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Table of Contents

	<u>Page</u>
Introduction	1
Co-operation	1
Control	3
Merrit District	4
Lorna	6
Adama Lake	7
Spius Creek	8
Slash	9
Experiments (Cage) Midday Valley & Lorna	11
Inspections	19
Douglas fir	19
Martin Mountain	20
Laboratory	20

ANNUAL REPORT
ENTOMOLOGICAL LABORATORY, VERNON, B.C.

1924

by Ralph Hopping

The amount of direct control of forest epidemics by both the Provincial and Dominion Forest Branches, undertaken during the spring of 1924 exceeded that of any previous year, being in fact almost double. Approximately \$45,000 was spent in British Columbia in direct control work.

Epidemic infestations in controlled areas have been reduced, as a rule, 90% by the control work, but owing to the increase in lumbering operations all over the Province new infestations are continually arising in widely separated districts, tremendously increasing the work of the personnel of the Vernon Laboratory.

Cooperation

The Provincial Government of British Columbia spent \$35,000.00 in 1924 on insect control work which consisted in cutting and burning trees infested with bark-beetles.

Five large crews were in the field and from time to time several smaller or "flying crews". Each crew consisted of from 15 to 36 men. A total of approximately 20,000 trees were cut and burned.

The Provincial Forest Branch depended upon the personnel of the Dominion Forest Laboratory at Vernon to make the infested trees, advise them as to the proper methods, conduct experiments to determine the proper methods to employ on the various problems arising, and make inspections of all logging operations in the Province in order to recommend methods for preventing infestations from starting. The entomologist in charge found himself, during 1924, very short handed having only four men to cover the immense field involved. These men, being only on for the summer season, were not able to work up the results of the operations and experiments. The Vernon laboratory, therefore, finds that it has been impossible to properly carry on.

The saving of actual commercial timber to the Province has been estimated as worth between 5 and 5 1/2 million dollars. In other words if the control work had not been done that much worth of timber would have been destroyed during the next four or five years. It is, therefore, estimated that the work of this laboratory is worth to the Province approximately one million dollars per annum.

Due to the upsetting of the natural balance in nature by the lumbering operations and various human activities infestations are continually breaking out in new localities and becoming more and more numerous and the demands upon the forest entomologist greater year by year.

The relations between this laboratory and the

Provincial Government have been the best possible in all cases and the various officials have often expressed their appreciation of the help extended them by the forest laboratory in British Columbia.

The revision and establishing of that part of the Provincial Forest Act relating to the prevention and control of bark-beetles has been largely due to the efforts of the personnel of the Dominion Forest Laboratory at Vernon.

Control

The control work has improved in effectiveness this year, as more careful burning was accomplished at an average cost per tree less than any previous year. This was due principally, to the close supervision given by the Victoria and Vernon offices of the Forest Branch, as well as that of the Entomologists office, which latter, however, was very short handed and had some difficulty in covering the ground.

In fact one Forest Branch ranger made complaint that he did not receive the help he should from my office, but it is obvious that a man cannot be in two places at once. An investigation of the assistant of which complaint was made, proved that he was dividing his time as judiciously as the amount of work he had to do would allow. As it was, some of our cage experiments came very nearly being ruined on account of being short handed.

I must earnestly request that this office be allowed the help asked for in the estimates. When the two

Forest Branches in British Columbia expend \$45,000.00 in insect control work in one year looking to us for entomological supervision, we should certainly supply enough men to cover the field work.

The Provincial Government had five large crews in the field and at various intervals smaller, or flying crews. Four of the large crews were in the Merritt District in the yellow pine infested area, and one at Lorna on the Kelowna watershed in the lodgepole pine epidemic. The Dominion Government crews were situated, one in the Spius Creek, in yellow pine infestation, and one in white pine infestation on Adams Lake.

