ANNUAL REPORT

ON

OPERATION OF THE FOREST BIOLOGY LABORATORY

CALGARY, ALBERTA

FOR THE FISCAL YEAR ENDED MARCH 31, 1960

by

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CANADA

DEPARTMENT OF AGRICULTURE

RESEARCH BRANCH

FOREST BIOLOGY DIVISION

June, 1960

CONTENTS

INTRODUCTION

Noteworthy developments in the fiscal year ended March 31, 1960, the twelfth year of operations for forest entomological investigations and the eighth year of operations for forest pathological investigations in the Alberta region, are reported on herein. The practice of issuing a single annual report on operations for the laboratory, instituted in 1959, is continued for 1960. This is in keeping with the intention of providing an integrated program of forest biology research and surveys for Alberta. Less emphasis was placed in the reporting year on the separate identities of entomological and pathological programs and staff than in years heretofore. It has been interesting, from the authors' viewpoint, that no loss of research and survey efficiencies have resulted. On the contrary, an equitable distribution of personnel, equipment, and funds is facilitated, and has been experienced under present arrangements.

ESTABLISHMENT

A number of major changes in staff and staff functions occurred during the year, affecting nearly every aspect of laboratory operations. Dr. R. W. Stark resigned in May, 1959, to accept a teaching and research appointment to the University of California, Berkeley. His contributions to the research accomplishments of the laboratory, since his appointment to Calgary in 1948, have been outstanding. The loss of his services have been felt accordingly. Negotiations to fill the vacancy created by Dr. Stark's departure culminated in the selection of Mr. H. F. Cerezke, a former student assistant and a graduate of the University of Alberta. At the time of writing Mr. Cerezke is pursuing studies on the lodgepole pine root weevil, a continuation of Dr. Stark's work.

A new research officer position to cover work related to the Forest Disease Survey was obtained during the year. Negotiations to fill this position ended with the selection of Mr. J. A. Baranyay, a former student, teacher, and research officer of the Sopron Forestry Faculty, Hungary. Mr. Baranyay's initial interest, apart from his general concern with survey operations, is a damage estimate of mistletoe-infected lodgepole pine.

The longstanding vacancy created by the departure of Dr. W. R. Henson to Yale University was filled by the appointment of Mr. J. M. Powell in September, 1959. Mr. Powell is a graduate of the University of London and, more recently, McGill University. His work at Calgary deals with bioclimatological studies on the black hills beetle. Mr. Powell brings to the laboratory a background of experience in climatology and plant geography.

The senior author, Mr. G. R. Hopping, terminated his position as Officer-in-Charge of the laboratory, at the close of the fiscal year 1959-60, after having held this post since the inception of the laboratory in 1948. Mr. Hopping took on a research assignment involving the bio-taxonomy of bark beetles, with an initial emphasis on Ips spp. and Dendroctonus spp., and is actively engaged in this work at the present time. His successor, Dr. G. P. Thomas, was selected during the year, and took office at the beginning of the fiscal year 1960-61. The position of Head, Zoology Investigations was left vacant, pending future developments affecting the Division. In the interim, Dr. R. F. Shepherd was assigned to research advisory duties on entomological matters to the new Officer-in-Charge. These duties take into account Dr. Shepherd's commitments to a research program of his own.

There were no new sub-professional positions added to the establishment during the year, but a total of twelve vacancies involving ten positions came up for consideration. Four positions remained unfilled at the close of the fiscal year, but at the time of writing only one position (Stenographer 1) remains unfilled. This position is being held vacant, pending a final decision on administrative arrangements for the laboratory. The vacancies resulted from the resignation of two Stenographers and the resignations of two Forest Biology Assistants and three Forest Biology Rangers.

Two research officers returned to university to complete their studies leading to the Ph.D. degree, R. J. Bourchier to New York State College of Forestry at Syracuse University, and R. W. Reid to Montana State College. Dr. Bourchier completed his studies in February 1960 and at the time of writing has received his degree. Mr. Reid is expected to receive his degree in June 1960. Two other officers completed theses during the year, Dr. R. F. Shepherd for the Ph.D. degree at the University of Minnesota, and Miss R. C. Robinson for the M.A. degree at the University of British Columbia. Both officers have received their degrees in the interim. Mr. A. A. Loman attended Oregon State College of Forestry during the year, taking studies leading to the M.Sc. degree. He will return to the laboratory in June 1960.

Messrs. J. A. Baranyay and H. F. Cerezke completed the residence requirements for the M.A. and M.Sc. degrees respectively, prior to joining the laboratory. Both of these men, together with Mr. Loman, plan to submit the necessary theses early in 1961.

LABORATORY AND FIELD ACCOMMODATIONS

A Forest Biology Ranger station was constructed at Lac La Biche in the fall and winter of 1959, and land was purchased in Grande Prairie for the construction of a ranger station in 1960. Approval was obtained for the construction of a wash-house and laundry at the Mt. Eisenhower Field Station, and at the time of writing this work is being done. Painting of the main building at the Kananaskis Field Station was carried out, and approval for the painting of the insectary and other outbuildings at Kananaskis in 1960 was gained during the year. Plans were made to convert a former Forest Biology Ranger house trailer for laboratory use, in keeping with the general plan to supply several of such units for field project work.

