PROCEEDINGS

OF THE TWENTY-FIRST ANNUAL

WESTERN FOREST INSECT WORK CONFERENCE

Seattle, Washington

March 2-5, 1970

Not for Publication

(For information of Conference Members only)

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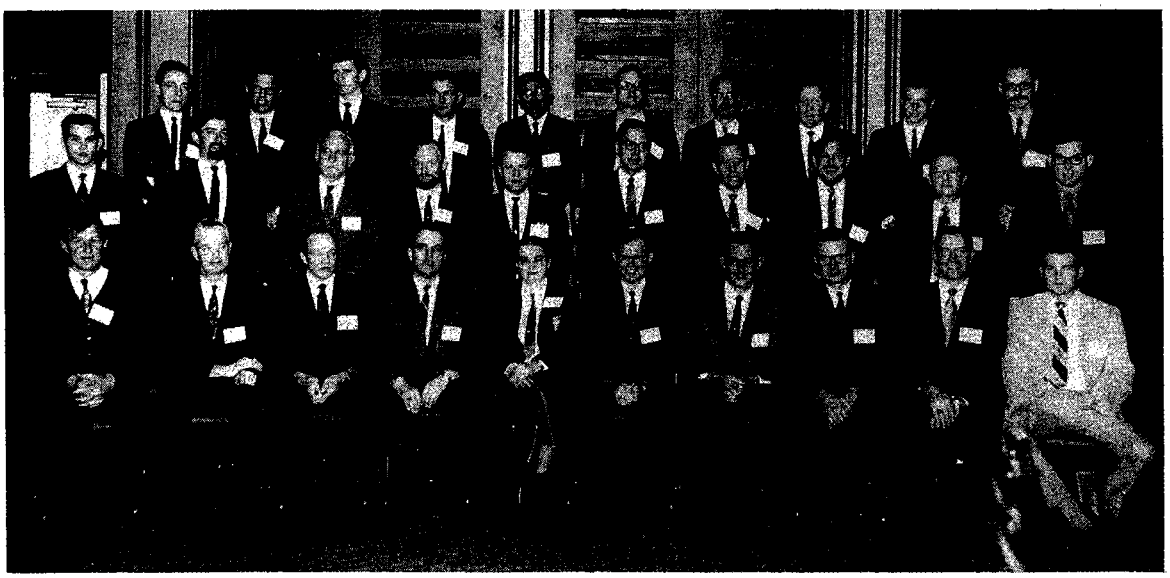
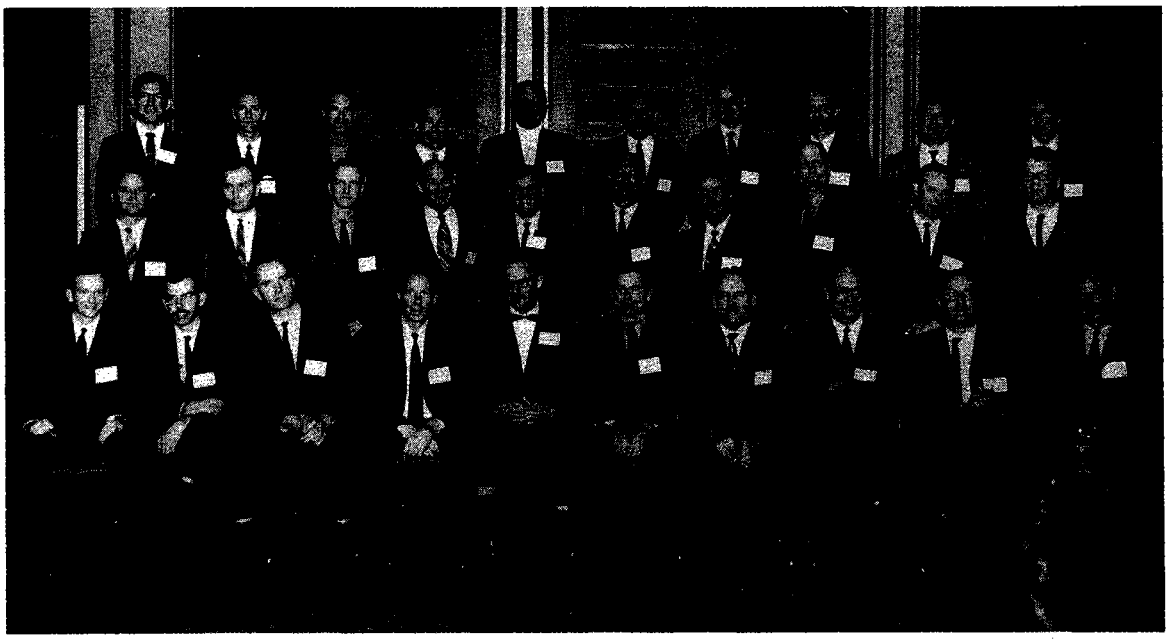
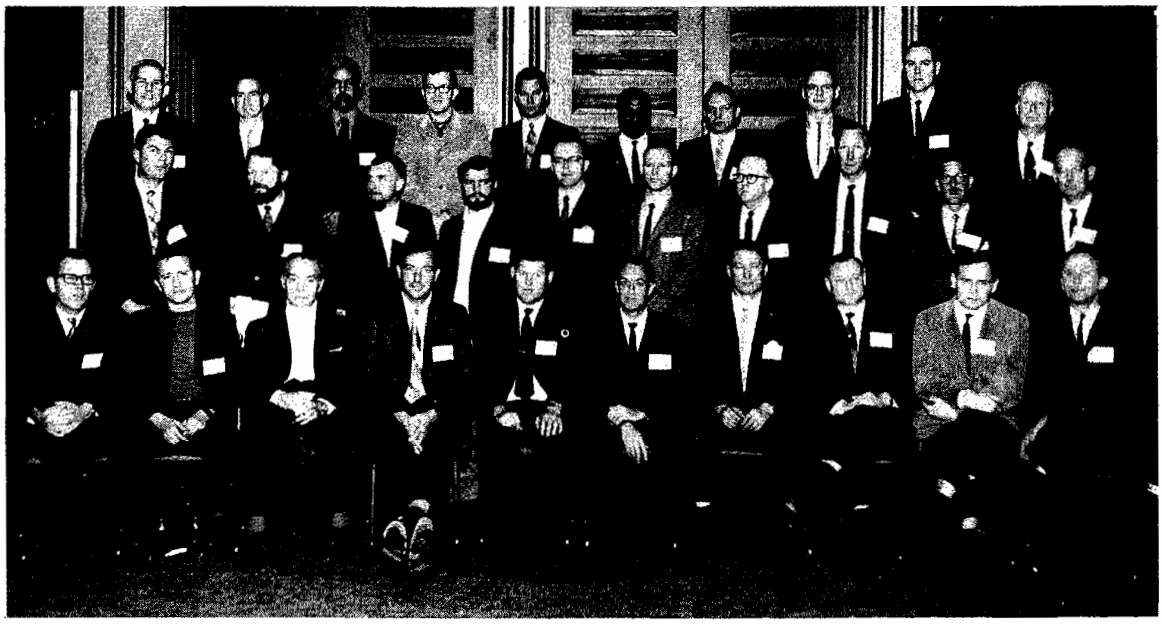
Victoria, British Columbia



Row 1: (L to R) Paul Lauterbach, John Wear, Tommy Gregg, Peter Orr, Mona Lambden, Joe Saunders, Jack Warren, Bill Scribner, Dave Ketcham, Bob Frye; Row 2: Ladd Livingston, Allan Berryman, Benton Howard, Malcolm Shrimpton, Arthur Raske, Jack Mounts, Hec Richmond, Charles Tiernan, D.O. Vandenburg, Mark Houseweart; Row 3: John Schenk, Dave Wood, Bernard Scott, Tom Silver, Bill McCambridge, Bob Dolph, Wayne Bousefield, Dave McComb, Chuck Germain, Paul Buffam.



Row 1: (L to R) Stephen Cade, Ronald Billing, Karel Stoszek, Jerry Knopf, Dick Washburn, Sergei Condrashoff, Bill Ives, Fields Cobb, Lloyd Browne, Boyd Wickman; Row 2: Donn Cahill, Herb Cerezke, Bob Stevenson, Galen Trostle, Lynn Marsalis, Al Rivas, Bill Waters, Gerry Lanier, Roy Shepherd, James Kimmins; Row 3: Mal Furniss, Leon Pettinger, Mel McKnight, John Schmid, Wilmer Bailey, Richard Orchard, Russ Mitchell, Gene Amman, Pat Shea, Bill Bedard.



Row 1: (L to R) Les McMullen, Mark McGregor, Ken Graham, Bill Klein, Ken Swain, Richard Hunt, Don Schmiege, Bohdan Maksymiuk, Les Safranyik, Dave Dyer; Row 2: Gary Pitman, Don Dahlsten, Bill Turnock, John Wenz, John Dale, Torolf Torgersen, Dave Crosby, Scott Tunnock, Howard Tripp, Robert Fisher; Row 3: Dick Mason, Roger Ryan, Norm Alexander, Gene Paul, Milt Stelzer, Tara Sahota, Steve Ilnytzky, Hank Thompson, Richard Roeper, George Staebler.

Row 1: (L to R) John Allen, Don Malmberg, Jim Richerson and Tara, Barbara Barr, Linda Bennett, Eveline Stokkink; Row 2: Ken Trautman, Gary Blanchard, Dick Holmes, Don Curtis, Alan Cameron, Roy Bennett, Rick Johnsey; Row 3: Bill Nagel, Al Larsen, Ron Stark, LeRoy Kline, Lewis Edson.

