PROCEEDINGS

OF THE

FOURTH ANNUAL

WESTERN FOREST INSECT WORK CONFERENCE

Victoria, B. C.

December 8 - 10, 1952

WESTERN FOREST INSECT WORK CONFERENCE

December 8, 9 and 10, 1952.

" Forest Entomology, Academic and Applied"

1. Registration of Delegates

2. CHAIRMAN (Mr. Richmond): Welcomed delegates to the Conference.

3. SECRETARY/TREASURER'S REPORTS: Mr. Philp C. Johnson read the Secretary's Report and the Treasurer's Report.

Dr. CHAMBERLIN moved that the two reports be accepted as read, and moved a vote of thanks to Mr. Johnson for his able work.

MR. BONGBERG: Seconded the motion.

4. The CHAIRMAN then asked each delegate to introduce the man on his right.

The Executive Committee of the Association met yesterday and have a few recommendations to submit for approval.

(a) A site for next year's meeting.

We would like that settled now because it is desirable to have a Programme Committee assigned for the location chosen to facilitate preparations for the meeting. It was decided not to confine our choice of a site to conform to the Western Forestry meeting or any other convention, and although the former is meeting in Seattle next year, we do not consider that a suitable place as we have no laboratory there. Therefore, the Executive propose that we meet in the area of the Inland Empire, possibly at Pullman, Washington.

MR. WILFORD: I would suggest that we meet in Colorada Springs at the same time as the S.A.F. meeting.

MR. JAENICKE: When you have a meeting of this kind at the same general time as some other one, there are a number of conflicts.

MR. FURNISS: Re Mr. Wilford's suggestion. I think you all know that will be a rather extended meeting and to add two days to it would make it rather difficult to get a large attendance, at that time of the year. I suggest we meet a little later in the season.

MR. P. JOHNSON: We decided on the Pullman area because there are two major educational institutions in the immediate vicinity. The State College of Washington is the Agricultural and technical university in Washington, and there is the University of Idaho only 9 miles away.

We wanted to have these two institutions act as co-hosts. The facilities there are adequate, and we thought that by having these two educational institutions play co-hosts, it would help the participating of other educational institutions. We are very gratified this year to have so many of the teaching profession at the Conference and we want to encourage the attendance of these people still further.

DR. CHAMBERLIN: Have the two schools accepted this proposal?

MR. JOHNSON: Perhaps Dr. Barr of the University of Idaho can answer that.

DR. BARR: I don't think there will be any difficulty, so far as I know.

DR. CHAMBERLIN : I move the 1953 meeting be held in the Inland Empire.

MR. FURNISS: Second the motion.

DR. CHAMBERLIN: Now, can you suggest a date? We might run into bad road conditions unless the Conference is held earlier or later in the season, and it seems to me that it would be advisable to hold it earlier.

CHAIRMAN: Now that we have agreed upon the site, I think further detail can be handled by the executive giving careful consideration to these suggestions.

The next point I would like to discuss concerns our by-laws - more particularly that section dealing with membership. Before so doing, however, I would like to review briefly the history of this topic so you may all be familiar with the problem.

In our organizational meeting, we established that membership was open to Forest Entomologists and others interested in the technical aspects of the profession of Forest Entomology. This was later revised because the fear was expressed that the group could conceivably change from a work conference to a general meeting if sufficient outsiders entered, and might even become little more than a pressure group or action committee of which there are already several. To safeguard it as a pure work conference, the by-law was amended to read: "Membership shall be restricted to Forest Entomologists and others primarily interested in the technical aspects of Forest Entomology." And so wording it, we practically eliminated all but those actively engaged in the profession.

As we gained experience, it became evident that our fears of losing our identity as a work conference were ill-founded, and with the development of the Division of Forest Biology in Canada, comprising both Entomologists and Pathologists, the desirability of

rewording that section of our by-laws became evident. Accordingly, at our Portland meeting last year (1951), I was instructed by this meeting to bring forth a proposed amendment at this time.

I have accordingly given all possible thought to this matter, and discussed it at a special meeting in Montreal last October when the following were present: Dr. M. L. Prebble, Chief, Division of Forest Biology, Ottawa; Dr. J. E. Bier, Head, Unit of Forest Pathology, Ottawa; Dr. J. Beal, Chief, Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, Washington, D. C.; Dr. Lee Hutchins, Chief Pathologist, In Charge, Division of Forest Pathology, Washington; and Mr. Ray Brown, Beltsville, Maryland. The unanimous opinion was that this gathering had been so successful as a work conference that nothing could be gained by either altering its nature or enlarging its membership or scope. It was felt that other interests, as Pathologists, might well organize their own independent work conference, meeting in conjunction or separately, as occasion warrants. At the same time, it would be desirable if our membership clause was such that other interested persons could attend regardless of the nature of their profession.

Following this, the various members of the executive were written for suggestions, and at a special executive meeting held yesterday, a proposed amendment was approved, which I offer to you now for your consideration and, I hope, acceptance.

Amendment to Article III

"Membership in this organization shall consist of Forest Entomologists and others interested in the field of professional Forest Entomology".

"Official members should be those who pay registration fees".

Mr. Keen moved that the amendment be adopted.

Seconded by Dr. Wygant.

Motion carried.

Mr. Don Parker, Washington, D. C., Moderator for the morning session introduced speakers from various stations to report on current insect conditions.

Philip C. Johnson (Coeur d'Alene Laboratory)

The region served the Coeur d'Alene laboratory includes northeastern Washington, northern Idaho, Montana, northwestern South Dakota and Yellowstond National Park in Wyoming. This is essentially the same as Forest Service Region One. During this year the region

experienced some of its greatest timber damage from forest insects. Western white pine forests are infested in several localities by the mountain pine beetle (Pinus monticolae). One of these comprises the heaviest epidemic outbreak of this insect in white pine in recent years. An important part of the region's forest resources are the extensive areas of inland type Douglas-fir. The Douglas-fir trees in this region differ from those on the coast in that they are smaller and apparently more susceptible to attack by the Douglas-fir beetle (Dendroctonus pseudotsugae). The Douglas-fir beetle this year has killed more timber than in any other year in the northern Rockies. Considering its early depredations, the beetle is easily one of the region's chronic forest insect pests. The mountain pine beetle is also active in lodgepole pine forests, principally in Montana. However, the outbreaks are of smaller magnitude this year than at any time during the past four or five years. Lodgepole pine is becoming more valuable as a source of pulpwood and considerably more attention has been given in recent years to the protection of these stands from insects.

The northern Rocky Mountain region has attracted wide attention from entomologists, foresters, and lumber industry in 1952 because of the tremendous outbreak there of the Engelmann spruce beetle (Dendroctonus engelmanni). The outbreak became evident early in June in 1952 and was immediately found almost everywhere in northern Idaho and northwestern Montana. At first reports there were rumors that up to 90 per cent of the Engelmann spruce timber was infested. Surveys showed, however, that approximately 588 million board feet of spruce was killed during the summer, an average of about only 6 per cent of the spruce resource. The outbreak apparently stemmed from blowdowns similar to those which fostered the outbreak of this beetle in Colordao in 1945. One of the chief differences between the Idaho-Montana outbreak and that in Colordo is the distribution of the infested spruce. In Idaho and Montana it occurs in a great many isolated areas totalling about a million and a quarter acres. Very few of the spruce areas are larger than 2 or 3,000 acres.

In lieu of direct control the laboratory advocated controlling the infestation by logging out the infested trees prior to emergence of the beetles. The U. S. Forest Service is co-operating with private lumber companies in this programme which was begun in July 1952. The programme to date has removed nearly 61 million feet of infested spruce, most of which is being sawn into lumber during the winter of 1952-53. This programme has created a problem in the region's logging and lumber marketing facilities. Labour in the woods is at a premium because of the many salvage logging operations. Concerted efforts are being made to absorb a very large volume of Engelmann spruce in the U. S. lumber markets.

It is sincerely hoped that another Colordo spruce beetle battle will not be on our hands. Even in its first year the outbreak has occasioned the largest bark beetle survey programme ever undertaken in this region.

Finally we come to the spruce budworm problem which has been very serious in recent years in the northern Rocky Mountain region. It is estimated now that about 2 million acres of forests, mostly Douglas-fir, are infested. Despite the fact that from 1 to 2 million acres have been infested by budworm during the last three to four years, no spraying to control the outbreak has been done with the exception of one effort in July 1952. On this occasion 12,000 acres of heavily infested fir forests were sprayed by airplanes in an experimental project on the Bitterroot National Forest in Montana. There has been a growing demand, however, for the spraying of vast areas of budworm in infested forests in the region. Wholesale spraying has been discouraged primarily becaue of a lack of techniques and the fact that many outbreaks subside naturally before excessive tree mortality has occurred. With the development of better control techniques emanating from the Oregon-Washington projects of the past three years there may be more occasion to spray budworm outbreaks in the northern Rocky Mountains.

This is about the extent of our problems. We have never had more insects to play with, bigger outbreaks, and fewer men to work on them.

Johnson: Mostly Douglas fir everywhere in the region, but two-thirds white fir (Abies grandis) in Idaho.

Mr. Wilford (Fort Collins Laboratory): The Fort Collins, Colorado laboratory services South Dakota, Wyoming (exclusive of Yellowstone National Park and some national forests in the extreme western part of the State), western Oklahoma and western Texas, Colorado and Nebraska. For all practical purposes this area coincides with Region 2 of the U. S. Forest Service. The commercial timber in this area is owned and managed mostly by the federal government; predominantly the Forest Service. Insect problems in this area for the past several years have been more or less overshadowed by the Engelmann spruce beetle outbreak in spruce. This outbreak resulted from an extensive blow-down in 1939. A build-up of the beetle population occurred in the wind-felled spruce. This outbreak now has been reduced to endemic proportions. During the 1950-52 control programme over 1,200,000 trees were chemically treated for control by the U. S. Forest Service. The total loss of 4 billion board feet of spruce resulted from the outbreak. We hope this will not occur again. No control programme in the spruce area is planned for 1953. Our spruce beetle surveys will continue; they will be as extensive as in 1952 to assure us of the status of the spruce beetle and to assure us that it remains within bounds at an endemic level. We are breathing somewhat easier now as a result of the control programme.

Among other insects of concern to us is the Black Hills beetle. At the present time, generally speaking, the Black Hills beetle is at endemic level within the Region. On the Harney National Forest

and the Black Hills National Forest the Black Hills beetle is at endemic level, reduced from epidemic proportions by Forest Service control. On the Bighorn National Forest we are completing a Black Hills beetle survey in ponderosa pine. A localized but serious outbreak is in progress, mostly outside the Forest boundaries. Interest for the survey has been shown by private home owners and ranchers bordering the Forest and I am sure a co-operative control job will be carried out. This outbreak is not a serious threat to commercial timber but a threat to the aesthetics of many homes. On the Roosevelt National Forest there has been a serious outbreak of the Black Hills beetle. No control has been carried on and the outbreak is not subsiding. Our survey immediately following the 1950-1951 cold snaps, on the Roosevelt National Forest, showed a reduction in the beetle population. Since then, however, the numbers of beetles have not reduced further; an epidemic continues. We would like to see control work carried on there.

In the Rocky Mountain National Park there is no serious insect situation; the Douglas fir beetle was knocked out by the cold snap of 1950-1951 and the Black Hills beetle is causing no serious damage. There have been a few spruce blow-downs in the Park but no serious spruce beetle build-up has resulted. On the Rio Grande National Forest the Black Hills beetle is being maintained at endemic levels. The same may be said for the San Isabel, Pike, San Juan, and Uncompahgre National Forests. In addition there was a spruce beetle outbreak on the San Juan. This was brought under control this year primarily be salvage logging. This is essentially the bark beetle picture for the area served by the Fort Collins laboratory.

The spruce budworm is a problem insect in this region. It has caused little loss of commercial timber. It is, however, destroying a potentially valuable forest product - Christmas trees. Outbreaks of this insect occur sporadically and disappear suddenly and unaccountably. Very little has been done in the way of control; we don't know the causes of the insect's fluctuations.

There is another defoliating pest on the San Isabel and Rio Grande National Forests, the Great Basin tent caterpillar. On the San Isabel it may be a serious threat to the watersheds and it may present a water pollution problem of significance. We feel that the situation has to be looked into more thoroughly before control can be decided upon. On the Nebraska National Forest insect infestations are not very serious; minor damage has been caused by the pine tip moth and the turpentine beetle.

It warrants comment here that we receive excellent co-operation from all forest managing agencies within the area. It is our co-operation upon which we can depend for good detection surveys.

We are happy to report that our spruce beetle control job is behind us and that other insect pests are at endemic levels. We are hoping to keep them that way and will do all within our power to do so.

