sec. 13, tp. 60, rge. 12, W. 3rd mer.) In both cases defoliation was very light.

In Prince Albert National Park, the sawfly was quite common during June and was found feeding on white spruce. At the time of examination feeding was still in progress and therefore an accurate estimation of feeding damage could not be made. The heaviest damage was noted in an area adjacent to the administration building at Waskesui where approximately 60 trees were being attacked.

A number of very scattered collections were made in the Prince Albert district. It was also found attacking spruce in the Candle Lake district (tp. 55, rge. 23, W 2nd mer.) but no defoliation was observed. Light populations of balsam fir sawfly were noted in the Fort a la Corne Provincial Forest (sec. 10, tp. 51, rge. 19, W 2nd mer.) Sawfly larvae were causing some defoliation in white spruce stands in this area but the infestation was light. They were also reported to be abundant on white spruce in sec. 1, tp. 51, rge. 16, W 2nd mer., but defoliation was light. A sample of balsam fir sawfly was also sent in from Nipawin (sec. 34, tp. 55, rge. 12, W 2nd mer.) in the Prince Albert district but defoliation on white spruce was reported as light. This insect was also noted on white spruce

in sections 10 and 11, tp. 54, rge. 11, W 2nd mer., but according to reports defoliation was light. At Grassy Lake Headquarters, (sec. 15, tp. 54, rge. 15, W 2nd mer.) white spruce was lightly attacked. Two reports were received from the Hudson Bay district, one on white spruce in sec. 16, tp. 43, rge. 3, W 2nd mer., where defoliation was reported as light, and another from Glen Alder, Saskatchewan, sec. 11, tp. 38, rge. 12, W 2nd mer., where defoliation of white spruce was also reported as light.

At Mafeking, Manitoba, balsam fir sawfly was found on white spruce in sec. 22, tp. 46, rge. 25, W.P.mer. Defoliation was reported as light. Several infestations of this sawfly were found in the western district of Manitoba, particularly in the southern part of the Duck Mountain Forest Reserve. It was general in townships 26 and 27, ranges 26 and 27, W.P.mer., with light concentrations in sec. 15, tp. 26, rge. 26, W.P.mer., and sections 20 and 22, tp. 27, rge. 26, W.P.mer. In sec. 15, tp. 26, rge. 26, W.P.mer., defoliation on the outer edges of one white spruce stand varied from zero to 20 percent. A survey was made in a lumbering area in tp. 26, rge. 26, W.P.mer. (timber berth 1120-2). Examination revealed only very light defoliation in the various areas where the sawfly was detected. A light infestation was reported from the Grandview cemetery (sec. 36, tp. 23, rge. 23, W.P.mer.) where approximately 20 ornamental trees surrounding the cemetery were attacked. Some of the defoliation, which amounted to approximately 25 percent, had been caused by the spruce budworm. However, it was presumed that the sawfly caused most of the damage. At Mile 21, on the Clearwater Lake Road, an isolated white spruce in a mixed stand of jack pine and black spruce was sampled and larvae of the balsam fir sawfly were found, but damage was reported as light. Near Solater, in sec. 17, tp. 34, rge. 23, W.P.mer., a report showed that a light infestation was recorded in a stand of white spruce in this area. A medium infestation was reported from Rossburn, Manitoba, where white spruce was found to have been defoliated by this sawfly.

Near Ashern, in the interlake district, a report on this insect was submited from sec. 11, tp. 25, rge. 8, W.P.mer., where it was found on white spruce. At the townsite of Sidney, in the N.E. 1/4 sec. 5, tp. 11, rge. 12, W.P.mer., white spruce in a shelter belt was reported to be moderately defoliated. Numerous collections were sent in from personnel of the Manitoba Pulp and Paper Company at Pine Falls. Although no serious damage was being caused the insects were scattered on balsam and spruce through the entire area. In sec. 25, tp. 18, rge. 9, E.P.mer., sawfly were feeding on balsam and spruce but damage was absent at the time of examination. In sec. 3, tp. 17, rge. 12, E.P.mer., balsam fir sawfly was found on balsam but no reports of defoliation were submitted. In sec. 1, tp. 19, rge. 13, E.P.mer., this insect was found on white spruce but there was no report of any noticeable feeding. Several samples were received from the vicinity of East Braintree. In a woodlot of white spruce, defoliation was reported as moderate. In sec. 4, tp. 8, rge. 14, E.P.mer., sawfly was found to be very active on one tree where defoliation was heavy; however, on other trees in the immediate vicinity it was light. In sec. 5, tp. 8, rge. 17, E.P.mer., white spruce and balsam showed signs of the needles turning red, but no insect damage was reported. At Whitemouth, ornamental white spruce was sampled and a collection of balsam fir sawfly was made. In this planting, parasites (Sturmia sp.) of the yellow-headed spruce sawfly were released in July of 1946. Defoliation was reported as light. At Rennie, Manitoba, another collection was made in a plantation of white spruce where another release of a parasite (Sturmia sp.) was made in 1946. Collections were also received from Red Rock Lake campsite where the larva were found on white spruce.

5. PLANTATION SURVEY

By V. Hildahl

(i) Introduction:

During September, 1948, forest insect rangers undertook a survey of plantations in Manitoba and Saskatchewan to determine the insect pests attacking the trees and the extent of the damage caused. In Manitoba, 1159 acres comprising 144 plantations were inspected. Of these, 116 were in the Spruce Woods Forest Reserve, 25 in the Sandilands Forest Reserve, and 3 at Grandview Ranger Station in the Duck Mountain Forest Reserve. In Saskatchewan, 26 acres comprising 10 plantations were inspected. All plantations were in the Nisbet Provincial Forest.

In the Spruce Woods Forest Reserve, plantings consist mainly of pure stands or mixtures of jack, Scots, lodgepole and red pine. In addition, there are a few pure and mixed white spruce plantations. Planting dates range from 1917 to 1945, however most of the plantations were established during the past 20 years. In the Sandilands Forest Reserve, plantings consist of red, Scots, and lodgepole pines in pure and mixed stands. Over 50 percent of the plantations in the reserve are pure red pine. Planting dates range from 1932 to 1943. The Grandview plantings consist of 3 small plots of white spruce which were established in 1920. Plantations inspected in the Nisbet Provincial Forest contained five species of pine: jack, lodgepole, red, Scots, and yellow; and two species of spruce: white and Englemann. The trees in these plantations were planted in 1916-18 and 1927.

(ii) Methods:

A number of trees ranging from 50 trees in smaller plantations to 150 trees in larger plantations were examined individually. In the beginning, a count of 50 trees was made in plantations under 2½ acres, 100 trees in plantations up to 5 acres, and 150 trees in plantations over 5 acres. However, this plan was abandoned in favor of a count of 50 trees in plantations up to 5 acres, 100 trees in plantations between 5 and 10 acres, and 150 trees in plantations

over ten acres. No survey was made of plantations with trees under 18 inches and over 20 feet in height.

For each tree examined, a record was kept of the incidence of the following:

white pine weevil (old and current damage)
pitch nodule maker (old and new nodules on main stem and laterals)
scale insects
gall aphids (Adelges sp.)
resin midge (Retinodiplosis sp.)
defoliation and its cause, and
other damage, i.e., frost, animal, etc.

(iii) Maps: (General and Detailed)

Maps were prepared and included in this report showing location of the plantings of the following areas:

Spruce Woods Forest Reserve
Sandilands Forest Reserve
Grandview Plantation

in Manitoba and the

McDowall Black, Nisbet Provincial Forest

in Saskatchewan. In addition, detailed maps were prepared of the four planting areas in the Spruce Woods Forest Reserve. These maps are designated:

Area A1
Area A2
Camp Hughes Area
Shilo Nursery and Plantations.

Area A1 is located approximately 12 miles west of Carberry on the north side of the Trans-Canada Highway. Area A2 is west of Area A1 and is located on the south side of the Trans-Canada Highway. The Camp Hughes area is in the vicinity of old Camp Hughes, and the Shilo Nursery and Plantations is located near the Forestry Headquarters at Shilo.

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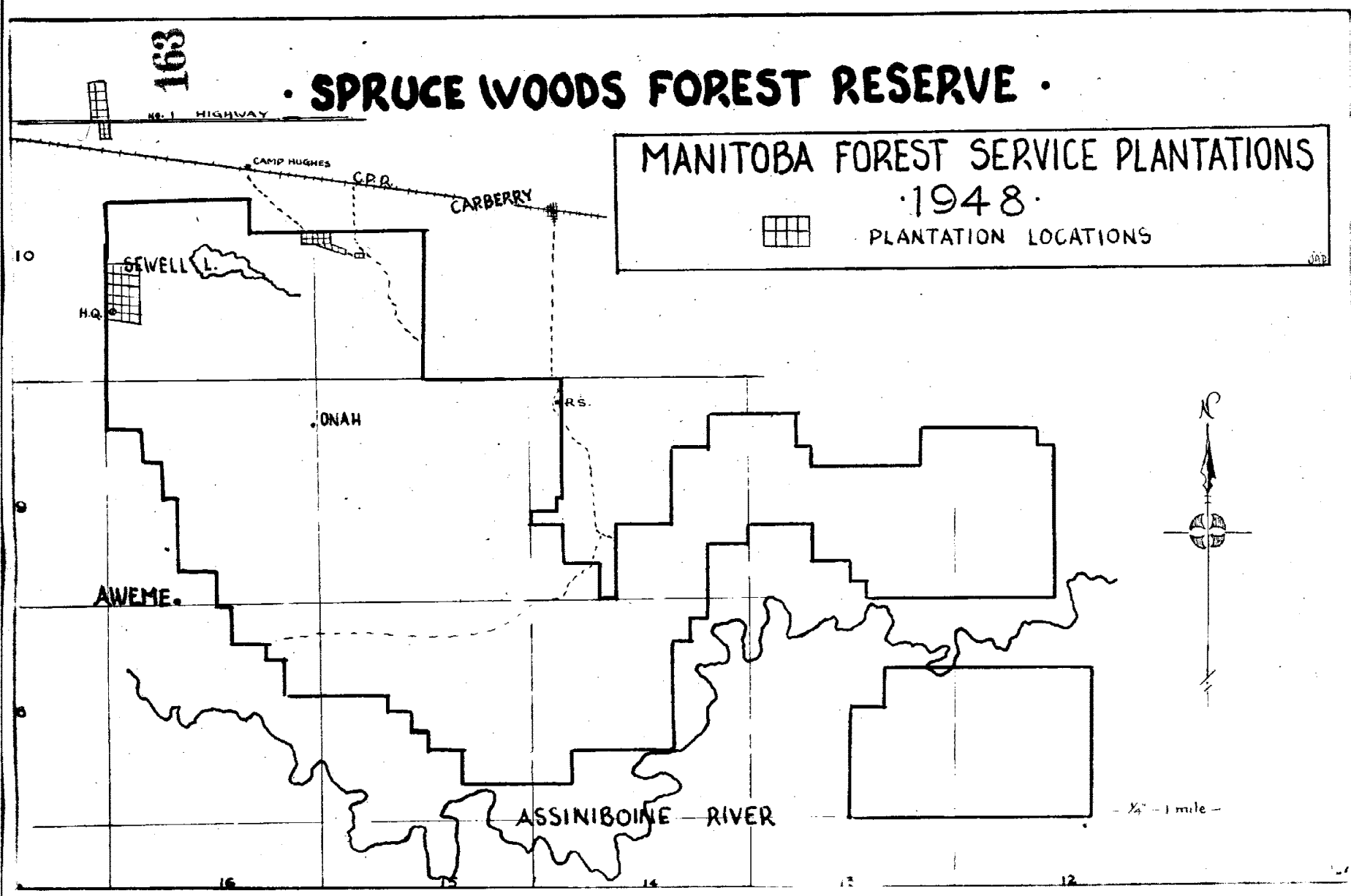
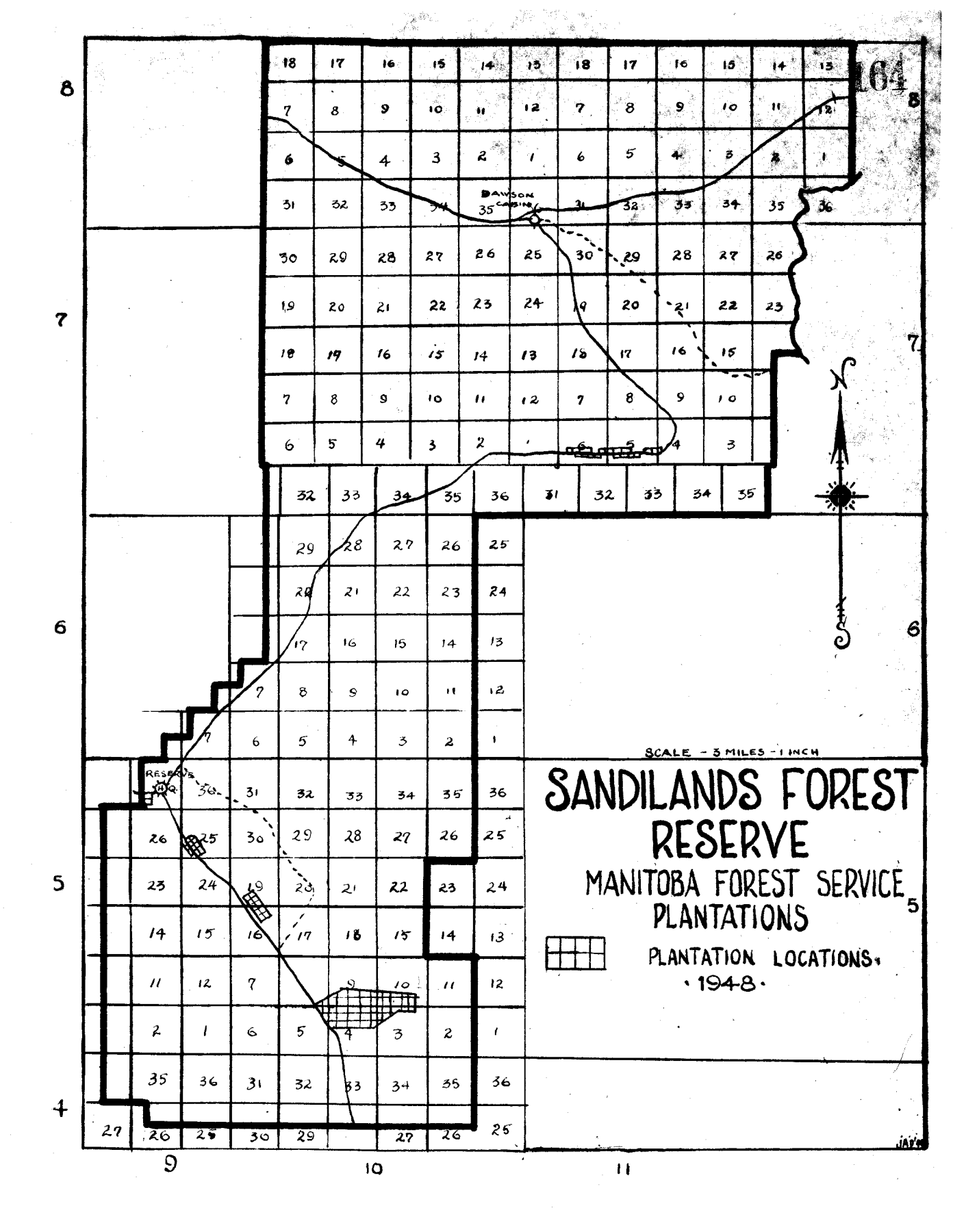
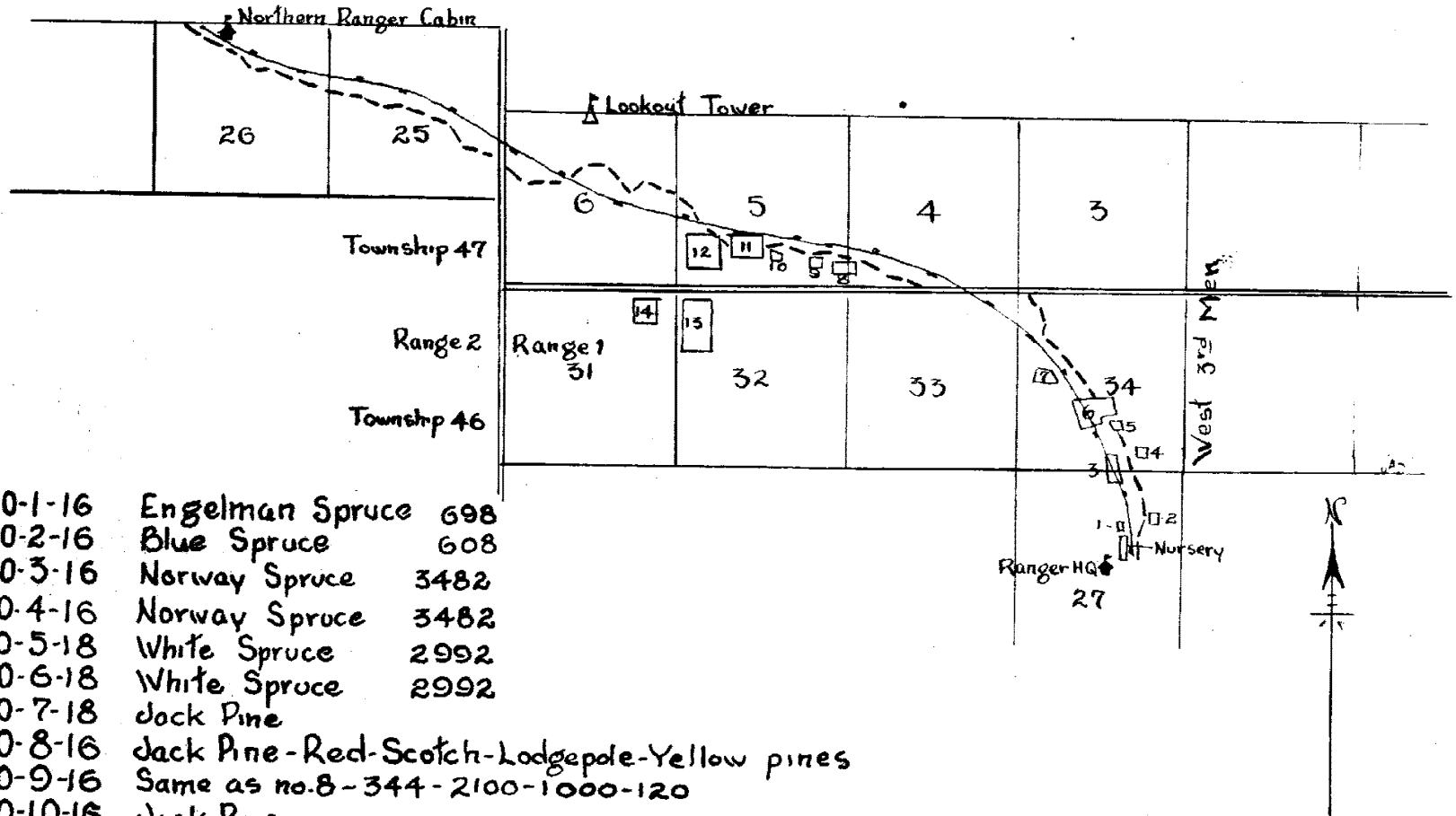
· SPRUCE WOODS FOREST RESERVE ·