PROCEEDINGS
of the Twenty-first Annual
WESTERN FOREST INSECT WORK CONFERENCE
Seattle, Washington
March 2-5, 1970

EXECUTIVE COMMITTEE (Twenty-first Conference)

E. D. A. Dyer, Victoria	Chairman
R. I. Washburn, Moscow	Immediate Past Chairman
L. H. McMullen, Victoria	Secretary-Treasurer
R. E. Stevens, Fort Collins	Councillor (1967)
P. G. Lauterbach, Tacoma	Councillor (1968)
D. L. Dahlsten, Berkeley	Councillor (1969)

R. L. Johnsey, Olympia	Program Chairman

EXECUTIVE COMMITTEE ELECT

D. L. Wood, Berkeley	Chairman
E. D. A. Dyer, Victoria	Immediate Past Chairman
T. W. Koerber, Berkeley	Secretary-Treasurer
P. G. Lauterbach, Tacoma	Councillor (1968)
D. L. Dahlsten, Berkeley	Councillor (1969)
W. E. Cole, Ogden	Councillor (1970)

W. F. McCambridge, Fort Collins	Program Chairman

Prepared by the Secretary-Treasurer, L. H. McMullen, from summaries submitted by panel and workshop moderators. Stenographic and duplication processing provided by the Forest Research Laboratory, Canada Department of Fisheries and Forestry, Victoria, B.C.

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TWENTY-FIRST ANNUAL WESTERN FOREST INSECT WORK CONFERENCE

The Conference was convened at 9:00 a.m. on March 2, 1970 by Chairman Dave Dyer, followed by the welcoming address by Mr. David G. Wood, special assistant to the Mayor of Seattle.

MINUTES OF INITIAL BUSINESS MEETING

March 2, 1970

The meeting was called to order by Chairman Dyer at 10:45 a.m. in the Vachon Room of the Washington Plaza Hotel, with 116 registered members.

Recognition was given to Phil Johnson, Jack Bongberg and Art Roe who have retired during the past year; also to Art Moore who has resigned.

The Chairman introduced Mr. Steve Ilnytzky who recently joined the Victoria lab. Other new members were then asked to rise and introduce themselves.

The Chairman appointed the nominating committee: Mal Furniss, Chairman, Al Rivas and Bill Bedard, and charged them to nominate a slate for Chairman, Secretary-Treasurer and Councillor to replace Dyer, McMullen and Stevens, respectively.

The Common Names Committee were to provide a replacement for Bob Stevenson whose term expires at this meeting.

In the absence of Walt Cole, Al Berryman was charged to fill the challenging chairmanship of the Ethical Practices Committee.

Treasurer's Report was read. Acceptance as read moved by Galen Trostle and seconded by Bill McCambridge. Carried.

Minutes of the final business meeting for 1969 were read and approved upon motion by Dick Washburn, seconded by John Schenk. Carried.

Minutes of the executive committee meeting, March 1, 1970 were read.

The Chairman discussed the appointment of the program chairman for the ensuing year early in the Conference and appointed Bill McCambridge to that position for the 1971 meeting. Bill discussed the possibilities in the Fort Collins-Denver area.

Meeting Places:

1971 - Already decided upon Fort Collins-Denver area.

1972 - The invitation from Rob Reid to hold our meeting in Edmonton was discussed.
Upon motion by Paul Lauterbach, seconded by Paul Buffam the invitation was accepted.

1973 - Paul Buffam invited the 1973 meeting to the Arizona-New Mexico area.

The Chairman appointed Al Rivas as chairman and Bill McCambridge as member of a committee on Current Research. This committee was charged to assess the need for lists of current research projects and to report to the final business meeting.

Upon a request for the current status of Bob Furniss' revision of Keen's manual, Mal Furniss indicated that it should be available in about 1½ years.

The Program Chairman, Rick Johnsey, discussed the program and arrangements for the current conference.

The Chairman adjourned the meeting at 11:45 a.m.

- - P R O G R A M - -

21st WESTERN FOREST INSECT WORK CONFERENCE
Seattle, Washington, March 2-5, 1970

Sunday, March 1

7:00 - 8:00 p.m. Registration for early arrivals in South Foyer.

8:00 - 10:00 p.m. Meeting of Executive Committee

Monday, March 2

8:00 - 9:00 a.m. Registration, South Foyer

9:00 - 10:15 a.m. Welcoming Address:
Honorable Wes Uhlman, Mayor of Seattle.

Keynote Address: "A LOOK AT THE FUTURE."
Mr. Dave Ketcham, U. S. Forest Service, Arlington, Virginia.

10:15 - 10:45 a.m. Coffee Break

10:45 - 12:00 a.m. Initial Business Meeting

12:00 - 1:30 p.m. Lunch

1:30 - 3:00 p.m. Panel: EFFECTS OF INTENSIVE MANAGEMENT ON INSECT POPULATIONS.
Moderator: George Staebler, Weyerhaeuser Forest Research Center, Centralia, Washington.

3:00 - 3:30 p.m. Coffee Break

3:30 - 5:00 p.m. Concurrent Workshops:

1. Potential defoliator problems in even-aged management.
   Dick Mason, Forestry Sciences Lab., Corvallis, Oregon.
2. Potential beetle problems in even-aged management.
   John Schmid for Bill McCambridge, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
3. Important new reproduction insects.
   Karel Stoszek, Weyerhaeuser Forest Research Center, Centralia, Washington.
4. Field testing attractants.
   Dave Wood, University of California, Berkeley, California.
5. Sampling flying insect populations.
   Mal Furniss, Forestry Sciences Lab., Moscow, Idaho.
6. Recent advances in pest control equipment.
   Lynn Marsalis, Equipment Development Center, Missoula, Montana.
7. Use of computers in forest insect research.
   John Harris, Forest Research Lab., Victoria, British Columbia.

Tuesday, March 3

8:30 - 10:00 a.m. Panel: PUBLIC RELATIONS IN FOREST PROTECTION.
Moderator: Benton Howard, U.S. Forest Service, Portland, Oregon.

10:00 - 10:30 a.m. Coffee Break.

10:30 - 12:00 a.m. Concurrent Workshops:

1. Prospects for improved control of defoliators.
   Dick Washburn, Forestry Sciences Lab., Moscow, Idaho.
2. Evaluating host resistance to bark beetles.
   Les Safranyik for Rob Reid, Forest Research Lab., Calgary, Alberta.
3. Status of balsam woolly aphid in the West.
   Russ Mitchell, Forestry Sciences Lab., Corvallis, Oregon.
4. European pine shoot moth in western forests.
   Gary Daterman, Forestry Science Lab., Corvallis, Oregon. (Cancelled)
5. Remote sensing.
   John Wear, U. S. Forest Service, Portland, Oregon.
6. Insect pathology.
   Hank Thompson, Forestry Sciences Lab., Corvallis, Oregon.
7. New Developments in artificial diets and insect rearing.
   Bob Fisher, R. A. Formula Co., Bakersfield, California.

12:00 - 1:30 p.m. Lunch

1:30 - 3:00 p.m. Concurrent Workshops:

1. Relationship of insect diet and host factors to pheromone production.
   Dr. D. D. Hardee, Boll Weevil Research Lab., State College, Miss. (Cancelled)
2. Meteorology and its use in studying insect ecology.
   Leo Fritchen, University of Washington, Seattle, Washington.
3. Educational programs to keep forest entomologists proficient.
   Ken Graham, University of British Columbia, Vancouver, B.C.
4. Effects of forest fertilization on insect populations.
   Paul Heilman, Washington State University, Puyallup, Washington.
5. Cone and seed insects.
   Stan Meso, U. S. Forest Service, Portland, Oregon. (Cancelled)
6. Insect pests of ornamentals.
   Joe Saunders, Washington State University, Puyallup, Washington.

3:00 - 3:30 p.m. Coffee Break.

3:30 - 5:00 p.m. Concurrent Workshops:

1. Interrelationships between root fungi and bark beetles.
   Fields Cobb, University of California, Berkeley, California.
2. Spruce budworm.
   Fred Honing, U. S. Forest Service, Missoula, Montana. (Cancelled)

Tuesday, March 3 (cont'd)

3:30 - 5:00 p.m. Concurrent Workshops (cont'd):

3. Insect survey and damage evaluations.
   Pete Orr, U. S. Forest Service, Portland, Oregon.
4. Pollution and insect problems.
   Jim Lowe, University of Montana, Missoula, Montana.
5. Insect photography.
   Roger Akre, Washington State University, Pullman, Washington. (Cancelled)
6. Nematodes as biological control agents.
   John Webster, Simon Fraser University, Burnaby, B.C.
7. Effects of cultural practices on beneficial insects.
   Don Dahlsten, University of California, Berkeley, California.

6:30 - 7:30 p.m. Reception.

7:30 - 8:30 p.m. Banquet

Wednesday, March 4

8:30 - 10:00 a.m. Panel: MANAGEMENT DECISIONS IN THE PREVENTION AND SUPPRESSION OF INSECT PROBLEMS
Moderator: Don Malmberg, Crown Zellerbach Corp., Seaside, Oregon.
Ken Trautman, Port Blakely Mill Co., Olympia, Washington.
Gary Blanchard, Starker Forests, Corvallis, Oregon.
John Allen, Bloedel Timberlands Development, Inc., Bainbridge Island, Washington.
Dick Holmes, Publishers Paper Co., Oregon City, Oregon.

10:00 - 10:30 a.m. Coffee Break.