Mr. Leslie W. Orr (Ogden Laboratory)

Area serviced is Utah, southern part of Idaho, west side of Wyoming, and Nevada.

Nevada occupies a large part of the region's land area but there is very little of it forested and it has very little economic importance. There is an infestation of Dendroctonus barberi on Charleston Mountain near Las Vegas. This is very important to people of Las Vegas. There are 200 ponderosa pine trees infested in this area.

In southern Utah we run into some other interesting problems. In the Dixie National Forest there is a rather bad infestation of Black Hills beetle in ponderosa pine. This insect has caused damage there to a number of trees in the past. A lot of control work has been done. Timber has made a rather slow growth. This is more of a loss as watershed cover on part of the area. We have found it best to practice direct control. There is much less infestation now than three years ago, but it is now building up again. The control job is staying about the same. We feel that the outbreak will have to run its course, for maybe five to ten years. We will have to do control there until the tendency to increase drops off. Several more years to be expected in control work, in that area.

In Bryce Canyon National Park we have an interesting situation and that is the fir needle miner in white fir. In 1949 we sprayed by aeroplane. The Park Service people felt they got very good control. In 1950 there was no damage at all. In 1951 we saw that there was a rather striking increase and there were quite a number of needles mined. Many of the trees were then on the point of dying. The importance there is that this timber is right along the road and the road follows along the rim of the Canyon and is a very scenic part of the area. It is very important that this infestation be controlled. When the moths are flying they are sprayed by D. D. T. 2 pounds to acre. About 75 per cent or 80 per cent were killed.

On Ashley and Wasatch National Forests there is mountain pine beetle in lodgepole pine. On the Teton Kaystone, Targhee and the Caribou area control of mountain pine beetle was done for several years, completed in 1951. Reconnaissance survey found no infestation at all in 1952.

Southern Idaho has insect problems in the Douglas fir and true fir. On the Boise and Payette National Forests trees were defoliated by the spruce budworm. Control was not recommended. It is felt that outbreaks may die out and not kill much timber. The area is so widespread it would be extremely difficult and expensive to control the budworm.

There is a combination Dendroctonus monticola and D. brevicomis infestation at Deadwood Reservoir on the Payette National Forest. Some 3,000 trees were treated by using ethylene dibromide. Some 200 new

attacks occurred this year, and the Forest Service included them in a timber sale there this year. Cutting is to begin next year. The pine butterfly is known to be endemic in this general area on the Boise National Forest. There is some lodgepole needle miner in parts of southern Idaho.

Chamberlin: What was species of fir needle miner?

Mr. Orr: Epinotia meritana.

Jack Bongberg (Albuquerque Laboratory):

On the first of September a field station was opened by the Division of Forest Insect Investigations to serve New Mexico and Arizona. In late October an aerial reconnaissance was made of timberlands in those two states. There are several minor insects in both states, including defoliators and bark beetles. Some 80 per cent of the timber is ponderosa pine. There is also some white fir and Engelmann spruce.

In the latter there are some losses from the Engelmann spruce beetle. Tree mortality by bark beetles in the fir in one local area ranges from 2 to 11 trees per acre. If this condition continues it will deplete fir in that area. In the south eastern portion of New Mexico is an infestation of fir looper. A new infestation has been discovered and an attempt to control it will have to be undertaken during 1953. Trees were completely defoliated this year. Spruce budworm is severe in one small area and there will be an attempt to control this infestation. There is budworm infestation on the north rim of Grand Canyon National Park. The northern entrance to this National Park is very scenic. It is hoped that the infested areas here will not get out of control. There is a high concentration of parasites here. The general pine bark beetle conditions on the Navajo reservation are of endemic proportions and the infestation which exists is scattered over 500,000 acres. In the White Mountain Baldy Area the spruce budworm has been active several years in conjunction with the Engelmann spruce beetle and is causing severe tree killing. There is a possibility that a spruce beetle epidemic may develop in this area.

Johnson: I would like to mention two other insect outbreaks in the nothern Rocky Mountain region which I forgot to include in my original presentation. One outbreak is that of a geometrid moth (Melanolophia spp.). The moth has appeared in epidemic numbers in the region for the first time in 1952, defoliating an area of 200,000 acres of Douglas and white fir forests in northern Idaho. The outbreak is spread over much of the same area infested by the Douglas-fir tussock moth infestation which was controlled in the first large-scale aerial application of DDT in 1947. Another outbreak of unusual record is that of a cecidomyid working on the needles of Douglas-fir Christmas trees. The outbreak has been playing hob with the Christmas tree industry in the Inland Empire during the current harvest season.

Mr. Eaton (Berkeley Laboratory)

The Berkeley Laboratory working area corresponds to Region 5 of the U. S. Forest Service (California and western Nevada). Field stations at Hat Creek, Miami (near Yosemite) and Placerville. We have no Engelmann spruce beetle. Pine bark beetles are the worst problem in this region. There is a western pine beetle epidemic in the ponderosa pine region on the east side of the Sierra Nevada Range. This year the epidemic does not seem to be any more serious than last year. Jeffrey pine beetle activity has increased considerably. There has been a very serious outbreak in the one remaining stand of virgin pine in the Plumas National Forest. In Lassen Volcanic National Park there is also trouble with the Jeffrey pine beetle. This is quite a serious problem. In the Lassen National Forest an epidemic covers an area of 6,000 acres, where timber is also infested with the western pine beetle.

The mountain pine beetle has caused considerable damage in an area of second growth near Yosemite National Park. We don't know how it got started but mountain pine beetle has gotten into sugar pine and has killed whole stands. Control work was done there early this spring by cutting and treating infested trees. There has been a reduction of 60 per cent to 70 per cent in the beetle population. We hope to finish the control work this fall. Also in Yosemite National Park there is a lodgepole needle miner problem. The situation looks serious but we are not sure what should be done. There is no spraying done here because of the rugged terrain.

In southern California forests there are a number of rather serious insect problems. Combinations of Ips engraver beetles, western pine beetle, Jeffrey pine beetle, and California flat-headed borer infestations are current in that area. We have not been able to do very much in the way of sanitation-salvage logging for bark beetle control in southern California.

In the North Warner Mountains spruce budworm occurs. This has been there for many years. It is found in the lodgepole pine as well as white fir. Plumas County has a sawfly outbreak in white fir. This has not done much serious damage. In forest plantations a small area in California is infested by the pine reproduction weevil. Here control has been successful.

Chamberlin: What type of control is used against the weevil?

Eaton: Aeroplane spraying with D. D. T. in oil solution.

Konnerson: What is the species of sawfly?

Eaton: *Neodiprion scutellatus*.

Mr. McCambridge (Alaska - Forest Service Region 10.)

The Tongass National Forest is 16,000,000 acres in size. Area covered by aerial surveys in 1952. Previous infestations of black-headed budworm reported in vicinity of Ketchikan. Aerial survey at the end of September and early October found current infestations covered 11,640,000 acres. Eight million acres of heavy and very heavy defoliation with some top killing. Sitka spruce only slightly defoliated in part of area. This could be serious situation, but have not been able to evaluate as yet.

Infestation apparently is moving northward. Picked it up in Portland Canal in British Columbia. On Admiralty Island some browning of foliage noticed this year. Moth flight was tremendous in Ketchikan, Petersburg, Juneau and Wrangell. Egg counts in areas of heavy defoliation (Portland Canal to Petersburg) .16 eggs on each inch of twig. Egg counts .43 eggs per inch found within the areas of light to moderate defoliation (Juneau and vicinity). Increasing definitely in this area but little defoliation found now. Counts were made in sixteen different areas. Parasites emerging from budworm pupae in vicinity of Admiralty Island and Ketchikan and also over in Taku Inlet.

To sum up the black-headed budworm situation in Alaska, we can say that the infestation appears to be moving northward. In the area from Portland Canal to Petersburg - the area of heavy to very heavy defoliation - egg counts were so light that gradual decreased defoliation is expected next year. Over in the area north of Petersburg to Haines - the area of light to moderate defoliation - egg counts were such that continued defoliation can be expected.

Mr. Davison (Portland Laboratory.)

The laboratory working area covers District 3 and 6 of Forest Service. The losses caused by forest insects during the current year have been the most severe since organized data have been gathered in our region. Winter wind-storms, causing extensive blow-down; large areas of fire-killed timber left standing in the woods; and drought conditions throughout the region have led to the present situation of bark beetle epidemics, and the continued epidemics of defoliators have contributed to make the over-all picture discouraging.

The most aggressive insect epidemic we have in the region is that of the Douglas-fir bark beetle, Dendroctonus pseudotsugae, which is active on both sides of the Cascade Range. In the east side stands of Douglas fir which have been heavily defoliated by the spruce budworm, the loss is reaching epidemic proportions on 492, 850 acres. The Umatilla National Forest, which has sustained most of the spruce budworm epidemic in the Blue Mountains area, has now 68 centers of Douglas fir bark beetle epidemic covering 213,450 acres.

The greatest timber loss caused by this beetle, however, has been in western Oregon and Washington. The epidemic condition is a result of the severe snow breakage and wind-throw that occurred in the winter of 1949-50, and then has been given added impetus by the drought and accompanying severe fire season in 1951. In western Washington, and Gifford Pinchot National Forest suffered the heaviest loss in 1951, and the Millicoma Tract of the Weyerhaeuser Timber Company, the Umpqua, Willamette and Siuslaw National Forests were the hardest hit in western Oregon. The 1951 loss for the west side stands of Oregon and southwest Washington totals some 1 billion 5 million board feet. The 1952 loss will not be evaluated until early next summer, but due to an additional winter of severe winds in 1951-52 there were almost 9 billion feet blown over, and a continuation of the 1951 drought, we can expect heavy additional kill. Ken Wright will discuss this situation further on Wednesday.

The western pine beetle last year for the first time in ten years, showed an aggressiveness that was leading to extensive group kills. The situation has become aggravated in 1952, and we now have 185 centers covering 673,790 acres. The most serious situation is on the Yakima Indian Reservation, where 159,520 acres were picked up in the 1952 aerial survey. Groups of 40 to 50 trees killed in 1952 were picked up on our permanent 320-acre study plots and estimates of from 200 to 400 trees per section have been made for the heaviest centers of infestation. The mountain pine beetle epidemic areas are numerous, but with two exceptions are small in size. There were 270 centers recorded during the aerial survey, covering some 270,740 acres. The largest concentrations are on two Washington forest - the Wenatchee and Snoqualmie, and on the Deschutes National Forest in Oregon. The largest outbreak is in the Wanoga Butte area, and is a potential threat to the extensive lodgepole pine stands in the Klamath basin. Fortunately, there has been practically no increase in this infestation during the past three years.

In north-west Washington the fir engraver beetles of the genus Pseudohylesinus have caused intensive damage in the silver fir stands. We were unable to finish the aerial survey in the northern part of the state, where we know there are additional areas of infestation so the figures I give you are incomplete. There are 43 centers of epidemic condition, covering some 162,440 acres. Most of these are on the Olympic National Forest where there are 20 centers with a total of 143,840 acres.

We have three major defoliator problems in the region - the spruce budworm, the hemlock looper, and the lodgepole pine sawfly.

The spruce budworm epidemic, which has been with us since 1944, and reached its peak in 1949, when it covered 2,276,000 acres has been reduced by control operations to 1,579,000 acres of which 153,000 were heavily defoliated.

Of the 1,431,520 acres of spruce budworm epidemic infestation in Oregon 23,840 are on the west slopes of the Cascade Range, within the Willamette National Forest. The remainder, or 1,407,680 acres are in the Blue Mountain area.

The infestation in the Blue Mountains continues up into the south-west corner of Washington, where there are an additional 127,200 acres on the northern tip of the range. The remaining 19,840 acres of budworm epidemic in Washington are on the east slopes of the Cascade Range, just west of Wenatchee.

Epidemic outbreaks of the hemlock looper totalling 12,720 acres were recorded in Washington during the past season. There are 40 centres covering 10,720 acres in Clallam County, and the other 2,000 acres were found in Wakiakum County. The Clallam County infestation does not appear to be aggressive, as there appears to be a combination of physiological disturbances in addition to the limited defoliation found there. The outbreak in south-west Washington which covers 2,000 acres, is still light, but is being watched closely.

An aggressive epidemic of lodgepole sawfly covering 19,800 acres blew up this past summer across the summit of the Cascade Range, west of Sisters, Oregon. This infestation is in stands of low commercial value, but there is one portion in a high use recreation area.

Control - Douglas fir beetle - salvage is recommended.

Western pine beetle - salvage is also recommended.

Mountain pine beetle - salvage where possible - spraying near Lake Wenatchee.

Fir engraver beetle - Salvage where possible.

Spruce budworm - Spraying.

Mr. Hopping:

Canadian Rockies and Northwest Territories.