RESEARCH PROGRAM - ENTOMOLOGY

1. Bionomics and population sampling - lodgepole needle miner.

(Project leader : J. A. Cook)

Intensive sampling was continued on the original four sampling areas in order to maintain the continuity of the life table work. However, the populations are now so low that it may be necessary, after the 1960 season, to replace intensive sampling on two areas with sequential sampling, and to increase the numbers of samples on the remaining two areas. The reason for this is to obtain results within acceptable limits of error. Two publications were issued during the year by the former project leader, Dr. R. W. Stark.

2. Environmental factors in outbreak and non-outbreak areas of spruce budworm.

(Project leader : R. F. Shepherd)

This project was concluded during the year with two papers, one in Ecology and the other (pending) in Canadian Entomologist.

3. Biology of the black hills beetle.

(Project leader : R. W. Reid)

The 1959 brood development was related to general weather conditions and to conditions in the microhabitat. More intensive work was done on the moisture conditions of trees in relation to the success or failure of attack and the success or failure of brood development. Studies on the interrelationships

of beetles and blue-staining fungi were initiated in cooperation with Miss R. C. Robinson. A summary of all work done to date on the biology of this insect by Mr. Reid will be the subject of his Ph.D. thesis, to be presented in May 1960.

4. Population studies on the black hills beetle.

(Project leader : R. F. Shepherd)

Population work was hindered in 1959 because of generally low populations in the study areas near Invermere, B.C. The planned testing of tree selection by caging a group of host trees was abandoned largely on this account. Experiments on the attraction of beetles to trees on which small numbers of beetles had been caged were continued. Laboratory investigations of possible moisture, temperature, and light preferences of adult beetles were also continued.

5. Effect of drought on the susceptibility of lodgepole pine to attack by the black hills beetle.

(Project leader : J. A. Cook)

Platforms designed to exclude precipitation moisture from the roots of trees, and thereby to simulate drought conditions for selected trees, did not cause appreciable reductions in soil moisture in 1959. A modification of the technique may be planned for 1960, in which selected trees on drought-prone soils could be supplied with abnormal amounts of water. In all of these experiments the plan is to test the reaction of treated trees to bark beetle attack before and after treatment. The 1959 experiments will be continued in 1960, whether or not a revised experiment is set up on drought-prone soils.

6. Biology of the pine needle scale.

(Project leader : C. E. Brown)

This project was terminated during the year with a paper on the reproduction of Phenacaspis pinifoliae (Fitch).

7. Identification and life history studies on Adelginae.

Investigations of the morphology and life history of Adelges cooleyi were concluded and reported on during the year. In addition, studies were made of the biologies of two other adelgid species from the Rocky Mountains region. These studies have been completed at the time of writing and will be reported on later in 1960.

8. Lodgepole pine root weevil.

(Project leader : R. W. Stark until May, 1959)

Studies on the life history and distribution Hylobius warreni Wood were suspended due to Dr. Stark's resignation. A summary of work done up to that time was issued during the year. Plans were made to reactivate the project in 1960 with the assignment of a new project leader.

9. Ecology, morphology and taxonomy of forest Geometridae.

(Project leader : W. C. McGuffin)

Dr. McGuffin spent the first of two scheduled field seasons at the Trinity Valley Field Station, near Vernon, B.C., pursuing his studies of geometrid larvae. In addition to collecting material for group studies, as already done on larentiine larvae, material was obtained for studies on variations between individuals from the same brood.

10. Bio-taxonomic studies on Scolytidae.

(Project leader : G. R. Hopping)

Substantial progress was made in gathering material and reviewing literature in preparation for an expanded program of bark beetle research in 1960, with initial emphasis being placed on Ips and Dendroctonus spp. Pityophthorus material obtained from other Divisional laboratories was determined and returned. A paper describing a new species in this genus was prepared during the year, and at the time of writing has been submitted for publication.

11. Bioclimatological studies on forest insects.

(Project leader : J. M. Powell)

A research program based on studies of the effects of climate on the development and activities of the different life stages of the black hills beetle was drawn up during the year in consultation with Drs. W. C. Wellington and R. F. Shepherd. A work plan involving extensive field work for 1960 was approved.

RESEARCH PROGRAM - PATHOLOGY

1. Microfungi of living lodgepole pine stems.

(Project leader : R. J. Bourchier)

Fifteen species of microfungi, including a new species, that had been isolated from more than one of a total of 40 sample trees have been identified and described in culture. At the time of writing a summary of this work has been submitted for publication. Cultural studies have revealed a variety of antagonistic and synergistic interactions between some of the fungi and Stereum pini, a common red-staining fungus in Alberta. Two microfungi caused weight loss in wood blocks when incubated in decay chambers. These results have also been submitted for journal publication.

A Ph.D. thesis summarizing all of the work to date was accepted by the State University of New York College of Forestry at Syracuse, New York, in February 1960. Work on the ecology and life histories of the more common microfungi is scheduled for 1960.