10:30 - 12:00 a.m. Concurrent Workshops:

1. Economics of insect control in second growth management.
   Barney Dowdley, University of Washington, Seattle, Washington.
2. Cultural control of forest insects.
   Hec Richmond, Consulting Forest Entomologist, Nanaimo, B.C.
3. Effects of scale insects on young trees.
   Dave Donley, Northeastern Forest Experiment Station, Delaware, Ohio.
4. The need for training in decision-making procedures and techniques in forest entomology.
   Ken Turnbull, University of Washington, Seattle, Washington.
5. Research and control priorities.
   Bill Turnock for Jim Johnston, University of Washington, Seattle, Washington.
6. Potential terminal weevil problems in young stands.
   Les McMullen, Forestry Research Lab., Victoria, B.C.
7. Concepts in manipulating scolytid populations.
   Gary Pitman, Boyce Thompson Institute, Grass Valley, California.

Wednesday, March 4 (cont'd)

1:30 - 5:30 p.m. Field Trip
Tour Boeing "747" Production Plant.

Thursday, March 5

8:30 - 9:30 a.m. Panel: ARE WE PROVIDING USEFUL ACADEMIC AND TECHNICAL TRAINING FOR FOREST ENTOMOLOGISTS?
Moderator: Bill Nagel, Oregon State University, Corvallis, Oregon.
Bill Waters, U. S. Forest Service, Arlington, Virginia.
Royce Cox, Potlatch Forests, Inc., Lewiston, Idaho.
Ron Stark, University of California, Berkeley, California.
Don Hopkins, Department of Natural Resources, Olympia, Washington.

9:30 - 10:00 a.m. Coffee Break

10:00 - 12:00 a.m. Final Business Meeting.

A LOOK TOWARD THE FUTURE

David E. Ketcham, Director of Forest Pest Control,
Forest Service, Washington, D. C.

Mr. Chairman, Mr. Wood, lady and gentlemen, it is a real pleasure for me to be here with you this morning at your 21st Western Forest Insect Work Conference. I have heard for a long time that the Western Forest Insect Work Conference was the "King" of the Work Conferences. While I was in the South, I always discounted these kinds of reports as western propaganda. Of course, after I was transferred to Missoula, Montana, and got properly oriented, I realized that most of the rumors were true. At any rate, I deeply appreciate the opportunity to speak with such a distinguished group here this morning.

My topic for this morning is "A Look Toward the Future." Sound familiar? It should; this is what everybody is doing these days. Unfortunately, some of us seem to do this only about once in every 10 years.

We are today on the threshhold of a new decade. This is not only the "Age of Aquarius," it is also the "Age of the Environment."

A bipartisan group of 9 Congressmen have urged designating the 1970's as "The Environmental Decade." January 1, 1970, was suggested as a good time for Americans to make the following New Year's resolution:

> I pledge that I shall work to identify and overcome all that degrades our earth, our skies, our water, and the living things therein, so that the end of the Environmental Decade of the 1970's may see our environment immeasurably better than at the beginning.

Nearly 80 additional Congressmen have signed the "pledge" since its introduction.

As his first official act of the new decade, the President on January 1 signed into law an Environmental Quality Bill and announced that the 1970's "absolutely must be the years when America pays its debt to the past by reclaiming the purity of its air, its waters, and our living environment. It is literally now or never." This bill, The National Environmental Policy Act of 1969, expressed the current sense of the Congress by stating, "The Congress recognizes that each person has a responsibility to contribute to the preservation and enhancement of the environment."

The saving of the environment has become a major political issue. It has replaced motherhood and has become a rallying point for a disparate range of adherents cutting across State, party, ideological, and age lines. According to Congressional Quarterly, the environment has replaced Vietnam and the economy as the primary issue for the Democrats.

Much of the new push for protection of the environment has come from the young. At scores of colleges, universities, and high schools

throughout the Nation, students are preparing to make their sentiments heard. Environmental groups have sprouted everywhere from Boston University to the University of Washington to the University of Texas. Students are asking that their curriculum be redesigned to include more courses on ecology and environmental issues. They are also demanding that the universities themselves stop polluting and cease research for firms that contribute to pollution.

Young people on high school and college campuses across the country are organizing a National Teach-In on April 22 to acquaint the general public with environmental issues.

My main point here is that people are concerned. People are concerned about the environment. They are concerned about the effects of pesticides on the environment. They should also be concerned about the effects of pests on their environment.

But how can they be concerned about the effects of pests on their environment unless we tell them what these effects are? How can we do this, you ask, when we don't know ouselves? The answer to this one is simple: we find out. The determination of the impact of forest insects and diseases on our forest resources should be our Number-1 job for the 1970's. We must know how to measure impact if we are to provide land managers with the information they need to decide for or against suppression. We must know how to measure impact if we're going to be able to determine the effectiveness of our suppression projects. And, perhaps most important of all, we must have this information on impact to guide our forest pest control and research programs and to support our requests for funds.

And what about pesticides? In some quarters you can almost start a fight by simply whispering the word.

As with most issues, the debate on pesticides has two sides. Those people who favor increased use of the chlorinated hydrocarbons cite their low cost and proven effectiveness in fighting disease and increasing crop yields. According to R.G. VanBuskirk in Farm Chemical Magazine, the cost of very inferior food would double in 5 years; and Americans would be short of essential foods in 10 to 15 years without DDT and other inexpensive, persistent pesticides.

Dr. G. K. Kohn, at a 1968 meeting of the National Agricultural Chemicals Association, reported that DDT's effectiveness in disease control has meant that 39.5 percent of 1.6 billion people who used to live in malaria-infested areas now are living in malaria-free environments; another 38.6 percent are protected by on-going malaria programs.

The World Health Organization in 1969 re-emphasized their support of use of DDT in countries where insect control is a life-or-death matter. World Health Organization official Dr. Weyland Hayes cited U.S. Food and Drug administration studies in which volunteers were fed for 12 months doses of DDT 200 times greater than the average daily intake with no ill effects.

Agricultural experts have also warned that as DDT use is limited, increased use of stronger, more poisonous pesticides may cause an increase in pesticidal poisonings among farm workers.

On the other side of the coin, those people who oppose the use of persistent pesticides point out that the sloppy use of non-specific persistent pesticides has resulted in the emergence of strains of pesticide-resistant insects, sometimes causing renewed disease epidemics. They have also stated that pesticides with shorter effective periods and greater specificity would be less likely to permit resistance and would limit environmental damage. Careful application of persistent pesticides, they have argued, provides little protection. DDT used in under-developed areas does not stay where it is applied; but vaporizes, enters the atmosphere, and is distributed everywhere in the world. Even arctic penguins contain DDT residues. According to Justin Frost, a Biologist at Southern Illinois University, more than half of each DDT application may be spread in that fashion in warm climates.

Persistent pesticides have been linked to reproductive failures in birds and fish, the death of wildlife, and human diseases. They may destroy helpful as well as harmful creatures. Interior Department records cite a case in Bolivia in which a DDT program intended to kill mosquitoes also destroyed all the village cats, encouraging the invasion of a wild, mouse-like animal that carried black typhus virus. The disease killed more than 300 villagers.

Many bills designed to regulate or prohibit the use of DDT and other pesticides and to authorize the study of their effects on the environment are pending before the U. S. Congress today. On February 6, Senator Nelson introduced for himself and Senator Mansfield bills to prohibit the sale or shipment for use in the United States of the chemical compounds known as aldrin, chlordane, endrin, heptachlor, lindane, and toxaphene.

State legislatures throughout the country are considering similar legislation. Arizona has banned the use of DDT and related pesticides for 1 year while researchers attempt to learn their effects. California banned the use of DDT and related pesticides in homes and gardens as well as the use of DDT in dust form for agricultural use. This bill expressed the intent that persistent pesticides would be totally eliminated from use at the earliest feasible time. Legislation passed by the Florida legislature created a restricted-pesticides category to be established by the Commissioner of Agriculture. Permits would be required to purchase, use, or possess a restricted pesticide. Maryland has just passed a bill prohibiting the use of DDT and several other chlorinated hydrocarbons in all cases except those where they are needed for the prevention or control of human diseases and other essential uses for which no alternative pest control means are available. Other States have passed similar legislation.

The use of pesticides is also receiving attention at the highest level of the Executive Branch of the Federal Government. The review of the pesticide problem and its effect on the environment is a special charge of the President's Environmental Quality Council.

On November 20, 1969, the Environmental Quality Council reviewed and discussed the recommendations of the Commission on Pesticides which recently reported to Health, Education, and Welfare Secretary Finch. This report stressed that our society has gained tremendous benefits from the use of pesticides to prevent disease and to increase the production of foods and fibers. However, it underscored the continuing need to be informed and concerned about the unintentional effects of pesticides on various life forms in the environment and on human health. The report also contained recommendations to restrict the use of DDT and certain other "hazard pesticides" based on an evaluation of their hazards to human health, the availability of an efficacious alternative, movement in the natural environment, concentration in the food chain, and other environmental considerations.

To carry out the intent of the recommendations of the Commission and to identify other appropriate actions that the Federal Government might take, the Council established a Committee on Pesticides under the Environmental Quality Council. This Committee will be chaired by the Secretary of Agriculture and will include the Secretaries of HEW, the Interior, and the Executive Secretary of the Environmental Quality Council, Dr. DuBridge. The Departments of Defense, Transportation, and State, including the Agency for International Development, will also be represented.

For your information here, I might add that since November 20, the President's Environmental Quality Council has been renamed the Cabinet Committee on the Environment; and the Committee on Pesticides has been renamed the Subcommittee on Pesticides.

The Subcommittee on Pesticides has established a Working Group to provide day-to-day coordination and to develop program and policy proposals for consideration by the parent committee. This latter group has replaced the Federal Committee on Pest Control. The Program Review Panel of this Working Group met for the first time on February 13.

In Secretary's Memorandum No. 1666, Secretary Hardin established the policy for the Department of Agriculture of practicing and encouraging the use of those means of effective pest control which provide the least potential hazard to man, his animals, wildlife, and the other components of the natural environment. This policy states--

--where chemicals are required for pest control, patterns of use, methods of application, formulations which will most effectively limit the impact of the chemicals to the target organisms shall be used and recommended.