1. Forest Tent Caterpiller, Malacosoma disstria Hbn.- Population was very high over portions of several townships west of Rimbey in south central Alberta and in the region of Chip Lake on the Banff - Jasper Highway. There were several less severe outbreaks, one near Rocky Mountain House and one near Smith. The defoliation in the Rimbey area was not nearly so severe as expected from the huge number of egg masses present. This may have been due to extremely wet weather in June and disease was present to some extent. The area was enlarged considerably less than in 1951. The present area near Rimbey is about 20 miles long and 15 miles wide. Judging from the egg distribution alone, total defoliation may occur over considerable areas in 1952. However, the viability of the eggs has not yet been tested.

2. Lodgepole Needle Miner, Recurvaria milleri Busck. - There are two separate outbreaks in the Canadian Rockies. The first covers most of Banff National Park, approximately one-quarter of Yoho National Park and a small portion of the north end of Kootenay Park. The second is in Jasper National Park.

Population studies in 1952 showed that the heavy winter kill of 1949-50 was not as general as believed. In various locations 300 - 500 feet above valley bottom, large numbers remain. Although these areas in themselves are small, there are enough of them and the number of miners in each so large that together they constitute a large population even when spread throughout the entire valley. In the Cascade Valley of this Park, which was not affected by the 1950 kill, the numbers have increased alarmingly from the 1950 estimate. As 1952 was a moth flight year it is expected that the outbreak will gain in intensity in 1953-54. In Yoho and Kootenay National parks the infestation remained at moderate to heavy levels.

The outbreak in Jasper National Park is limited to two areas, the total extent being less than five square miles. The two areas are:

(1) Along the road to Mount Edith Cavell approximately 14 miles south-west of the town of Jasper, and

(2) Poboktan Creek, 40 miles south of Jasper.

The miners in these two areas are so numerous that it is feared the outbreak will spread. Barring some ecological factor now unknown, there is no barrier to its spread, as lodgepole pine is the principal cover type throughout Jasper Park.

3. Bark Beetles.- At present there are no major outbreaks of the mountain pine beetle in the Rocky Mountain Region except in the Columbia River Valley district which is just over the line in the British Columbia region, so I will leave that for the next speaker. No outbreaks of Dendroctonus borealis have occurred for a long time.

Ips perturbatus showed a little more activity in the vicinity of one logging operation this year. This was at Calling Lake, 24 miles east of the town of Athabasca. The Company was cutting to a diameter limit of 12 inches and the Ips probably jumped from the slash and killed the residual stand on an area of 80 acres. The rise in Ips population was also noted on one operation in spruce near Smith in the Lesser Slave Lake Region but was much less severe, than the one at Calling Lake.

In summary, we have no extensive bark beetle outbreaks east of the west boundaries of Kootenay and Yoho National parks, nor from the U. S. boundary northward into the Northwest Territories.

4. Hypomolyx piceus - During a bark beetle slash project at Strachan west of Rocky Mountain House in an 85-year old stand of lodgepole pine, it was found that 95 per cent of the trees had suffered root damage by this weevil. More widespread examinations disclosed severe root damage in several other localities in the Clearwater Forest District between the Bow River and Nordegg. In most trees the injury has been going on for a number of years and the growth rate must be drastically reduced. The causes of this heavy infestation in certain areas will constitute a research problem beginning in 1953.

5. Two other outbreaks may be of passing interest. One was the total defoliation of willow over an area of 30 square miles on the Quatre Fourches River near Lake Athabasca. This was caused by a looper, Lycia ursaria.

6. The Large Aspen Tortrix, Archips conflictana - An outbreak near Fort Smith in the Northwest Territories has been in progress for at least three years and covers about 40 square miles. Some of the more mature trembling aspen appear to have been killed by it. Usually these outbreaks do not last more than two or three years similar to the forest tent caterpillar.

7. Lodgepole Pine Aphid, Cinara sp. - Discolouration of young lodgepole pines occurred over about 400 acres near Nordegg, Alberta. The tops of some trees were so severely damaged that top killing may result. Another Cinara was extremely abundant on ornamental spruce in Edmonton and nearby towns. Generally speaking this year was an extremely bad aphid year in Alberta on both conifers and deciduous trees and shrubs. Severe galling of spruce by Adelges cooleyi was also noteworthy.

Eaton:

Q. To what extent has lodgepole miner caused mortality?

A. Mortality is very low at the present time.

Barr:

Q. It has a one-year life cycle?

A. A small percentage of larvae coming through in one year. Maybe one year in three.

Mr. Dyer:

Two main areas of interest - the Coastal Region and the Interior Region of British Columbia.

On the coastal area bark beetle problems are almost non-existent. In the interior bark beetle problems seem to be becoming increasingly serious over the last few years. The Douglas fir beetle is in the dry

area of British Columbia as far as Prince George and down through southern B. C. and a bit on the edge of the coastal region from Quesnel to Merritt. White pine is being attacked and has been for the last six years. The Mountain Pine beetle has infested small areas but has consistently been getting larger. We are also experiencing what looks like the start of an outbreak in western yellow pine.

In the interior this year we have had tent caterpillar quite extensively, and light infestation of black-headed budworm. On the coast the black-headed budworm seems to be on a decided increase in the (Skeena) Prince Rupert District, the Queen Charlotte Islands and on Vancouver Island around Alberni Inlet. Defoliation caused by Melanolophia has been reported but this has been very limited. In our experience it has been limited along the coastal fringe rather than higher areas. Spruce budworm has evolved in two or three areas. In two year cycle it occurs in the interior on high alpine fir in the Prince George country but somewhat lighter than in 1951. The only other budworm problem is in the Lillooet district. Spruce budworm on the B. C. coast seems to have practically disappeared. The hemlock sawfly Neodiprion tsugae is also on the increase at present.

Keen:

Q. How do you account for killing area by black-headed budworm?

A. There is not very much killing but a little on northern part of Vancouver Island. Top killing is far more common.

Furniss:

Q. Was there very much spruce bark beetle activity?

Dyer:

No - very little.

Furniss:

Q. Was there black-headed budworm on the Haines Road?

Dyer:

A. Yes, there was some reported. There was also a little spruce budworm up there.

TUESDAY, December 9, 1952.

TEACHING FOREST ENTOMOLOGY

Moderator: M. G. Thomson

Moderator: In opening the formal sympsium I would like to say that it is unfortunate that many of you missed the first half of the symposium held at the Strathcona the last few nights.

I will now introduce the panel members:

Dr. Graham - from University of British Columbia, Vancouver, B. C.

Dr. Chapman - from Montana State University, Missoula

Dr. McSwain - from University of California, Berkeley

Dr. Barr - from University of Idaho, Moscow

Dr. Chamberlin - from Oregon State College, Corvallis

Dr. Callenbach - from Montana State College, Bozeman

Dr. Underhill - Walla Walla College, College Place (Washington)

Moderator:

I will call first upon Dr. Chapman.

Dr. Chapman:

The course at Montana State University in forest entomology has been in existence for five years. It was established by request of the school of forestry. A service course is given for forestry students three times a week and with one laboratory period. This course covers forest policy and has the following aims:

1. To try to get a comprehension or feeling for the role of forest insects.

2. To learn something about the major forest insect pests.

3. To be able to relate forest entomology to forestry as a whole. I don't believe in just giving the students pure entomology, but try to tie it into the field of forestry.

Dr. McSwain:

We have no forest entomology courses at Berkeley. Sole interest of forest entomology course is beetles. Courses are built around the idea of teaching the forest students, forest entomologists and majors from wild life management who also take the course. As a result we try to give a combined course in the role of insects in forests as well as the role of insects in forest management. We try to orient the students in forest entomology and insect systematics. I will give you a brief picture as to how the course has evolved. Roughly seven or eight years ago we had one lecture a week but in a very short time we have increased the course and we now give four lectures a week. At the last part of the course we try to rush through and cover all insects in forest. I was allowed to come here to find out how to teach forest entomology.

Dr. Graham:

The development of the (forest entomology) course had its origin in two things.

1. The development of sustained yield.

2. The development of insurance problems in the forest.

The courses are developed with two objectives:

1. To acquaint the foresters with the type of problems that they will encounter as foresters.

2. To try to offer training for those who specialize in forest entomology. The forester has to acquaint himself with the nature of insect problems and then recognize that as a forestry student he is having a great number of courses thrown at him in a disjointed way having each subject treated as though it stands alone and so it is desirable to show where forest insect problems fit into the field of forest entomology.

An attempt is made to show the student the respective roles of the forest entomologist and the forestry engineer in dealing with insect problems.

It is necessary for the forest entomologist to be familiar with the biological aspect in being able to recognize and identify and remember all the problems of the insect and thus know suitable methods of control whether they be direct or biological. The forester has not specialized in forest entomology and is just acquainted with the problems he faces. He should know how to protect the forests. The forester exercises some of the control over the types of insects

which could be combatted and the forest entomologist is the man who may put into practice some of the applications noted by the forest entomologist and the forester. The account of the various considerations that enter into the analyses of the insect problem begins with the recognition of the insect as a pest of some consequence and the relation of that insect in forest practice. The objectives in forest entomology include also the appraisal of insect problems and forecasting of infestation trends in order to provide the time element needed for advance determination of the need of controls, the explanation of outbreaks and their decline which provide the clues as to the most suitable type of control which may be applied, and the consideration of the applied method of control -- direct, biological, or silvicultural. That forms the basis of the general course given to forestry students in the junior year. A shorter, briefer form is given to the forestry engineers. A course is given in research methods and for forest entomologists in insect ecology.

Barr: We offer a service course for foresters which is not required for graduation. We have an unfortunate situation in that we only have a single lecture in entomology and a two hour lab once a week during the semester. We then have to separate the hay from the chaff. The course is designed along entomology lines. We want the foresters to get an appreciation of insects and in so doing we take up metamorphosis. The last part of the course is concerned with forest entomological techniques. It is also concerned with the work of forest insects and the insects' phases. We are concerned more along the lines of insurance measures. If the student gets an appreciation of entomology on a higher level we will have accomplished something. It is a matter of educating the foresters. Pressure cannot be applied from professors but from their own ranks.

Chamberlin: We have two separate problems from a teaching point. I have a science course for three quarters. Then there are two advance courses. There are 20 credits in the final courses and in addition to that those who are going into forest entomology usually take up some problem and they usually write their thesis on some aspect of this subject. If they go through with this course they have a fair knowledge of forest entomology. We like to get the students into the forests during the summer. The chief forester of the United States Forest Service devotes considerable space in his annual report to emphasizing the growing importance of insects in the forest yet he doesn't think of giving a formal four-year course curriculum to foresters without devoting time to the fire situation. The students should get out into the field and they want to know the material and what to do with it. As a rule we are pretty well loaded up with straight teaching. We try to give the student the type of forestry he will need and all the possible information required. Twelve or fourteen years ago when forest entomology was a required course in forestry we used to get a pretty fair cross section and try to make the work sufficiently interesting that by the time he finished his course he came back and took additional courses. We tried to interest some of the more outstanding students in taking forestry or taking additional courses. Some came back in a year or two and took masters degrees. We considered this quite an accomplishment. Copies of material from the field laboratories are very much appreciated by the professors. There has been some talk of exchanging material. Personally I am quite receptive of that idea. I took six months to visit the institutions of forest entomology. A number of these were in Canada. I got a wonderful lift in meeting people I had corresponded with. I went to

Halifax, Toronto. Montreal and Quebec among other places. I met Dr. DeGryse for the first time.

Callenbach: We do teach entomology. Dr. Chapman gives us a great deal of help. We teach entomology not forest management. I think too often we get too close to our own field to see it in perspective. We should think first of the objectives. Are we trying to train a professional entomologist, a professional forester or a professional forest entomologist? We need to develop a good entomologist and one who can cooperate with the foresters. The man must be trained in research.

Underhill: In the last year we turned out thirty majors in a biological course in forest entomology. This followed by a general course in systematics. The course in forest entomology is not for foresters. A lot of interest is due to Dr. Chamberlin's training. We try to make the course as practical as possible. There is one two-hour course three times a week and one three-hour lab. We teach students to identify damage as they see it. We require the students to have a collection turned in at the end of the courses. (e.g. bark beetles identified as to genus). Part of the students are "pre-meds", and part are entomologists. The practical aspect of the course is an important one. The students go away with a greater appreciation for forest entomologist's problems.

Benedict: I don't know if it is especially proper that I should start a discussion of this sort. However, it is one of particular interest and I have been especially interested in the discussions of the group of professors deciding the scope of instructive work. Joe Chamberlin has fastened onto a very fundamental problem in his reference to the elective nature of forest entomology to a forester. Something is basically wrong with foresters if forest entomology stands as an elective. I agree that perhaps as being a forester I can see the perspective a little more clearly than one whose background was based solely on forest entomology. However, the foresters themselves must understand the importance of forest entomology. They are beginning to see clearly the problems they face as forest managers and they cannot solve all the problems until forest entomology is one of the aspects in forest management. I wonder, therefore, if progress might not be made if considering it as some states do in cooperation with land managers. Land managers must have an appreciation of inroads and impacts with insects and insect diseases. Progress would appear to be made more rapidly if we talked with educators and land managers of the basic necessity of forest entomology in growing trees as a group.