2. Etiological, host-parasite, and ecological investigations of Atropellis piniphila.

(Project leader : J. C. Hopkins)

Atropellis piniphila (Weir) Lohman & Cash has been proved to cause a well-known and widely distributed stem and branch canker of lodgepole pine. Work during the year added to a growing knowledge of the locus of entry of the pathogen, the sequence of symptom development, and the growth rate of the pathogen within the host. A seasonal fluctuation of spore discharge has been demonstrated, and meteorological factors influencing the rate and duration of spore discharge have been elucidated. The range of variation in morphological characters exemplified in material obtained from several regions of North America was determined, and an asexual spore form having diagnostic value in identifying this fungus has been induced in culture. Work planned for 1960 emphasizes an investigation of the growth impact of this disease in lodgepole pine.

3. Influence of site on variations in red heartwood stain of lodgepole pine.

(Project leader : J. E. Nighswander)

A survey involving the taking of red stain samples from stands of selected ages (50-100-200-years old) and sites (dry-mesic-wet) at various locations in Alberta and eastern British Columbia shows a distinct correlation between stand age and the relative frequency of red stain fungi. Cultural

isolations from stained wood have provided an assessment of the fungi involved in this problem. Stereum pini and Tympanis hypopodia appear to dominate the mycoflora of 50- and 100-year old trees, while Fomes pini and Coryne sarocides are more common in older trees. Studies on the biology of red staining fungi in vitro show different temperature optima. It is planned to relate these and other differences to field conditions in 1960.

4. Nuclear phenomena of stem rusts of indigenous pines.

The first stages of work to obtain cytological evidence that will illustrate the unique ability of certain members of Cronartium spp. to abbreviate their life cycles by means of repeating aeciospores were taken during the year. Spore material was collected for several species of rust in a number of areas. This material has been stored pending the opportunity for further work.

5. Blue-staining of beetle infested lodgepole pine.

(Project leader : R. C. Robinson)

A start was made on work to determine the role of blue-staining fungi in the decline of lodgepole pines infested with the black hills beetle. A number of fungi, including yeasts, have been isolated from beetles and stained wood. Limited trials involving the caging of beetles on non-infested trees, and the selection of wood samples at time intervals thereafter, resulted in the isolation of fungi from wood that had been exposed to beetle attack for a minimum of six days. Samples of stained wood were collected for histological study.

6. Cultural studies of wood-inhabiting hymenomycetes.

(Project leader : R. C. Robinson)

The taxonomy and decaying potential of hymenomycetes isolated from dead and living material has come under particular study recently, in an attempt to bridge gaps in our present knowledge of this group of fungi. A start was made on differentiating by cultural means the fungus Fomes igniarius and its assumed varieties.

7. Ecology of branch-stub infections in aspen.

(Project leader : D. E. Etheridge - Quebec laboratory)

The initial data on this report were taken in Alberta. The final data on the mycoflora of dead aspen branches and the interpretation of all data resulted from work done at the Quebec laboratory. A summary of these results has been prepared for circulation in interim report form.

8. Decay of Populus spp. in Alberta.

(Project leader : G. P. Thomas)

A 3-year study of cull resulting from decay in living aspen and balsam poplar was concluded during the year. Examination of about 1350 trees by dissectional means has been completed, showing the over-all loss of volume due to rot to be 25% for aspen and 10% for balsam poplar in trees averaging 61 and 65 years respectively. A paper describing the relative importance of the different heartrot fungi for both species will appear shortly in the Can. J. Botany. A second paper relating to cull, in terms of tree and stand characteristics, is being prepared at the time of writing. The project will be terminated with the publication of the latter paper.

9. Decay of boreal white spruce in Alberta.

(Project leader : G. P. Thomas)

This project resulted from longstanding requests for information on decay in boreal white spruce in Alberta. Prior to the initiation of this project, some work was done in Alberta on spruce decays by the Saskatoon laboratory, as part of a larger study for the 3 prairie provinces (Denyer and Riley. 1954. For. Biol. Div., Saskatoon. Mimeographed). Data resulting from the present study have been integrated with those of the earlier study, and at the conclusion of the year only a small amount of sampling remained to be done. The data are in a very early stage of analysis, which precludes the mentioning of little beyond the fact of a variable but low volume loss for spruce.

10. Decay of lodgepole pine logging slash.

(Project leader : A. A. Loman)

Investigations to determine possible differences in the rates of deterioration of slash under contrasting conditions in logged-over lands were continued during the year. Interpretations resulting from field observations in 1959 are as follows: ground-contact slash had deteriorated faster than suspended slash regardless of the silvicultural system employed in cutting, ground-contact slash had deteriorated about 45% in 7 years, suspended slash had deteriorated faster (37%) following clear logging than after partial logging (11-26%) in 7 years, 7 of the 81 different species of fungi isolated from decayed slash had caused most of the rot. A report on these and other aspects of the investigation was issued during the year. Further work is planned for 1960.