SCALE - 3 MILES - 1 INCH
SANDILANDS FOREST RESERVE
MANITOBA FOREST SERVICE PLANTATIONS
PLANTATION LOCATIONS
1948
DAWSON CABIN
RESERVE HQ
8
7
6
5
4
9
10
11

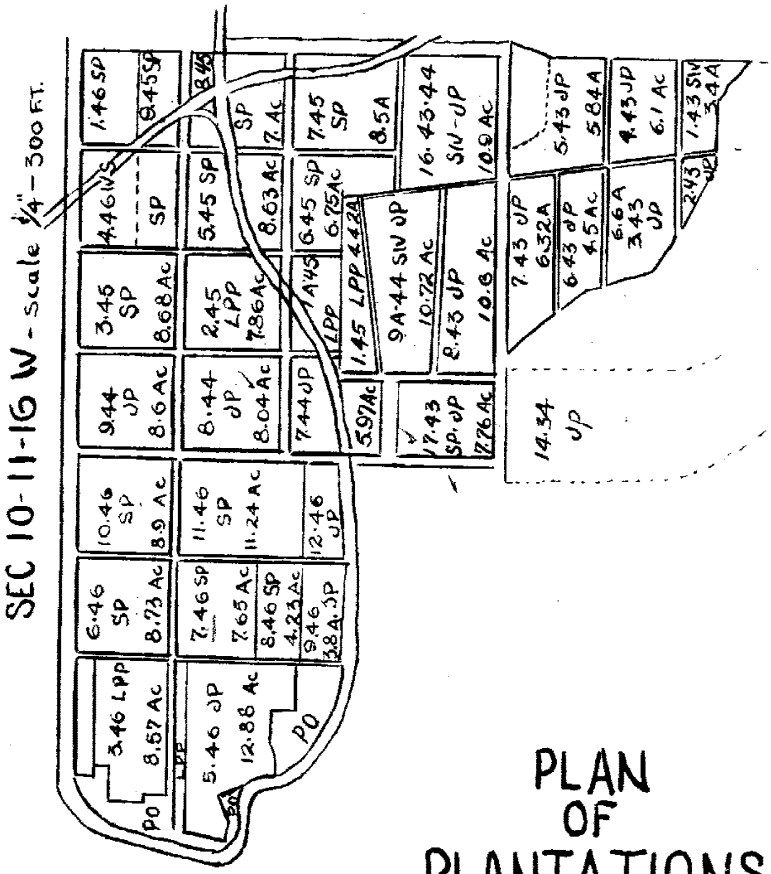
NISBET PROVINCIAL FOREST MACDOWALL BLOCK PLANTATION



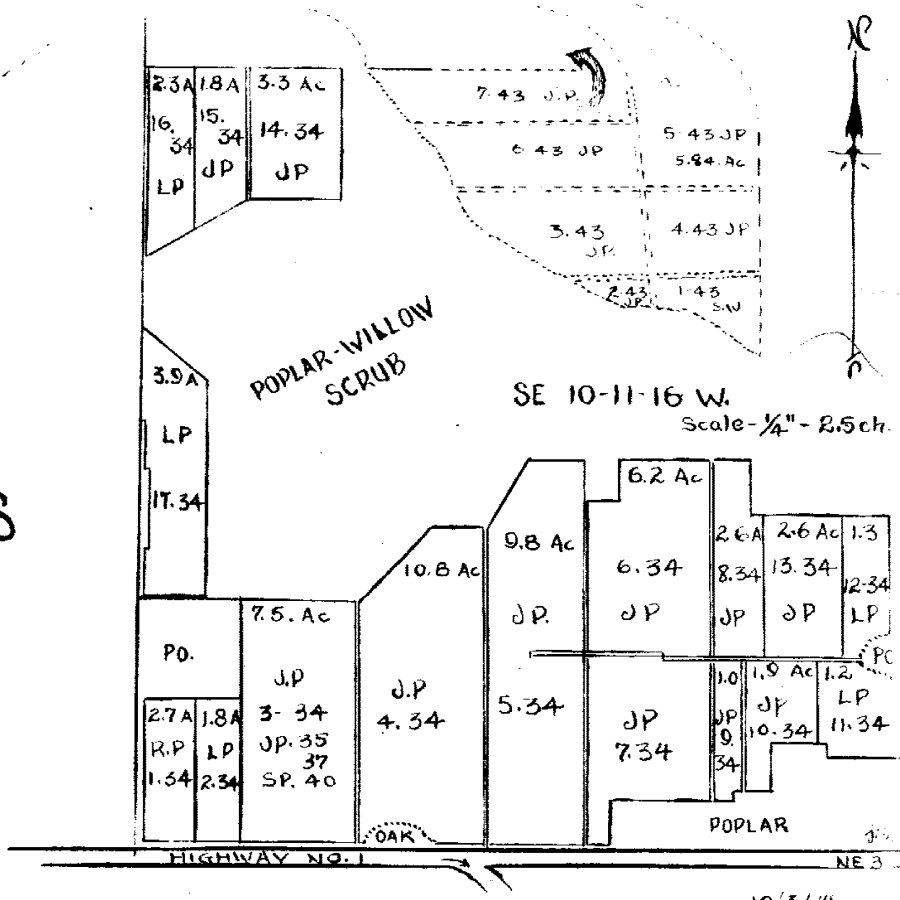
NO-1-16 Engelman Spruce 698
NO-2-16 Blue Spruce 608
NO-3-16 Norway Spruce 3482
NO-4-16 Norway Spruce 3482
NO-5-18 White Spruce 2992
NO-6-18 White Spruce 2992
NO-7-18 Jack Pine
NO-8-16 Jack Pine-Red-Scotch-Lodgepole-Yellow pines
NO-9-16 Same as no.8-344-2100-1000-120
NO-10-16 Jack Pine
NO-11-17 White Spruce 4646
NO-12-18 Jackpine
NO-13-18 Jack pine
NO-14-18 Jackpine

SPRUCE WOODS AREA

- Area A1 -



PLAN OF PLANTATIONS



10/3/42

PLANTATIONS
· SPRUCE WOODS AREA 1938 ·

Scale 1 inch — 5 chains

NW- of SW 6-11-16

SW· 6-11-15

Plot 8
JP 2·2
13.43 Acres
Refill '40-SP
42-JP

Plot 9
JP 2.2
16-95 Acres
Refill '40- JP

Refill 1940
42 JP
Plot 10 JP 2.2
11. 24 Acres

1940 JP
'42 JP
Plot 11
JP 2-1
9.41 Acres

.25 Acres
Plot 14 Blue Spruce
Refill '40 W.Sp.