We, therefore, had a total of seven large crews to mark infested trees for, besides the occasional flying or smaller crews, and the cage work mentioned under the account of "Experiments." This was accomplished with a personnel of four men, too few for the work, which was necessarily slighted in order to cover the ground.

Merritt District

The control work for 1924 was concentrated on one big area called the "Aspen Cove Control Unit" spotted with heavy epidemic infestation. The areas in the Midday Valley were not worked this year, principally because the years 1925 and 1926 will see the area completely cut off by the Nicola Pine Mills, and also due to the past control work having saved as much of the timber as it was economically possible to

do under existing conditions in that area.

Large crews to the number of four, containing from 20 to 36 men worked through part of April, May and the greater part of June. A total of 14,829 trees were cut and burned. These were infested with the two usual bark-beetles, Dendroctonus monticolae and Dendroctonus brevicornis.

The following table gives the total number of M.B.M. and trees treated in the Merritt District control work and the total cost to the Province of British Columbia for five years, 1920 to 1924 inclusive.

Table of work done each year with costs
(Forest File)

28
4
112

Year	M.B.M. Cut	No. of trees	Cost per tree	Cost per M.B.M.	Total cost
1920	556,145	3150	1.86	-----	5,893.19
1921	674,345	3955	1.79 ?	-----	9,947.00
1922	2,268,931	7657	1.55	-----	11,880.23
1923	3,095,615	8407	2.02	5.48	17,924.23
1924	4,040,012	14829	1.61 ?	5.90	27,499.86
	10,635,048	37998			73,144.51

Logging on the Aspen Grove Area during 1924 consisted of a small strip cut along the Coldwater road. The slash has been burned. The Rangers report for October 24, 1924, showing that the slash of 144 M. ft. B.M. was piled and burned at a cost of \$0.72 per thousand feet out.

After the spring control work which ended in June 1924 the Provincial Forest Branch employed a qualified man,

one Hector Richmond, to check the control areas in order to find how many unworked infested trees were left after the control work. The checking was done between Aug. 25 and Sept. 15 on the epidemic areas where the large crews were located. The unworked trees, according to the check, were as follows:

Spearing.....	94 trees
Brookmere.....	118 trees
Voght and Kane Valleys.....	1407 trees
Olson Lake.....	<u>373 trees</u>
Total 1992 trees	

To this must be added some small spots here and there on the area, making a probable total of 3000 trees and reinfestation of about 10% or 1500 trees to be added. This gives a total of about 4500 trees to be worked in 1925 to complete the initial control work or a total cost of approximately \$10.000 for 1925.

There will in 1926 be some reinfestation here and there in small groups, which must be worked until the infestation is lowered to one-half of one percent of the total stand, which stand is variously estimated as between 250 and 350 million feet B.M. for the Aspen Grove unit.

Lorna

This infestation became epidemic in lodgepole near the watertank at Lorna in 1921. In 1922 and 1923 requests were made for funds to control the epidemic, but as no fixed amount is set aside by the Provincial Government for

insect control work, it was not until the spring of 1924 that funds were available for this purpose. In the meantime the infestation had spread across Sawmill Creek and assumed startling proportions. It was estimated that the increase in 1924 over 1921 was about 600%. This was due to the bark-beetle Dendroctonus monticolae alone, D. brevicornis not being able to breed in lodgepole. As this infestation is at a much higher elevation than the Merritt District, epidemic work did not commence until May 14 and lasted until the first days of July.

A total of 5290 trees were cut, piled and burned. The maximum crew consisted of 29 men. The total cost of the operation was \$5702.66 with an average cost of \$1.08 per tree.

Although the money was available it was impossible to quite finish the work, there being about 1000 infested trees left at the termination of the control work in July. The extremely dry hot weather in the early days of July caused much trouble in controlling the fires, so the work was closed down for the season. There will probably be considerable increase in infested trees left on the area, possibly 100% so that it will not be surprising if the 1000 trees have increased to 2000 in the spring of 1925.