11. Decay of living lodgepole pine in Alberta.

(Project leaders : G. P. Thomas and A. A. Loman)

Little work beyond the locating of sample areas for 1960 was done on this project during the year. A review was made of several smaller studies related to this project, in anticipation of bringing together existing data as a nucleus for an expanded program of work on lodgepole pine decays.

12. Ecology of the Indian paint fungus.

(Project leader : G. P. Thomas)

Some scouting was done during the year in spruce-balsam forests, along the eastern slopes of the Rocky Mountains, to locate this important heartrotting fungus. It was noted in several localities on sub-alpine fir (Abies lasiocarpa) where it had previously been unreported. A more intensive survey for this fungus was planned for 1960. This work is preliminary to a more detailed study of fir (Abies) decays.

SURVEY PROGRAM - ENTOMOLOGY

An increased emphasis was placed on special survey projects during the year, involving mainly investigations of Adelginae, Bruce spanworm, and spruce budworm. The amount of time available for aerial surveys of outbreak areas was similarly increased, involving mainly poplar defoliators, larch sawfly, and spruce budworm.

The total area that was infested by the larch sawfly was greater in 1959 than in 1958. The gradual movement of heavy infestation areas to the north and west of the Province noted in the past few years continued in 1959. The largest area of heavy defoliation occurred in the northern part of the Province and immediately adjacent areas of the Northwest Territories.

Aspen defoliation was again serious in 1959, the most widespread damage resulting from leaf rollers, mainly Pseudexentera improbana oregonana. The forest tent caterpillar was again widespread in the Province, but heavy defoliation was limited mainly to Elk Point and southeast of Grande Prairie. The Bruce spanworm was generally evident along the foothills, north to Grande Prairie, and east through the boreal region to Saskatchewan. A general decline in Bruce spanworm populations from 1958 was evident in the more southerly regions of its distribution in Alberta.

The aspen leaf miner was again common in the National Parks areas and was generally more widespread in these areas than in previous years.

The Douglas fir beetle occurred in outbreak proportions in the Porcupine Hills region. The infestation was most damaging to stands marginal to recently logged-over areas.

Infestations of the one-year cycle spruce budworm had increased in area and intensity along the Liard and Slave Rivers. Elsewhere there had been a general decline from previous years.

In general, the damage to coniferous trees was light in Alberta during the year, excepting a sustained infestation of the larch sawfly. Deciduous trees were much more seriously affected, mainly by defoliators. Damage in the Northwest Territories resulted mainly from the spruce budworm and the larch sawfly.

SURVEY PROGRAM - PATHOLOGY

Disease survey operations were highlighted by special surveys to extend the known distributions of Atropellis piniphila, lodgepole pine dwarf mistletoe, and rust diseases. In addition, a special survey was made to note the effects of late frosts on aspen foliage.

The Atropellis canker disease of lodgepole pine was noted in 11 areas not previously known to be affected. The distribution of this disease is now known to be general, rather than sporadic, in Alberta and the National Parks on lodgepole pine. Infections involving 50 per cent or more of the trees over large areas are common. Basal infections of 20-year old trees were noted in scattered localities.

The dwarf mistletoe disease, in contrast with the Atropellis canker disease, is now known to have a sporadic distribution throughout the Province on lodgepole and jack pines. Large areas are known to be free of the disease. On the other hand, extensive infections involving all of the trees in an area are common.

Stem and branch rusts of conifers were investigated in several areas of foothills forests. One large area, near Robb and Hinton, was surveyed with the view to establishing permanent sampling points to follow the progress of Cronartium comandrae, Peridermium harknessii, and P. stalactiforme in young stands of lodgepole pine. Similar observations are planned for the root fungus Armillaria mellea in the same area in future years.

Surveys of cull resulting from decay in white spruce, aspen, and balsam poplar were continued during the year in cooperation with the Alberta

Forest Service. The aspen and poplar survey was finished in 1959 with the final sampling by dissectional means of 1362 trees. Technical guidance was given on the planning and field operations of a cull survey of balsam poplar in Wood Buffalo Park carried out by the Department of Northern Affairs and National Resources.

Climatic diseases were common in Alberta during 1959. The most conspicuous of these was a condition known as aspen clumping, involving a thinning out and clumping of foliage at the extremities of branches. This disease is now believed to result directly from late frosts, and is most severe on trees that leaf out early in the year. Winter injury in the form of red belt was common and severe in the vicinity of Jasper and east to Hinton.

Needle cast and leaf spot diseases, although widespread in Alberta in 1959, did not reach epidemic levels except in very localized areas.

PERSONNEL AND FUNCTIONS

Name and classification	Period employed	Functions and projects
Professional		
Bourchier, R.J. AGR470RLF-10 R.O.(A) 2.	Full time except educ. leave 21/9/59 - 3/2/60	Taxonomy and pathology of heartwood microfungi of living lodgepole pine; Forest Disease Survey.
Brown, C.E. AGR470RLF-6 R.O.(A) 2.	Full time	Head, Forest Insect Survey; Special projects.
Cook, J.A. AGR470RLF-12 R.O.(A) 2.	Full time	Tree susceptibility to black hills beetle; Lodgepole needle miner population studies.
Hopkins, J.C. AGR470RLF-8 R.O.(A) 2.	Full time	Etiological, host-parasite and ecological relationships of *Atropellis piniphila*.