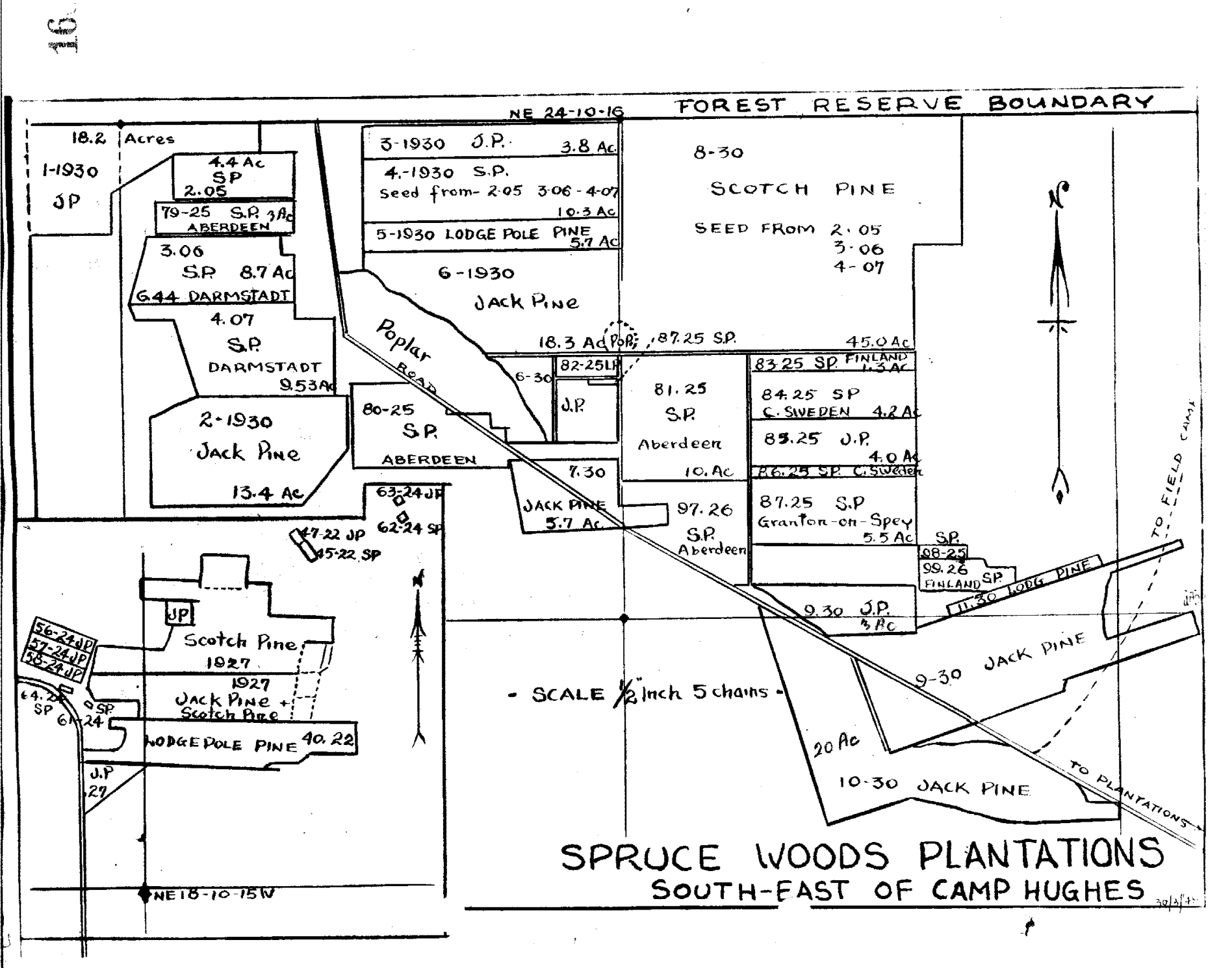
Plot 15
JP 2.1
9.41 Acres
'40 JP

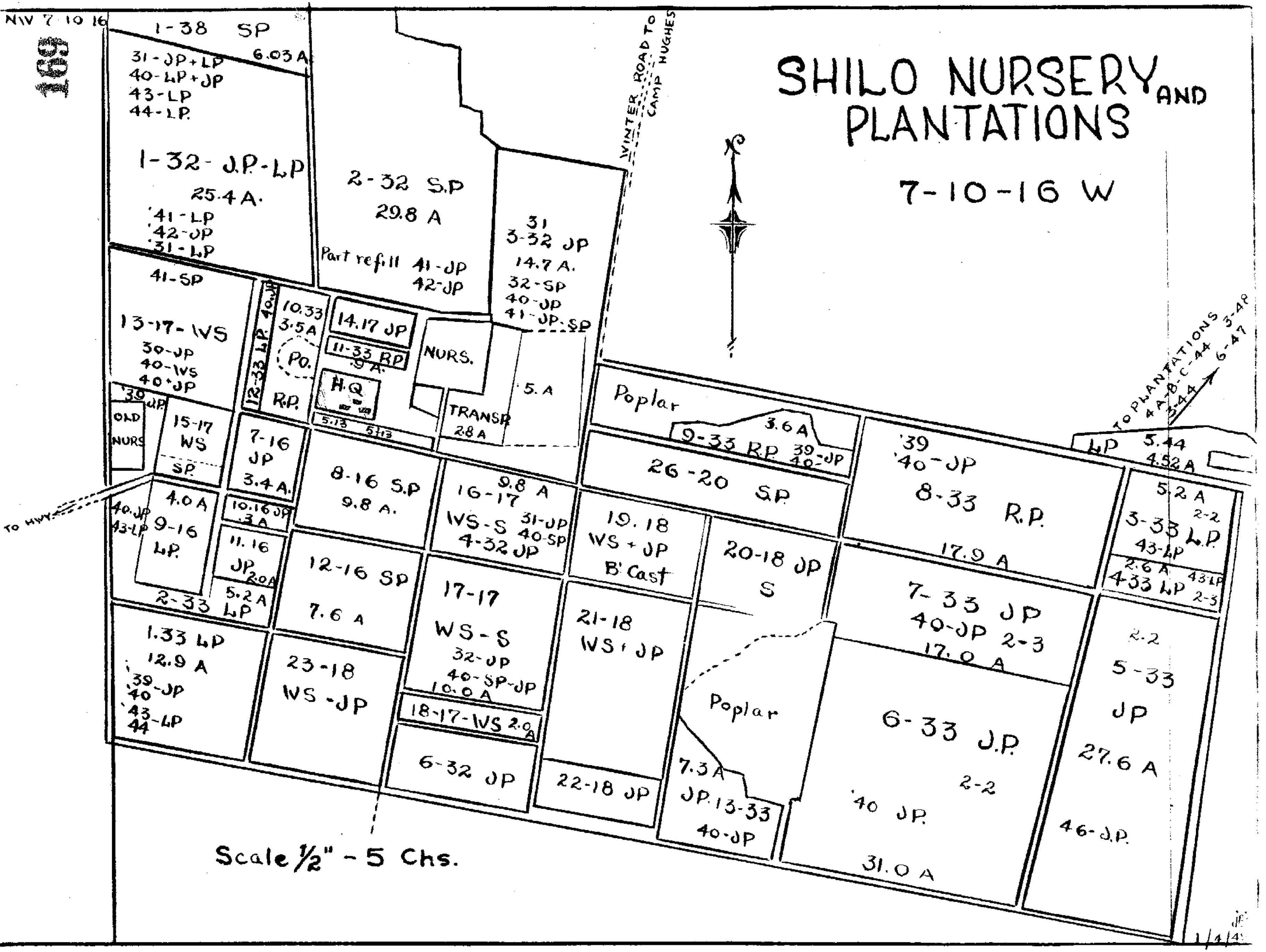
Area A2

'40. JP
Plot 12
J.P 2.1 4.35 Ac

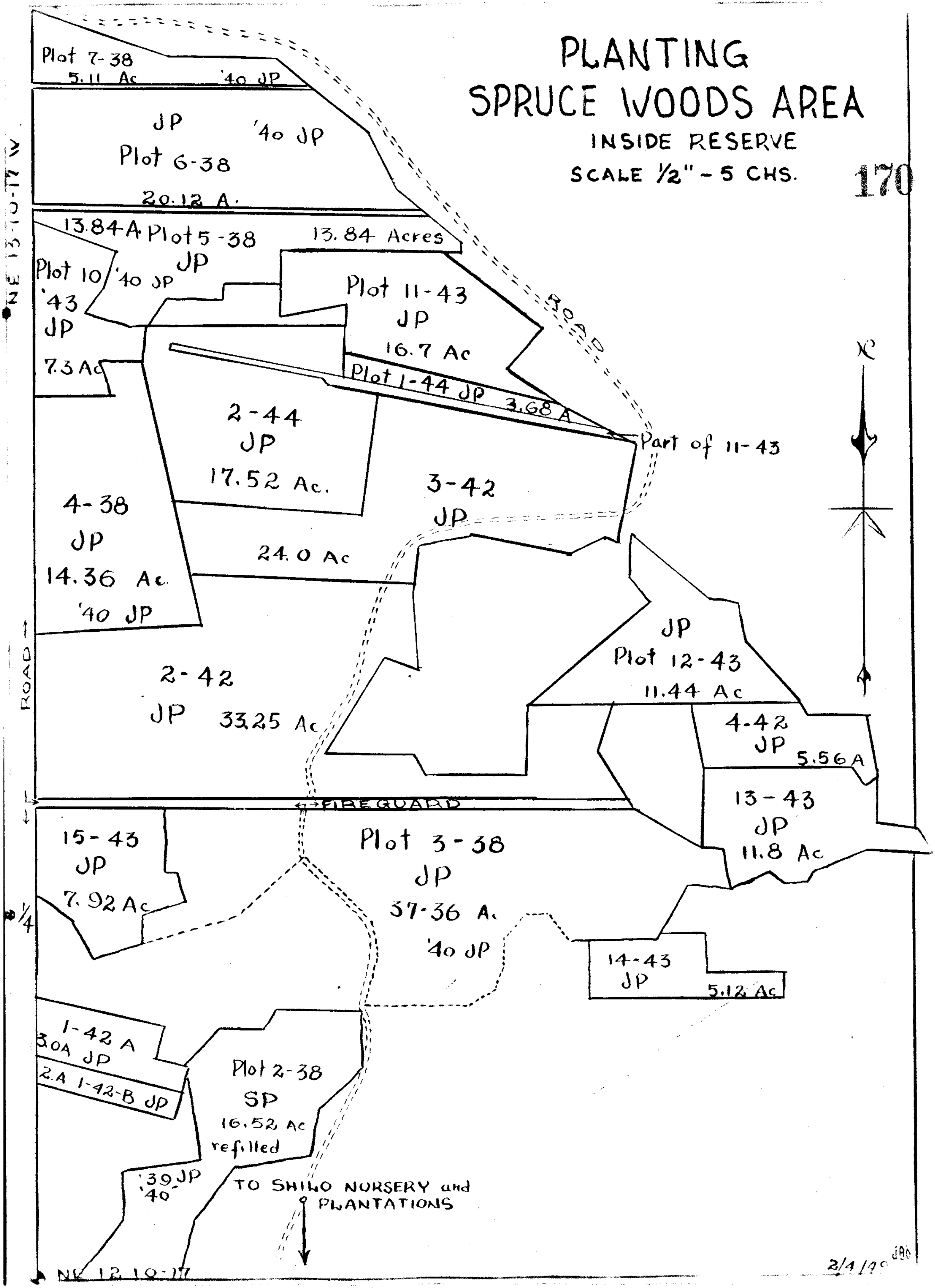
Plot 13
J.P 2-1 3.36 Ac
'40 JP

J.P.D '49

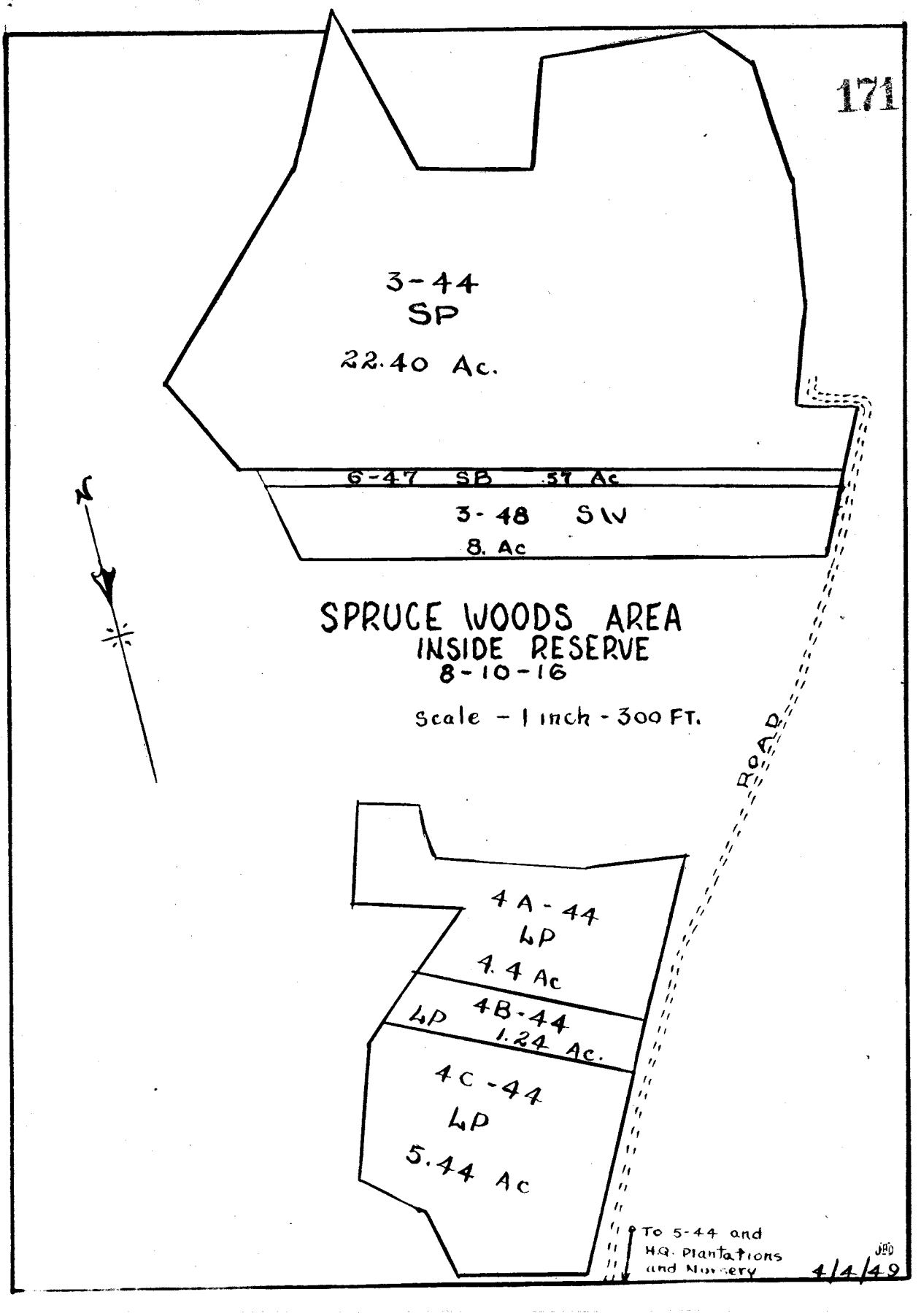

FOREST RESERVE BOUNDARY
NE 24-10-16
18.2 Acres
1-1930 J.P.
4.4 Ac S.P. 2.05
79-25 S.P. 3 Ac ABERDEEN
3.06 S.P. 8.7 Ac
6.44 DARMSTADT
4.07 S.P. DARMSTADT 9.53 Ac
2-1930 Jack Pine 13.4 Ac
3-1930 J.P. 3.8 Ac
4.-1930 S.P. Seed from- 2.05 3.06 - 4-07 10.3 Ac
5-1930 LODGE POLE PINE 5.7 Ac
6-1930 Jack Pine
18.3 Ac
Poplar Road
8-30 SCOTCH PINE SEED FROM 2.05 3.06 4-07
87.25 S.P. 45.0 Ac
82-25 LP
6-30 J.P.
80-25 S.P. ABERDEEN
7.30 JACK PINE 5.7 Ac
81.25 S.P. Aberdeen 10. Ac
97.26 S.P. Aberdeen
83.25 SP FINLAND 1.3 Ac
84.25 SP C. SWEDEN 4.2 Ac
85.25 J.P. 4.0 Ac
86.25 SP C. Sweden
87.25 S.P Granton-on-Spey 5.5 Ac
88-25 S.P.
99.26 FINLAND SP.
11.30 LODG PINE
9.30 J.P. ½ Ac
9-30 JACK PINE
20 Ac
10-30 JACK PINE
TO FIELD CAMP
TO PLANTATIONS
63-24 JP
62-24 SP
47-22 JP
45-22 SP
JP
Scotch Pine 1927
56-24 JP
57-24 JP
58-24 JP
1927 Jack Pine + Scotch Pine
64.24 SP
60-24 SP
LODGEPOLE PINE 40.22
J.P 29
NE 18-10-15 W
- SCALE ½ Inch 5 chains -
SPRUCE WOODS PLANTATIONS
SOUTH-EAST OF CAMP HUGHES



SHILO NURSERY AND PLANTATIONS
7-10-16 W
169
NW 7-10-16
1-38 SP
6.03 A
31-JP+LP
40-LP+JP
43-LP
44-LP.
1-32-J.P.-LP
25.4 A.
41-LP
42-JP
31-LP
2-32 S.P
29.8 A
Part refill 41-JP
42-JP
31
3-32 JP
14.7 A.
32-SP
40-JP
41-JP.SP
WINTER ROAD TO CAMP HUGHES
41-SP
13-17-WS
30-JP
40-WS
40+JP
12-33 LP 40-JP
10.33
3.5 A
Po.
R.P.
14.17 JP
11-33 RP
.9 A.
H.Q
5.13
5.13
NURS.
TRANSP.
2.8 A
5. A
Poplar
3.6 A
9-33 R.P.
39-JP
40-JP
39
40-JP
8-33 R.P.
17.9 A
LP
5.44
4.52 A
TO PLANTATIONS
4 A-B-C-44
3-44
3-48
6-47
39 JP
OLD NURS.
15-17
WS
SP
7-16
JP
3.4 A.
8-16 S.P
9.8 A.
9.8 A
16-17
WS-S
31-JP
40-SP
4-32 JP
19.18
WS+JP
B'Cast
26-20 SP
20-18 JP
S
5.2 A
2-2
3-33 LP
43-LP
2.6 A
4-33 LP
43 LP
2-3
TO HWY.
4.0 A
40-JP
43-LP
9-16
LP.
10.16 JP
.3 A
11.16
JP
2.0 A
12-16 SP
7.6 A
17-17
WS-S
32-JP
40-SP-JP
10.0 A
21-18
WS+JP
7-33 JP
40-JP 2-3
17.0 A
5.2 A
2-33 LP
1.33 LP
12.9 A
39-JP
40
43-LP
44
23-18
WS-JP
18-17-WS 2.0 A
6-32 JP
22-18 JP
Poplar
7.3 A
JP.13-33
40-JP
6-33 J.P.
2-2
40 JP.
31.0 A
2-2
5-33
JP
27.6 A
46-J.P.
Scale 1/2" - 5 Chs.
1/4/4



PLANTING
SPRUCE WOODS AREA
INSIDE RESERVE
SCALE ½" - 5 CHS.
170
Plot 7-38
5.11 Ac
'40 JP
JP
'40 JP
Plot 6-38
20.12 A.
13.84 A Plot 5-38
13.84 Acres
JP
Plot 10
'40 JP
'43
JP
7.3 Ac
Plot 11-43
JP
16.7 Ac
ROAD
Plot 1-44 JP 3.68 A
Part of 11-43
2-44
JP
17.52 Ac.
3-42
JP
24.0 Ac
4-38
JP
14.36 Ac
'40 JP
NE 13-10-17 W
ROAD
2-42
JP 33.25 Ac
JP
Plot 12-43
11.44 Ac
4-42
JP
5.56 A
13-43
JP
11.8 Ac
FIREGUARD
15-43
JP
7.92 Ac
Plot 3-38
JP
37-36 A.
'40 JP
14-43
JP
5.12 Ac
¼
1-42 A
3.0A JP
2.A 1-42-B JP
Plot 2-38
SP
16.52 Ac
refilled
'39 JP
'40
TO SHILO NURSERY and
PLANTATIONS
NE 12-10-17
2/4/40


3-44
SP
22.40 Ac.
6-47 SB .57 Ac
3-48 SW
8. Ac
N
SPRUCE WOODS AREA
INSIDE RESERVE
8-10-16
Scale - 1 inch - 300 FT.
ROAD
4A-44
LP
4.4 Ac
4B-44
LP
1.24 Ac.
4C-44
LP
5.44 Ac
To 5-44 and
H.Q. Plantations
and Nursery
JBD
4/4/49

(iv) Insects Encountered:

The following is a list of pests and tree species attacked by area:

NISBET PROVINCIAL FOREST

- MacDowall Block Plantations -

TREE SPECIES	INSECT SPECIES
Engelmann Spruce	White pine weevil; yellow-headed spruce sawfly; Adelges sp.
Jack Pine	White pine weevil; resin midge (Retinodiplosis sp.); pitch nodule maker; scale,(Toumeyella sp.) Adelges sp.
Red Pine	Resin midge,(Retinodiplosis sp.); pitch nodule maker; white pine weevil.
White Spruce	White pine weevil; Adelges sp.; resin midge, (Retinodiplosis sp.); yellow-headed spruce sawfly.
Lodgepole Pine	White pine weevil; pitch nodule maker; resin midge,(Retinodiplosis sp.)
Scots Pine	Pitch nodule maker; resin midge,(Retinodiplosis sp.)
Yellow Pine	White pine weevil; resin midge,(Retinodiplosis sp.)