Adams Lake

The Adams Lake project was situated above the east shore of that lake distant about three miles by trail. This epidemic was in a fine stand of comparatively young white

pine (Pinus monticola) caused by the same bark-beetle as found in yellow and lodgepole pine, Dendroctonus monticola.

Work was begun on May 15 and terminated July 9. All supplies must be packed up a steep mountain for at least three miles. The total number of trees cut was 1264 with a volume of 329,265 ft. B.M. at a total cost of \$3548.29.

Mr. Brown and the writer inspected the work after completion, and found the entire operation one of the best we had ever seen.

Exactly how the foreman managed to burn the piles without scorching the standing timber, as he did, was a cause of speculation to the inspectors. If it is possible to obtain this foreman in 1926 it should be done.

During the course of the work another area of infestation was discovered not far distant. This area with the 400 trees marked but not cut in 1924 will constitute the 1925 control work.

It is, therefore, recommended that \$3550.00 be expended in 1925 work to begin as soon as the snow will allow.

Spius Creek

This work, a recleaning of the Spius Creek area first worked in 1920 has never had the reinfestation, and some small outlying groups of infestation, entirely cleaned up in any one year. The area was recleaned in 1921 and again in 192² and 1924. No work was done in 192³. The infestation is

now at a fairly low state but will possibly have to be again re-cleaned in the spring of 1926.

In the meantime the Vernon Laboratory will conduct a checking of the area during the summer of 1925 in order to determine the exact status of the remaining infestation.

On thousand two hundred and forty-three trees were cut and burned in 1924 showing that the infestation was again increasing. The total cost being \$1612.19.

Slash

By the term slash is meant the debris left on the ground after logging operations. This includes, stumps, cull logs, tops and limbs. A large factor in this slash has sometimes been the logs cut for milling purposes, left upon the ground and not hauled to the mill at all; or left over one year upon the logging area.

Just how many bark-beetles such slash will produce has always been an unknown quantity. By caging slash after logging operations the Entomological Branch have been trying to get some definite data. The experiments have only covered a period of one year that of 1924 and cannot be said to be conclusive, but the average number of Dendroctonus brevicornis and monticolae recovered from caged slash is sufficient to account for any of our epidemics.

Stumps, tops and cull logs have been caged separately and collections made from these cages each day throughout the season. An average per acre of 2160 Dendroctonus have been recovered. This means that 100 acres of slash produces 216

thousand bark-beetles must either enter fresh slash or the standing nearby timber. The only other alternative is to die and they are certainly not going to die with food alongside them.

Slash of some species of trees is much more dangerous than that of others. Among the most dangerous in the west I would class yellow pine (*Pinus ponderosa*) and spruce (*Picea engelmann*). Douglas fir (*Pseudotsuga taxifolia*) slash has not generally been considered a menace, principally because the Douglas fir bark-beetle (*Dendroctonus pseudotsugae*) has seemed to decidedly prefer slash to standing trees. In the E. C. interior, where only small quantities are cut, a few sporadic epidemics have occurred which have quickly subsided.

In 1921 I made an inspection of the coast of British Columbia as far north as the Queen Charlotte Islands. Epidemics of bark-beetles did not then exist on the coast, but there was evidence that considerable numbers were breeding in the slash. In 1923, however, they began to attack standing Douglas fir and have increased tremendously in 1924. It is evident that the slow increase in the slash on the large operations all along the coast the beetles have at least exceeded the supply of fresh slash and are now attacking the standing timber in epidemic form. The Douglas fir beetle has, however, a Hymenopterous parasite which may decimate the broods in time to prevent very widespread damage. This, however, is only a possibility.

The best means of control is prevention.

Prevention can best be accomplished through forest management.

The conclusion is, therefore, evident, that the slash must be taken care of in some manner which will prevent the breeding of species of insects which kill standing timber. Piling and burning is probably the best method known, but in the case of timber as large as that upon the coast, a combination of peeling and piling and burning would probably be the most economical method.