--persistent pesticides will not be used in Department pest control programs when an effective, non-residual method of control is available. When persistent pesticides are necessary to combat pests, they will be used in minimal, effective amounts; applied precisely to the infested area; and at minimal, effective frequencies.

--non-chemical methods of pest control, biological or cultural, will be used and recommended whenever such methods are available for the effective control of target pests. Integrated control systems utilizing both chemical and non-chemical techniques will be used and recommended in the interest of maximum effectiveness and safety.

What all of this means is that we can no longer sit back and depend on chemicals like DDT and lindane to do our job for us. We are going to have to take a long, hard look at all of our projects and programs involving the use of pesticides to see whether or not chemicals must be used to do the job. If chemicals are necessary, then we must be sure that we have identified all the possible adverse effects which might occur from their use and take the necessary steps to minimize them. We must also intensify our research and developmental efforts to find effective substitutes for our persistent pesticides. This will mean that research, forest pest control organizations, and land managers will have to work together in a closely coordinated manner if we are going to accomplish this job within the time limits available.

As you can see from the challenges I have discussed so far, we need more than technology and expertise in forest entomology to do our job of forest insect control today. Our activities involve people and have social and political as well as technological aspects. Our ivory tower has turned into a glass house. The public, and especially the youth of our Nation, are greatly concerned with everything that we do. Dealing with the public and involving them constructively in the protection of our forest resources from forest insects is perhaps our greatest challenge. One way to find out how to involve the public is to ask the public. The Forest Service did just this recently when they asked certain key figures to comment on a Task Force Report on public involvement.

William E. Towell, Executive Vice-President of the American Forestry Association said, "The thing that I would stress is that public involvement must be achieved before a decision is reached. Too often it has been merely a defensive tool after sides have already been chosen and opinions formed. More power to you and the Forest Service in this new effort."

J. Witney Floyd, Utah State University, said, "I believe that these tehcniques of public involvement must generally be utilized. I think that the multiple-use nature of the responsibility of the Forest Service places them in a position where they must endeavor at all times to get the fullest degree of public involvement obtainable. Because the more public involvement you get, the more understanding you should obtain. Consequently, you should get better cooperation, better support, and as a result better judgment. I believe, also, that this involvement, if handled judiciously, will not and does not, necessarily imply that you're dependent on public involvement for decisions but that you are dependent on society for advice, opinion, and support. I believe the administrator can utilize most of these tehcniques in this matter and, at the same time, help make the public feel that they are helping with the decisions."

Art Roberts, Western Forestry and Conservation Association, expressed interest in the analysis and supported the approach so long as the public involvement processes did not replace long-established pipeline of communication with the National Forest user groups and old established organizations.

Brock Evans, Northwest representative of the Sierra Club said,"... the proposed processes and techniques for involving public participation in

Forest Service activities are commendable and certainly represent a welcome departure from past traditions. However, if I may speak frankly (and I know you want me to), I sense that the Forest Service is still failing to come to grips with the real issue, that is-- what is the proper role of the forester (or indeed of any professional) in a Democratic society? Throughout both your letter and the attached paper dealing with involvement techniques, one gets the feeling that professional expertise rather than Democracy will prevail in determing goals and objectives. Rather than actually trying to inform and educate the public so that it may make a decision; the effort made, perhaps unintentionally, appears to be in the unfortunate position of really only paying lip service to public participation in order to get the support for professionally predetermined ends. I deeply hope that I am misinterpreting what I read."

Interesting? You bet. This cross section of opinion gives us a good look at how others see our programs. Our challenge is to make public opinion and involvement a tool, not a barrier. This applies to all of us, not just the Forest Service.

In the agenda for this 21st Annual Western Forest Insect Work Conference, the program committee has attempted to emphasize the passing in the near-future of old-growth forestry and its related insect problems and to proclaim a new era of more intensively managed "second-growth" forests with perhaps different insect problems. This-- along with the new emphasis on the environment, the critical need for good information on impact which forest insects have on our forest resources, pesticides, and public involvement-- illustrates another aspect of our changing times. In preparing this talk I tried to find some appropriate quotation relating to change which would add a little "class" to my remarks. Much to my surprise, most of the famous quotations I could find were very negative in their tone. I began to wonder why this was so. Was it because of man's fear of the unknown, a fear of what undesirable results change might bring? If this were really the case, what a traumatic experience some people must have living in times such as these we have today. However, I don't think that we should approach the future with fear. I think that we, through positive and thoughtful action, should create change. Tennyson said "Man is master of his fate". Let's use our knowledge, our expertise, our concern along with those of others, to do our part to create and maintain a high quality environment for ourselves and for future generations. For the first time in many of our lives we have the opportunity to play a leadership role in a key National issue. Let's make the most of it.

PANEL: EFFECTS OF INTENSIVE MANAGEMENT ON INSECT POPULATIONS

Moderator: George R. Staebler

Participants: Jay Gruenfeld, Benton Howard, Boyd Wickman, Rick Johnsey

In an informal round-table discussion, this panel looked at "The outlook for insects and entomologists in the intensively managed forest". It was pointed out that in the new forest enterprise we are faced with a whole new ball game. Not only is the forest different from anything we have dealt with up to now, but the business aspects are also different. We will be maximizing benefits whether they be measured in profit dollars or in other terms. The cost of preventing losses to insects or other agents will be looked at with a critical, jaundiced eye. Money spent to prevent loss will have to be judged as an investment in exactly the same sense as money spent on cultural practices to increase yields in other ways. The business of forestry will be characterized by the fact that the storehouse of wood is no longer the commodity of value; growth of wood is the dominant feature on the income side of the ledger to be balanced against the costs of forestry practices, including protection from insects, required to attain that growth.

The panelists described the intensively managed Douglas-fir and ponderosa pine forests and the distinctly different character required of a forest where the adequacy of growth is judged as a return on capital invested in growing stock. It is expected that wide growth rings, wide spacing, shorter rotations, vigorous trees and a considerable change in ecology and hence susceptibility to insect attack will be characteristic.

There was some discussion of the insects of concern in such a forest, the chances of introduction of new species and the effect of "domestication" of trees through genetics. The panel discussed briefly the role of surveys and detection systems and the intensity necessary under more intensive management.

Finally, there was discussion of the new role of the entomologist as a vital part of the enterprise, with objectives and goals identical to those of the manager of the enterprise, i.e., a healthy forest and business providing goods and services at minimum cost. The manager must learn to use the entomologist (and other specialists) effectively in achieving their common goals. The importance of good communication between manager and specialist in the early stages of this development was recognized.

PANEL: PUBLIC RELATIONS IN FOREST PROTECTION

Moderator: Benton Howard

Participants: Gerry Kelley, Terry Cornelius, Herb Willison, Brock Evans

Good morning, gentlemen. Many are concerned with our forest environment. As we all know, insects will have an enormous impact on the environment. As we discussed yesterday, there is a great need to communicate and this morning we are going to communicate. After the panel members have presented their

views, the session will be open. Please participate.

You are not the decision makers. You are the scientists. Your job is to evaluate, prognosticate, and recommend. The decision makers are the managers, the owners, the special interest groups, the public. These are your clients.

For the 21 years of Work Conferences you have been telling it your way but now your clients-- the manager, the owner, the environmentalist, the ecologist, the public, and yes, even if I may be a bit facetious "the little old lady in tennis shoes"-- is going to tell you how it's going to be. Your responsibility as scientists is to tell these clients the biological truths, the what, the where, the when, and the choices that are open, and the probable results that will follow each course of action that might be taken. But your clients will make the decisions as to the choice and the action taken, not you. In order for the decision to be made in harmony with the facts, your clients must understand you, your message must be received loud and clear. So our panel will tell you how you should tell them the facts. The language must be different for the different clients. The truth won't change but your presentations must. In this way better decisions can be made.

I have purposely selected people with divergent viewpoints, with diverse, and often conflicting interest. They are strong men with strong opinions and will defend them strongly. They are articulate and knowledgeable. These are your clients so listen closely and learn.

The first panel member or speaker, was Gerry Kelly. He was born in Palo Alto, California, attended school at Stanford, Oregon State and Yale. Has two degrees, one in Forestry and one in Theology. He is a Public Relations Officer on the Snoqualmie National Forest. He spoke on the viewpoints of the news media. (Gerry W. Kelly, Snoqualmie National Forest, 905 Second Avenue Building, Seattle, Washington 98104.)

Gerry stressed the need to know your news people. When it is essential to work with them, you must build trust and confidence. You need to go to them, learn the format of how they need the material, and their language. He stressed that at times, if you did request it, you would have an opportunity to review the article.

The next speaker was Terry Cornelius. Born in Vancouver, Washington, now a Junior at the University of Washington. He is in the Environmental Study Program. He is also President of the Committee on the Environmental Crisis. He terms himself as an ecoactivist. He is a big believer in taking action on ecological problems. He is highly political.

Terry suggested that for the student group, they prefer an informal session on a one-to-one basis, talking in small groups, and generally in the student's lingo and forget the "pro" or entomological jargon. He brought out quite forcefully that "youth" are vitally concerned and will "fight," literally, for what they believe in. But again, the speakers must come to them and talk to their interests. They are not interested in formal papers or formal presentations.

The third speaker was Herb Willison, a native Portlander. A graduate from

Oregon State University with a Masters from Yale and some school work at Duke. Has worked for the Forest Service and the State of Oregon. He has taught at Idaho and Oregon State University. He is a Silviculturist and handles insect and disease control problems for Crown Zellerbach Corporation where he is currently employed as a Forester. He represented industrial forestry. Herb's speech follows:

ENTOMOLOGICAL EMPATHY

(Participation in panel on "What kind of information do we need from the entomologist?" Western meeting of Forest Entomologists, Seattle, March 3, 1970, by C. H. Willison, Assistant Chief Forester, Crown Zellerbach Corporation, Northwest Timber Operations.)