- GRANDVIEW PLANTATIONS -

TREE SPECIES	INSECT SPECIES
White Spruce	Sawfly (species unknown); white pine weevil.
Jack Pine	Nil - (Trees too tall for examination).
Scots Pine	None observed - trees too tall for examination.

SANDILANDS FOREST RESERVE

TREE SPECIES	INSECT SPECIES
Red Pine	Jack pine budworm (Choristoneura fumiferana Clem.)
Scots Pine	Jack pine budworm; pitch nodule maker
Lodgepole Pine	Jack pine budworm; pitch nodule maker

SPRUCE WOODS FOREST RESERVE

- Area A1 (West of Carberry) -

TREE SPECIES	INSECT SPECIES
Jack Pine	Pitch nodule maker; white pine weevil; twig borer.
Lodgepole Pine	Pitch nodule maker; white pine weevil.
Scots Pine	Pitch nodule maker; white pine weevil.

- Area A2 (West of Carberry) -

TREE SPECIES	INSECT SPECIES
Jack pine	Pitch nodule maker; white pine weevil; twig borer.
Lodgepole Pine	Pitch nodule maker; white pine weevil.
Scots Pine	Pitch nodule maker; white pine weevil.

- Camp Hughes Area -

TREE SPECIES	INSECT SPECIES
Jack Pine	Pitch nodule maker; white pine weevil; twig borer, aphids.
Lodgepole Pine	Pitch nodule maker; white pine weevil.
Scots Pine	Pitch nodule maker; white pine weevil, wood borer bark beetles.

- Shilo Nursery and Plantations -

TREE SPECIES	INSECT SPECIES
Jack Pine	Pitch nodule maker; white pine weevil, twig borer, aphids.
Lodgepole Pine	Pitch nodule maker; white pine weevil, twig borer.
Scots Pine	Pitch nodule maker; white pine weevil.
White Spruce	Sawfly (species unknown); spruce gall aphid (Adelges abietis L.)

(v) Summary of Plantations:

Plantations were summarized by area. Data on size of each plantation in acres, year planted, years restocked and species, total number of trees examined in each plantation, number of each species examined, and average height and range of each species are contained in the following tables:

TABLE A

MacDowall Block---Nisbet Provincial Forest

TABLE B

Grandview Plantations

TABLE C

Sandilands Forest Reserve

TABLE D

Area A1---Spruce Woods Forest Reserve

TABLE E

Area A2---Spruce Woods Forest Reserve

TABLE F

Camp Hughes Area-Spruce Woods Forest Reserve

TABLE G

Shilo Nursery and Plantations-
Spruce Woods Forest Reserve

TABLE A

MacDowall Block---Nisbet Provincial Forest

Plantation No.	Forest Service Number	Acreage	ENGELMANN SPRUCE						LODGEPOLE PINE					
			Average Height	Range	Year Planted	Years to stocked	Species	Number examined	Average Height	Range	Year Planted	Years to stocked	Species	Number examined
1.	1-16	.25	18	10/29	1916	?		50						
2.	1-16	2.							20	15/22	1916	?		50
3.	2-16	1.5							22	15/30	1916	?		13
4.	5-16	1.06							25	20/35	1916	?		3
5.	11-18	.75												
6.	12-18	13.												
7.	13-18	1.35												
8.	15-27	1.30												
9.	7-17	3.43												
10.	8-18	1.65												

TABLE A (cont'd)

MacDowall Block---Nisbet Provincial Forest

Plantation No.	Forest Service Number	Acreage	JACK PINE						SCOTCH PINE					
			Average Height	Range	Year Planted	Years re-stocked	Species	Number examined	Average Height	Range	Year Planted	Years re-stocked	Species	Number examined
1.	1-16	.25												
2.	1-16	2.												
3.	2-16	1.5	22	15/30	1916	?		22	15	15/30	1916	?		5
4.	5-16	1.06	30	20/35	1916	?		47						
5.	11-18	.75	37	30/40	1918	?		50						
6.	12-18	13.	29	20/35	1918	?		150						
7.	13-18	1.35	29	25/35	1918	?		50						
81	15-27	1.30	16	10/20	1927	?		50						
9.	8-18	1.65												
10.	8-18	1.65	29	17/35	1918	?		50						

TABLE A (cont'd)

MacDowall Block---Nisbet Provincial Forest

Plantation No.	Forest Service Number	Acreage	RED PINE						YELLOW PINE						WHITE SPRUCE					
			Average Height	Range	Year Planted	Years re-stocked	Species	Number examined	Average Height	Range	Year Planted	Years re-stocked	Species	Number examined	Average Height	Range	Year Planted	Years re-stocked	Species	Number examined
1.	1-16	.25																		
2.	1-16	2.																		
3.	2-16	1.5	23	15/30	1916	?		8	21	15/30	1916	?		2						
4.	5-16	1.06																		
5.	11-18	.75																		
6.	12-18	13.																		
7.	13-18	1.35																		
8.	15-27	1.30																		
9.	7-17	3.43													10	2/32	1917	1926	W.Sp.	100
10.	8-18	1.65																		

TABLE B

Grandview Plantation---Duck Mountain Forest Reserve

Plantation No.	Forest Service Number	Acreage	WHITE SPRUCE						SCOTS PINE						JACK PINE					
			Average Height	Range	Year Planted	Years re-stocked	Species	Number examined	Average Height	Range	Year Planted	Years re-stocked	Species	Number examined	Average Height	Range	Year Planted	Years re-stocked	Species	Number examined
1.	S-6	.25	11	1/20	1920	?		50												
2.	S-5	.25	10	2/18	1920	?		50												
3.	S-4	.25	9	2/15	1920	?		50												
4.	Plot-17	.12							26	12/35	1922	?		?						
15.	Plot-16	.18													29	24/36	1922	?		?

TABLE C

Sandilands Forest Reserve

Plantation No.	Forest Service Number	Acreage	RED PINE						SCOTCH PINE						LODGEPOLE PINE					
			Average Height	Range	Year Planted	Years fo stocked	Species	Number examined	Average Height	Range	Year Planted	Years fo stocked	Species	Number examined	Average Height	Range	Year Planted	Years fo stocked	Species	Number examined
1.	1	4.8	5	3/6	1933	?		50												
2.	2	.86	6	5/10	1933	?		50												
3.	3	.48	6	4/8	1933	?		50												
4.	4	.95	6	3/8	1933	?		50												
5.	5	.61	6	4/10	1933	?		50												
6.	6	3.4	5	3/6	1933	?		50												
7.	1	1.7	2	1/3	1943	?		50												
8.	1	10.9							4	1.5/5.5	1942	?	?	83	2	1.5/5	1942			17
9.	2	10.7	3	2/6	1940	?		52	3	2/6	1940	?		46	2	2/5.5	1940			2
10.	2	3.7	2	1/4	1943	?		50												
11.	1	3.4							4	2/5	1940	?		50						
12.	1	15	2	1.5/6	1939	?		11	3	.5/6	1939	?		105						
13.	1	8.1	2	1.5/5.5	1939	?		100												
14.	1	22.1	3	2/6	1938	?		150												
15.	3	6.7	5	2/6	1937	1941	S.pine	87	4	2/6	1941			13						
16.	2	9.0	4	2/6	1937	1941	S.pine	100												
17.	2	2.6	3	2/4	1938	?		50												
18.	1	12.3	4	2/6	1937	1941	R&Spine	150												

TABLE D

Area A1----Spruce Woods Forest Reserve

Plantation Number	Forest Service Number	Average	JACK PINE					
			Average Height	Range	Year Planted	Years Restocked	Species	Number Examined
1	3	7.5	11	5/20	1934	1935,3740	Pj,Ps	100
2	6	6.2	9	4/18	1934	1935,40	Lpp,Pj	150
3	7	5.1	9	4/15	1934	1935,40	Lpp,Pj	50
4	1	2.7	5	2/9	1934	1935,3740	Pr,Ps	50
5	2	1.3	11	1/15	1934	1935,3740	PjLppPs	7
6	4	10.8	7	3/15	1934	1935,3740	Pj	150
7	5	9.8	8	3/15	1934	1935,40	Pj	150
8	9	1.0	8	5/12	1934	1935,40	Pj	50
9	15	1.8	8	4/15	1934	1940	Pj	50
10	14	3.3	9	4/15	1934	1940	Pj	100
11	3	8.6	5	4/8	1943	?		100
12	2	1.12	5	4/9	1943	?		50
13	7	6.32	4	1/7	1943	?		100
14	6	4.5	5	3/7	1943	?		100
15	5	5.43	5	2/6	1943	?		100
16	4	6.1	5	3/7	1943	?		100
17	9A	10.72	5	4/7	1944	?		100
18	8	2.6	9	6/15	1934	1935,40	Lpp,Pj	42
19	13	2.6	9	5/15	1934	1935,40	Lpp,Pj	44
20	12	1.3	8	4/14	1934	1935,40	Lpp,Pj	85
21	17	3.9	7	4/10	1934	1935,40	Lpp,Pj	65
22	16	2.3	7	4/9	1934	1940	Pj	40
23	11	1.2	8	5/12	1934	1935,40	Pr,Pj	80
24	8	10.6	5	4/7	1943	?		150
25	9	8.5	4	3/6	1944	?		100
26	8	8.04	4	3/5	1944	?		100
27	7	5.97	4	2/6	1944	?		100
28	10	1.9	7	6/15	1934	1935,40	Pj	50
29	6	6.75						
30	17	7.76	3	1/5	1943	Nil		100

TABLE D (cont'd)

Plantation Number	Forest Service Number	Acreage	SCOTCH PINE					
			Average Height	Range	Year Planted	Years Restocked	Species	Number Examined
1	3	7.5	4	3/6	1934	?		50
2	6	6.2						
3	7	5.1						
4	1	2.7						
5	2	1.8	7	1/15	1934	1935,37,40	Pi,Lpp,Fs	8
6	4	10.8						
7	5	9.8						
8	9	1.0						
9	15	1.8						
10	14	3.3						
11	3	6.8						
12	2	1.12						
13	7	6.32						
14	6	4.5						
15	5	5.43						
16	4	6.1						
17	9A	10.72						
18	8	2.6						
19	13	2.6						
20	12	1.3						
21	17	3.9						
22	16	2.3						
23	11	1.2						
24	8	10.6						
25	9	8.6						
26	8	8.04						
27	7	5.97						
28	10	1.9						
29	6	6.75	2	.5/3	1945	?		15
30	17	7.76						

TABLE D (cont'd)

Plantation Number	Forest Service Number	Average	LODGEPOLE PINE					
			Average Height	Range	Year Planted	Years Restocked	Species	Number Examined
1	3	7.5						
2	6	6.2						
3	7	5.1						
4	1	2.7						
5	2	1.8	6	1/15	1934	1935,37,40	Pj,Lpp,Ps	35
6	4	10.8						
7	5	9.8						
8	9	1.0						
9	15	1.8						
10	14	3.3						
11	3	6.6						
12	2	1.12						
13	7	6.32						
14	6	4.5						
15	5	5.43						
16	4	6.1						
17	9A	10.72						
18	8	2.6	7	6/15	1934	1935,40	Lpp,Pj	8
19	13	2.6	5	5/15	1934	1935,40	Lpp,Pj	6
20	12	1.3	6					25
21	17	3.9	6					35
22	16	2.3	6					10
23	11	1.2						
24	8	10.6						
25	9	8.6						
26	8	8.04						
27	7	5.97						
28	10	1.9						
29	6	6.75						
30	17	7.76						

TABLE K

Area A2——Spruce Woods Forest Reserve

Plantation No.	Forest Service Number	Acreage	JACK PINE						SCOTCH PINE					
			Average Height	Range	Year Planted	Years re-stocked	Species	Number examined	Average Height	Range	Year Planted	Years re-stocked	Species	Number examined
1.	11	9.41	8	1/14	1938	1940, 1942.	Pj	150						
2.	8	13.4	14	1/15	1938	1940,1942	Ps, Pj	129	6	4/7	1940	1942	Pj	21
3.	2	16.9	11	3/18	1938	1940	Pj	150						
4.	10	11.2	8	2/18	1938	1940,1942	Pj	150						
5.	1	9.41	9	3/15	1938	1940	Pj	150						
6.	12	4.35	9	5/15	1938	1940	Pj	100						
7.	13	3.36	9	4/15	1938	1940	Pj	100						

TABLE F

CAMP HUGHES AREA---SPRUCE WOODS FOREST RESERVE

Plantation No.	Forest Service Number	Acreage	JACK PINE						SCOTCH PINE						LODGEPOLE PINE					
			Average Height	Range	Year Planted	Years re stocked	Species	Number examined	Average Height	Range	Year Planted	Years re stocked	Species	Number examined	Average Height	Range	Year Planted	Years re stocked	Species	Number examined
1.	10	20	11	5/25	1930	?	PJ	150												
2.	none	15							16	12/20	1927	?		100						
3.	9	?	9	3/20	1930			75												
4.	3	3.8	14	8/18	1930			50												
5.	4	10.3							12	6/20	1930			100						
6.	5	5.7													8	3/11	1930			50
7.	6	18.3	13	7/20	1930			150												
8.	82	1.5													12	5/20	1925			50
9.	87	3.5							14	10/20	1925			50						
10.	7	5.7	15	10/25	1930			100												
11.	80	4	8	4/15	1925	?	PJ	8	13	8/20	1925	?	PJ	41						
12.	2	13.4	17	10/25	1930			151												
13.	79	3	7	4/15	1925	?	PJ	19	11	4/15	1925		PJ	30						
14.	1	18.2	15	6/35	1930	?		150												
15.	97	4.9							12	8/18	1926			50						
16.	81	10							14	5/20	1925			150						
17.	8	35							16	8/30	1930			58						
18.	83	1.3							15	7/20	1925			50						
19.	85	4	16	5/35	1925			50												
20.	40	6													11	5/25	1922			100
21.	?	2	16	8/25	1927			50												
22.	11	2	6	5/10	1930		PJ,Lpp	7							12	3/20	1930	?	PJ,Lpp	43
23.	99	2	5	3/12	1926		PJ	26	6	3/12	1926		PJ	24						
24.	96	1	5	3/6	1925		PJ	47	5	3/6	1925		PJ	3						
25.	9	3	13	5/10	1930		PJ	50												
26.	87	5	6	4/20	1925		Ps. PJ	28	13	4/20	1925		Ps.PJ	22						

TABLE O (a)