Unless some method of forest management is put into effect by which the slash is prevented from breeding bark-beetles our losses, even on the coast, will far exceed any fire losses the Province has sustained to date.

Experiments

A number of experiments in caging infested trees have been carried on since 1921. The value of this cage work has demonstrated the importance of these projects. In 1924 we were able, from the time of emergence of various bark-beetles in the various cages, to regulate the working of the control crews in the field. Mr. Manning, in charge of Forest Management recognized the value they were to the Provincial Forest Branch, and earnestly hoped we would be able to continue them. He felt that if the Provincial Government spent \$35,000.00 as they did in 1924, that the Dominion Government should at least provide enough men to afford them the instruction they needed in the bark-beetle control work.

These experiments, which outside the personnel

cost us less than \$250.00 per year, are solving many of our problems which have bothered us in the control work.

They have enabled us for instance to cut the reinfestation in controlled areas from 40% which in California and Oregon they are still getting, to 9% and 10% in the areas worked in 1923 and 1924 in British Columbia.

New species have been obtained and described from these cages such as the bark-beetle Carphoborus ponderosae and Phloeosinus scopulorum recently described by Dr. J. M. Swaine, adding types to the Canadian National Collection.

The caging of slash, such as tops, cull logs and stumps, in enabling us to prove the menace such unburned material is to our standing forests, and has been an important factor in revising the British Columbia Forest Act and probably the most important factor in legislation tending toward the conservation of our forests in the entomological line.

The lack of sufficient men to perform the inspection work and carry on the experimental work at the same time, has been one of the most serious problems we have had to contend with in our work in British Columbia. In 1924 we had 27 cages in 7 groups, 17 in the Midday Valley and 6 at Lorna. The first (17) being situated in the yellow pine (Pinus ponderosa) infested areas, and the second (6) in the infested lodgepole pine (Pinus contorta) areas.

The following list enumerates the cages in each group with the experimental number used. The material

emerging was collected each day and given a lot number under the experimental number.

The construction of the first cage in 1921 has been simplified from year to year, so that our cages while just as serviceable, now cost much less than the original 1921 cage. This has been done by eliminating as much as possible sawn lumber and utilizing poles on the ground, thus saving cost of milled material and hauling charges.

1924 Gage Experiments

Midday Valley - 17 cages

- 17126 - Cull log
- 17127 - Cull log
- 17128 - Top
- 17129 - Top
- 17130 - Stump

} Slash on a cut over area.

- 17131 - 54" Trunk
- 17132 - limbs of
17131
- 17133 - top of
17131
- 17134 - stump of
17131

} Yellow Pine infested 1923

- 3. 17153 - Stump)
 17154 - stump)
 17155 - Top)
 17156 - Cull log) Slash out June 1924 on logging area.

- 4. 17109 - 32" Trunk)
 17110 - Limbs of 17109)
 17111 - Stump of 17109) Yellow pine caged 1923 and recaged 1924.
 17112 - Top of 17109)

- 5. Lorna - 6 cages
 17201 - Stump)
 17202 - Trunk) Pinus contorta.

- 6. 17203 - Trunk)
 17204 - Stump) Picea engelmanni

- 7. 17205 - Trunk)
 17206 - Stump) Abies lasiocarpa

Group E.

This group, Exp. 17126 to 17130 inclusive has been for the purpose of determining just what species and how many per acre breed in such material. The experiment must be continued at least five years to obtain any reliable average. While the figure obtained of 2160 Dendroctonus to the acre from this intial experiment, in caging slash, is indicative of the menace unburned slash is to the standing timber it is not a reliable figure as the emergence many vary greatly from year

to year due to time of cutting and dry or wet years, and numerous other factors. The question of what effect slash has on infestations has always been a moot one. Many forest entomologists in the United States claim it does not affect epidemics in standing timber, but their opinion has not been placed upon any definite experimental data. This is the first time that experiments of this order have been conducted.

Group 2.