Chamberlin: I want to agree with the remarks just made and go a step further. It seems it would be very proper for the association to take definite action and request all forestry schools to have a class for foresters to find out what a bug is. A first class forest entomologist must be a forester. The two are correlated. A man must have some fundamental courses in forestry. I believe that pressure must be brought to bear from the outside.

Orr: Would it not be of interest to this group to have someone discuss something that is done at eastern schools. Perhaps Mr. Chamberlin could give some of that information.

Chamberlin: Bob Furniss could explain that better than I. That is a very good point.

Wygant: At Syracuse and Purdue forest entomology is required by forestry majors. At Syracuse forest entomology is given in the forestry school. Forest entomology is given by the entomology department in Purdue. At Syracuse the course, you might say, is of a more complete nature. Students are given some experience in Colorado and Indiana with some of the foresters. One of the criticisms from foresters in the field is that they don't tie the courses together (i.e. the courses of forestry and forest entomology). They were critical of some things learned in entomology. They want general terms rather than specific terms.

Callenbach: That criticism is justified. They don't integrate. There is a finger pointing that men teaching book courses fail to tie them in. It means sending students up who are not prepared for entomology courses. You have to break down their resistance to get them to learn absolutely anything. The student is not sold on the idea that that is the main part of his training. You have to break down his resistance and teach him something. This cannot be done. The forester must sell the idea to interest him. We must sell the programme by publicity.

Stark: There are no lectures at Toronto. There is a general zoology course in the first year. In the third year there is course work in forest entomology, the life history of various important insects, and forest ecology.

Parker: I notice in the outline that there is a list of some of the qualifications in federal employment. It might establish our subject a little bit if we look at them. We are concerned with the requirements set forth by the Civil Service Commission. We were hiring men and were confronted immediately with the set qualifications and standards, one of which is that a man should be an entomology major and have twelve hours as an entomologist. This used to be 20 hours. Some students are interested in Federal employment and would fill out forms for Civil Service examinations, take preparation courses, and take the examinations. I have heard a little bit about Syracuse boys telling of training them for it. Professor MacAndrews kept in pretty close touch with the Civil Service requirements. They have to have so many hours of entomology or they cannot take the examination, which often prevents us from taking up a good man. Some men cannot qualify.

Furniss: In listening to the panel present the requirements of students it outlined an ideal set-up. They have pointed courses out to types of students they get. (Certain courses for those who go into forest entomology (i.e. those who will be employed as foresters and forest entomologists)). I think in considering that proposal when some of us would not be present we might think something about the organization of the group. It is a work conference and we have steered away from an action committee as a direct control from those activities.

Evenden: Do the Forestry deans have a requirement that graduates are the only ones eligible in forest entomology. There has been a lot of action and talking on that. They are really up against it to get work in any time.

Moderator: What courses are required by laboratories then?

Chapman: I believe that you mean that you men have the responsibility of developing a new course. If so, how would you like to go about it?

TUESDAY A.M. 10:15

Hopping: There are two things to keep in mind when training forest entomologists: one, training for a forest entomological research man; or, two, training for an extension man, or whatever you want to call him, apart from a research man. I think the training of those two types of forest entomologist should be quite separate. I agree with Joe Chamberlin that it is probably a prime requisite that the Forest Entomologist be firstly a forester, but there are so many courses in the Forestry Curriculum that he cannot do otherwise than go back and spend quite a number of years getting other zoological training. It is probably five or six years after he graduates from Forestry before he is ready for serious entomological work.

Another way, he can go up through Zoology and get his Forestry later, but I think that is possibly a little harder way to do it.

Before he gets away from you, stress the approach to the research problem. I would like to see some guidance given before he is faced with research problems as some of them just haven't got a clue as to how to go about it. Another thing is not to try to take in too broad a field. Stick to some small part of it to work out as a project. If they start on a broad problem, they get tangled up in too many facets of it.

Johnson: We should keep in mind two things which have been brought out this morning, one, our programme theme is the teaching of forest entomologists and we have recognized two forms of teaching so far: (a) the service type for Forestry Majors and other allied fields; and (b) the teaching given to those who plan to make Forest Entomology a career. One course or semester will not do the trick, in most cases. That is one problem we might consider.

The next, and perhaps the most important, is the teaching of Forest Entomology to students who wish to make a career in that field. Very few places, at least on the U. S. side, make it possible to make a Forest Entomologist either out of a Forestry Major or Entomological Major within the four-year undergraduate period. In most cases, the man completely changes his field during graduate work, which has to be done at the graduate level. This is a hardship. I don't see how we can get a trained Forest Entomologist who had not had at least one year of graduate work. It seems simply out of the question to get a Forest Entomologist Major with only a Bachelor's degree. Our problem would seem to be how to get a Forest Entomologist out of the present teaching requirements. It is almost certain that he must be a graduate student to begin with.

Chamberlin: It seems to me the ideal situation would be to set up a forest entomology curriculum integrated with the School of Forestry. As a matter of fact, I have already put that idea on the Dean's desk, but they haven't had the money to put the course in the catalogue this year. What should be included for a man registered with the expectation of continuing in the field

of Forest Entomology? (We have research courses and literature, etc., and if he is a Major from our Department, he is going to get a very excellent background in the scientific writings and in knowing how to use the library and books, etc.) The course would consist of mapping, dendrology, silviculture, and mensuration. What else should he have in your viewpoint.

Trostle: I think you should add ecology.

Konnerson: Would add photo interpretation.

Thomson: We should get the laboratory heads to express their views on what they would like included in the courses, and should center our discussion around that. A student is interested either in forestry or in forest entomology. (Refers to mimeographed material -- "Courses Required for Graduation" -- page 2) As it stands today, if you go into forestry I say the graduate is an applied entomologist. At the present time there are very few opportunities for students to go into a western college and come out as a forest research man. He comes out trained in survey or control operations. We can spend the next hour discussing what the student is going to get out of the course -- whether Zoologists have a chance in this field.

Richmond: I'd like to ask "What is a Forest Entomologist"? We have been talking about developing forest entomologists, but just what are these people? I think the first thing is to decide in what field the man is most interested. Turning out a forest entomologist is a little different from turning out a new car from the factory. You can't take a student into a school of forestry and say we will make an entomologist of this one or a logging engineer of this one, etc. I don't think there is any question but the basic principles in a forestry course are designed to produce a practical man who can go into logging engineering, technical forestry, etc. For that reason, the basic requirements for a good research man are overlooked. This man probably does not know what lies ahead of him, but a faculty adviser can look down the road over which he has come and offer practical advice based on his knowledge and experience. There should be some analysis of that student and if he is of a research mind, then some attempt should be made to instill in him the basic philosophy of research. If he has such potentialities, he needs a different background during his training. I think there is a lot of merit in what Dr. Chamberlin has said about lining up forestry courses which can be given in conjunction with other course work designed for forest entomologists.

McSwain: An increasing number of students going to college are going first of all to a junior college -- we feel that about 90 per cent of our undergraduate enrolment has been through a junior college first. Even more than that, I think, is the fact that many of us here had an interest in entomology before we went to college and went there with the idea of training in entomology. Now we get students coming to us with no clear-cut idea of what they want to do because they don't know in the first place what the job entails. Publicity is necessary. We can't have students coming in to take Forest Entomology if they are not aware of the job. They haven't the background necessary.

Underhill: I agree with Dr. McSwain. We have a lot of students coming in who are not sure of what they want to do. I'd like to know what you think of

a general biological background of B.A. with some work in entomology -- what can they do when they get through? That is their attitude: can we go into some work in entomology? What is there for a student with a general biological background? There should be some publicity and some direction given to them when they first get into college to direct them.

Dyer: It seems to me that we are up against a rather difficult proposition in discussing research as well as the practical aspects in the training of a forest entomologist. I feel that the basic courses necessary in training a man in forestry almost have to be a prerequisite in considering whether he will be a research man or a practical forest entomologist or a practical forester. If he is going to be a research man he should have the basic biological courses and other courses necessary, it may not be possible in the time he is there to give him all those basic courses needed by a good research man. I think it would be better to consider training up to the level of a practical forest entomologist first without considering whether he is going into research work. What does he need up to the time of his Bachelor Degree? and then, what does he need if he is going on into research?

Chamberlin: I am inclined to agree with Mr. Richmond. Dr. McSwain has said we get mainly freshmen and sophomore students, and a man must have a deep and tremendous interest in any field, particularly in the field of entomology, and I think there must be training beyond the Bachelor Degree for one going into research.

Johnson: In the work of our Division, it used to be that we took a forest entomologist or we sought a forest entomologist who was well qualified to do anything in that field of forest entomology. Within the last couple of years, even, our small branch has expanded into definite areas of activity. On the one hand our laboratories are thinking in terms of personnel equipped to handle forest insect surveys and to assist in giving advice on forest insect control operations. On the other hand, there are those who are being channelled into research work. We find there is a definite background needed for that. The survey and control man must have a sound knowledge of forestry, forest mensuration, and some of those things which the average forest graduate has, but the research man has an entirely different approach. He is primarily a biologist and the thought seems to be crystallizing that research men in forest entomology should have a basic training in biology. Often the biological aspects are overlooked. Only the survey and control fields are taken into consideration.

On top of that, you have men who come from some schools teaching forest entomology as a major subject. The men themselves have very definite leanings. We have seen men hired to do research work and it has subsequently developed that they are not so suited for research work as for survey problems, and so are re-assigned and vice versa. So it is not a clear-cut problem from the standpoint of employment itself. But it is now necessary for one to declare oneself and specialize in one of the fields -- the field is getting too broad. It has only been recently realized that forest entomology is limited. Unfortunately, a man who is going into research often cannot undertake that activity if he has had a strictly forestry background. We should start right now and split up the problem, then add the requirements of college graduation, crediting schools, and other things such as civil service requirements, etc.

It seems almost hopeless to develop a curriculum to satisfy all these things.

Clemens: A forest entomologist must be a very broadly trained person. He apparently is combining the training of a forester and an entomologist. We have tried to meet that in U.B.C. in this way: we feel we cannot turn out a well trained forest entomologist in four years so they must put in approximately six years. He comes up to his field from two directions, from forestry, in which case he will have had sound training in forestry. He will have had his first year general biology, second year general zoology, and in his third and fourth, forest entomology. Then, he may come up through Arts, in which case he will have had a broad training in zoology with possibly two courses in forest entomology. In the fifth and sixth years, if he has come up through forestry, he will get his biology subjects with a wide range of choice. He should have then a course in Genetics, Biological Statistics, probably Invertebrate Zoology so he will know the birds, mammals, and fish, and he will have had a number of general courses in entomology. He will get Systematics, Morphology, and perhaps some Insect Physiology and Insect Ecology. If he comes up through Arts he has to go and get a Forestry training and we have worked out an arrangement with the Faculty of Forestry whereby this student will get fundamental forestry courses.

Callenbach: Does a man get a Master's Degree at the end of those six years?

Clemens: Yes.

Eaton: The problem is how to train a forest entomologist. There are medical entomologists, etc., but how do you get a research entomologist out of a medical entomologist, and so on?

McSwain: We feel that many students cannot afford the time necessary so we try to give them a broad basic training. Although they may have a burning interest in entomology, we insist on a broad background in zoology, botany, genetics, physics, and so on, with the expectation that they will have to pick up from there after graduation and continue in their particular field, and that is actually what they do. We make no pretence of turning out medical entomologists in four years. In fact, that is one reason we have only a Bachelor's Degree in the Faculty.

Chamberlin: They must have a good knowledge in two of the main subjects, forestry and entomology.

Callenbach: I think the man in agriculture research must also have basic information in two fields as well. I don't think a forest entomologist is in any way different or unique. In the final course we have in advanced economic entomology the student is given a topic to prepare him for control activities, for professional representatives of the various companies, etc. Students in research will be given topics to prepare them for additional work.

Wygant: Are they required to take general agricultural courses?

Callenbach: No.

Barr: There is no question of research in forest entomology. The principal

approach is very similar to an agricultural entomologist, but when it comes to survey and control factors, I think the forest entomologists have to have a broader background in forest entomology than does an agricultural man in animal husbandry, for example.

Chamberlin: The student is going to decide one way or the other toward the end of his third year. I think research must come beyond the Bachelor's Degree. We cannot lose sight of the fact that many are men who served in the Forces, are married, and have obligations, and these men who are heading towards a degree today are making great sacrifices.