Shilo Nursery and Plantations----Spruce Woods Forest Reserve

Plantation No.	Forest Survey Number	Acreage	JACK PINE						LODGEPOLE PINE					
			Average Height	Range	Year Planted	Years re-stocked	Species	Number examined	Average Height	Range	Year Planted	Years re-stocked	Species	Number examined
1.	1	25.4	8	1/25	1932	1931,44,40, 41,42, 43	Pj.Lpp	95	7	1/25	1932	1931,44,40, 41, 42,43.	Pj.Lpp	9[illegible]
2.	3	5.0							5	2/7	1933	1943	Lpp	9[illegible]
3.	4	2.6							6	3/10	1933	1943	Lpp	9[illegible]
4.	15	3.4												
5.	8	17.9	7	4/10	1933	1939, 40	Pj	140						[illegible]
6.	13	10	7	1½/30	1917	1916 - 19, 20, 39, 41	Pj.Ns.Sp	132						
7.	?	2	8	2½/10	1937	?	?	50						
8.	23	10	6	4/10	1918	?		10[illegible]	5	4/10	1918	?		[illegible]
9.	2	5.2	10	4/14	1933	1940,43,44	Pj.Lpp	41	7	4/14	1933	1940,43,44	Pj.Lpp	[illegible]
10.	1	12.9	5	3/10	1933	1939, 40, 1944, 45	Pj.Lpp	83	5	3/10	1933	1939, 40, 1944, 45	Pj.Lpp	6[illegible]
11.	11	9	7	1/12	1933	1940	Pj.Lpp.Sp.	24						
12.	40	5.44							2	1/2½	1944	Nil		9[illegible]
13.	5	4.52							1.5	2/2½	1944	Nil		9[illegible]
14.	6	4.4							1.5	1/3	1944	Nil		9[illegible]

TABLE G (b)

Shilo Nursery and Plantations---Spruce Woods Forest Reserve

Plantation No.	Forest Survey Number	Acreage	SCOTCH PINE						RED PINE						WHITE SPRUCE					
			Average Height	Range	Year Planted	Years re stocked	Species	Number examined	Average Height	Range	Year Planted	Years re stocked	Species	Number examined	Average Height	Range	Year Planted	Year s re stocked	Species	Number examined
1.	1	25.4																		
2.	3	5.0																		
3.	4	2.6																		
4.	15	3.4	55	4/20	1917	1921	?	25							11	4/20	1917	1921	?	25
5.	8	17.9							5	4/10	1933	1939 1940	Pj	10						
6.	13	10.													11					18
7.	?	2.																		
8.	23	10																		
9.	2	5.2																		
10.	1	12.9																		
11.	11	9	5	1/12	1933	1940	Pj, Sp Lpp	23	7	1/12	1933	1940	Pj, Sp Lpp	3						
12.	40	5.44																		
13.	5	4.52																		
14.	6	4.4																		

TABLE G a (cont'd)

Plantation No.	Foresters-Beltsville No.	Acreage	JACK PINE						LODGEPOLE PINE					
			Average Height	Range	Year Planted	Years re-stocked	Species	Number examined	Average Height	Range	Year Planted	Years re-stocked	Species	Number examined
15.	3	22.4												
16.	10	3.5	7	3/10	1933	?	PJ	50						
17.	2	29.8	6	4/20	1932	1931,41,42	PJ	53						
18.	3	14.7	10	7/20	1932	1932,40,41	Sp, PJ	55						
19.	16/4	9.8	8	2/20	1917 1932	1917, 1932 1931, 1940	Ws,PJ,Sp.	74						
20.	4B	2.84	2.5	1/3	1944	W11		14	1.3	1/3	1944	W11		36
21.	19	9.9	9	3/24	1918	?		100						
22.	5	27.6	9	4/15	1933	1940	PJ	150						
23.	6	31	10	4/20	1933	1940	PJ	150						
24.	7	17	9.5	5/15	1933	1940	PJ	150						
25.	13	7.3	7	4/20	1933	1940	PJ	100						
26.	6	6.2	8	3/20	1932	1940	PJ	100						
27.	18	2	9	2/22	1917	1932,1940	PJ	41						
28.	17	10	7	3/16	1917	1932, 1940	PJ, Sp	150						
29.	3	37.36	9	5/12	1938	1940	PJ	150						

TABLE G b (cont'd)

Plantation No.	Forest Survey Number	Acreage	SCOTCH PINE						RED PINE						WHITE SPRUCE					
			Average Height	Range	Year Planted	Years re stocked	Species	Number examined	Average Height	Range	Year Planted	Years re stocked	Species	Number examined	Average Height	Range	Year Planted	Years re stocked	Species	Number examined
15.	3	22.4	12	1/3	1944	Nil		100												
16.	10	3.5																		
17.	2	29.8	10	4/20	1932	1931,41 42.	P1	97												
18.	3	14.7	11	7/20	1932	1932, 40,41	P1,Sp.	95												
19.	16/4	9.8	5	2/20	1917 1932	1917,32 31,40	Ws P1,Sp.	22							11	2/20	1917 1932	1917,32 31,40	Ws P1,Sp.	4
20.	48	1.24																		
21.	19	9.9																		
22.	5	27.6																		
23.	6	31.																		
24.	7	17.																		
25.	13	7.3																		
26.	6	6.2																		
27.	18	2.													9.5	2/22	1917	1932 1940	P1.	9
28.	17	10.																		
29.	3	37.36																		

TABLE 9 a (Cont'd)

Plantation No.	Forest Survey Number	Acreage	JACK PINE						LODGEPOLE PINE					
			Average Height	Range	Year Planted	Years re-stocked	Species	Number examined	Average Height	Range	Year Planted	Years re-stocked	Species	Number examined
30.	14	5.6	5	3/6	1942	Nil		50						
31.	3	24.0	7	2/8	1942	Nil		150						
32.	14	5.12	5	3/6	1943	Nil		50						
33.	13	11.8	5	3/6	1943	Nil		100						
34.	12	11.44	5	4/6	1943	Nil		100						
35.	11	16.7	5	4/6	1943	Nil		150						
36.	2	17.5	4	2/5	1944	Nil		150						
37.	1	3.68	5	4/6	1944	Nil		50						
38.	1	6.03	9	3/14	1938	1939.1940	Pj.Sp.	25						
39.	2	16.52	7	3/16	1938	1939.1940	Pj	78						
40.	9	3.6	6	3/12	1933	1939.1940	Pj	47						
41.	15	7.92	6	2?/9	1943	Nil		100						
42.	10	7.3	7	2/9	1943	?		100						
43.	1	2.	6.5	2/11	1942B	?		50						
44.	1	3.	7	2/10	1942A	?		50						
45.	2	33.25	7	3/10	1942	?		150						
46.	4	14.15	9	2/16	1938	1940	Pj	150						
47.	5	10.68	9	3/15	1938	?		150						
48.	7	5.11	8	2?/13	1938	1940.1942	Pj	33						
49.	6	16.12	8	4/13	1938	1940	Pj	150						
50.	2	.25												
51.	17	7.76	3	1/4	1943	Nil		100						

TABLE G a (cont'd)

Plantation No.	Forest Survey Number	Acreage	SCOTCH PINE						RED PINE						WHITE SPRUCE					
			Average Height	Range	Year Planted	Years re stocked	Species	Number examined	Average Height	Range	Year Planted	Years re stocked	Species	Number examined	Average Height	Range	Year Planted	Years re stocked	Species	Number examined
30.	4	5.6																		
31.	3	24.0																		
32.	14	5.12																		
33.	13	11.8																		
34.	12	11.44																		
35.	11	16.7																		
36.	2	17.5																		
37.	1	3.68																		
38.	1	6.03	7	3/14	1938	1939.40	Pi.Sp	75												
39.	2	16.52	7.5	3/18	1938	1939.40	Pi	72												
40.	9	3.6							3	3/12	1933	1939.40	Pi	3						
41.	15	7.92																		
42.	10	7.3																		
43.	1	2.																		
44.	1	3.																		
45.	2	33.25																		
46.	4	14.15																		
47.	5	10.68																		
48.	7	5.11	6.5	2½/13	1938	1940.42	Pi	17												
49.	6	16.12																		
50.	2	.25	4	3/5½	1941	Nil		50												
51.	17	7.76																		

(vi) Summary of Insect Conditions:

In the Nisbet Provincial Forest, injury by the pitch nodule maker occurred on 28 per cent of the jack pine examined but only a few nodules were found on each tree. Nodules were also found on red, Scots and lodgepole pine. Only 5 per cent of the lodgepole pine was infested.

Leader damage caused by the white-pine weevil was evident on all species of pine examined in the Nisbet plantations. Twenty-five per cent of the jack pine, 41 per cent of the red pine and 11 per cent of the lodgepole pine were infested. Both yellow pine and Scots pine were examined but too few trees were examined to determine the degree of infestation.

Engelmann spruce and white spruce in the plantations were severely infested with galls caused by Adelges (probably abietis L.). One hundred per cent of the Engelmann spruce were infested compared with 28 per cent of the white spruce. Light defoliation by the yellow-headed spruce sawfly was observed on 40 per cent of the Engelmann spruce and 5 per cent of the white spruce.

In the Grandview plantations, light defoliation by a sawfly (species unknown) was evident on 5 per cent of the trees examined. Leader damage caused by the white-pine weevil occurred on less than 1 per cent of the trees examined.

In the Sandilands Forest Reserve, only 6 per cent of the lodgepole pine and 4 per cent of the Scots pine examined were infested with the pitch nodule maker. Except for a few nodules found on the trees in one plantation, red pine was free of attack by the pitch nodule maker. No trace of the white-pine weevil was found.

In the Spruce Woods Forest Reserve, trees bearing old and new nodules of the pitch nodule maker were found in practically all plantations. From 3 to 100 per cent of the trees examined in each plantation were so affected. Of the trees examined, 35 per cent of the jack pine, 65 per cent of the lodgepole pine and 10 per cent of the Scots pine were infested. Leader damage caused by the white-pine weevil was light in most plantations; only 3 per cent of the Scots pine, 1 per cent of the lodgepole pine and less than 1 per cent of the jack pine were infested.

A complete summary of insect conditions in each plantation is shown in the tables appended hereto.

TABLE A

MacDowall Block - Nisbet Provincial Forest

P.I.S. Plot Number	Trees Infested with Pitch Nodule Maker						Trees Infested with White-Pine Weevil												Trees Infested with Midge											
	Jack Pine		Lodge-pole Pine		Scots Pine		Engel-mann Spruce		Jack Pine		Red Pine		White Spruce		Lodge-pole Pine		Yellow Pine		Jack Pine		Red Pine		White Spruce		Lodge-pole Pine		Scots Pine		Yellow Pine	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	—	—	—	—	—	—	9	18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	10	—	—	—	—	—	—	—	—	1	2	—	—	—	—
3	12	54	3	23	2	40	—	—	11	50	3	37	—	—	2	15	1	50	9	42	1	12	—	—	2	15	4	80	1	50
4	10	21	0	0	—	—	—	—	12	25	—	—	—	—	0	0	—	—	13	27	—	—	—	—	1	33	—	—	—	—
5	0	0	—	—	—	—	—	—	6	12	—	—	—	—	—	—	—	—	14	28	—	—	—	—	—	—	—	—	—	—
6	43	28	—	—	—	—	—	—	44	29	—	—	—	—	—	—	—	—	31	20	—	—	—	—	—	—	—	—	—	—
7	6	12	—	—	—	—	—	—	10	20	—	—	—	—	—	—	—	—	10	20	—	—	—	—	—	—	—	—	—	—
8	31	62	—	—	—	—	—	—	19	38	—	—	—	—	—	—	—	—	32	64	—	—	—	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—	—	—	—	—	—	12	12	—	—	—	—	—	—	—	—	19	19	—	—	—	—	—	—
10	8	16	—	—	—	—	—	—	21	42	—	—	0	0	—	—	—	—	9	18	—	—	0	0	—	—	—	—	—	—

Note: The yellow-headed spruce sawfly caused light defoliation to the spruce in Plantations Nos. 1 and 9.
An aphid Adelges sp. was also noted on spruce in the same plantations

TABLE B

Grandview Plantations

F.I.S. Plantation Number	Sawfly		White-Pine Weevil	
	No.	%	No.	%
1	4	8	0	0
2	0	0	2	4
3	0	0	1	2

Note: The three plantations at Grandview, Manitoba, consist of three small plots of white spruce

TABLE C

Sandilands Forest Reserve

F.I.S. Plantation Number	Trees Infested With											
	Pitch Nodule Maker						Budworm					
	Scots Pine		Lodgepole Pine		Red Pine		Scots Pine		Lodgepole Pine		Red Pine	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	-	-	-	-	0	0	-	-	-	-	1	2
2	-	-	-	-	0	0	-	-	-	-	0	0
3	-	-	-	-	0	0	-	-	-	-	0	0
4	-	-	-	-	0	0	-	-	-	-	0	0
5	-	-	-	-	0	0	-	-	-	-	0	0
6	-	-	-	-	0	0	-	-	-	-	2	4
7	-	-	-	-	0	0	-	-	-	-	2	4
8	2	2	0	0	-	-	5	6	2	12	-	-
9	3	6	0	0	0	0	2	4	-	-	-	-
10	-	-	-	-	0	0	-	-	-	-	1	2
11	1	2	-	-	-	-	4	8	-	-	-	-
12	5	4	-	-	0	0	4	3	-	-	-	-
13	-	-	-	-	0	0	-	-	-	-	0	0
14	-	-	-	-	0	0	-	-	-	-	0	0
15	0	0	-	-	0	0	0	0	-	-	0	0
16	-	-	-	-	0	0	-	-	-	-	0	0
17	-	-	-	-	0	0	-	-	-	-	0	0
18	-	-	-	-	0	0	-	-	-	-	0	0

Note: A few trees in the plantations in the Sandilands Forest Reserve showed evidence of injury caused by animals

TABLE D

Area A1---Spruce Woods Forest Reserve

F.I.S. Plot Number	Trees Infested with Pitch Nodule Maker						Trees Infested with White-Pine Weevil					
	Jack Pine		Scotspine		Lodgepole Pine		Jack Pine		Scotspine		Lodgepole Pine	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	45	45	1	2	---	----	2	2	0	0	---	----
2	93	35.3	---	----	---	----	0	0	---	----	---	----
3	14	28	---	----	---	----	1	2	---	----	---	----
4	---	----	20	40	---	----	---	----	1	2	---	----
5	0	0	0	0	16	45.7	0	0	0	0	0	0
6	17	11.3	---	----	---	----	1	.7	---	----	---	----
7	19	12.7	---	----	---	----	1	.7	---	----	---	----
8	5	10	---	----	---	----	0	0	---	----	---	----
9	14	28	---	----	---	----	0	0	---	----	---	----
10	26	26	---	----	---	----	2	2	---	----	---	----
11	9	9	---	----	---	----	0	0	---	----	---	----
12	7	14	---	----	---	----	2	4	---	----	---	----
13	20	20	---	----	---	----	0	0	---	----	---	----
14	10	10	---	----	---	----	0	0	---	----	---	----
15	10	10	---	----	---	----	0	0	---	----	---	----
16	14	14	---	----	---	----	0	0	---	----	---	----
17	7	7	---	----	---	----	0	0	---	----	---	----
18	19	45.2	---	----	---	----	4	9.5	---	----	---	----
19	22	50	---	----	1	16.7	0	0	---	----	0	0
20	14	56	---	----	10	40	0	0	---	----	1	4
21	19	29.2	---	----	0	0	0	0	---	----	11	31.4
22	10	25	---	----	0	0	0	0	---	----	3	30
23	16	32	---	----	---	----	0	0	---	----	---	----
24	37	24.7	---	----	---	----	0	0	---	----	---	----
25	4	4	---	----	---	----	0	0	---	----	---	----
26	4	4	---	----	---	----	0	0	---	----	---	----
27	10	10	---	----	---	----	0	0	---	----	---	----
28	23	46	---	----	---	----	2	4	---	----	---	----
29	---	----	0	0	---	----	---	----	0	0	---	----
30	5	5	---	----	---	----	0	0	---	----	---	----