This group Exp. 17131 to 17134 inclusive is principally to determine the emergence from a standing infested tree in a forest. It is a continuation of the experiment begun in 1921 and continued each year to date. As may be seen by the table we are now separately caging the limbs, top, trunk and stumps to obtain just what portion of the tree certain bark-beetles breed in, or what portion produces the bulk of the emergence. Trees of different diameter have been caged viz. 1921 - 18" D.B.H., 1922 - 24" D.B.H., 1923 - 32" D.B.H. and in 1924 - 54" D.B.H.

Group 3.

These cages Exp. 17153 to 17156 inclusive are really 1925 experiments in caging slash. We had reason to believe that slash cut in 1924 had some fall emergence before the general emergence of the following summer.

In this we were right, but owing to lack of help the figures and material have not yet been compiled.

Group 4.

This group consists of Experiments 17109 to 17112 inclusive. The number of bark-beetles which do not emerge during one season, but hold over until the following season, has never been determined, if any. In this particular tree it was found that 6% breed over. On this supposition the 1923 cage was repaired in 1924. Many species were also recovered which did not emerge in 1923.

Group 5.

This group Experiments 17102 and 17103 was situated in the Pinus contorta infestation at Lorna where an epidemic was killing the cover to a most important watershed supplying the Kelowna, B.C., fruit growers with their irrigation water. The control crews safely continued their work three weeks longer than usual, due to the inspections made by the man in charge of the experiment, both in the field and in the cages.

Group 6.

This consisted of two cages, Experiments 17203 and 17204 made of the trunk and stump of spruce (Picea engelmanni) where an epidemic was just starting in the spruce stands on the same watershed as group 5.

Group 7

A few trees were found to be infested of balsam (*Abies lasiocarpa*) in the same watershed as groups 5 and 6. These were Experiments 17205 and 17206 consisting of the stump and trunk of the infested tree.

The greater part of the material in Groups 5, 6 and 7, however, has not been worked up, due again to insufficient help in the forest laboratory at Vernon.

The building of the cages and the control work necessarily must be performed at the same time, and it follows that the men spotting trees for the control work cannot build cages as well, therefore, it is necessary to have one man at each of the two districts where the cages are located; besides the entomologists marking trees for the control work.

In the four groups of cages in the Midday Valley collections were made each day from June 15 to September 1st and in the three groups of cages at Lorna from July 1 to September 1.

In group 2 the collections were from the second year the tree was caged, last years cage having been merely repaired. Group 3 consists of four cages, two stumps a cull log and a top of slash cut in June of this year and caged August 1, giving part of June and July to become infested. The purpose of this was to determine if any emergence occurred before fall as well as to be ready for any early spring emergence in 1925.

This cage work is some of the most important we have, as it will give us definite information on many problems

in regard to times of emergence, effect of dry and wet years, number of broods, number of parasites and their increase and decrease if any, and especially the cutting period when slash is most susceptible to infestation. There are only a few of the many problems which can eventually be worked out from the data collected. But this work must be kept up to date and enough help be supplied to attend to the cage work during the summer and work up the data collected during the winter.

The only cage upon which the data has been completed was that containing the trunk of the Engelmanni spruce. The following list of species and the number of specimens gives some idea of the large number of specimens collected.

<i>Dendroctonus engelmanni</i>	28
<i>Ips perturbatus</i>	650
<i>Dryocoetes affaber</i>	928
<i>Polygraphus rufipennis</i>	959
<i>Trypodendron cavirostris</i>	620
<i>Scierus annectans</i>	24
<i>Bryocoetes septentrionus</i>	23
<i>Eccoctogaster piceae</i>	6
<i>Pityogenes, Pityophthorus, etc.</i>	218
<i>Hylastes</i>	1
<i>Hylurgops</i>	1
Total Ipsids	<u>3468</u>

An additional number of insects of all orders to the amount of 2351 were also collected which give us additional records of hosts for many species of which the hosts were unknown. This spruce was a comparatively small tree as some of our cages have yielded as high as 30,000 insects in one season.