Barr: We are certainly faced with a different type of student nowadays. A lot of them are going just to stay out of the Services for an extra year or so. Servicemen from the last war were eager to learn and wanted to do well. They could see the point of all this education. Then they dropped out of the picture and we have the normal type of high school graduate who only want to be spoon fed.

Furniss: The question was asked as to what educators would like to see in individuals turned out by the various colleges. The type of forestry course outlined by Dr. Clemens of U.B.C. is the ideal type of instruction as I see it for a forest entomologist going into either the detailed research field or some other specialized field, and those are the graduates we would like to see. I think we need not be too concerned about the details of any course, but we have to look to the individual. At Syracuse they stress biology and from experience we know that some individuals from that course could be taken at that point for further training. I think the instructor should pick out the individual, determine his attitude and assess him in a realistic way, then invite those students to take specialized work.

Orr: The main thing seems to be to give good basic training. Then those who are really interested in forest entomology, and have a natural aptitude for it, could be encouraged to go to schools which are equipped for that advanced training.

McSwain: I think a number of schools already do that. At the end of the junior year, we take students out on some field trips and explain to them just what the work entails if they plan to go on into entomology.

Graham: It is desirable that there be some diversity in these institutions. With the diversity of outlook it may produce a better range of trained men for the course in entomology.

Hopping: (Moderator) 1. I would ask Dr. Parker what are the particulars relative to any science and going on and specializing? As a Forestry Major?

2. What encouragement can be offered to a student (forestry student) with a smattering of entomology, for work with the Federal Civil Service?

Parker: I was approached by Professor MacAndrew on this same subject, and he was concerned over the future and chances for employment. I didn't know what to say. While we have a need for many more well trained research forest

entomologists and well trained people to serve in the survey fields, we immediately ran into the employment ceiling. We need to increase the force, and yet we hesitate to say to a professor that he should turn out more men. We cannot promise a thing.

The Civil Service does recognize the difference in training when considering entrance salaries and the lowest professional grade is GS-5, a Bachelor's Degree, with primarily a Major in Entomology. A fellow with a Master's Degree can qualify in GS-7 by taking an examination based on training and experience, but not a formal examination. If he has a Doctor's degree he is eligible to a grade higher on entrance.

The Civil Service does not really set the standards -- the agency employing the people works with the Commission, and whereas it used to be a requirement to have 20 hours in entomology, that was dropped a few years ago to 12 hours. But for the research man we feel we should not go too low, on his basic fundamental requirements.

When hiring, we have access to the Civil Service registry. We are given three names and we pick one. And we have selective certification due to the peculiar nature of our business. We have an opportunity to select men who have the entomological requirements behind them and in addition, training in forestry, or we can go to the Forestry Register and pick a forester who has done a junior forester's examination. The present employment possibilities in the Federal Government are limited entirely by the resources available for hiring. We need men. You could easily develop your force without any trouble, but if we try that we would certainly have trouble in finding qualified men.

Furniss: I'd like to get an idea of the Canadian employment picture.

Richmond: If a vacancy occurs, applicants are considered. These applicants are graded by the laboratory head if possible, and are taken on as probationers for 3 months. Usually he starts as a Technical Officer, Grade 1. Later he goes to Technical Officer, Grade 2, and from that point it is decided whether he will go into the Research Officer class or continue in the Technical Officer class. In our work, all graduates go into the research classification. His progress through the various grades depends entirely on the man himself and he is periodically graded by the laboratory head.

Hopping: We interview the applicant beforehand to find out what his classifications and education are.

Parker: We don't enjoy as much freedom in this question of interviewing. I think that is a desirable need. We also have a probationary period but I can't recall whether it is for 6 or 12 months. At that time, we decide whether we want to keep the man, drop him, or guide him into another field. We get three sets of papers if we ask for statistics on a man, the judgement of the review board which gave him his grading and we can see from that what training and experience he has had. We may not get the chance for an interview, though. (Rest of comment "off the record".)

(Adjourn for lunch)

TUESDAY P.M 1:30

Mr. Johnson opened the meeting and explained that some of the members were at the meeting of the Pest Control Board.

Thomson (Moderator): What are the aims of forest entomology?

Johnson: What do we mean by forest entomology? Do we mean the field or the working theories of forest entomology? We have only to consider what are the various phases of action in this field. From that we get back to our theme "how to best prepare men for these fields"? In our branch of government service our endeavour is taking definite shape in two directions, survey control and other research. Some are primarily engaged in the field of forest research, others work in surveys on forest pest control work. We find research men being trained to help survey men in control work. So in stating what are the present aims in forest entomology I would say the field is broadening and it is more difficult to have men adequately trained for all phases of forest entomology and that perhaps the Civil Service Commission should have one set of qualifications for a research man and other requirements for those who are going in for survey or control. One requires a biological background and the other a forestry background. Forest entomology would seem to employ the knowledge of that branch of entomology dealing with forest insects and the problems created by that type of insect. A forest entomologist must be able to go in and regulate forest outbreaks, to make population estimates and to know something about control methods, i.e. what methods are available and then to assist the land owner or manager in carrying out those methods. He must know not only insect ecology but also forest ecology.

Kinghorn: The ultimate aim should be the reduction of forest insect damage to an absolute minimum whether aesthetic or economic.

Thomson: Is forest entomology the true scientific field or an applied field? Is it possible to reduce your economic losses or is it a matter of finding bigger and better ways of spraying or in treating each as a separate issue? Will there always be outbreaks?

Gibson: On the basis of looking back over the years, thirty years ago most of those who took forestry were inclined to take general forestry. Since then we have seen forestry expand, an expansion now needed for the various phases of the work. I have seen the same thing building up in the forest entomology situation. A forest entomologist today would be at a loss to know what to do in spraying if he did not know his chemistry. It is necessary to bring in men who have been specially trained along botanical lines, so you know how to preserve the plant but control the insects. One of the requirements should be that a forest entomologist will not be just a forester or an entomologist, but will also have a background in chemistry and botany. Men will then be able to go into the line which they like most. In developing a course where we just have so many years of entomology backing up a forestry course, the graduate is going to be at a disadvantage in solving the forest entomology problems of today.

Chamberlin: Forest entomology is going to have to depend to a large measure

on whether or not we are going to have two branches, the field entomologist and the research entomologist.

Dyer: In increasing our knowledge of principles besides our means of conservation or protection we should have the means of increasing those principles and building them up as much as we can. We should not overlook those biological principles of environment.

Graham: I think this question can be treated on the concept that the whole field of forest entomology has its basis in the economics of utilization of timber and therefore the ultimate objective is the protection of these timber resources whether they are purely commercial or aesthetic. The field of forest entomology must encompass fundamental processes from which the applications can be drawn. That brings up the question as to what is research. Every piece of information fits in as part of research. I think it is necessary to do a certain amount of appraisal work to establish the ground on which the research is to be started.

Barr: I would like to consider forest entomology and to go beyond it, particularly with regard to research. The entomologist should try to contribute his scientific knowledge, and possibly some of the data that he gathers to help those who study in other fields. There should be a scientific field as well as zoology and botany.

Graham: It was not my intention to imply that I considered only subjects that bear directly on protection but that is the reason for our existence as forest entomologists and the reason for our organization but I do admit the existing grounds for a fundamental knowledge with an immediate objective of application.

Clemens: A forest entomologist is a biologist who has an outlet in the applied field. The forest entomologist is primarily a biologist and his outlet is in the control of forest entomology.

Thomson (Moderator): What of the concept that forest entomologists are engineers who are attempting control.

Gibson: You cannot get away from forestry as regards forest entomology. Take the old concept of removing an insect from under the bark by peeling or by burning the tree. Now such action does not answer the question because of the value of the host material. A trained entomologist without a forestry background might not have had sufficient training to visualize the problem whereas a forest entomologist might develop a method that is entirely effective and not too expensive for the values involved.

McSwain: An agricultural entomologist is not trained to teach students all phases of entomology. Some time in the future foresters will have a better understanding of forestry and it will be more of a question of a liaison between the entomologist and the forester. Perhaps we will eventually come to working in groups.

Thomson (Moderator): Some questions in regard to section E were brought up in the morning session and no attempt was made in defining same. Replies as

to the value of courses are very significant. A question asked was, "If some recent graduates who have now had a few years experience in the field would state what they have missed and what they wish had been included".

Hopping: I am not a recent graduate but I feel that english and writing should be included in every curriculum. Much more english should be included.

Callenbach: In a recent list showing the degree of importance of subjects required, forest entomology and forest pathology ranked about sixth to eighth, about four-tenths of a point separated the two. English and writing were first on the list.

Dobson: I talked before a group in my graduation year and it was a sad experience. Stress is put on technical subjects and it does not give a student time to take subjects like public speaking, dramatics which would enable a person to express himself much more clearly.

McSwain: I don't feel the answer to that is in taking a lot of english or speech courses to overcome the difficulty. I do feel that in many entomology courses there are excellent opportunities to have students turn in written reports and spoken reports. The general opinion is that students are not given the opportunity to express themselves. When you have large classes you are not going to ask for 60 to 100 reports and it is very easy to fall into the habit of not seeing that students can express themselves.

Davison: I think the professors should show the student where he is going wrong in his own writing. I feel after writing various literature on forest entomology that perhaps reports should be reviewed by the english professors. They are not interesting enough. I don't know how to make them so.

Trostle: English and writing should come before students ever reach college. Perhaps the trouble lies in the lower schools.

Johnson: The laboratory, more and more, does not hire a man for his technical education, his knowledge is taken for granted. Other qualities are looked for.....the ability of men to use their initiative. A lot of the initiative could be developed in school. We are looking for the man who can do something on his own and hope he will grow to administrative status. That is one of the things that is lacking. There should be a little more desire to want to do the work and to feel that the job is one liked and the job one is most happy in.

Stark: In the subjects given at C.I.F. psychology is very high on the list. There is no psychology in the undergraduates education. This is sadly lacking.

Barr: I think there should be social sciences, political sciences and philosophy rather than purely technical lines. We place too much emphasis on technical courses.

Hopping: There should be more of the humanities in training of the forester. It is suggested that there should be a fifth year in forestry in order to include those courses.

Barr: Many universities ask that they be taken in first or second years but they should be taken later in the senior years.

Chapman: Are we as responsible people in the state university, going to reflect the will of the people or initiate the will of the people. We have a limitation in this business of evaluation. Is there not something wrong with many jobs in forest entomology where a person does not feel the biology he took is important.

Chamberlin: Do you suppose the list of subjects we were talking about will be published?

Thomson: I have a copy of this table in my office.

Thomson: A number of professors want to get the evaluation of people on the floor as to what they think should be included in the straight forestry course.

Barr: What do you expect foresters to know about forest entomology?

Stark: Forest entomology is just as important as fire protection. I think entomology and pathology should have as high a position as fire protection.

Kinghorn: The fact is that they don't. We will have to give a service course.

Johnson: In the first place I don't see how you could limit what was to be taught in a service course. You must concentrate on getting students to have an appreciation of what the whole field of entomology is and less on the details of the life of various insects. They should know the various insect problems in relation to other problems of forestry.

Chamberlin: Would you agree that a man could absorb these things if he did not know what an insect was? The first thing you have to do is to put him wise to what an insect is. You teach them this and external morphology and when this is done one-third of the time has been used. Then I try to give them the idea of how important insects are in the forest and what our losses are. We can tell them about the entire field of control and the damage on the Pacific slope and about the bark beetle being the only loss and definitely now more prevalent but we still cannot handle the bark beetle problem.

Johnson: You cannot make an entomologist out of a man in three credits. There are two hundred cooperators in our region. All we want is not to make entomologists out of these men but to alert them to the damage in the forest and make them cognizant of the fact that the damage is growing.

McSwain: There is the question of the effect of schools of forestry. They show a great interest in fire protection and not enough in forest entomology. We have not been able to tell students that anything can be done about epidemics. I came because I want to know about the major problems. We should now be able to tell forestry students what can be done to combat these outbreaks. We want to know more about the major problems in teaching in universities. Where are we as professors to get this information.

Graham: It is not a question of what you should cram down their throats but

what you can cram down. I have expressed the opinion to my students that they want to go out logging. I think the one question which is foremost in my mind about such people is where do they fit into the picture. Sooner or later they are likely to be faced with an insect problem of some consequence. He should have an open ear to what the forest entomologist recommends. For instance when a man refused to believe catastrophe was about to strike he learned by sad experience by not putting in salvage operations which were recommended to him.

Davison: I wonder if in the service course we should work from the forester's angle rather than the entomologist's angle? Frank Brockman's course at the University of Washington, one of the best courses (fire protection), is leading in the right direction.