TABLE E

Area A8---Spruce Woods Forest Reserve

F.I.S. Plot Number	Trees Infested with Pitch Nodule Maker				Trees Infested with White-Pine Weevil				Trees Infested with Twig Borers			
	Jack Pine		Scotspine		Jack Pine		Scotspine		Jack Pine		Scotspine	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	52	34.7	-	-	2	1.3	-	-	7	4.7	-	-
2	17	13.2	-	-	13	10	2	9.5	21	16.3	0	0
3	19	12.7	-	-	0	0	-	-	0	0	-	-
4	41	27.3	-	-	0	0	-	-	0	0	-	-
5	33	22	-	-	0	0	-	-	0	0	-	-
6	15	15	-	-	9	9	-	-	4	4	-	-
7	19	19	-	-	6	6	-	-	2	2	-	-

TABLE F

Camp Hughes Area - Spruce Woods Forest Reserve

F.I.S. Plot Number	Trees Infested with Pitch Nodule Maker						Trees Infested with White-Pine Weevil					
	Jack Pine		Scotspine		Lodgepole Pine		Jack Pine		Scotspine		Lodgepole Pine	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	32	21	--	--	--	---	1	1	--	--	--	--
2	--	--	0	0	--	---	--	--	0	0	--	--
3	7	9	--	--	--	---	2	3	--	--	--	--
4	31	62	--	--	--	---	0	0	--	--	--	--
5	--	--	23	23	--	---	--	--	0	0	--	--
6	--	--	--	--	50	100	--	--	--	--	2	4
7	70	47	--	--	--	---	0	0	--	--	--	--
8	--	--	--	--	50	100	--	--	--	--	1	2
9	--	--	6	12	--	---	--	--	8	16	--	--
10	23	23	--	--	--	---	0	0	--	--	--	--
11	7	88	2	5	--	---	0	0	2	5	--	--
12	26	17	--	--	--	---	0	0	--	--	--	--
13	12	63	4	14	--	---	0	0	3	10	--	--
14	21	14	--	--	--	---	0	0	--	--	--	--
15	--	--	0	0	--	---	--	--	7	14	--	--
16	--	--	5	3	--	---	--	--	23	15	--	--
17	No record made, tree too large											
18	--	--	8	16	--	---	--	--	0	0	--	--
19	38	76	--	--	--	---	0	0	--	--	--	--
20	--	--	--	--	81	81	--	--	--	--	0	0
21	26	52	--	--	--	---	0	0	--	--	--	--
22	5	71	--	--	5	12	0	0	--	--	0	0
23	7	27	0	0	--	---	0	0	0	0	--	--
24	5	11	0	0	0	0	0	0	0	0	--	--
25	10	20	--	--	--	---	0	0	--	--	--	--
26	7	25	0	0	--	---	0	0	1	5	--	--

Note: About one per cent of the trees in the Camp Hughes area showed evidence of damage caused by frost and animals.
Less than one per cent or the trees were also attacked by bark beetles and wood borers.

TABLE G

Shilo Nursery and Plantations--Spruce Woods Forest Reserve

F.I.S. Plant. Number	Trees Infested with Pitch Nodule Maker						Trees Infested with White-Pine Weevil					
	Jack Pine		Scotspine		Lodgepole Pine		Jack Pine		Scotspine		Lodgepole Pine	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	35	36	---	---	40	72	0	0	---	---	0	0
2	---	---	---	---	44	88	---	---	---	---	0	0
3	---	---	---	---	49	98	---	---	---	---	1	2
4	---	---	11	44	---	---	---	---	0	0	---	---
5	123	87	---	---	---	---	0	0	---	---	---	---
6	123	93	---	---	---	---	0	0	---	---	---	---
7	43	86	---	---	---	---	2	4	---	---	---	---
8	108	100	---	---	42	100	0	0	---	---	1	2
9	38	92	---	---	9	100	0	0	---	---	0	0
10	82	98	---	---	67	100	2	2	---	---	0	0
11	24	100	12	52	---	---	0	0	0	0	---	---
12	---	---	---	---	11	22	---	---	---	---	0	0
13	---	---	---	---	18	36	---	---	---	---	0	0
14	---	---	---	---	6	12	---	---	---	---	0	0
15	---	---	0	0	---	---	---	---	0	0	---	---
16	48	98	---	---	---	---	0	0	---	---	---	---
17	48	90	20	20	---	---	1	2	1	1	---	---
18	38	69	11	11	---	---	0	0	2	2	---	---
19	46	62	5	22	---	---	0	0	0	0	---	---
20	6	42	---	---	3	.08	1	7	---	---	0	0
21	24	24	---	---	---	---	0	0	---	---	---	---
22	76	50	---	---	---	---	1	.6	---	---	---	---
23	77	51	---	---	---	---	0	0	---	---	---	---
24	124	83	---	---	---	---	0	0	---	---	---	---
25	91	91	---	---	---	---	1	1	---	---	---	---
26	60	60	---	---	---	---	1	1	---	---	---	---
27	16	39	---	---	---	---	0	0	---	---	---	---
28	130	86	---	---	---	---	0	0	---	---	---	---
29	48	32	---	---	---	---	4	3	---	---	---	---
30	12	24	---	---	---	---	0	0	---	---	---	---
31	25	16	---	---	---	---	0	0	---	---	---	---
32	4	8	---	---	---	---	0	0	---	---	---	---
33	24	24	---	---	---	---	0	0	---	---	---	---
34	20	20	---	---	---	---	0	0	---	---	---	---
35	39	26	---	---	---	---	1	1	---	---	---	---
36	13	9	---	---	---	---	0	0	---	---	---	---
37	15	30	---	---	---	---	0	0	---	---	---	---
38	20	80	5	7	---	---	0	0	0	0	---	---
39	45	57	3	4	---	---	1	1	0	0	---	---
40	20	42	---	---	---	---	0	0	---	---	---	---
41	9	9	---	---	---	---	0	0	---	---	---	---
42	4	4	---	---	---	---	0	0	---	---	---	---
43	25	50	---	---	---	---	0	0	---	---	---	---
44	22	44	---	---	---	---	0	0	---	---	---	---
45	38	25	---	---	---	---	0	0	---	---	---	---
46	35	2	---	---	---	---	1	.7	---	---	---	---
47	8	1	---	---	---	---	1	.7	---	---	---	---
48	4	12	---	---	---	---	1	.7	---	---	---	---
49	11	3	---	---	---	---	0	0	---	---	---	---
50	---	---	2	4	---	---	---	---	0	0	---	---

Note: In Plantation No. 3, 20 per cent of the white spruce was infested with Adelges sp., and less than 1 per cent with yellow-headed spruce sawfly.
In Plantation No. 6, less than 1 per cent of the white spruce was infested with yellow-headed spruce sawfly.

6. Permanent Sampling Stations

In 1948, a new phase of Forest Insect Survey sampling was inaugurated in Manitoba and Saskatchewan. In order to attain some continuity of survey sampling, several permanent sampling stations were established in each of the major forest districts. These stations will be re-sampled each year to determine the fluctuations and trends of insect populations in known areas.

The sites for the stations were selected on the basis of freedom from interference and accessibility. For the most part, they were established either in forest reserves or on crown lands.

Standard procedure was employed for establishing and sampling all permanent sampling stations. Sites selected were marked with a galvanized-tin sign nailed to a tree at the centre point of the sampling station. The stations were numbered consecutively according to district, e.g., E1, E2, E3, etc., for the Eastern District of Manitoba. In Saskatchewan the sampling stations were numbered in the same manner, e.g., PA1, PA2, PA3, etc., for the Prince Albert District of Saskatchewan.

Method of sampling at the permanent sampling station was as follows: from the station marker, a compass direction was selected for the centre line of the plot. (The compass direction was recorded for future reference.) Five trees within a strip one chain wide running in that direction up to a maximum of 250 feet from the station marker were selected for sampling. The trees selected were well spaced along the strip.

Tables showing the locations of the permanent sampling stations according to districts are appended hereto.

TABLE A

Permanent Sampling Stations - Eastern District of Manitoba - 1948.

Date Established	Plot No.	Tree Species	Location					Directions for Locating Plot
			Place	Sec.	Tp.	Rge.	Mer.	
June 7	E-1	Jack pine	Riverton, Man.	26	24	2	E.P.	Located in jack-pine ridge near Rosenburg, Manitoba.
June 7	E-2	White poplar	Riverton, Man.	1	25	2	E.P.	1/10 mile north of Rosenburg Tower
June 8	E-3	Jack pine	Riverton, Man.	11	25	2	E.P.	6/10 mile north of Rosenburg Tower
June 11	E-4	Jack pine	Ashern, Man.	24	31	10	W.P.	On left hand side of road to Gypsumville, Manitoba.
July 10	E-5	White poplar	Arborg, Man.	--	22	1	W.P.	11 miles west of Arborg along highway
Aug. 12	E-6	Jack pine	Lac du Bonnet, Man.	--	14	10	E.P.	7 miles south of Lac du Bonnet on Highway No. 11.
Aug. 13	E-7	Balsam fir White poplar	Falcon Lake, Man. Whiteshell For. Res.	--	9	17	E.P.	2½ miles south of No. 1 Highway near Falcon Lake

TABLE B

Permanent Sampling Stations - Western District of Manitoba - 1948.

Date Established	Plot No.	Tree Species	Location					Directions for Locating Plot
			Place	Sec.	Tp.	Rge.	Mer.	
June 5	W-1	White spruce	R.M.N.P., Man.	9	21	19	W.P.	1½ mi. south of Moon Lake on Dauphin Road
June 5	W-2	White spruce	R.M.N.P., Man.	35	21	19	W.P.	150 yds. south of Mi. 146 on Dauphin Road
June 5	W-3	Tamarack	R.M.N.P., Man.	23	21	19	W.P.	¼ mile south of Mi. 144 on Dauphin Road
June 5	W-4	White spruce	R.M.N.P., Man.	14	20	19	W.P.	7/10 mile south of Jct. of Lake Audy and Dauphin Roads
June 5	W-5	White poplar	R.M.N.P., Man.	10	20	19	W.P.	2/10 mile south of Jct. of Lake Audy and Dauphin Roads
June 8	W-6	White spruce	R.M.N.P., Man.	3	21	20	W.P.	On Lake Audy Road. Marker visible
June 8	W-7	White poplar	R.M.N.P., Man.	4	21	20	W.P.	2.1 miles from Baptist Camp Road along Lake Audy Road
June 8	W-8	Jack pine	R.M.N.P., Man.	35	19	17	W.P.	.9 mi. east of Mile 12, Norgate Road
June 8	W-9	White spruce	R.M.N.P., Man.	35	19	17	W.P.	¼ mi. east of Mile 8, Norgate Road
June 8	W-10	White poplar	R.M.N.P., Man.	25	19	18	W.P.	300 yds. east of Whirlpool River, Norgate Road
June 18	W-11	White poplar	Bield, Manitoba.	19	26	26	W.P.	½ mi. east of Bield Ranger Station
June 18	W-12	White spruce	Bield, Manitoba.	22	26	26	W.P.	On Valley River Road
June 18	W-13	Tamarack	Bield, Manitoba.	22	26	26	W.P.	On Valley River Road
July 19	W-14	Jack pine	Grandview, Man.	1	27	24	W.P.	Jack pine plantation adjacent to Ranger Station
June 19	W-15	Scotch pine	Grandview, Man.	1	27	24	W.P.	500 yds. west of Ranger Station
June 15	W-16	White spruce	Grandview, Man.	1	27	24	W.P.	500 yds. west of Ranger Station
June 21	W-17	White spruce	Singoosh Lake, Man.	28	30	25	W.P.	6/10 of a mile west of Blue Lakes
June 21	W-18	Black poplar	Singoosh Lake, Man.	28	30	25	W.P.	1 mile west of Blue Lakes
June 21	W-19	White poplar	Garland, Man.	--	30	25	W.P.	2 miles east of Blue Lakes
June 21	W-20	Jack pine	Garland, Man.	--	30	25	W.P.	Along road to Blue Lakes
June 21	W-21	White poplar	Garland, Man.	--	30	25	W.P.	200 yds. east of bridge between Singoosh and Blue Lakes
June 21	W-22	White spruce	Garland, Man.	19	30	24	W.P.	Across road from Forestry Cabin - Singoosh Lake

TABLE C

Permanent Sampling Stations - Hudson Bay District of Saskatchewan - 1948

Date Established	Plot No.	Tree Species	Location					Directions for Locating Plot
			Place	Sec.	Tp.	Rge.	Mer.	
July 5	H.B.1	Jack pine	Veillardville, Sask.	16	45	4	W.2nd	1½ miles north of Veillardville
July 5	H.B.2	Tamarack	Veillardville, Sask.	--	45	4	W.2nd	North of Veillardville on Forestry Road
July 6	H.B.3	Jack pine	Veillardville, Sask.	--	45	4	W.2nd	3 miles north of Veillardville
July 6	H.B.4	White poplar	Hudson Bay, Sask.	28	45	4	W.2nd	Mi. 3.7 Spruce Products Road, Hudson Bay
July 6	H.B.5	White spruce	Veillardville, Sask.	9	46	4	W.2nd	5 3/10 miles north of Veillardville
July 8	H.B.6	White poplar	Greenwater Lake, Sask.	10	41	11	W.2nd	1 mile east of Greenwater Lake in Porcupine Provincial Forest
July 8	H.B.7	White poplar	Greenwater Lake, Sask.	10	41	11	W.2nd	300 yds. north of Ranger Station
July 10	H.B.8	White poplar	Maloneck R.S., Sask.	15	36	32	W.P.	¼ mi. south of Ranger Station
July 10	H.B.9	White spruce	Maloneck R.S., Sask.	15	36	32	W.P.	200 yds. south of Sampling Stn. H.B.8, Maloneck Ranger Station
July 10	H.B.10	White poplar	Maloneck R.S., Sask.	15	36	32	W.P.	300 yds. south of Sampling Stn. H.B.9, Maloneck Ranger Station

TABLE D

Permanent Sampling Stations - Prince Albert District of Saskatchewan - 1948.

Date Established	Plot No.	Tree Species	Location					Directions for Locating Plot
			Place	Sec.	Tp.	Rge.	Mer.	
Aug. 4	P.A.2	Jack pine	Bittern Creek, Sask.	9	58	26	W.2nd	½ mile north of Bittern Creek Ranger Station
July 21	P.A.3	Jack pine	Prince Albert, Sask.	13	48	23	W.2nd	Steep Creek Block, Nisbet Provincial Forest
Aug. 13	P.A.4	Black spruce Tamarack	Prince Albert, Sask.	8	49	25	W.2nd	1 mile north of Prince Albert
Sept. 26	P.A.5	Tamarack	Prince Albert, Sask.	6	49	23	W.2nd	Steep Creek Block, Nisbet Provincial Forest
July 14	P.A.6	Jack pine	Prince Albert, Sask.	31	49	24	W.2nd	Red Rock Block, Nisbet Provincial Forest
Sept. 24	P.A.7	Tamarack	Prince Albert, Sask.	9	50	22	W.2nd	On Elk Creek Road, Fort a la Corne Provincial Forest

IV LARGE SAMPLE INVESTIGATIONS

A. Sampling Larch Sawfly Populations

R. R. Lejeune

During 1948, studies were initiated on the possibilities of using sawfly oviposition damage (i.e. curled tips) on tamarack as a means of estimating sawfly population. The method hitherto in use of determining cocoon populations has several disadvantages. It is very time consuming in relation to the amount of data procured. In addition, the standard error of the estimate of cocoon populations is usually high because of the variability caused by lack of uniformity in ground cover, locations under the tree canopy, moisture and other factors. Finally, cocoon populations in any given site can, and usually do, change markedly during the interval between cocooning and emergence of sawfly adults. Thus, the cocoon population is not static even after the seasonal activity of the larvae is completed. It is constantly being reduced by factors of environmental resistance.