Inspections

Besides the investigational work and general inspection of the direct control work, numerous inspections have been made of slash left by the operations of many small mills, and epidemics just starting. The former, that of the slash of small mills, was conducted in order to recommend proper methods of slash disposal. Of the latter the most important have been the Douglas fir epidemic on the coast north of Vancouver and that of Martin Mt. south west of Chase in lodgepole pine.

Douglas fir

The infestation was examined and a separate report forwarded both to the Ottawa and Victoria offices. In some small sections control measures would pay to inaugurate but the main epidemic north of Sebelt is beyond our control on any economical basis. There is a possibility that it may die out as so many Douglas fir epidemics have due to the attack of the bark-beetle Dendroctonus pseudotsugae.

This is the largest epidemic yet known in North America and is confined to the region of the oldest

lumbering operations on the coast, a large part of it being in cutover areas.

A small infestation just above Minkish Lake on Vancouver Island in white pine due to the attack of the bark-beetle Dendroctonus monticolae should be controlled in the spring of 1925 as it is spreading rapidly.

Martin Mountain

The timber stands on Martin Mt. are mostly lodgepole pine. An epidemic infestation has broken out here, due to the bark-beetle Dendroctonus monticolae, which is assuming large proportions, and will in the next three years entirely kill the lodgepole on this area unless controlled. At the instigation of the Kamloops office of the Dominion Forest Branch an examination was made of this infested area and a brief report rendered. Apparently this stand of timber is depended upon for ties for the C. N. R. railroad. Every effort should be made to control the epidemic in the spring of 1925.

Laboratory

Requisitions for supplies were cut to the minimum needs of the year. The field men, H. H. Thomas, Kenneth F. Auden, Norman L. Cutler and Geo. R. Hopping, averaging not over two weeks in the laboratory as all but Mr. Thomas were obliged to shorten their temporary appointments and return to College.

A total of 327 letters were sent out to date of January 1, 1925 or in other words for the first 9 months of

the fiscal year, correspondence for the remaining three months being conducted from Ottawa.

Many carefully identified species of Coleoptera have been forwarded other than bark-beetles of which 16 species were entirely new to the Ottawa collection. Many of the species sent were from my own private collection from California and the south-western states, Colorado and New Mexico. Of the bark-beetles were several new species of Pityophthorus, Carpoborus ponderosae Sw. and Phloeosinus scopulorum Sw.

The card index for British Columbia species of Coleoptera has been kept up to date over 300 species being added for the year 1924 and the bibliographical references to the Coleoptera have been largely increased during the year.

The general collecting for the year has been almost entirely mounted, but much of the material still remains to be identified. Of the material collected in the cage experiments over 1000 bottles still remain to be worked up. This material should be kept up to date but owing to lack of help it has been impossible to do so.

Entomologist.

February 16, 1925.

10411

Pacific 1924 Insect and Disease Index

Species	PDF Page
bark beetles	4
<i>Carphoborus ponderosae</i>	15, 24
<i>Dendroctonus brevicomis</i>	8, 10, 11
<i>Dendroctonus engelmanni</i>	21
<i>Dendroctonus monticolae</i>	8, 10, 11, 12, 23
<i>Dendroctonus pseudotsugae</i>	13, 22
<i>Dryocoetes affaber</i>	21
<i>Dryocoetes septentrionus</i>	21
<i>Eccoptogaster piceae</i>	21
<i>Hylastes</i> sp.	21
<i>Hylurgops</i> sp.	21
<i>Ips perturbatus</i>	21
<i>Phloeosinus scopulorum</i>	15, 24
<i>Pityogenes</i> sp.	21
<i>Pityophthorus</i> sp.	21, 24
<i>Polygraphus rufipennis</i>	21
<i>Scierus annectans</i>	21
<i>Trypodendron cavirois</i>	21