PERSONNEL AND FUNCTIONS (Cont'd.)

Name and classification	Period employed	Functions and projects
Professional (Cont'd.)		
Hopkins, M.E.P. AGR470RLF-11 R.O.(A) 2.	Full time	Forest Insect Survey; Special projects; Taxonomy and life histories of Adelgidae.
Hopping, G.R. AGR470RLF-1 R.O.(A) 4.	Full time	Officer-in-Charge; Organization administration, direction of Zoology projects; Bio-taxonomic studies of Scolytidae.
Loman, A.A. AGR470RLF-13 R.O.(A) 1.	Full time except educ. leave - 1/10/59 - 31/3/60	Decay of lodgepole pine slash; Forest Disease Survey.
McGuffin, W.C. AGR470RLF-2 R.O.(A) 3.	Full time	Ecology, morphology, and taxonomy of forest Geometridae.
Nighswander, J.E. AGR470RLF-15 R.O.(A) 2.	Full time	Influence of site on variations of red heartwood stain; Nuclear phenomena of stem rusts.
Powell, J.M. AGR470RLF-5 R.O.(A) 1.	30/9/59 - 31/3/60	Climate in relation to the black hills beetle.
Reid, R.W. AGR470RLF-7 R.O.(A) 2.	Full time except educ. leave - 6/10/59 - 31/3/60	Biology of the black hills beetle.
Robinson, R.C. AGR470RLF-14 R.O.(A) 1.	15/6/59 - 31/3/60	Bio-taxonomic studies on blue stain fungi in beetle infested trees; Forest Disease Survey.
Shepherd, R.F. AGR470RLF-9 R.O.(A) 2.	Full time	Population and resistance studies on the black hills beetle.

PERSONNEL AND FUNCTIONS (Cont'd.)

Name and classification	Period employed	Functions and projects
Professional (Cont'd.)		
Stark, R.W. AGR470RLF-4 R.O.(A) 3.	1/4/59 - 2/5/59	Bio-ecological studies on Hylobius sp.; Lodgepole needle miner population studies.
Thomas, G.P. AGR470RLF-3 R.O.(A) 3.	Full time	Head, Forest Pathology Investigations; Organization, direction, and administration of pathology research; Cull surveys; pro tem Head of Forest Disease Survey.
Sub-professional		
Andrews, M.J. AGR470RLF-24 F.B.R. 1.	1/4/59 - 20/9/59	Ranger, Crowsnest - Bow River District.
Bigalow, G.C. AGR470RLF-21 F.B.R. 1.	1/4/59 - 24/8/59	Ranger, Northwest Territories District.
Debnam, P.S. AGR470RLF-29 Asst. Tech. 3.	Full time	Field and studio photography and pertinent records.
Draper, N.M. AGR470RLF-47 Steno. 1.	1/4/59	Accounts and attendant correspondence.
Draper, N.M. AGR470RLF-46 Steno. 2.	1/7/59 - 31/3/60	General stenography and secretary to Head, Pathology Investigations.
Emond, F.J. AGR470RLF-23 F.B.R. 1.	Full time	Ranger, Grande Prairie District.
Gautreau, E.J. AGR470RLF-31 Asst. Tech. 2.	29/2/60 - 31/3/60	Assistant on laboratory projects (zoology).

PERSONNEL AND FUNCTIONS (Cont'd.)

Name and classification	Period employed	Functions and projects
Sub-professional (Cont'd.)		
Gray, M.H. AGR470RLF-45 Steno. 2.	Full time	Senior stenographer and secretary to Officer-in-Charge.
Gregory, G.G. AGR470RLF-46 Steno. 2.	1/4/59 - 15/6/59	General stenography and secretary to Head, Pathology Investigations.
Kerr, M.W. AGR470RLF-43 Clerk 4.	Full time	Office administration, purchases, accounts.
Kusch, D.S. AGR470RLF-28 Tech. 1.	Full time	Operation of insectary and supervisor of rearing for Insect Survey.
LaRue, P.F. AGR470RLF-20 F.B.R. 1.	Full time	Ranger, Clearwater District.
Laut, J.G. AGR470RLF-26 F.B.A. 1.	1/4/59 - 16/9/59	Assistant on field and laboratory projects (pathology).
Marx, G.M.D. AGR470RLF-33 Asst. Tech. 2.	19/5/59 - 31/3/60	Assistant in laboratory experiments; Cultural identifications; General laboratory duties (pathology).
Patterson, V.B. AGR470RLF-19 F.B.R. 2.	Full time	Ranger, Brazeau - Athabasca District and Supervisor.
Petty, J. AGR470RLF-18 F.B.R. 2.	Full time	Ranger, National Parks District and Supervisor.
Ridgway, J.I. AGR470RLF-27 F.B.A. 1.	Full time	Assistant on field and laboratory projects (pathology).

PERSONNEL AND FUNCTIONS (Cont'd.)