The management of forest land, like that of raising agricultural crops, requires primarily an active, positive approach. However, there is a certain amount of protection associated with it; in other words, the prevention of certain undesired occurrences.

These occurrences are concerned with fire, disease, insects, animals, birds, even people. Fire, while an ever-present danger, has actually been delegated to second or third place among the protective functions of managing forest lands. Number one today, as the chairman has mentioned, is the damage done by insects.

If in fact insects are the major destructive force in the forest, I as a manager must learn better how to cope with it. What I need to know may be very similar to the needs of all of the users of forest products, as expressed by us who are members of this panel.

From the standpoint of the manager of forest land, there are three major types of insects with which we are concerned. These are classified by the type of damage: those which kill the tree by working in the cambium layer and girdling it, mostly the bark beetles; those which feed on the leaves or needles and thus weaken or kill the tree, exemplified by the budworms and loopers; and those which kill the tip of the tree, thus reducing its production of wood and its utility for mankind. These are typified by the weevils and the tip moth. The things I must know are: what insects to be wary of, how to identify them quickly, and determine when a dangerous epidemic situation is breeding, how to effectively prevent the epidemic developing and thus prevent the loss of wood or wood quality.

Before any research is undertaken to answer my needs, however, there must be some measure of the losses to be prevented by using the results of research and development. If the losses may be less than the cost, the research may not be justified. I would expect this criterion to apply also to other uses and

users of the forest, but I must limit my illustration to the timber growing.

On our timberlands we have been subject to losses inflicted by all three of the classes of insects mentioned. However, in our case by far the most serious has been the hemlock looper, one of the needle feeding insects. We can document five outbreaks of the hemlock looper in the Crown timberlands of the Coast Range of Oregon and Washington. The first one of record was in 1930. It amounted to less than 1,000 acres. This resulted in a total loss of the old-growth stand. The ground is now occupied by a dense type of 40-year-old hemlock.

The next outbreak started in 1943. The affected area was sprayed with an arsenic solution in 1945. The old-growth stand on approximately 10,000 acres was killed by the looper attack, but nearly 80% of it was salvaged by logging operations over the next five years.

The looper population again got out of hand near Neah Bay in 1947. This time its natural enemies took over and the looper population declined after about one year with loss of timber on about 1,000 acres. This was in a remote area and the loss was not discovered until two years later.

The next outbreak occurred east of Seaside in 1962. The thousand acres infected by the looper was successfully sprayed with a DDT solution in 1963.

The last one on record was in Pacific and Wahkiakum Counties which started to blow up in 1963. The 75,000 acres, of which less than 10% were on Crown, were successfully sprayed in 1964. Again about 80% of the stands killed by the hemlock looper were salvaged before the timber became unuseable. The successful control in 1945, 1963 and 1964 was the result of effective research, and development of control methods by forest entomologists. The unsalvaged loss over these five outbreaks amounts to the timber of 4,000 acres, which today would be valued at over $5,000,000. If we add to this the probable loss which would have been incurred if the other outbreaks could not have been salvaged, we have an estimate of $21,000,000 representing loss over 40 years. The total area affected was 18,000 acres, or 5% of our timberland. Control treatment then has covered only about 0.1% of the hemlock lands annually. Our ownership of 370,000 acres in the coastal area represents only a portion of the coastal hemlock type where the hemlock looper damage is most likely to occur. It is reasonable to assume that the loss in all the public and privately owned hemlock timber belt would be in proportion and would therefore amount to a much larger total loss.

With this much background on what one insects means, I can better establish the framework (listed below) of what I want

to know, and in what form it is most useable.

1. How much are we likely to lose from actions of an insect in volume and forest disturbance?

2. What will research to develop a control method cost?

3. What kind of control method may be developed?

4. How much are probable costs of control method?

5. Are there any potential problems from control method?

1. Basic to any evaluation of an insect's activities, beneficial or harmful, is an understanding of its life cycle. From that, with observation of gross action of damaging insects on a large scale, the manager can be furnished with an estimate of what damage, what loss, has been sustained in past outbreaks. This is known for some insects, not understood for others.

2. The damage that might be sustained should be measured in terms of the cost of the research itself. To use an exaggerated example, if the average annual loss caused by a bark beetle working in lodgepole pine is $500,000, and it would cost $300,000 per year for eight years to develop a control method, I would question the desirability of starting such a research project. It would not be in the public interest to invest public funds in such a project. Public funds come from all users of timber and recreation alike.

3. The control method may be by use of mechanical hand work, chemicals, parasites, diseases, or other means. The application may be by hand, by ground machine, by air. The control method really will be described in two steps. First, in comparison with previous developments, there can be a reasonably sound estimate of how the damaging insect may be kept in check. Second, after the research and development work is completed, there is an exact description in detail of what to do and when it must be done.

4. But the cost of applying the control method comes into focus here. This is different from the cost of research. The manager is interested in the control cost in two ways:

a. What will it cost me per acre or per tree to control? I can make some estimate of what I can afford to pay for control. For instance, a beetle may reduce growth per acre by 20 cubic feet per year because individual trees are killed. If that growth has a value of $0.15 per cubic foot, the loss is $3.00 per acre per year. If the control itself costs $40.00 per acre, I would hesitate to use it. If it cost $10.00 per acre, I would go ahead.

b. The other reason for interest in cost is to compare again with the potential damage and research cost. In the original illustration, the damage was $500,000 and the research cost $300,000. If the control costs would amount to $300,000 in the affected timber region, the project would be even less in the public interest.

5. The last concern is potential problems. Will the control add to fire hazard? Is there a chemical involved? If so, what is the disposition of that in soil, wildlife, water?

These are the kinds of information the timberland manager needs, and the form he needs it. The format may not be basically different from the needs for the recreationing public or for those concerned with aspects of environment other than the trees themselves.

When the researching entomologist fills my Christmas stocking with this batch of goodies it will be a Merry Christmas indeed.

The fourth speaker was Brock Evans, a noted Environmentalist. A native of Columbus, Ohio, attended Princeton University, graduated cum laude 1959; University of Michigan Law School, J.D. and LL.D., 1963; in military service, United States Marine Corps; 1963-1967, private practice of law in Seattle. Present occupation, is Northwest Representative of the Federation of Western Outdoor Clubs and of the Sierra Club. The Sierra Club, as you know, is a national conservation organization of approximately 100,000 members in 20 chapters across the Nation. The Federation of Western Outdoor Clubs comprises some 47 clubs in eight western States from Utah through Alaska. A total of over 100,000 members. Both organizations have a long history of deep and active involvement in conservation in the West and across the Nation. His other conservation positions are: Director, North Cascades Conservation Council; Founder and Director, Washington Environmental Council; past Chairman, Conservation Education Division of the Seattle Mountaineers.

Brock Evans emphasized the need to look at all the facts, the total environment, that it all must be considered. He outlined some of the positions of the Sierra Club, explaining that they were not opposed to logging per se but are definitely so in areas they feel have other values, and to them, higher values. These are specific areas, particularly de facto wildernesses, recreational areas, and the like. Again and again Evans pointed out, as did the preceding [redacted] must talk to your audience and with your audience.

Following the presentation by the four speakers, there was a very lively question and answer period amongst members of the panel and the audience. This was continued during the coffee hour after the panel was adjourned.

PANEL: MANAGEMENT DECISIONS IN THE PREVENTION AND SUPPRESSION OF INSECT PROBLEMS.

Moderator: Don Malmberg

Participants: Ken Trautman, Gary Blanchard, John Allen, Dick Holmes

INTRODUCTION

Thank you for that introduction. My father would be proud to hear it, my mother might even believe it.

Mr. Chairman, ladies and gentlemen. It is indeed a high honor for me to moderate this panel. Knowing these men and the work they represent adds up to the feeling of great pride in accomplishment. May I introduce them briefly to you now. Mr. Ken Trautman, Operations Manager, Port Blakely Mill Company, Olympia, Washington. Mr. Gary Blanchard, Forester, Starker Forests, Corvallis, Oregon. John Allen, Forest Manager, Bloedel Timberlands Development Incorporated, Bainbridge Island, Washington. Dick Holmes, Research Forester, Publishers Paper Company, Oregon City, Oregon.

Yes, this panel is made up entirely of men from industry. It was no accident, it was deliberate, but why? Why not a balanced panel from Federal, State and Private Agencies? The best answer is found by looking at your program. Other panels and workshop sessions have been hard at work since Monday and others will do their utmost following our presentation. The range of talent truly is well represented; therefore, we saw an opportunity to present the views of production-minded industrial representatives who are and have been deeply involved with intensive management practices in the young growth forests striving to achieve specific goals and objectives. Each panel member has his story to tell as it relates to the general theme assigned to us which was "Management Decisions in the Prevention and Suppression of Insect Problems"; the words "in the Young Forest" got lost in the printing somehow.

But first a little background on why this panel is here today. When Pete Orr invited me to do this job at the Insect Work Conference, I said No; I'm no expert on insects; you have the wrong man. Peter insisted, by saying we would like to have you moderate anyway even if you don't know what you're talking about. So we began. Began to assemble a panel of production-minded men from Industry all of whom hold the forest resources in high regard and are continually striving to improve their performance. When asked to serve on this panel, the answer was always the same. The experts are in the audience, what do you want me for up on that Speakers' Platform? Isn't this going to be another case of a few men speaking with a great deal of authority on a subject we know very little about? The challenge was worth a try, so here goes. What happens now is a bit unpredictable, let's see what happens.