Wright: Brockman approaches it from the angle that Phil mentioned. He gives a minimum of insurance and tries to impress upon them the cooperation that foresters can get from forest entomologists. He concentrates on a few relative insects that are around them. He has an advantage in that during summers he has worked on control jobs around the west and a lot of time is used on the different control methods used on insects.

Kinghorn: Does it include protection courses. That creates a problem because it is not considered a part of forest entomology.

Johnson: I think that maybe the thing we should strive for is to get the forestry school to devote some time to telling about those aspects so we can give the type of course that we are talking about. Why not urge the schools to do likewise in forest entomology. If they do that then the student has some basis for taking these service courses.

TUESDAY P.M. 3:15

Thomson (Moderator): Regarding Section F - Item 1.

Chamberlin: In a great many cases experimental work is going on but is not ready, for obvious reasons, to be released to the public, but I think the material is of benefit to those in the teaching profession. There are certain problems in various parts of the country, such as in Colorado and Utah, and in various laboratories in Canada, and I think there should be some system whereby every educational institution which is interested would receive that material. Some say they haven't the facilities nor the money to put out this information and material. But if we could have some decent specimens of bark or beetles in alcohol, we could get our men to mount them. Then, those looking over such specimens would get a better idea of what the work entails and whether they would like to be forest entomologists.

Another thing, probably every laboratory has extra slides and if we had some system whereby a list could be sent around, such as we received a short time ago from the U.S.D.A., we could order some of these slides for a reasonable fee. There is some excellent photography done in the various stations throughout the country, but only a very limited number of people get to see this work. Again, if a list could be sent out so we could order on a cost basis, it would be a fine thing. I think that a few remarks I made at

Portland had some result because I received about twice as many mimeographed reports this last year as I had received in any one year before.

Dyer: We need to know what each person's requirements are. Whether we are able to do anything about it remains to be seen but we would be in a better position if we knew those requirements.

Chamberlin: You are right there. In Sault Ste. Marie, where they are getting a lot of material which occurs in the N.E. and at Belleville in the parasitic laboratory, I have talked to them about this proposition and they have sent me sets of everything put up there. The laboratory at the "Soo" gets 6,200 shipments of forest insects each season on their surveys and of course they have quantities of different material of the more commonplace variety. Those are the things we are most interested in. I think we should all get together very closely on this kind of thing, though it will be mostly a one-sided affair.

Johnson: I want to get down on my list the things Joe has mentioned and try to show why he is getting some material now and perhaps not others.

Re insect specimens; it used to be that years ago, we were able to collect specimens to add to our own collections. In recent years we have not had the opportunity to do this. In Coeur d'Alene we have not had a single specimen prepared for the collection since the mid years of the war. For many years we had a man who took care of the collection, but we have not had the time in recent years because of pressure of work. We forgot the eight hour day long ago, but we still can't keep up. In order to send specimens to all of you would require one of our men to take off enough time to collect them in the woods, bring them in, put them up in alcohol and ship them.

In the matter of bark specimens, these would have to be collected, for though we have a good collection in our own laboratory it has not been added to.

We are building up, like some other American laboratories, an excellent collection of 2 X 2 slides -- not because we have a qualified photographer, but because some of the men themselves are interested in photography as a hobby and do this extra work. We received a request a while ago to send our slides to an institution for inspection. Our slides number between five and six hundred now, but the mere thought of sending that whole collection through the mail made us turn it down. Yet, we realize that we should get that material out to the schools. In connection with this request we have heard from Dr. Beal stating that we should do what we can and as a result we have proposed instead that institutional representatives either come to Coeur d'Alene and look through our collection and select the slides they would like to have or at least let us know the group of insects they would like to have, and then reproduce them for themselves. In that way we minimize the chances of loss or damage to our collection.

Re photographs; we would like to send you some but we are so far behind we have not even been able to catalogue our negatives. We have tried sending them out to commercial firms for printing but it has resulted in prints which we do not like to send out.

We have made progress in the matter of sending out reports by

having them mimeographed.

Chapman: Is there someone who can give me information on the use of forest entomologists by industrial companies.

Gibson: I can cite instances in which the J. Neil Lumber Company did, as well as the Anaconda Copper Company and the Northern Pacific Railway. On lots adjacent to theirs there was infestation which might spread to their property at some later date, so being progressive in their thinking, these companies detailed men to accompany our survey crews and these men were trained in the way we carried out our work and in the identification of insects. There was no charge for these men. They were not forest entomologists, but there is a definite place for such men.

Johnson: Other companies are the Weyerhaeuser Lumber Company, Crown-Zellerbach and the Western Pine Association.

Kinghorn: To the best of my knowledge there is not one forest entomologist employed by industry in British Columbia, as such. We had one man working for us, a graduate forester, for two years but he left for work with MacMillan and Bloedel in the spring of 1952. I was speaking to him not long ago and he said that when he applied for the job they were interested in what general type of forestry service he had. That was what they wanted when they employed him. His forest service background was what got him the job.

Thomson: That man has recently been placed on ambrosia beetle control.

Kinghorn: His position is not solely in forest entomology but they have put him on special projects which include certain types of salvage and other specialized projects, not necessarily just forest entomology.

Trostle: Many of the lumber companies in our region have not hired foresters until recent years, so it shows they are quite a bit behind in that respect. Once their economics build up to where they can afford to hire them, they will probably hire entomologists.

Chamberlin: Re Item G-3. The State Forester's Office in Oregon hired a commercial company to make a twenty-six minute film on the spruce budworm, in colour. That film created a great deal of interest in the spruce budworm problem and I think that more such work should be done.

McSwain: That particular film is now being used in the Introductory Course in Forestry.

Johnson: Re Item G. I think that during the last year there has been more general publicity in forest insect problems than ever before. In our case we have had a number of newspapers in Spokane suddenly realize that there is a Forest Insect Laboratory close by, and they check with us on articles and questions when necessary. The quality of reporting has improved accordingly. Newspaper men seem to be more conscious than ever before of some of the big outbreaks and the part they can play in preserving the economy in their region. We have several enquiries at our laboratory this past year for pictures to illustrate damage by insects, and of the insects themselves. I consider this a very promising sign, though there is still a lot of work to be done in this

respect.

Re Item G-2 "The need for extension forest entomologists". There are very few County Agents who are prepared to advise farmers and summer home owners about forest insect damage and control, and consequently these people run into insect problems of their own making, particularly the problem of the Ips Engraver beetles in the Ponderosa pine stands. We have been trying to make contact with as many County Agents as possible, to get this information out. We are being called on more and more to give talks, illustrated lectures, etc., even to Church groups and men's clubs.

Sager: Where is the ultimate value in acquainting the public with forest entomology? Is it acquainting the politicians or the direct value of acquainting the public and students who might wish to enter that field?

Davison: One of my jobs in the Portland laboratory is to work with the lumber industry as a means of getting their support for forest insect survey work. We need liaison between the public and ourselves. We want to develop public relations to get better awareness of the insects we have in our area. Through the efforts of the lumber associations we have been able to get that information out, and to enlist their aid in the surveys.

Thomson: A forest entomologist may make any recommendations he wishes, but notwithstanding how sound they are, unless the forest industry is willing to accept them and put them into practice, the entomologist might just as well do nothing. A case of that kind happened some time ago, where the recommendations were ignored, much to the regret of the particular company. The man in question returned to the entomologist a couple of years later and apologized. He wished he had taken the suggestion when it was given, but since then his attitude has been entirely different and he now cooperates to the best of his ability. We need to arouse public opinion.

Callenbach: We owe a certain amount of responsibility to the public in informing them as to what is going on. We need to popularize many of these fields, it is just good sound citizenship.

Chamberlin: At Oregon State College we have an Extension Entomologist who gets the problems of the farm wood lot and the home which is being attacked by termites. He has had no broad training along forestry lines but he is a very sound individual, trained at Idaho incidentally. He brings his problems in and we talk them over, he writes the replies and talks with these people. This creates a lot of goodwill and people even go to the trouble of writing to thank him.

Johnson: Another important aspect is gaining financial support for the work of the forest entomologist. Congress has no way of appreciating the magnitude of current problems unless they hear about them. The spruce budworm situation aroused the attention of everyone and Congress could not overlook it. When the request came for money control, it didn't take too much education of those in Washington to appreciate the situation and allot the funds necessary. They have to be shown that there is a need for insect control and unless you have a public that is aware and makes itself heard, Congress is not going to take any notice. The work of our bureau has been fostered in many cases by groups

of people representing the forest industry, etc., who go directly to Congress and ask for funds.

Thomson: Any other questions? Well, I want to call the attention of this group to an editorial on this subject in the "Journal of Economic Entomology", the October issue, dealing with the forest entomologist.

I have been asked by the Chairman to request that a committee be set up to present definite resolutions on the basis of what can be done to further the education of forest entomology in western colleges. I shall leave the composition of that committee up to the Chairman but would suggest that it contain at least one laboratory head to present the laboratory side of the picture and one or more of the interested members of the teaching staff to go into the matter and bring out some concrete proposals to be voted upon and acted upon by the various delegates to this conference.

Chamberlin: Since we have considerable membership on both sides of the border the committee should include a representative of the teaching staff and of the laboratories from the States and from Canada.

Johnson: I would suggest that, since the laboratory heads are not here just now, this matter of selection should be postponed until the morning in as much as our evening is occupied and there won't be an opportunity to get together. I think I would ask Mr. Richmond to deal with the selection of a committee in the morning.

Chamberlin: I think the committee should be appointed tonight and let them get together after the dinner tonight. There are some very important things coming up during the morning and we should have all members here.

Johnson: I am willing to accept your suggestion.

Thomson: Could we have Dr. McSwain, Dr. Chamberlin and Dr. Graham to represent the teaching staff, Mr. Thomson to represent Canadian laboratories, Mr. Orr to represent United States laboratories, Mr. McLeod member at large, and Mr. Richmond ex officio in his capacity as chairman of this conference.

Thomson: I am wondering whether the American laboratories are adequately represented. (Agreed that they are.)

Gibson: I would suggest that those resolutions be presented well before the closing session in case there should be additions or changes.

Johnson: The usual procedure is to present the resolutions and ask for their acceptance. At that time, if there are any radical changes from the floor, they could be changed.

WEDNESDAY A.M. 9:00, DECEMBER 10

Chairman: Richmond

Thomson: (Called upon to give a summary of the discussion of yesterday.) The first point on the agenda was a discussion of the aims of forest entomology, present and future. The members discussed rather a parallel problem of what the nature of the future forest entomologist is likely to be. It was felt that many of the questions raised were relevant because the future forest entomologist was not going to be one man. Instead of having a general forest entomologist, the work will be covered by teams of specialists, economists, botanists, entomologists, and foresters, each working in conjunction with the other. Therefore, it should be not too important as to what the actual background of an individual student has been because he will only be a member of a team.

In view of the reduced membership, several of the items were only briefly covered in the morning and the second portion was omitted. Two other questions were substituted:

1. What do recent graduates in the field of forest entomology feel they lacked in their training?

Mention was made of the papers on education in forestry given at the C.I.F. meeting in Montreal and to a paper given by J. W. Barrett of the College of Forestry, State University of New York, Syracuse, entitled "The Role of Hamanity and other Liberal Courses". The members were in agreement that english and speech training were two of the major lacks. They agreed that there should be a broadening of the curriculum to require students to take some of the humanities and sociology.

2. What do practising forest entomologists feel should be required in a service course?

It was the general opinion that forest protection should be included, from the point of view of biology, a course in orientation for the forester.

One of the most interesting parts of the discussion yesterday was to be on liaison, but it was felt that the absence of many members reduced the value of that topic so it was only lightly reviewed, and it was requested that the chairman appoint a committee to bring forth definite resolutions to be presented this afternoon.

Richmond: With regard to next year's meeting, we have now confirmed that it may be held at Washington State College and the University of Idaho.

The Programme Committee to be as follows:

Dr. Maurice James, Washington State College, Pullman - CHAIRMAN
Dr. W. J. Barr, University of Idaho
Mr. Jack Walters, Vernon Laboratory, B. C.
Mr. P. C. Johnson, Coeur d'Alene, Idaho.

Hopping (Moderator): Discuss Section A - Damage Appraisals. Questions 1, 2 and 3 could be discussed together.

Wygant: Appraisal of losses is actually one year behind the sampling of the insect population. The question we have is what is an adequate sample, and we have a lot of work to do yet. It has been suggested that we use a sample $4\frac{1}{2}$ feet high on the tree to measure the insect population per square foot of bark surface. Annual sampling will determine, in time, the trend in insect population during an outbreak. Appraisal of damage is done in the fall but population sampling must wait until the spring.