Name and classification	Period employed	Functions and projects
Sub-professional (Cont'd.)		
Robins, J.K. AGR470RLF-16 F.B.R. Sup. 1.	Full time	Chief Ranger.
Rothlin, M.G. AGR470RLF-33 Asst. Tech. 2.	1/4/59 - 15/4/59	Assistant in laboratory experimental work and general laboratory duties (pathology).
Rothlin, M.G. AGR470RLF-30 Asst. Tech. 2.	16/4/59 - 31/3/60	Assistant in disease herbarium and Disease Survey.
Shantz, E. AGR470RLF-44 Clerk 1.	Full time	Library assistant and general correspondence for Insect Survey.
Stanley, R.R. AGR470RLF-17 F.B.R. 2.	1/4/59 - 16/12/59	Ranger, Peace River District and Supervisor.
Stevenson, G.R. AGR470RLF-25 F.B.A. 1.	Full time	Assistant on Disease Survey; Equipment care and inventory.
Stewart, M.C. AGR470RLF-47 Steno. 1.	3/8/59 - 15/2/60	Accounts and attendant correspondence.
Tomlinson, G.E. AGR470RLF-32 Asst. Tech. 2.	Full time	Assistant on field and laboratory projects (zoology).
Unterberger, H. AGR470RLF-34 Asst. Tech. 2.	16/11/59 - 31/3/60	Assistant on Insect Survey.
Watson, J.A. AGR470RLF-31 Asst. Tech. 2.	1/4/59 - 10/1/60	Assistant on field and laboratory projects (zoology).

PERSONNEL AND FUNCTIONS (Cont'd.)

Name and classification	Period employed	Functions and projects
Sub-professional (Cont'd.)		
Watson, J.A. AGR470RLF-24 F.B.R. 1.	11/1/60 - 31/3/60	Ranger, Crowsnest - Bow River District.
Watson, W.T. AGR470RLF-34 Asst. Tech. 2.	1/4/59 - 30/9/59	Assistant on Insect Survey.
Watson, W.T. AGR470RLF-26 F.B.A. 1.	1/10/59 - 10/3/60	Assistant on laboratory projects (pathology).
Wilkinson, N.W. AGR470RLF-22 F.B.R. 1.	Full time	Ranger, Lac La Biche District.
Seasonal		
Bain, A.Y. AGR470RLF-38 Stud. Asst.	2/5/59 - 15/9/59	Assistant on Insect Survey.
Browett, R.J. AGR470RLF-42 Stud. Asst.	2/5/59 - 12/9/59	Assistant on field projects (pathology).
Cerezke, H.F. AGR470RLF-41 Stud. Asst.	2/5/59 - 21/9/59	Assistant on field projects (zoology).
Charnetski, W.A. AGR470RLF-35 Stud. Asst.	2/5/59 - 21/9/59	Assistant on field projects (pathology).
Elliott, D.P. AGR470RLF-Cas. Labour.	2/7/59 - 1/9/59	Maintenance of Kananaskis Field Station; Assistant on Insect Survey.
Kiddle, A.L. AGR470RLF-1R Cook.	4/5/59 - 13/9/59	Cook at Mt. Eisenhower Field Station.

PERSONNEL AND FUNCTIONS (Cont'd.)

Name and classification	Period employed	Functions and projects
Seasonal (Cont'd.)		
Mabbott, J.D. AGR470RLF-39 Stud. Asst.	2/5/59 - 10/9/59	Assistant on field projects (pathology).
Malchow, D.G. AGR470RLF-40 Stud. Asst.	2/5/59 - 14/8/59	Assistant on field projects (zoology).
Patsula, P.J. AGR470RLF-36 Stud. Asst.	2/5/59 - 8/9/59	Assistant on Insect Survey.
Popowich, J.W. AGR470RLF-37 Stud. Asst.	2/5/59 - 8/9/59	Assistant on field projects (pathology).

VACANT POSITIONS

Name and classification	Period vacant	Functions and projects
AGR470RLF-4 R.O.(A) 3 (vice Stark)	3/5/59 - 31/3/60	Bio-ecological studies on Hylobius sp.
AGR470RLF-17 F.B.R. 2 (vice Stanley)	17/12/59 - 31/3/60	Ranger, Peace River District and Supervisor.
AGR470RLF-21 F.B.R. 1 (vice Bigalow)	25/8/59 - 31/3/60	Ranger, Northwest Territories District.

VACANT POSITIONS (Cont'd.)