Our first speaker is Ken Trautman. Ken graduated from Washington State University in Forestry in 1955. He has managed a tree farm second to none where thinning of young Douglas fir is concerned.

The title of Ken's paper is: "The Woodlands Managers' Concern about Control of Damage by Insects." Ladies and gentlemen, Mr. Trautman.

"The Woodlands Managers Concern about Control of Damage by Insects"

Ken Trautman

Operations Manager,
Port Blakely Mill Co., Olympia, Washington

When Don Malmberg first asked me to be on this panel to discuss the insect problems in young forests, I asked myself, "Do we really have a problem?" "What is the dollar loss if any?" If asked to contribute money to insect research, would we and what kind would we support? Or would I advise the officials of our company that the best solution presently is our intensive management of young stands?

I can't answer these questions for other landowners and their specific problems, but I can answer for the tree farms which we manage throughout Washington, Oregon, and Idaho. And the answer is: We do not have a serious insect problem in our working forests. I then thought I just can't make a statement we don't have a serious beetle problem and sit down, so I would like to relate to you the main reason we don't have a serious problem and that is --- We manage the heck out of our young stands. I don't mean by this that all you have to do is build some roads, get a logger, do some thinning or salvage and the beetles go away. Anyone that thinks this hasn't been in the woods lately. We made this very mistake in our early projections as to when to make repeat thinnings. At first, it was felt that once we thinned a stand and had the trees infected with beetles and fungi-beetle combinations removed that we could sort of close the chapter on this stand for ten years, then we changed it to a five-year interval: now we still hold to the five-year schedule but with a constant watch for and the immediate removal of these mortality combinations.

Let me briefly tell you a little about the company that employs me. The Port Blakely Mill Company is an old Washington corporation formed just over a hundred years ago. The original O.G. stands were railroad logged to the salt water and transported by water to a company mill just across the sound from Seattle on Bainbridge Island. After the mill burned, the Company got out of the manufacturing business and to this day they have been strictly in the land and timber management game. Basically the stands in which we are working today are a result of this O.G. logging and/or fires occurring around 1900.

One of the Founders of the Company, James G. Eddy, started the Placerville Research Center in California in the 1930's to pioneer work in the field of forest genetics. It was through this man and his nephew Garrett Eddy, now president of this company, that the Port Blakely Mill Company made the decision in 1948 to begin an intensive management program of these young stands.

The decision of this company in 1948 to initiate a management program and

to take the lead in commercial thinning of young stands, ages 45-55 years old was an important one. To me this decision was almost as significant as the starting of a genetics program in the 30's.

I hope some of you are not saying to yourselves, O.K. so you got a thinning program going; So what! What has this got to do with beetles? We are convinced that the decision to begin these commercial thinnings and to commit this company to an investment of hundreds of thousands of dollars in roads was a paramount one in checking beetle infestations, in recovering dollar losses from beetle kill and other forms of mortality and increase the yield of our young stands.

While I am on the subject of roads and access and mentioning the committment to this type of an investment I would like to mention specifically our John W. Eddy Tree Farm in the Grays Harbor Mason County area with headquarters in McCleary, Wash. This tree farm, before 1948 had no company logging roads. There were, of course, the old railroad grades. The bulk of this 30,000 plus acre tree farm was primarily unmanaged, even-aged stands of Douglas fir. These unmanaged stands, even though they were on good site and very vigorous in growth were not without mortality from beetles, fungi, blodown, etc. Since 1948, we have constructed or re-constructed over 200 miles of road on this tree farm and have thinned, on an average, over these years 1000 - 1500 acres every year.

Over the years, starting with 1948, the company has established many (7 to be exact) growth study plots. These have been in various age classes ranging from 25 to 50 years when set up for their first thinning. These generally are 10 acres of thinned and ten acres of control. Growth studies are made from measurements taken annually. Several of the plots are gridded for fungi and beetle studies. Under our present marking system, we have never had a serious build-up of beetle population in the slash. We even put in a plot to over cut, taking in the neighborhood of 44% of the original stand and here we had no beetle build-up which moved into the residual trees.

It was from the information gathered from our growth plots relating 5 - to 10 year intervals that we decided on the 5-year intervals. But we have found that even with our thinnings at 5-year intervals that it is necessary to do salvage work at times between thinnings to keep current with mortality. This mortality is from a fungi-beetle combination rather than beetles building up and taking a healthy crown tree. We find that when we are able to keep current with our mortality we realize little or no dollar loss and we eliminate the possibility of beetle build-up.

To facilitate this between thinnings salvage operation we needed a small contractor who was efficient and could be trusted to be on his own with limited supervision to roam throughout our road systems and stands to cut and remove dying, dead and down trees. We found such an operator but his self-loading truck was home-made as was most of his equipment and left much to be desired. To increase the efficiency of this type of operation, I made a trip to the Minnesota-Wisconsin country and our company purchased one of the first hydraulically operated self-loading trucks for this contractor. This proved to be very beneficial for both the contractor and our company until the contractor got it all paid for -- saw greener pastures, and left

us. We are again looking for another operator with an old home-made truck.

In my years with this company I can't recall ever constructing a road just to combat a beetle infestation. However, management decisions were made to construct roads into undeveloped stands because of a combination of insects, root fungi, blo-down, bear damage and other natural mortality. I can't emphasize enough the importance of access roads and the small operator in recovering this yield before it becomes a dollar loss. This point was brought home so clearly to us that we had roads into our stands after the 1962 blo.

I have been talking about Douglas-fir stands where, if you have a tree infected with beetles and it dies, one has a period of years to salvage this tree and recover the dollar. I would like to mention just briefly our John Day Oregon Pine Tree Farm. This tree farm is completely roaded now and I would like to point out how much more important the roads are in recovering dollars lost in pine stands versus Douglas fir. We use the same policy here, sanitation cuts every five years, with a small operator keeping current with beetle kill trees. The important thing here is, that if a tree dies from beetles you have less than a year to get that tree out and recover in the neighborhood of $50.00/M stumpage. But, if it stays longer than one year it is scaled as dead pine and the stumpage drops to about $2.00/M. It is our general observation in this area that the beetle population is on the rise and we are finding many trees unable to pitch out the attacks as before. So, consequently, our salvage operations are all the more important on this tree farm.

In general, our insect problems in our young Douglas-fir and pine stands have not been serious. I have several slides showing insect build-up of ips, and a scale insect in our young pine stands. But, although they appear serious and the defoliation is quite severe, they have never reached an epidemic stage. So with our young non-merch stands holding their own against these severe attacks, our management decisions towards the insect problem have been those geared to recovering the potential dollar loss from mortality in our merchantable stands.

I believe that in the control of insects, we in the forest industry, have tremendous research capabilities and we may soon have to call upon them with the use of DDT coming under severe scrutiny and criticism. I feel that the researcher and the forest manager or administrator should work together to maximize the total productivity or yield and this can only be achieved by minimizing or at least regulating the dollar loss from mortality.

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Now let's change the scene to the State of Oregon and call on a man who also is moving up fast in his profession. Our next speaker is Gary Blanchard. Gary graduated from Oregon State University in 1961 and went to work on the Starker Forests. As he enters the 10th year of his fine career, he has learned there is more to his job than pushing men, methods and machines into a profitable combination of achieving economic goals. People and talking with and to people now demands much of his

time. Last week Gary presented a splendid paper to the Oregon Logging Conference in Eugene. He is here today to present his views on the subject, "Is Salvage our Best Control?" Ladies and gentlemen, Mr. Blanchard.

"Is Salvage our Best Control"

Gary Blanchard
Starker Forests, Corvallis, Oregon

The scope of my talk today will generally be limited to my observations in the coast range of Oregon. The family organization I work for owns about 55 thousand acres of second-growth and cut-over timberland scattered over Northwest Oregon. We are primarily a tree farming enterprise and as such place at least as much emphasis on growing trees as harvesting them.

We regard ourselves as intensive land managers. We have developed thinning schedules with 3- to 5-year intervals, are deeply involved in brushfield reclamation, genetic improvement, and other methods of attaining maximum returns on timberland investments.

We have no old growth to manage, but at times wish we could help our neighbors manage theirs. Our lands are intermingled with those managed by the U. S. Forest Service, The Bureau of Land Management, the Oregon State Forestry Department, other timber companies and many small individuals. Much of this land adjacent to ours receives little if any maintenance and is thus prime habitat for insects and disease. It seems logical to assume that in areas where endemic populations are high, epidemic populations can be reached more quickly. In our case, we are confident that our losses due to the Douglas-fir bark beetle and possibly other insects would be greatly reduced if our federal neighbors had a more expeditious salvage policy. We are fortunate to have good access to most of our property by old road systems and by their proximity to state and county roads, so we are usually able to salvage all types of mortality quite easily. For example; by the fall of 1964 we had salvaged nearly 100% of our trees damaged by the wind in October of 1962.

During the last few years, new logging equipment and changing utilization standards have enabled us to begin commercially working stands as young as 25 years and it appears this trend will continue. Since much of our land supports stands in these younger age groups, we are very concerned about factors which will adversely affect them. Many people feel that the well-managed second-growth Douglas-fir forest will have very few serious insect problems and in general we have little evidence to dispute this. However, we are nervous about several things.

Apparently the Douglas-fir pitch moth has been a rather insignificant tree killer in the past, but possibly because few people were concerned about young stands in the past and that is where this particular moth seems to be most prevalent. It usually enters through wounds in young trees and with intensive management will come more wounds in young trees. We have concluded from our observations over recent years that by the time the pitch

moth's activity becomes noticeable, the host tree will be so weakened that it won't recover. Our concern over this insect is more than casual because it is present in small numbers in nearly all of our young stands.