An estimate, based on the egg population, overcomes the latter objection in that it at least provides a value of the potential population. It is the only stage which can provide some tangible absolute figure since any estimate of the population made on a subsequent stage or period of the insect's development is simply an estimate of a dynamic changing and probably decreasing population at any given time.

On the other hand, to make the best use of a population estimate based on egg counts, some idea must be obtained of the mortality of the sawfly in succeeding stages of development. Unless something of the causes and magnitude of mortality succeeding the egg stage is known, an index of population based on egg populations is also somewhat limited in its usefulness. However, even without this knowledge, it is felt that it is the best and least variable stage to use as a population index. Any other stage would have the limitations suggested for egg counts, plus several others.

The characteristic curling of tamarack tips produced by the manner in which the female sawflies oviposit, lends itself to a comparatively simple, rapid and accurate method of sampling.

As a preliminary effort to evaluate the possibility of using curled tips as an index of population, work was initiated in 1948. Some was carried out in Riding Mountain National Park, Manitoba, on a stand sampling basis, while individual tree sampling was carried out in the Whiteshell Forest Reserve, Manitoba. The latter is fundamental to the development of this method.

In this preliminary work, six trees were selected for sampling; two in the 10 to 20 foot height class, two in the 20 to 30 foot height class and two in the 30 to 40 foot height class. All trees were uniformly heavily defoliated between 75% to 100%. The basic idea of the experiment was to take two different sizes of samples from the six trees and to compare sample estimates with the absolute curled tip population obtained from these trees. Although not strictly accurate, values concerning the absolute finite population of the limited sampling universe of six trees used in this study are referred to as parameters in the subsequent discussion.

The smallest sample consisted of two entire branches, selected at random and removed from each of the following crown levels; upper, mid and basal third. The number of curled and non-curled tips on each was then counted. In the next step, two additional branches were removed from each stratum. The data from these were then combined with the first two branch samples to give a four branch same for each level. Finally, the trees were felled and all the tips, damaged and undamaged, counted to provide values on population parameters.

Results:

See Table I on following page.

TABLE I

SUMMARY OF TOTAL DAMAGED AND UNDAMAGED TIPS
ON SIX SAMPLE TREES

TREE NO.	UPPER THIRD		MIDDLE THIRD		BASAL THIRD		TOTALS	
	Total Tips	Curled Tips	Total Tips	Curled Tips	Total Tips	Curled Tips	Total Tips	Curled Tips
1	208	84	45	16	48	11	301	111
2	254	65	185	54	35	12	474	131
3	248	43	232	91	11	6	491	140
4	315	114	1142	269	163	93	1620	476
5	343	190	735	396	480	300	1558	886
6	472	66	407	87	64	20	943	173
TOTALS	1840	562	2746	913	801	442	5387	1917

TABLE II

SUMMARY OF PERCENT CURLED TIPS IN THE VARIOUS CROWN LEVELS OF THE SIX SAMPLE TREES

TREE NO.	HEIGHT (FT)	% CURLED TIPS			
		Upper Third	Middle Third	Basal Third	Per Tree
1	15	40%	35%	23%	37%
2	15	25%	29%	34%	27%
3	25	17%	39%	54%	28%
4	25	36%	23%	57%	29%
5	35	54%	54%	62%	57%
6	35	14%	21%	31%	18%
AV.%		30%	33%	55%	35%
S.D.*		15.2%	12.2%	16.1%	13.4%

* Standard Deviation

Coefficient of variability = 38.

It will be noted from Table I that 5387 tips were recorded. It is interesting to observe too, the distribution of tips in the crown. The largest number occur in the centre which will normally have the greatest peripheral area of growing healthy branches, a slightly smaller number is found in the upper third of the crown which has a small area of growing tips and the smallest number is found in the lower third of the crown where many of the branches are more or less suppressed.

The greatest number of damaged tips also occur in much the same order but the percent of curled tips shows a different trend. The percentage of tips damaged increases from the bottom towards the top of the crown. The above would indicate that to obtain a representative sample, all parts of the crown should be included.

The preceding tables represent data on the population parameters of the experiment. In the succeeding tables, the estimates obtained from two sizes of samples are presented and compared with the parameters. In Table III, the percentage of damaged tips obtained from two complete branches removed from each of the upper, middle and basal crown levels is summarized.

TABLE III

SUMMARY OF DAMAGED TIPS FOR TWO BRANCHES REMOVED FROM EACH OF THREE CROWN LEVELS

TREE NO.	UPPER THIRD			MIDDLE THIRD			BASAL THIRD			TOTAL		AV.% CURLED TIPS	DEV.FROM POPULATION PARAMETER
	Total Tips	Curled	%	Total Tips	Curled	%	Total Tips	Curled	%	Total Tips	Curled		
1	48	18	37	19	7	37	8	1	12	75	26	35	-2%
2	33	8	24	27	8	30	15	4	27	75	20	27	nil
3	36	9	25	40	23	57	9	5	56	85	37	43	+15%
4	41	17	41	83	25	30	67	36	54	191	78	41	+18%
5	24	14	58	92	60	65	33	24	73	149	98	66	+9%
6	26	5	19	32	6	19	18	2	11	76	13	17	- 1%
TOTALS	208	71	34	293	129	44	150	72	48	651	272	42	+ 7%
STANDARD DEVIATION			14.4%			17.7%			25.7%			16.7%	

S.E. of estimate = 8.7%
Coefficient of variability = 40.

TABLE IV

SUMMARY OF CURLED TIPS FOUND FOR FOUR BRANCHES REMOVED FROM EACH OF THREE CROWN LEVELS

TREE NO.	UPPER THIRD			MIDDLE THIRD			BASAL THIRD			TOTAL		CURLED TIPS %	DEV. FROM POPULATION PARAMETER.
	Total Tips	Curled	%	Total Tips	Curled	%	Total Tips	Curled	%	Total Tips	Curled		
1	69	26	38	20	7	35	31	7	22	120	40	33	- 4%
2	47	13	28	46	16	35	24	8	33	117	37	32	≠ 5%
3	42	10	24	60	28	47	11	6	54	113	44	39	≠ 11%
4	72	31	43	165	45	27	108	60	55	345	136	39	≠ 10%
5	51	31	61	145	93	64	98	72	73	294	196	67	≠ 10%
6	59	15	25	60	12	20	24	5	21	143	32	22	≠ 4%
Totals	340	126	37	496	201	40	296	158	53	1152	485	43	≠ 8%
Std. Deviation			14.2			15.6			20.9			16.5	

S.E. of Estimate = 7.9%
Coefficient of variability -

Comparing standard errors and the mean percent of curled tips for samples of the two sizes, it is apparent that little, if any, increase in accuracy is obtained from the larger sample. While the S.E. of estimate is reduced slightly by taking four branches for each sample, the actual estimate of curled tips (43 percent) is not as close to the population mean of 35 percent as the two branch samples. However, the S.E. of estimate of both is well within the limit of error normally required for good samples.

It is of interest to note from the above tables that the variability between trees is greatest in the values from the lower third of the crowns as indicated by the standard deviations in the bottom row of each table. Also, the same trend towards a higher percentage of curled tips in the lower part of the crowns noted in data for population parameters is evident for the samples in Tables III and IV.

A final statistical test was applied by determining correlation coefficients between samples and parameters for the variates in each crown level and the estimates for each tree. The reasoning behind the analysis is that if the samples provide a good estimate of population parameters, there should be a high degree of correlation between the sample and parameter variates. The data on which the coefficients are based, are set forth in the following table.

DATA USED FOR COMPUTING CORRELATION COEFFICIENTS

TABLE V.

TREE NO.	UPPER THIRD			MIDDLE THIRD			LOWER THIRD			TOTAL TREE COUNT		
	X_1	Y_1	Y_2	X_1	Y_1	Y_2	X_1	Y_1	Y_2	X_2	Y_3	Y_4
1	40	37	38	35	37	35	23	12	22	37	35	33
2	25	24	28	29	30	35	34	27	33	27	27	32
3	17	25	24	39	57	47	54	55	54	28	43	39
4	36	41	43	23	30	27	57	54	55	29	41	39
5	54	58	61	54	65	64	62	73	73	47	66	67
6	14	19	25	21	19	20	31	11	21	18	17	22

X_1 = % Curled tips for population parameter in each crown level
X_2 = % Curled tips for entire tree
Y_1 = % Curled tips for 2 branch samples for each crown level
Y_2 = % Curled tips for 4 branch samples for each crown level
Y_3 = % Curled tips for each tree for 2 branch samples
Y_4 = % Curled tips for each tree for 4 branch samples

The following correlation coefficients were computed:

1. Between population parameters and two branch samples from the three crown levels

$$r_{x_1y_1} = .891$$

2. Between population parameters and four branch samples from the three crown levels

$$r_{x_1y_2} = .939$$

3. Between population parameters and two branch samples for each tree

$$r_{x_2y_3} = .880$$

4. Between population parameters and four branch samples for each tree

$$r_{x_2y_4} = .878$$

Correlations 1 and 2 are significant well beyond the 1% level and correlations 3 and 4 are significant at about the 2% level. This indicates that there is a definite correlation between the population estimates and parameters.

Discussion:

From the foregoing, it is evident that the two types of samples provide good estimates of the parameters. Since the increase in accuracy of the estimate by using a four branch sample over a two branch sample is negligible, the use of the latter is preferable. Single branch samples are not recommended because they provide no error control on variability between samples from the same sampling unit.

While the data presented indicate that the sampling methods employed provide good estimates of populations on individual trees, they do not indicate the extent of sampling required to provide an estimate of the population in any given area or stand. More work is required on this phase, but some evidence has been obtained that about six trees, selected at random, will provide a reasonably good picture of the sawfly density in stands two to five acres in extent.

The original intention, when it was decided to investigate curled tips as a population index, was to determine the number of curled tips which could be counted on a tree viewed from several angles. However, since for a given degree of infestation the apparent infestation would appear to be much heavier in a stand composed of large trees than on a stand composed of small ones, it was decided to place the method on a relative rather than on an absolute basis by converting the number of curled tips to percentages. This reduces the factor of tree size to a common denominator. For example, some idea of variations in absolute populations can be gathered from the number of larch sawfly eggs computed per tree for the three tree sizes used in this study: 2500 for a 15 ft. tree, 6500 for a 25 ft. tree and 11000 for a 35 ft. tree.

A possible disadvantage of using percentages lies in the growth habits of tamarack subjected to sawfly defoliation. Repeated defoliation reduces the number of new shoots (which, with few exceptions, are required for oviposition); hence, while the population density of the sawfly in a given stand may remain constant over a number of years, a reduction in new shoots may result in a greater percentage of them showing oviposition damage. Consequently, on a percentage basis the population index might show an increase where no increase occurred. This is another aspect requiring further study.

During the course of this work, a large number of curled tips was examined for larch sawfly eggs or egg scars through the season. The number of eggs deposited per curled tip averaged 21. The number per tip increased steadily from 11.9 on June 25th to 26.7 on August 26. This increase is probably associated with the lengthening of the new shoots as the season progresses since the number of eggs per shoot seems to vary directly with the length of the shoot.

In this report, only a broad analysis of the data from the standpoint of sampling methods has been attempted. No attempt has been made to explain related considerations such as the usual first appearance of defoliation at the top of the crowns, the effect of tree height on intensity of attack, etc.

It would appear that the method of estimating sawfly populations by determining the percentage of curled tips from two whole branches on each of three crown levels is a fairly promising one for estimating sawfly populations. In its present stage of development, it would apply more particularly to newly attacked vigorous or fairly vigorous stands of tamarack which have not yet begun to show much evidence of reduced vigour or growth. It is probable that modifications will have to be made if the method is to be applied to all types of stands from vigorous to seriously weakened. Information is also required on the relation between the initial egg population and the degree of survival in the succeeding developmental stages if the population index based on curled tips is to have any concrete meaning insofar as actual populations are concerned.

V [illegible]

1. The Budworm Pupal Survey

(a) Introduction

The budworm pupal survey, which was started in 1938 was carried on in 1947. Collections of budworm pupae for this survey were confined to areas of infestation in Manitoba. Although budworm was present in other areas of the Prairie Provinces, it was not in sufficient quantity generally, to warrant the making of collections. All pupae were collected by the staff of the Winnipeg Laboratory.

(b) Areas Contributing

Budworm pupae were collected from three study areas. These areas were the Sandilands Forest Reserve, Spruce Woods Forest Reserve, and Red Rock Lake in the Whiteshell Forest Reserve. Material for the jack pine budworm pupal survey was obtained from the Whiteshell and Sandilands Forest Reserves. The spruce budworm pupae were collected in four separate regions in the Spruce Woods Forest Reserve. Collections from each of these regions were set up as four distinct and separate areas, where medium to heavy infestations were present. The four regions were located in the reserve as follows:

A1. in the north-western part of the reserve near Onah.
A2. in the north-western part of the reserve near Onah.
B1. northern boundary of the reserve east of saw mill.
B2. northern boundary of the reserve south of camp site.

Table I indicates the source and number of pupae received in 1947.

(c) Organization

The revised "Directions for the Budworm Pupal Survey" which were included in the 1944 Annual Report, pages 39 to 49, were followed for procedure in 1947.

TABLE I

Source and Number of Pupae Received in the 1947 Budworm Parasite Survey

Locality	Collector	No. of Collections	Date of Collection	No. of Pupae
Spruce Budworm				
Spruce Woods Forest Reserve	R.B.Barker, H.Fyfe, J.Coate, W.Addison,			
Area A1.	B.Mathers, G.Kolbe	1	July 9	281
Area A2.		1	July 9	369
Area B1.		1	July 3	1440
Area B2.		1	July 9	446
Jack Pine Budworm				
Sandilands Forest Reserve	V.Hildahl, R.Purse C.Conyers, H.R.Wong	1	July 17	1491
Whiteshell Forest Reserve Red Rock Lake	R.R. Lejeune T. Bridgman W. Ewart	1	July 21	1584
TOTALS		6		5611

(d) Analysis of Data

(i) Parasites reared. The following parasites were reared from budworm pupae in 1947. The species are listed in order of abundance:

HYMENOPTERA:

Itoplectis conquisitor (Say)
Phaeogenes hariolus Cress.
Amblymerus verditer Nort.
Psychophagus tortricis Br.
Brachymeria compsilurae Cwfd.

DIPTERA:

Madremyia saundersii (Will.)
Zenillia caesar Ald.
Phryxe pecosensis (Tns.)
Nemorilla pyste Wlk.

The species of dipterous parasites mentioned here are listed below to show the areas from which they were recovered. All dipterous adults have been identified, with the exception of a number of puparia which will be incubated to obtain adults for identification.*

Species	Sandilands For. Res.	Spruce Woods Forest Res.	Whiteshell For. Res.
Madremyia saundersii (Will.)	x	x	x
Zenillia caesar Ald.	x	x	x
Phryxe Pecosensis (Tns.)	x	x	x
Nemorilla pyste Wlk.	-	-	x

(ii) Pupal parasitism for 1947. The degree of parasitism for all the areas sampled during 1947 is set down in Table 2 which follows. Only the mortality caused by parasites is taken into consideration, with the parasitism percentage based on the total number of pupae received,** minus those dead from other causes. Methods used in the calculation of parasitism and natural mortality follow those used in 1942. These are set forth in the 1942 Annual Report, page 26.