Number and classification	Period vacant	Functions and projects
AGR470RLF-24 F.B.R. 1 (vice Andrews)	21/9/59 - 10/1/60	Ranger, Crowsnest - Bow River District.
AGR470RLF-26 F.B.A. 1 (vice Laut)	17/9/59 - 1/10/59	Assistant on field and laboratory projects (pathology).
AGR470RLF-26 F.B.A. 1 (vice Watson, W.T.)	11/3/60 - 31/3/60	Assistant on field and laboratory projects (pathology).
AGR470RLF-30 Asst. Tech. 2 (vice MacArthur)	1/4/59 - 15/4/59	Assistant in disease herbarium and on Disease Survey.
AGR470RLF-31 Asst. Tech. 2 (vice Watson, J.A.)	11/1/60 - 28/2/60	Assistant on field and laboratory projects (zoology).
AGR470RLF-33 Asst. Tech. 2 (vice Rothlin)	16/4/59 - 18/5/59	Assistant in laboratory experimental work and general laboratory duties (pathology).
AGR470RLF-34 Asst. Tech. 2 (vice Watson, W.T.)	1/10/59 - 15/11/59	Assistant on Insect Survey.
AGR470RLF-46 Steno. 2 (vice Gregory)	16/6/59 - 30/6/59	General stenography and secretary to Head, Pathology Investigations.
AGR470RLF-37 Steno. 1 (vice Draper)	1/7/59 - 2/8/59	Accounts and attendant correspondence.
AGR470RLF-47 Steno. 1 (vice Stewart)	16/2/60 - 31/3/60	Accounts and attendant correspondence.

CONFERENCES AND CONSULTATIONS

Name, location, and date	Persons attending
International Botanical Congress, Montreal, Quebec, August 19 - 29, 1959.	R. J. Bourchier J. C. Hopkins G. P. Thomas
Consultation (W.G.Wellington) on bark beetle biology, Victoria, B.C., August 23 - 27, 1959.	R. W. Reid
Entomological Society of Alberta, Calgary, Alberta, October 15 - 18, 1959.	C. E. Brown M. E. P. Hopkins G. R. Hopping J. A. Cook R. F. Shepherd W. C. McGuffin
Canadian Phytopathological Society (Regional), Edmonton, Alberta, October 19, 1959.	J. C. Hopkins J. E. Nighswander R. C. Robinson G. P. Thomas
Entomological Society of Canada, (joint meeting with Ent. Soc. of America), Detroit, Michigan, November 30 - December 3, 1959.	G. R. Hopping
Consultation (D.A.Ross) on insect survey and insectary operations, Vernon, B.C. November 30 - December 4, 1959.	D. S. Kusch J. K. Robins
Western Forest Disease Work Conference, Pullman, Washington, December 8 - 11, 1959.	J. E. Nighswander G. P. Thomas
Canadian Institute of Forestry (Regional), Edmonton, Alberta, February 5, 1960.	R. F. Shepherd G. P. Thomas
Western Forest Insect Work Conference, Ogden, Utah, March 9 - 11, 1960.	G. R. Hopping R. F. Shepherd

REPORTS AND PUBLICATIONS

Interim Mimeographed Reports

Bourchier, R.J. and A.A. Loman. 1959. Check list of fungi and diseases for the genus Pinus in Alberta. Can. Dept. Agr., Res. Br., For. Biol. Div., Calgary, Alberta.

Cook, J.A. 1959. Induced drought in lodgepole pine and its relationship to successful mountain pine beetle attacks. Can. Dept. Agr., Res. Br., For. Biol. Div., Calgary, Alberta.

Hopping, G.R. and G.P. Thomas. 1959. Annual report on operations of the Forest Biology Laboratory, Calgary, Alberta, for the fiscal year ended March 31, 1959. Can. Dept. Agr., Res. Br., For. Biol. Div., Calgary, Alberta.

Loman, A.A. 1959. Deterioration by decay of lodgepole pine logging slash near Strachan, Alberta. Can. Dept. Agr., Res. Br., For. Biol. Div., Calgary, Alberta.

Shepherd, R.F. 1959. Population studies on the mountain pine beetle. Can. Dept. Agr., Res. Br., For. Biol. Div., Calgary, Alberta.

Stark, R.W. 1959. Studies on the pine root weevil, Hylobius warrenii Wood in Alberta. Can. Dept. Agr., Res. Br., For. Biol. Div., Calgary, Alberta.

Bi-Monthly Progress Reports

Hopkins, J.C. 1960. The locus of entry of the canker fungus Atropellis piniphila into lodgepole pine stems. In Can. Dept. Agr., Res. Br., For. Biol. Div., Bi-Monthly Prog. Rept., 16(2):3. Ottawa.

Shepherd, R.F. 1960. Blue-stain fungi associated with the mountain pine beetle. In Can. Dept. Agr., Res. Br., For. Biol. Div., Bi-Monthly Prog. Rept., 16(3):2-3. Ottawa.

Publications

Bourchier, R.J. 1960. Microfungi in the stems of living lodgepole pine. State Univ. of New York Coll. of For. at Syracuse Univ. Ph.D. thesis.

Publications (Cont'd.)

Brown, C.E. 1959. Reproduction of the pine needle scale, Phenacaspis pinifoliae (Fitch). Can. Ent., 91(9):529-535.

Brown, C.E. et al. 1959. Province of Alberta. Forest Insect Survey. In Ann. Rept. of the Forest Insect and Disease Survey (1958). Can. Dept. Agr., Res. Br., For. Biol. Div., Ottawa.

Cumming, M.E.P. 1959. The biology of Adelges cooleyi (Gill.) (Homoptera, Phylloxeridae). Can. Ent., 91(10).

Hopkins, J.C. 1959. A spore trap of the vaseline slide type. Can. J. Botany, 37:1277-1278.