Gibson: We have found in our sampling of the mountain pine, Douglas fir and Engelmann spruce beetles that our estimates of attacks the following year are not too reliable. We don't know what is going to happen during the winter when we may have unseasonable weather conditions which will lower the population and woodpeckers which do a lot to lower the insect population. So it has been found necessary, even with control recommendations, to wait until the early spring and then go into those areas to see what population has overwintered before we have a resonably accurate index. For that reason fall population samples, of the bark beetle for instance, cannot be considered as a too reliable index of what to expect the following year.

Hopping: How do you do that sampling in the spring? How many samples?

Gibson: In the spring we go into areas where control has been recommended, based on the possibility that in the current year it will be necessary to alter those recommendations in case the population is found too low. Then it has been chiefly basal sampling above the snow line to make sure we were above the protecting influence of the snow during the winter. Sometimes it has been necessary to make that examination on snowshoes or skis in order to give ample time to the interested agency to put into effect our control recommendations.

Hopping: How many samples in that area do you take?

Gibson: We know we may have unseasonable weather in the low-lying areas, and in the hills it may not be as effective. So we make a basal sample of various sides of the trees at different altitude levels. The physical difficulties are such that we have to do the best we can with the conditions as they are. It won't necessarily be on a definite strip line, but it will be a sampling of the infested trees and we go from group to group. No attempt is made to supplement our survey data.

Johnson: I would like to know what Canada is doing in this kind of work?

Hopping: Spot checks.

Lauterbach: How accurate is the basal sample as compared with one higher up on the tree?

Gibson: It gives us a fair index. We realize that from tree to tree and from sample to sample, the variation is high but by getting as many samples as possible we can overcome that and get a fair picture. It is necessary that

we sample at least two sides of the tree, the sunny side and the north side, in order that any variation can be measured. There is usually a heavier brood near the base of the tree than there is higher up.

Orr: Another way is to count so many attacks per square foot as an indication of population density during fall surveys. We run our surveys on the basis of one-fifth acre survey plots and take samples on the sides facing the center of the plot. Taking a half square foot bark sample gave an indication of the average infestation per square foot. We also measure the size of the tree, the number of trees doesn't mean too much, but measure the diameter of the tree for sampling.

Wilford: In our spring sampling at Colorado, we made samples of different types of stems and it was much easier for us to take a sample at breast height, especially if on snow shoes, but we also took samples higher up the boles. Reliable estimates could be made from the single sample at the lower part.

Trostle: In our fall surveys we could tell by the appearance of the brood that there is a difference between broods, that is, some may be potentially more dangerous than others.

Thomson: We made counts at one-foot intervals and we found everything from the heavy attack at the bole to none at the top, and vice-versa. One sample could not give an integrated factor. Has anyone done similar work?

Johnson: We have done some stem analyses of Ponderosa pine for western pine beetle determination. We found the brood varies considerably. During the peaks it could be found pretty well over the entire bole, but other times they were restricted to any place along the bole, not necessarily along the base.

Kinghorn: What does Mr. Trostle mean by the appearance of the brood?

Trostle: The number of eggs which hatch. The size of the adult varies and often we get attacks with no bluestain which indicates less brood potential.

Bongberg: In most of the bark beetle work I have been concerned with, the majority of our surveys have to do with measurement of the number of trees killed and then trying to project whether the losses in the following year will increase or decrease. Last year we decided that appraisal of timber losses is not necessarily adequate for determining control. This happened in Modoc National Forest. The next spring there was loss occurring all through the country but we couldn't find out where the beetles came from. We expected a continued heavy loss, but by the time they got in there with their salvage equipment and operations, the losses did not develop. Can you tell me whether the number of trees as measured in the survey will indicate the status of the infestation the following year?

Furniss: Break it down into two basic problems: (1) whether the infestation is rising, falling, or standing still. That determines the need for control and is the basic population sampling problem. (2) Has to do with the insect itself, to be done either directly or indirectly. Sampling in the field and counting them.

Then there is the problem of sampling or determining the number of trees recommended to be controlled. I think those two things are being confused. People count the attacks and assume that a large number of attacks may be significant. Exactly the opposite is usually true. Counting the number of attacks won't do a bit of good. It has been our observation that we just do not know specifically where we stand with regard to these things. You can't tell just by looking at them whether control should be undertaken or not. I don't think there is any practical sampling mode to apply. As a matter of fact, I think most people in the western pine beetle problem look at a forest and if there is the scattered type of infestation, etc., they are not too worried about it, but when it gets into groups of 40-50 trees, it becomes serious.

Hopping: Appraisal of damage itself is not enough. Eventually you must have population sampling of some sort and then you must establish some correlation between your basic samples and what is happening up in the trees.

Furniss: I am not trying to minimize the need for population trends, but under existing conditions we do not know how to make them and have not got the manpower facilities to make them.

Evenden: Basal sampling will give good data because we know attacks of some bark beetles occur at the base first, especially mountain pine beetle in white pine. Mr. Bedard worked out a system of evaluating broods at any time of the year, but it requires a large staff.

Jaenicke: Re pine beetle work in Oregon in the early '20's. Too often we measure in terms of the number of trees per section, and that is not what we really need, but to know how they recur. If the trees are scattered, that is one thing. If you have 100 trees per section and many in small groups of 2 or 3, we think we are on the verge of something worse. So in addition to this numerical adding up, we analyze the occurrence of those trees. How dependable that criteria is, is something we do not know. We have to follow through in order to find out what happens when we have scattered tree infestation, group them, and then decline it, because there must be things responsible for the decline. Miller used to think that when the group became tremendously large that was the time for the break to occur, and so we are pretty much confused.

Hopping: We have done some basic work to determine the distribution of broods in trees under various conditions of infestation.

Let us go on to Question #4.

Jaenicke: There is one part not mentioned and that is the area involved in the infestation. In other words, if the infestation by any one of our bark beetles covers 60,000 acres and the value is concentrated perhaps in 10 or 15 thousand acres, in order to give protection is it necessary to cover the whole area? I think most of us agree that we have not covered enough area but perhaps there is some information available to make it possible to deliniate the area we want to control. Before we make a decision as to whether we do control work or not, we will have to consider what area we are actually going to cover in our control operations. We may decide that economic values on a small area are not sufficiently great to justify control work.

Wilford: We have bark beetles attacking single trees and in very small groups, specifically in the Black Hills in the Harney National Forest. If we can see that the beetle population is down possibly we will suggest a hold-off in insect control. We are at a loss to know just when to stop control and when to commence it. We are better able to know when to start it, though.

Hopping: What is your criterion used in the first place to establish control on an area?

Wilford: When large numbers of trees are attacked in groups.

Jaenicke: Accessibility to these parts is a great deal better than it was twenty years ago, what with gyppos, etc. We feel there are two main purposes: (1) to salvage the infested timber; and (2) to accomplish control.

Bongberg: We don't know at what point to recommend control based entirely on the number of attacked trees per unit of land.

Gibson: We have been toying with the idea that a loss of 1 per cent of the stand involved is sufficient to make us view the situation as a possible indication of a rise in infestation, and we must view that along with other things as a possible threat to the stand. When it gets above that percentage, it gets to be a dangerous situation, and indicates a rising population. If we take off a section of bark and find very numerous population that indicates a rise, but if it is comparatively light with lots of killing from various factors, that indicates a decline. We must temper our ideas of whether the infestation seems to be increasing or decreasing.

Hopping: Is that for all beetles?

Gibson: No. We must consider trees susceptible to attack and the one per cent would not necessarily be volume but trees of a susceptible nature. That one per cent seems to be approximately an endemic situation in many cases. It seems not an abnormal loss in Engelmann spruce. In white pine, however, a valuable timber, we must be on the alert for a decided increase in infestation if a one per cent loss is observed.

Dyer: In considering the aggressiveness of the population and the values involved, no one seems to have mentioned what effect the type and age of the stand has in this evaluation in determining the need for control. Surely the valuable stands in an area must be considered very strongly.

Wilford: In inaccessible virgin spruce areas in Colorado, the losses from Engelmann spruce beetle are very high, but these areas being inaccessible, and the stands being virgin, we have to accept this until the areas are made accessible.

Hopping: Re Question 5.

Wygant: In Colorado, with the Black Hills beetle, we found a half chain

wide strip was better than a one-fifth or one-quarter acre circular plot, because it takes less time to run that strip.

Wilford: It is better to get more strips per area than greater width of strip.

Wygant: There is a saving of time in running that half chain strip.

Furniss: What is your objective?

Wygant: To count the number of attacked trees per unit of land. We want to find out the way to have the least sampling in order to gain the most efficient estimate of damage.

Trostle: When we used the one-chain strip on spruce and Douglas fir, we found it inefficient because the trees could not be observed at that distance; we therefore used the half-chain strip on these species.

McCambridge: We had done some work with one chain and half-chain strips in Colorado and found them to be unsatisfactory. In Engelmann spruce we wanted to find out which was the most efficient circular plot size -- either 1/10, 1/15, or 1/20. We had done work with one chain and half chain strips so we were pretty well satisfied that a circular plot was better. This summer we conducted a study in which we selected a series of lines running through the areas where we would establish plots at two chain intervals -- 1/20, 1/15, and 1/10 acres. The 1/20 acre was just as good as the 1/10. The 1/20 acre plots were the fastest but the time saved was not significant. The only thing we could do was get the same accuracy. So we are afraid to recommend the 1/20 rather than the 1/10.....

Eaton: The timber type in relation to the type of sampling is very important. 1/5 acre plots were used in Eastern California as a basis for determining the number of infested Ponderosa pine trees to be salvaged by logging. The same sampling was used in two different timber sale areas and in one case the estimate was way under and in the other, it was way over.

Lauterbach: Do we need greater sampling if the insect population is lower?

Furniss: Yes. They type of infestation is one of the factors which influences the type of sampling needed.

Wygant: Our studies in Colorado are intended only for the Black Hills beetle in Ponderosa pine and it is not intended to apply the results of these tests to other insect species.

Wilford: The Colorado studies are intended not to decrease the amount of work for the sake of accuracy, but to get better accuracy.

Gibson: The single scattered tree or large groups influence the accuracy. You get a greater degree of accuracy in small groups. You have to have a greater coverage with a larger concentration than with a small concentration to hit the areas that are infested.

Jaenicke: The first thing to be determined before sampling begins is the

boundary of the area to be sampled and then stick by that. If you sample 100,000 acres and then it is desirable to get the information on 25,000 of those 100,000 acres, the temptation is to get the sample from the small acreage. That is all wrong. The sample needed for the 25,000 acres will be much more intensive than the sample needed for 100,000 acres in order to get some degree of accuracy to estimate.

WEDNESDAY A.M. 10:30, DECEMBER 10

Moderator: Mr. G. Hopping

6. Damage appraisals - Sample plots vs. check plots for use in estimating timber loss.

Bongberg: Sample plots vs. check plots - many of us have been using check plots for long terms to estimate expected tree mortality for the future year. Sample plots are used after an infestation is discovered and you go in and sample it. Check plots are used year after year. The sample plot is a temporary one.

Keen: The check plot is a yardstick on which we base an appraisal. Visual appraisal of an infestation is often made without sampling. Very close appraisal can be made by a man who knows his business.

Furniss: Plots can be used to evaluate losses on a distinct area and to determine the trend of those losses from year to year.

Hopping: Do you think that you need two kinds of plots? Are check plots more useful for evaluating trends than they are for estimating purposes? We found them very useful in regard to the western pine beetle, more useful in Douglas fir. We are able to assess a year to year fluctuation.

Evenden: We have given a lot of thought to making permanent plots but infestations themselves do not stay too long in any one plot.

Gibson: Check plots are of a seasonal nature. Almost all surveys must begin before the beetle attack period for the season is over. The data for the first areas examined or surveyed must be corrected because of the attacks which have occurred subsequent to the survey. At the beginning of the season the area which had a pretty fair infestation must be observed and the attacked trees noted at the time. Then you run that same strip periodically during the season and notice the number of attacks which have occurred subsequent to the preceding examination. At the end of the season bring together all data for these strips, plot a graph of attacks on time of examination and use the resulting curve for correcting the survey data.

Keen: In the western pine beetle outbreak in the east side stand there were 30 to 50 trees per section. One-third of one per cent per year to a half of one per cent. Losses which are higher than the replacement by growth are considered epidemic rather than endemic.

Gibson: A strip, if it is a somewhat backward season may have only 40 per

cent of the total attacks on the 1st of August of what it will have at the end of the attack period. You should run a strip, making sure it has sufficient infestation, and go over it every week or ten days. The more retarded the season the more frequently strips should be run. Strips run between the 1st of August and the 10th may show about 50 per cent of the total attack for the season at that time. By the end of the season we note the total number of attacked trees on the check strip and we can make our estimate for any time during the attack period.

Chamberlin: Would there be too much variation from year to year. Are you, from the accumulated data, able to know what the situation would be say in October?