The common tent caterpillar is another potential problem. Occasionally it poses a threat to good stands of alder and fir associated with the alder, but little concern is expressed unless a few tents appear on someone's apple trees. It is my understanding that there are controls available for this insect, but they are expensive so the common attitudes are, "What the heck, we have too much alder anyway" or "Give it a year or two, it will run its course". Can we afford this attitude in the face of a shrinking land base, higher taxes, and the demand for more wood?

In the spring of 1968 we had a contractor grooming a piece of cut-over land near Corvallis. He had done this type of work for us for several years so we gave him the prescription for this particular area, showed him the boundaries, and turned him loose. A week or so later he called me and said there were some nice trees on the area with thin tops and yellowing foliage, and wondered if he should cut them. I told him to use his judgement and thought little more about it until I paid him a visit. He had practically clear-cut a beautiful little pole patch. At first my confidence in him was shaken, but upon closer inspection I agreed that the trees were definitely on the way out and should have been cut. The tops of all of the sick trees were perforated with little holes much as the Douglas-fir bark beetle might do. The Forest Entomologists at Oregon State University identified the insect as Pseudohylesinus nebulosis. When asked what to do about them, they said we should remove the infested trees, tops and all. We did remove the logs, but by the time we got around to disposing of the tops, the beetles had moved out. Where had they come from? How much damage were they doing? Where did they go? How could we have prevented their attack? Nobody seemed to know.

The oak looper is another insect affecting us in much the same way as the tent caterpillar. Occasionally the loopers will eat all the oak leaves around and then start on the fir, but before they completely kill the fir, the population will dwindle back to endemic proportions. What conditions would have to exist before these or other insects would do damage on the scale of past spruce budworm or hemlock looper epidemics? Wouldn't it be better to detect population buildups and exercise possible control early rather than to wait and fight epidemics?

We would like to maintain approximately 10 per cent of our growing stock as grand fir, hemlock, Western red cedar, Sitka spruce, or other desirable species and have these well distributed throughout our Douglas-fir stands. In theory this is a "don't put all your eggs in one basket" technique, but in practice it isn't working too well. Grand fir is attacked by aphids and pitch moths, cedar by an insect that bores little holes in the heartwood, and Sitka spruce can't even get out of the reproduction stage because of the weevil. In our area Western hemlock seems to be our best choice for a second species, but either disease or insects could change this rapidly.

Now comes the big question: WHO WILL SUPPORT THE KIND OF STUDY NECESSARY TO FIND PRACTICAL SOLUTIONS?

We have all seen many broad surveys on forest mortality and lost growth but most of them are more useful as items of general interest than as tools for forest managers. Aerial surveys are expensive, frequently out of date by the time they are published, and report insect damage which may or may not be an index of insect population. But, even with their shortcomings, aerial surveys are providing valuable information for some areas that would be hard to obtain any other way.

A cheaper and probably more functional type of information, but perhaps harder to obtain is from the thousands of well-trained people in our region's forests who have never made an insect report. We are currently trying to convince our local forest protection association that they could perform a valuable additional service to our area at little extra cost by training all of their personnel to recognize other potential forest hazards as well as fire. If everyone in the woods would concentrate on becoming more aware of what is going on around them, many more problems could be solved while still in their infancy. We definitely need specialists to focus their interests on narrow disciplines, but they should be getting more help from the vast reservoir of dormant talent that is working on the ground every day.

Starker Forests would support efforts aimed at improving professional and public awareness of all tree farming problems but probably any further financial support would have to be on an investment basis. Money for any purpose is hard to get, but a good sales pitch can be pretty effective. The family I work for is, I am sure, as hard to squeeze a dollar out of as any employer represented here; but, two years ago we were approached about joining a cooperative effort aimed at improving the genetic quality of our forest planting stock. Our cost was to vary according to our degree of involvement, but the minimum investment would be several thousand dollars. Our decision to go ahead was not without a great deal of consideration, but as outlined by its designers, the program will certainly return us much more than it will cost. In other words, we are convinced it will be a good investment.

Just to say that X million board feet are dying annually on X number of acres due to insects may not be a very convincing approach for gaining support to fight those insects. But if we could go to our legislators or boards of directors and by using reports from all of our people in the field show them actual or even potential dollar losses on specific properties and then couple this with a good program aimed at preventing the recurrence of the problem, we should at least interest the business oriented people and they seem to be the ones who say yes or no.

Regardless of how you go about selling the program it will be necessary to have up-to-date information on population trends and you as researchers are missing a good bet if you don't make more use of us in the woods.

In summary:

We would like to see more attention given to all of the unmaintained forests

in our region, particularly those of our neighbors.

We are apprehensive about the future roll of insects in well-managed Douglas fir. Hopefully this concern will prove to be unwarranted, but while we are waiting to see, we would like to be increasing our knowledge of our total environment.

We question the value of further extensive, expensive damage surveys and would rather see future information collected on a monitoring approach aimed at heading off mortality problems so they never become logging problems. This system should involve many more people and result in much more useful information.

Insects rate as one of the primary causes of forest mortality, yet the most common control seems to be salvage and this is often too late. If in fact salvage is the most effective control measure, then the whole industry should "get with it". If salvage is not the answer, then let's design some programs with favorable COST/BENEFIT ratios and put them to work.

Our panel is half way home. Ken and Gary can relax as the tempo increases with our next speaker. John Allen graduated twice from the University of Washington, the first time in 1947. Then he won his Masters Degree in 1949. His experience includes many professional achievements on the job, in the Society of American Foresters and now is hard at work as the Chairman of the Research Advisory Council for the Washington Forest Protection Association. The goals are aimed largely at insects and diseases. We are pleased to have John Allen give us his views on the critical subject, "What type of insect research would we support". Mr. Allen.

"What Type of Insect Research Would We Support?"

John Allen, Forest Mgr.
Bloedel Timberlands Dev. Inc.

We are a small timber company with holdings, mostly second-growth, in Whatcom, Skagit and Clallam Counties, Washington. The tree species on our lands are: Douglas fir 47%, hemlock 29%, hardwoods 12%, cedars 8%, true firs 2% and Sitka spruce 2%.

We are just completing an inventory of our timber and find that our largest non-fire losses in timber volume are caused by: Suppression in densely stocked stands, bark stripping and girdling by bears, root rot, blow-down, ice storm damage and perhaps summer and winter moisture stress. The damaged or weakened trees are attacked by boring insects, but with the easy accessibility of most of our lands and highly mobile logging equipment, we do salvage most of the dead and down trees before insects make them a total loss.

The following insect activities were noted on second-growth trees, but were not considered a threat to our main timber crop: Weeveling of Sitka spruce, bud damage to silver fir, caterpillars on hardwood and some conifers, bark miners on Douglas fir and ant workings in red cedar.

Our reproduction survey lists heavy browsing damage from deer, mountain beaver and rabbit, minor losses to porcupine and beaver, and no losses to insects.

We might conclude that insects are not a serious problem to our timber and reproduction. However, compilations of timber data are not designed to single out and measure forest insect losses. We know that many of the cedar poles that were tallied as 100% sound will when felled be swarming with small black ants. Between their honey-combing and the initial butt-rot some of the poles will be a total loss. The reproduction survey indicates some poorly stocked Douglas-fir plantations, but does not reveal that the seedlings were shipped from a white grub infested nursery and arrived at the planting site with most of the roots eaten back to stubs.

Our survey does not sample the seed beds and transplant beds at our Company nursery. It is quite obvious that here, with browsing animals fenced out insects are a serious problem. We are providing a free lunch for beetle grubs, root weevils, aphids and caterpillars. Annually they consume thousands of seedlings.

Also not listed in our survey are the threats to our forests from insect buildups beyond our boundaries. We are aware of these and they do influence our management decisions. Concern about the woolly aphid has prompted us to harvest silver fir in a ten-year rotation for Christmas trees and to replant several areas to noble fir. The threat to white pine from several insects has caused us to proceed very cautiously with our program of planting blister rust resistant white pine.

Concern over possible insect attacks and also our complete lack of knowledge of the impact of soil organisms and numerous other unnoticed insect losses over the life span of a stand of timber has convinced us that there is a need for long-time data gathering on insect populations, for fundamental insect research, for detailed studies over rotation ages; but we do not believe that our small timber company can become involved in such research programs. We cannot guarantee the continuity of financial support needed; we cannot ride herd on the program. Several years from now our management may have critical problems of other types and have to terminate all commitments to long time research. Therefore we are shooting for short term goals, trying to solve our present day problems, and leaving it to larger organizations to promote long range research.

Specific insect research that we are interested in is as follows:

Nursery insect control without soil fumigation or repeated applications of insecticides.

The timing of fertilizer applications to our forests, which

we are told should be tied to the greatest activity period of soil bacteria. This probably requires studies of the role of all soil organisms to the availability of nutrients to trees.

Insect resistant trees - after geneticists develop resistant clones we would be willing to establish seed orchards and clonal banks of promising specimens.

Practical insect controls - developing viruses, sex attractants or other techniques into useful tools.

Basically we are interested in applied research, rather than fundamental research, and all proposals are considered from this viewpoint.

When a research proposal does interest us we look for several requirements as a necessity for our participation:

1. That it is well conceived by qualified personnel who will have ample time to work on it.

2. That it has a realistic time schedule that should bring the program to a conclusion in not over five years, preferably sooner.

3. The percentage taken for overhead is reasonable.

4. That our continuing financial participation is on a voluntary basis and if a cooperative venture that it is not too costly for us.

5. That there will be progress reports on both the research work and the expenditure of funds. We do not want to burden the researcher with detailed accounting, but we do want to know what is being done.

6. The project will not be considered complete until there is a concise report provided to the participants and there is prompt publication of the results.