Loman, A.A. and R.J. Bourchier. 1959. Province of Alberta. Forest Disease Survey. In Ann. Rept. of the Forest Disease Survey. In Ann. Rept. of the Forest Insect and Disease Survey (1958). Can. Dept. Agr., Res. Br., For. Biol. Div. Ottawa.

Nighswander, J.E. 1959. The epidemiology of the jack pine-oak gall rust. Univ. Wisconsin, Dept. Pl. Path. Ph.D. thesis.

Robinson, R.C. 1960. Black stain in yellow cedar, Chamaecyparis nootkatensis (D. Don) Spach. Univ. Brit. Col., Dept. Biol. and Botany. M.A. thesis.

Shepherd, R.F. 1959. Phytosociological and environmental characteristics of outbreak and non-outbreak areas of the two-year cycle spruce budworm, Choristoneura fumiferana (Clem.) (Tortricidae). Ecology, 40(4):608-620.

Stark, R.W. 1959. Population dynamics of the lodgepole needle miner, Recurvaria starki Free., in Canadian Rocky Mountain Parks. Can. J. Zoology, 37(6).

Stark, R.W. 1959. Climate in relation to winter mortality of the lodgepole needle miner, Recurvaria starki Free., in Canadian Rocky Mountain Parks. Can. J. Zoology, 37(6).

Reports and Publications Submitted or in Preparation.

Bourchier, R.J. 1960. Laboratory studies on microfungi isolated from the stems of living lodgepole pine (submitted to Can. J. Botany).

Reports and Publications Submitted or in Preparation (Cont'd.)

Bourchier, R.J. 1960. Microfungi from the stems of living lodgepole pine (submitted to Mycologia).

Brown, C.E. 1960. Protection against insects. In Park Warden Manual. Can. Dept. North. Affairs and Nat. Res., Nat. Parks Br., Ottawa (submitted).

Brown, C.E. et al. 1960. Province of Alberta. Forest insect survey. In Ann. Rept. of the Forest Insect and Disease Survey (1959). Can. Dept. Agr., Res. Br., For. Biol. Div. Ottawa (submitted).

Cumming-Hopkins, M.E.P. 1960. Notes on Hyalophora spp. from the Forest Insect Survey, Calgary. In Can. Dept. Agr., Res. Br., For. Biol. Div., Bi-Monthly Prog. Rept. (submitted).

Cumming-Hopkins, M.E.P. 1960. The biology of Adelges lariciatus (Patch) (Homoptera, Phylloxeridae) (in preparation).

Cumming-Hopkins, M.E.P. 1960. The biology of Pineus similis (Gill.) (Homoptera, Phylloxeridae) (in preparation).

Cumming-Hopkins, M.E.P. 1960. A parthogenetic generation of Adelges coolevi (Gill.) on spruce. (in preparation).

Etheridge, D.E. 1960. Factors affecting branch infection in aspen. Can. Dept. Agr., Res. Br., For. Biol. Div., Calgary, Alberta. (submitted).

Hopkins, J.C. 1960. Studies on Atropellis piniphila in culture. Can. J. Botany (in preparation).

Hopping, G.R. 1960. A new species of Pityophthorus Eichoff (Coleoptera; Scolytidae) in Alberta. Can. Ent. (submitted).

Nighswander, J.E. 1960. Studies on fungi associated with red heartwood stains of lodgepole pine. Can. Dept. Agr., Res. Br., For. Biol. Div., Calgary, Alberta. (in preparation).

Thomas, G.P. et al. 1960. Fungi and decay in aspen and balsam poplar in the boreal forest region, Alberta. Can. J. Botany (submitted).

Thomas, G.P. 1960. Protection against diseases. In Park Warden Mannual. Can. Dept. North. Affairs and Nat. Res., Nat. Parks Br. Ottawa (submitted).

Reports and Publications Submitted or in Preparation (Cont'd.)

Thomas, G.P. et al. 1960. Province of Alberta. Forest Disease Survey. In Ann. Rept. of the Forest Insect and Disease Survey (1959). Can. Dept. Agr., Res. Br., For. Biol. Div. Ottawa (submitted).

Thomas, G.P. and G. Paul. 1960. Decay os aspen and balsam poplar in boreal forests, Alberta. Can. J. Botany (in preparation).

FINANCIAL STATEMENT

	Allotment	Expenditure
Travelling & Removal Expenses	16.630	16.583
Freight, Express & Cartage	700	576
Postage	750	420
Telephone & Telegrams	790	965
Materials & Supplies	9,500	8,742
Fuel for Heating		1,237
Repairs & Upkeep of Buildings & Works	1,780	1.672
Rental of Lands & Buildings		148
Repair & Upkeep of Equipment	8,000	10,308
Rental of Equipment	1,400	939
Municipal Services		174
Unemployment Insurance Contributions	25	9
Wages	1,925	1,303
Overtime		24
Allowances		475
Office Stationery Supplies & Equipment		3,394
Construction of Buildings & Works	9,150	9,843
Purchase of Equipment	16,280	16,532
Sundries	475	2,095
Total (excluding Salaries)	67,405	75,439