* May 5, 1948 - Winthemia fumiferanae Tll. was recovered from the Whiteshell Forest Reserve.

** A number of pupae received from Area B1, in the Spruce Woods Forest Reserve had been killed by a predator, Dioryctria reniculellla Grt.

TABLE 2

Percentage Mortality of Pupae From the 1947 Budworm Survey

Area of Manitoba	Itoplectis conquisitor	Phaeogenes hariolus	Diptera	Chalcids	Miscellaneous Hymenoptera	TOTAL
Spruce Budworm Spruce Woods For.Res.						
Area A1.	32.41	0.46	13.42	4.27	0.00	50.46
Area A2.	7.22	0.00	31.77	4.33	0.00	43.32
Area B1.*	45.33	0.44	6.51	0.09	0.00	52.37
Area B2.	0.00	0.00	88.30*	0.00	0.00	88.30*
All Areas Combined	35.11	0.35	15.90*	1.28	0.00	52.64*
Jack Pine Budworm Sandilands Forest Res.	16.23	0.37	2.08	0.00	0.00	18.68
Whiteshell For.Res. (Red Rock Lake)	0.98	3.24	6.33	0.45	0.00	11.00

* These figures are distorted by the large percentage of pupae in Area B2 which were dead from causes other than parasitism (78.92%)

Table 2 shows the percentage of pupae parasitized by chalcids but not the actual numbers which emerged from the pupae. These figures and the occurrence of different species in each area are shown on Table 3.

TABLE 3

Chalcids Reared From 1947 Budworm Pupal Survey

Species	Area	No. of Chalcids	Average No. per parasitized pupa
Amblymerus verditer Nort.	Spruce Woods Forest Res. Area A1.	61	7
	Area A2.	82	-*
	Whiteshell Forest Res. Red Rock Lake	70	-*
Psychophagus tortricis Br.	Spruce Woods Forest Res. Area A2.	4	-*
	Area B1.	23	23
Brachymeria compsilurae Cwfd.	Spruce Woods Forest Res. Area A2.	1	-*
	Whiteshell Forest Res. Red Rock Lake	4	-*

* The average number of chalcids per parasitized pupae could not be determined, owing to several species occurring in the same rearing cage.

(iii) Natural mortality of pupae. The percentage of pupae from which no moths or parasites emerged is given in Table 4.

An effort to determine the cause of death of the pupae referred to in Table 4 was carried on again this year. Each pupa was examined and its condition recorded in Table 5. In this table 'parasitized' refers to pupae containing dead parasites. Some of these dead parasites were identified as Itoplectis and Phaeogenes, but others such as immature Diptera, Chalcidoidea and unknown Ichneumonoidea could not be identified specifically and are recorded as such. 'Injured' refers to pupae showing mechanical injury; 'containing moths' refers to pupae containing partly or fully formed moths, which failed to emerge. 'Shrivelled pupae' were small and dessicated, the body contents having a scale-like appearance; 'diseased' pupae showed discoloration and in some cases fungus mycelia; 'others' refers to pupae which could not be classified. These pupae were completely or partly empty and the cause of death could not be determined.

Table 6, which follows, shows the percentages of pupae parasitized in each area. The percentages are based on the number of pupae from which parasites have emerged plus the number of dead pupae which contained unemerged parasites. Table 9 (given later) also shows the percentage of pupae parasitized in each area, but the percentage mortality is based on the number of pupae from which parasites have emerged, and does not take into account the dead pupae found to contain unemerged parasites. Comparison of Table 6 with Table 9 indicates that the greatest difference is in the mortality caused by dipterous parasites.

(iv) Other host-parasite relations of the budworm pupal survey. Other relationships between host and parasite are dealt with in the tables which follow. Similar tables have been included in all annual reports since the inception of the survey. It should be noted that in Area B1 in the Spruce Woods Forest Reserve, the total number of pupae on which the percentages are based does not include those pupae killed by Dioryctria reniculella Grt.

TABLE 4

Natural Mortality of Pupae Received in 1947.

AREA	No. of Pupae in Sample	No. of Unemerged Pupae	% Unemerged Pupae
Spruce Woods For.Res			
Area A1.	281	65	23.13
Area A2.	369	192	52.03
Area B1.	1378*	242	17.56
Area B2.	446	352	78.92
Sandilands For.Res.	1491	148	9.93
Whiteshell For.Res. Red Rock Lake	1584	257	16.22

* In Area B1 of the Spruce Woods Forest Reserve, the number of pupae in the sample does not include those pupae damaged by the predator, Dioryctria reniculella Grt.

TABLE 5

Condition of All Unemerged Pupae

	% Parasitized						Injured	Containing Moths	Shrivelled	Diseased	Others
	By Itoplectis	By Phaeogenes	By unknown Hym.	By Diptera	By Chalcoide	Total					
Spruce Budworm Spruce Woods For. Res.											
Area A1.	0.00	0.00	3.08	0.00	0.00	3.08	13.85	38.46	9.23	1.54	33.85
Area A2.	0.00	0.00	0.00	1.56	0.00	1.56	13.02	20.83	27.08	0.52	36.98
Area B1.	1.24	0.00	0.00	2.48	0.41	4.13	13.22	33.06	5.79	6.61	37.19
Area B2.	0.57	0.00	0.00	1.14	0.00	1.70	11.08	21.31	27.84	0.00	38.07
Jack Pine Budworm Bandilands For.Res.	0.68	0.00	0.00	6.08	1.35	8.11	7.43	22.30	4.05	4.73	53.38
Whiteshell For. Res. Red Rock Lake	0.00	1.95	0.00	0.78	0.00	2.72	15.18	39.69	5.45	6.61	30.35

TABLE 6

Percentage Parasitism of all Pupae in 1947

Area	Itoplectis conquisitor	Phaeogenes hariolus	Unidentified Hymenoptera	Diptera	Chalcids	Total Parasitized
Spruce Woods For.Res.						
Area A1.	24.91	0.36	0.71	10.32	3.20	39.50
Area A2.	5.42	0.00	0.00	24.66	3.25	33.33
Area B1.	37.59	0.36	0.00	5.80	0.15	43.90
Area B2.	0.45	0.00	0.00	19.56	0.00	19.96
All Areas Combined	24.66	0.24	0.08	11.60	0.93	37.51
Sandilands For.Res.	14.69	0.34	0.00	2.48	0.13	17.64
Whiteshell For.Res. Red Rock Lake.	0.82	3.03	0.00	5.43	0.36	9.66

Pupal mortality from both parasitism and other causes in the three study areas is given below:

Area	Percent Parasitism	% Natural Mortality	% Total Mortality
Spruce Woods Forest Reserve			
Area A1.	38.79	23.13	61.92
Area A2.	32.52	52.03	84.55
Area B1.	43.18	17.56	60.74
Area B2.	18.61	78.92	97.53
All Areas Combined	36.66	34.40	71.06
Sandilands Forest Reserve	16.83	9.93	26.76
Whiteshell Forest Reserve Red Rock Lake	9.22	16.22	25.44

The hymenopterous parasite, Itoplectis caused the greatest mortality of any parasite recovered from budworm pupae in both the Spruce Woods and Sandilands Forest Reserves. In the Whiteshell Forest Reserve, various species of Diptera together caused the greatest mortality. In this area, Phaeogenes surpassed Itoplectis as a mortality factor. Of the five species of Diptera identified, three, Madremyia, Zenillia and Phryxe were common to all areas. Madremyia was most abundant. Nemorilla and Winthemia were recovered only from pupae originating in the Whiteshell Forest Reserve. Except in Areas A1, and A2, Spruce Woods Forest Reserve, chalcid parasites caused almost negligible mortality. Identifications of Diptera were made only from adults; many specimens died in the larval or pupal stage.

Sex ratios of Choristoneura fumiferana Clem. pupae; Phaeogenes hariolus Cress. and Itoplectis conquisitor (Say) emergents, are shown in Table 10. 'Natural dead' pupae were excluded from the computations.

Sex ratios of Itoplectis conquisitor (Say) and Phaeogenes hariolus Cress. reared from male pupae and female pupae of Archips fumiferana Clem. are shown in Table 11.

(e) Summary

A total of 2536 spruce budworm pupae and 3075 jack pine budworm pupae were collected for the 1947 Budworm Pupal Parasite Survey.

The following parasites were recovered from this material:

HYMENOPTERA

Itoplectis conquisitor (Say)
Phaeogenes hariolus Cress.
Amblymerus verditer Nort.
Psychophagus tortricis Br.
Brachymeria compsilurae Cwfd.

DIPTERA

Madremyia saundersii (Will.)
Zenillia caesar Ald.
Phryxe pecosensis (Tns.)
Nemorilla pyste Wlk.
Winthemia fumiferanae Tll.

TABLE 7

Percentage Mortality of Male Pupae in 1947.

AREA	Itoplectis conquisitor	Phaeogenes hariolus	Diptera	Chalcids	Miscell.	Total parasitized	Natural Dead	Total Mortality
Spruce Woods For.Res.								
Area A1.	34.44	1.11	12.22	8.89	0.00	56.67	10.00	66.67
Area A2.	7.14	0.00	34.42	6.49	0.00	48.05	33.77	81.82
Area B1.	38.02	0.72	4.16	0.00	0.00	42.90	16.79	59.69
Area B2.	0.00	0.00	19.58	0.00	0.00	19.58	75.52	95.10
All Areas Combined	28.32	0.55	11.16	1.66	0.00	41.70	26.38	68.08
Sandilands For.Res.	14.76	0.47	1.42	0.00	0.00	16.65	10.03	26.68
Whiteshell For.Res. Red Rock Lake	0.81	3.64	6.60	0.67	0.00	11.73	12.53	24.25

TABLE 8

Percentage Mortality of Female Pupae in 1947

AREA	Itoplectis conquisitor	Phaeogenes hariolus	Diptera	Chalcids	Miscell. Hym.	Total Parasitized	Natural Dead	Total Mortality
Spruce Woods For.Res.								
Area A1.	20.42	0.00	9.42	0.52	0.00	30.37	29.32	59.69
Area A2.	4.19	0.00	16.28	0.93	0.00	21.40	65.12	86.51
Area B1.	36.71	0.00	6.61	0.15	0.00	43.47	18.36	61.82
Area B2.	0.00	0.00	18.15	0.00	0.00	18.15	80.53	98.68
All Areas Combined	21.44	0.00	11.01	0.29	0.00	32.73	40.65	73.38
Sandilands For.Res.	14.29	0.00	3.00	0.00	0.00	17.28	9.68	26.96
Whiteshell For.Res. Red Rock Lake	0.83	1.30	4.16	0.12	0.00	7.01	19.48	26.48

TABLE 9

Percentage Mortality of all Pupae in 1947.

AREA	Itoplectis conquisitor	Phaeogenes hariolus	Diptera	Chaloids	Miscell. Hym.	Total Parasitized	Natural Dead	Total Mortality
Spruce Woods For.Res.								
Area A1.	24.91	0.36	10.32	3.20	0.00	38.79	23.13	61.92
Area A2.	5.42	0.00	23.85	3.25	0.00	32.52	52.03	84.55
Area B1.	37.37	0.36	5.37	0.07	0.00	43.18	17.56	60.74
Area B2.	0.00	0.00	18.61	0.00	0.00	18.61	78.92	97.53
All Areas Combined	24.45	0.24	11.08	0.89	0.00	36.66	34.40	71.06
Sandilands For.Res.	14.62	0.34	1.88	0.00	0.00	16.83	9.93	26.76
Whiteshell For.Res. Red Rock Lake	0.82	2.71	5.30	0.38	0.00	9.22	16.22	25.44

TABLE 10

Sex Ratios of *Choristoneura fumiferana* Clem., *Itoplectis conquisitor* (Say) and *Phaeogenes hariolus* Cress. for the 1947 Pupal Survey

AREA	Sex ratio of *Choristoneura fumiferana* Clem.	Sex ratio of *Itoplectis conquisitor* (Say)	Sex ratio of *Phaeogenes hariolus* Cress.
Spruce Woods Forest Reserve			
Area A1.	.625	.671	.000
Area A2.	.632	.300	——
Area B1.	.487	.458	.000
Area B2.	.628	——	——
All Areas Combined	.534	.478	.000
Sandilands Forest Reserve	.292	.472	.200
Whiteshell Forest Reserve Red Rock Lake	.511	.769	.512
TOTAL	.454		

TABLE 11

Sex Ratios of Itoplectis conquisitor (Say) and Phaeogenes hariolus Cress. Reared from Male and Female Pupae of Choristoneura fumiferana Clem.

AREA	MALE PUPAE		FEMALE PUPAE	
	Itoplectis conquisitor (Say)	Phaeogenes hariolus Cress.	Itoplectis conquisitor (Say)	Phaeogenes hariolus Cress.
Spruce Woods Forest Reserve				
Area A1.	.484	.000	.821	—
Area A2.	.273	—	.333	—
Area B1.	.343	.000	.580	—
Area B2.	—	—	—	—
Sandilands Forest Reserve	.353	.200	.774	—
Whiteshell Forest Reserve Red Rock Lake	.667	.333	.857	.813

As in 1946, the percentage of parasitism was much lower in the jack pine budworm areas (Sandilands and Whiteshell) than in the spruce budworm area (Spruce Woods). Also as in 1946, the greatest mortality from parasites in Spruce Woods was caused by Itoplectis followed by various Diptera; Phaeogenes parasitism continued to be very low. A similar relationship existed in Sandilands in both 1946 and 1947. In the Whiteshell Forest Reserve, Itoplectis produced very little mortality in either year.

In the four areas within Spruce Woods Forest Reserve, total parasitism ranged from 18.61% in Area B2 to 43.18% in Area A2 (Table 9). The percentage of parasitism by Itoplectis was very variable and by Phaeogenes consistently low. Various species of Diptera caused substantial mortality in each area; as in 1946 the highest mortality occurred in Area A2. Chalcid parasitism in Areas A1, and A2 was approximately 3% but in Areas B1 and B2, it was negligible or absent.

Specimens of dead pupae suspected of being diseased were sent to the Forest Insect Laboratory at Sault Ste. Marie for examination by Mr. D. M. McLeod and Dr. K. Graham. These pupae were selected from the unemerged pupae remaining after moth and parasite emergence was completed. Fungus was found in specimens from each of the three main areas but its pathogenicity on healthy larvae has not yet been established. No absolute evidence of virus action in the tissues was obtained.

VI. FINANCIAL STATEMENT

FINANCIAL STATEMENT

1948 - 1949

BUILDINGS & LANDS:			
	Upkeep.....	$32.50	
	Acquisition.....	5,161.65	$5,194.15
SALARIES:			
	Temporary.....	29,334.24	29,334.24
WAGES:			
	Temporary.....	1,432.65	1,432.65
EQUIPMENT:			
	General.....	2,257.62	
	Scientific.....	720.07	2,977.69
	Upkeep.....	732.24	732.24
EXPRESS, FREIGHT & CARTAGE:			86.85
MISCELLANEOUS:			252.46
COMMUNICATIONS:			
	Telegraph.....	50.23	
	Telephone	111.90	162.13
SUPPLIES:			
	General.....	1,791.26	
	Photographic.....	37.47	
	Scientific.....	320.39	2,149.12
TRAVEL:			8,743.16
	TOTAL.....		**$51,064.69**

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