Gibson: You get a fair indication by the 1st of October depending upon the weather. The 1st of August shows some variation but by the 10th of September not very much variation.

Evenden: It might be better to use permanent sample plots to get such things as trend in infestation.

Trostle: Our strips are permanent. That is the same line is re-run each year so long as the infestation persists. If the infestation is no longer present we do not continue the strips.

Bongberg: Would there be any advantage in your appraisal of infestation in white pine if you had an area of trees checked annually or biannually to find out what change in rate of losses has occurred. I rather favour some type of permanent checked tree plot to find out what the infestation is then or has been.

Evenden: The answer is yes. I still don't think it would answer the question of appraisal. If you could locate an area where a plot would have some loss then the answer would be yes.

Chamberlin: Do you not take a permanent plot and then have fire come in?

Keen: Well we have had a series of plots since 1921. There was perusal unit by unit in the Ashland, Oregon, area prior to this. In 1921 we had check plots which we surveyed each year. We have continuous records on all of those. It makes a very valuable record. A lot of data has come out of these. I am hoping to summarize that long period of loss and correlate them with climatic conditions to see what the epidemiology has been in Oregon and East Oregon.

Gibson: We had some similar plots in 1925 and some long strips in 1931 and we have kept constant records. We have records in mountain pine beetle and have loss data back to 1923. We hope to analyze these records and to make a study of the changes occurring on these plots. We have micro plots showing seedlings which came up during the heavy stand loss and the changes in some of the understory of younger trees. It is very difficult to cover large areas in plots intensively.

Hopping: We had permanent plots in the Kootenay in 1934. We took plots infested and a length of plots north through the valley in the Crown stands

and we got some extremely interesting data on plots and got the sequence of the attack and the entire history for a period of about twelve to fourteen years until 85 per cent of the stand was covered leaving only the trees below 5 and 6 inches diameter.

Furniss: I would like to comment on permanent plots. In estimating permanent plots you find an objective. It is just as important to have records during non loss years, as it is during high loss years. That means a long investment. Sample plots have an entirely different objective.

Question B (1) Hopping: A great deal was done by Mr. Richmond in yellow pine outbreaks.

Richmond: It is a long time ago since yellow pine sampling was done. I have been away from the project for so long. I think I am safe in saying that the trend in the population in western pine beetle was indicated by population sampling. The procedure used was that a section of bark was used. The tree was cut as soon as it was attacked. It was checked by weekly sampling of the larvae population as it developed. That infestation was subject in the latter part of the cycle to parasites and predators. In the last couple of years we had a definite increase in predacious insects and the population of bark beetles showed a marked decline although the infestation was still going strong. Unfortunately most of these data are in report form only, never having been published.

Hopping: How are populations best sampled?

Keen: For a good many years in bark sampling for white pine beetle population we counted the egg galleries and the emergence per square foot of bark surface. The variation per square foot was so great there were not enough square feet to give proper sampling. In 1925 the infestation was very high. Emergence per square foot was the greatest in any previous year. The population was simply tremendous. Something happened between the time of emergence and the attacks on the next trees. We got a tremendous amount of data without good conclusions being reached. The conclusions were not very significant as to trends.

Chapman: Do you ever use flight traps for trapping beetles?

Evenden: That always brings up the famous argument -- how far can the beetle fly? We used weather bureau kites. We went out into sage brush in Montana and put these kites up and collected a lot of static electricity which made it very uncomfortable. The net was 12 feet in diameter and in that we caught a lot of Ips beetles. They found that a lot of the bugs had got over the ridges.

Hopping: We tried the same thing in the Kootenays, set at various angles. The bears tore them all down.

Furniss: There is the problem of shaving bark and it is very hard work. Caging work collects a lot of beetles. We devised some ingenious traps but ended up with material on hand and whether it has any significance or not remains to be seen.

Hopping: We did quite a lot of that work on the largest trees but we just got a tremendous amount of data. We did lodgepole pine and larch. That data is still in files and nothing has ever been done on it. We took figures for all parts after initial attack.

Richmond: What use can be made of this data that we got on population? Or what use has been made of it? Which of various means offer the greatest possibility for further experiments?

Gibson: It would seem to me that one of the valuable things would be knowing what we can expect the next year from population we have found at this time.

Keen: Our hope has been that by population sampling we can guage an epidemic ahead of time. This is a very desirable objective.

The Douglas fir beetle in Canada and the Pacific Northwest

I Current status and methods of assessment.

(1) In what districts of the region is this beetle currently causing damage?

Hopping: This point was covered by the regional reports.

(2) What is the nature of this damage, widespread or confined, isolated in virgin stands or associated with logging or other disturbances?

Trostle: Northern Rocky Mountain Range. We have everything from a few trees attacked in a mature Douglas fir stand to hundreds of acres of solid kill. We suspect from all indications that this infestation has developed mainly from a 1949 blowdown. Our aerial reconnaissance only registered 1951 attacks and some areas in 1952 which had no red tops had more infestation than the red tops on the map. Almost every year one can find small areas of infestation, sometimes a fairly good sized group of trees. We flew an aerial reconnaissance survey this spring over a damaged area of Douglas fir and tried the best we could to put it on the map. The single trees we found did not show up on our map. The Forest Service has begun a cooperative surveys under our technical supervision. That is where much of our data has come from. We ran some reconnaissance surveys ourselves, mostly on percentage of loss basis. We have done no work on population studies. I might add that in our area since we have no pitch tubes on the trees we determine attacked trees by boring dust.

Graham: B. C. Region.

Douglas fir beetle has been associated with logging at the present time. In the virgin stands it may account for the perpetuation of Douglas fir type. There is increased importance of the Douglas fir bark beetle in the interior. This constitutes a threat to the wood industry. In the region, generally, small outbreaks can be traced down to logging operations conducted by small operators, loggers who do not carry out sanitation practice. Thus, small pockets of infestation resulted from leaving long butts and in some instances piles of mill slabs have been infested after they have been sawn and form the galleries, thus slabs provide centers of infestation.

Walters: Interior B. C. Region. Source of spot infestation is generally confined in the vicinity of logging, often where windfalls are found. We have made one aerial survey and were able to count the actual number of trees. The current status has so far been assessed by damage appraisals.

Wright: In our region in Oregon and Washington the epidemic infestation is very widespread. When a survey was made last summer there was somewhat over one billion feet killed in 1951. The damage is in mature stands and in old growth virgin stands not yet as old as the fir in many areas. We can trace the infestation back to the windstorms of 1949 and 1950. There was a heavy infestation by beetles in the following year which spread out into the greener timber. The problem is so bad at the present time because of windstorms and with an epidemic already in progress we are sure the thing will expand a great deal more. As to how we have detected and evaluated the damage, we have done this by aerial survey. This tied down the boundaries. We did evaluation survey again using aircraft - used four aeroplanes and flew one mile apart. Mappers mapped location of blowdown and beetle killed timber on one inch to the mile maps. Various stands were sampled on the ground to correlate the aerial observation with the actual trees. As to an assessment of the current status of the outbreak, it has been primarily by damage appraisal. The 1952 loss will be easing up sometime this fall but we won't know until next spring anything about the size of the area and the volume of timber involved. It appears some form of aerial work is the only way to go about it.

Eaton: California Region. In this region the Douglas fir beetle problem is very minor. We have had several small outbreaks but I don't believe I can give any information on just what was the cause of these outbreaks. We know that windfalls are the source of them. We have not made damage appraisal or population studies.

Orr: Interior Rocky Mountains. In our region there have been a lot of Douglas fir killed. It ranges from very few trees up to 100 acres, mostly in the area infested with spruce budworm. In one area in particular there was a lot of windthrow a couple of years ago and infestation was found there. So far all we have been able to do is a reconnaissance aerial survey. We did it late in the fall in November. I haven't been back since that time.

Wilford: Central Rocky Mountains. At the present time Douglas fir beetle is endemic. Several years ago we had it in Roosevelt National Forest and Rocky Mountain National Park. In 1950 and 1951 the population of Douglas fir beetle was reduced tremendously and has remained the same to date. This year we made only one reconnaissance survey and found its extent low. Unfortunately in an aerial reconnaissance survey on San Juan National Forest we have picked up an attack of Douglas fir beetle.

Bongberg: Southwest Region. The Douglas fir beetle in the Southwest is in pockets in every case that has been observed this far. The fir type is being killed out gradually, but the groups are getting larger. In one area in Southeastern Arizona quite a lot of infestation is present.

Hopping: Alberta and Canadian Rockies. There is not enough Douglas fir in Alberta.

WEDNESDAY P.M. 1:00, DECEMBER 10

II 1. What are the life cycles and habits of this insect?

Gibson: In the region in which we are associated the life cycle is about one year. We find that in attacks of this insect the attacks are pretty well up in the tree. We detect the infested tree by boring dust. There is a heavy concentration of insects in the bark. The similarity of dusts of various borers could make an error in discovering the Douglas fir beetle. Dust often shows the presence of Ips flat-headed borers and round headed borers. The Douglas fir beetle goes into the cambium layer to construct the egg gallery. Larvae, in the latter part of their feeding period, go into the bark. You have to examine the outer bark to make sure you are not missing any of the insects.

Dobson: Overwintering stages.

Gibson: Occurs in all life history stages except the pupal stage. There is no hibernation of the pupal stage.

Walters: I have no definite information to offer but indications are, in the interior of British Columbia, that they have a one year life cycle -- two flights -- in the spring and summer. We have noticed them sometimes as far down as the root collar of trees. We are seeking more information on the blue stain fungi.

Keen: How do you observe it? By looking at the bark.

Chamberlin: In some trees you get a very blue stained appearance.

Gibson: Blue stain is more apt to be apparent in upper parts of tree or in the lower, damper parts of the tree. Getting back to the Douglas fir bark beetle the habits of this beetle are like that of the Engelmann spruce beetle. They first attack big old veteran trees, then they attack those not quite so big. There are sometimes successive years of attack on the same tree. They do not confine their attacks to the thicker bark trees.

Chamberlin: It has no respect for age.

Graham: What is the pathologist's point of view on blue stain?

Salisbury: It is an isolated fungi. We have very few specimens. We have some blue stain from Douglas fir that we think has some association with the bark beetle. Blue stain is not known so well in Douglas fir, as it is in others.

Lauterbach: The majority of standing trees die if they have blue stain in the bark.

Wright: With regard to detection work on analyses on trees killed by Douglas fir beetle over the last five years it was apparent that progress in decay of logs was caused by beetles. Wood rotting fungi occurs more readily in beetle infested trees.

Dyer: I wonder whether anyone has noticed any differences in rainfall areas. Are outbreaks very general in heavier rainfall areas?

Wright: Our outbreak now is west of the Cascade Mountains in the wet part of the State of Oregon.

Chamberlin: It is practically all tied in with windfall, isn't it?

Wright: Yes.

Evenden: Douglas fir beetle outbreaks are associated with windfall and logging operations in the northern areas. We are attempting to see what can be done in connection with cooling logs. We have had some success and some failure.

Johnson: What does cooling of logs mean?

Evenden: The opposite of hot logging. After trees are felled logs are left in the woods to "cool" to attract beetles, then they are taken in to the sawmill.

Kinghorn: On a road trip in western Oregon in the country where windfalls occurred I noticed in some trees there was a noticeable lack of foliage and it looked to me like needle cast. What was the Oregon situation?

Wright: In Oregon Poria weirii - root rot - has been quite a factor. There were a good many trees, perhaps three quarters, infested with beetles. The beetles now are moving out into the green timber.

Chamberlin: Does an attack of fungi have any appreciable bearing on windthrow?

Wright: Yes. Quite a bit.

Dobson: What about the role of fire in predisposing outbreaks?

Jaenicke: Logging has been going on for a long, long time. We have found a large number of Douglas fir beetles in slash, in the tops and in cool logs, year after year. This lead some of us to make rash statements. We thought it was not a serious insect. We have disregarded the large number of beetles as being insignificant. We have found Douglas fir beetle in areas which have not been defoliated to any extent by spruce budworm. It is evident from what we have seen in the drier parts of Oregon and Washington that, for reasons we cannot put our fingers on, there is a tremendous increase in Douglas fir beetle everywhere. Certainly there are factors which we do not understand.

Chamberlin: Our annual average rainfall has dropped during the last few years.

Keen: I thought the rainfall was higher.

Chamberlin: Not in the valleys.

Richmond: My experience is that we have always had the Douglas fir bark beetle but generally speaking it has not been the economic problem that the pine bark beetles have. I believe, however, that losses in the aggregate are much more serious than we realize since it operates in such a persistent yet unspectacular manner. Right now the industry is becoming very disturbed about this insect, the first time in our experience that it has aroused any very great concern.

At this time the proceedings were drawn to a close by the Chairman due to the departure of many delegates on the afternoon boat to Seattle.