Finally, when we do provide financial support, it is usually done in cooperation with other members of the Washington Forest Protection Association, or by contribution to university programs.

Our final speaker is Dick Holmes, who graduated from Oregon State University in 1961. After gaining valuable experience working for the Oregon State Board of Forestry, Dick moved into the job of Research Forester for Publishers Paper Company based in Oregon City, Oregon. Being in the research business, Dick was concerned about being accurate and careful in preparing his remarks for presentation here this morning. Knowing the production men he works with in his company it is little wonder he is under pressure to come up with answers they can use in getting the job done. Of the many choices available, Dick has selected to speak on the subject "Insect Impact on the Working Forest." Ladies and gentlemen our final speaker, Mr. Holmes.

"Insect Impact on the Working Forest"

Richard W. Holmes
Publishers Paper Co., Oregon City, Oregon

I was impressed when Don asked me to participate in his panel at your conference this morning. I took my assignment rather seriously and started gathering information that might be valuable in describing insect problems in the working forest. I had occasion to ask a couple of logging contractors just what they thought about the insect situation they've experienced during their careers. One thought a minute or two, took a fresh chew of snoose, and declared: "The only good bug's a dead bug," and that was that. The other operator was working in the Bull Run Watershed when I asked him about insects. He looked around at the vast expanse of over-mature, old-growth and said: He was sure glad there were so many insects around because if there weren't the agency responsible for the management of this land probably never would log it and he'd be out of a job. I believe the key here is over-mature timber; contrast this to the second-growth of young-growth forests we are turning toward today. These are really working forests, where a year's production of wood isn't wiped out by decay and insect damage.

In the distant past I can remember a silvilculture professor exhorting his class to stop and think a minute about young Douglas fir and western hemlock forests. Here we have a situation that should be ideal for destructive agents -- (disease and/or insects) -- vast expanses of single-species, even-age stands. If anything ever got started in here, it wouldn't stop until everything was wiped out. But for some reason or another, these stands are nearly unique in their resistance to any one of a number of destructive agents to disrupt good, efficient management. This is what the silviculture professor was trying to impress on his class. It didn't really dawn on me until about five years later. I asked myself the same question: Are there any insects or diseases that really raise constant trouble for young-growth stands of Douglas fir and hemlock in Western Oregon and Washington? To be sure, there are isolated outbreaks and trouble spots; you might be able to name a dozen insect threats, but in practice there are no serious insect pests. Maybe it isn't the natural resistance of the species; maybe we foresters with the help of forest entomologists are taking better care of our young-growth forests before insect problems arise.

There is a good article by Mr. William Waters in the February edition of the Journal of Forestry that effectively states the case for forest entomology and how insect research is paying off. The paper was also presented at the annual meeting of the Society of American Foresters. I thought it was a good summary of the results of past insect work on forest management today, and how entomologists along with forest land managers must get ready for the job ahead.

Because of harvesting practices in the 1920's and 1930's most land-owning companies are now in the rather favorable position -- at least I consider it favorable -- of being able to manage the vast expanses of young growth timber I mentioned earlier. These stands are truly remarkable -- they are dynamic in every sense of the word, the process of change is condensed many

times, and revisits to permanent growth plots at five-year intervals are amazing.

Any agency or company responsible for such stands must make the forest work efficiently, often for different objectives and using different methods.

The processes are generally parallel and the working forest is the result. As with any large operation, decisions are made from top levels on down. In most cases, alternatives and influences are discussed and weighed prior to deciding on a course of action.

Specifically, and as an example, one subject often discussed in our area is the spruce tip weevil. Publishers Paper Co. is taking a long look at its Sitka spruce plantation program after continuous attacks by this insect. This review brought out an interesting fact: In one particular large tract, only 40% of the areas planted to spruce in the last 14 years are now considered spruce stands. The majority of these lands have converted to western hemlock -- then why plant spruce when the species is subject to weevil attack and the area will eventually convert itself to hemlock? Now we get to the discussion part of a decision: These areas were considered Sitka spruce sites -- lowland areas, deep soil, sometimes high site, sometimes wet, within one to three miles of the ocean. Some advance the theory that if not promptly planted after logging or rehabilitation, brush will invade and there will be a serious delay in establishing the new crop.

Sitka spruce, being a rather hardy tree, is able to withstand the brush competition, and occupy the site until hemlock is able to get started, thus serving as a nurse crop. If this is the purpose of planting Sitka spruce, does it follow that we be concerned about subsequent insect attack? Yes, for spruce is a valuable, fast growing species.

Unfortunately weevil attacks continue into 20- to 40-year-old stands, seriously slowing the growth and deforming the spruce, now approaching merchantability. Here we start becoming concerned; now we can measure the cost of damage directly in dollars, but our lesson is already learned: Insect damage has influenced the decision to plant spruce only where necessary as a so-called nurse crop, salvage what merchantable spruce we have now, and concentrate our efforts on those species -- Douglas fir and hemlock -- that are less susceptible to insect loss. Fortunately, we have good alternatives in this case; hemlock will occupy many of the same sites as does spruce.

With respect to those primarily engaged in managing young-growth forests, I believe insect problems do not influence management decisions as much as the other way around: management decisions influence insect problems. The policy is set forth: maximize production in all phases of forest land management -- not just timber -- take advantage of all resources available;

decisions are built around this policy: harvest of the timber crop at the point where the stand ceases to grow at an increasing rate; prompt reforestation with vigorous planting stock of a suitable seed source -- in many cases genetically proven superior. Pre-commercial thinnings, where necessary, to achieve maximum growth, then the start of a series of merchantable thinnings designed to favor the best growing trees in the forest. The result is a vigorous stand which you still tell me is least subject to insect attack.

I don't mean to lull myself or anyone else into a state of false security. The silviculture professor's words come to mind every once in a while: If anything ever got started, it wouldn't stop until everything was wiped out.

My advice to foresters working in young-growth timber is: Beware of any insect or disease situation that could conceivably flare into a situation out of hand -- whether it is something familiar looking or not. As far as I see it entomologists are a step ahead in Western Oregon and Washington young-growth forests, for their job, along with foresters, is one of prevention rather than suppression of an existing problem.

Perhaps in the past insects have only become part of a management program when they've been a problem. Recently, however, especially as we move toward forest land management instead of timber management, foresters must consider the total picture and perhaps look at it from a new perspective. As we establish policy and make decisions, we must take into account all influences from water temperature to plantation survival, from economic return to environmental quality. An important part of this high degree of administration will be regulation of insect problems and losses by management objectives as much as possible.

Here is where entomologists will step forward with their contribution to the establishment of these objectives, with important consideration given to the effects their recommendations will have on all forest resources.

SUMMARY

Thank you panel members for taking the time to prepare and present your message in person. Now let's summarize.

The cost of hiring a professional man in entomology is beyond the reach of most small to medium sized outfits today. When such a man is added to an existing staff including facilities and overhead, the cost ranges from $25,000 to $40,000 per year. In ten years the cash out of pocket ranges from ¼ to nearly ½ million dollars, and that is without adding a technician or two to help get the job done. Therefore, the cooperative approach to get a technical job done in industry is a pretty good next best choice. But here

then are lessons we have already learned. To support a graduate student or two needs to be discussed, or to call on the professional services of a fine professor is another topic deserving some clarification. We need to contract with a position on a faculty, not with students or professors by name. We do not feel a transfer, a sabbatical or some other leave of absence is a good enough excuse as to why we failed to receive a technical report on time. Sometimes the student does not finish his thesis and graduate precisely on shedule; I know, it took me 2 or 3 times as long to do so as the smart ones. A pretty copy of a bound and certified PhD. dissertation is nice to have but not a must. A brief technical report of the findings is necessary and can be furnished on time. Such a report gives the what, why, how and findings of the task at hand, without the sophisticated format rightfully demanded by splendid universities. Furthermore, some schedule of planned work to be achieved can be provided in advance of approving the project so we can monitor progress being made at least quarterly to see if we are 25, 50 or perhaps even 75% of the way home. We can then see the need to reinforce the job to be done. In industry, we call this method of getting a job done "Management by Objectives". Why can't we tighten up our research programs and proceed on clearly defined goals with techniques based on measured evidence both in terms of time and money and call this system, "Research by Objectives", why not?

Here are a few slides from business to illustrate what we mean. Our topic is now on firm ground. At last we are on a subject we know something about. We suggest the word "research" can be substituted in the slides wherever the word management appears.

We recognize the serious loss of wood supplies due to insects. We also feel the sting of society when chemicals are used carelessly to control insects in some areas. As we move into the seventies, we urge the use of biological methods, not chemical ones, to control the harmful insects. To this end we see chances for success and with the support of society.

Mr. Chairman. The panel members join me in saying thanks to you and the Program Committee for inviting us to appear at your Conference. Our presentation has ended. Thank you for your attention.

PANEL: ARE WE PROVIDING USEFUL ACADEMIC AND TECHNICAL TRAINING FOR FOREST ENTOMOLOGISTS

Moderator: Bill Nagel

Participants: Bill Waters, Royce Cox, Ron Stark, Don Hopkins

R. W. Stark:

The question posed to this panel was: Are we providing useful academic and technical training for Forest Entomologists? Also, our moderator has asked me to speak for a few minutes about existing and future needs and how the University is to meet these needs.

If my answer to the question was YES, then existing and future needs would consist of money, facilities and students in that order. However, I have chosen to answer NO to the question. Now, I could stop here and make myself popular as the shortest-winded speaker on this panel, but having been designated as a forest entomologist for 11 years and as a Professor of Forest Entomology for 11 more years, my answer requires some elaboration.

Back in 1952, S. A. Graham posed the question: Forest Entomologist-Forester or Entomologist? That question still bedevils academic circles today as witnessed by the varying curricula. The previous speaker underscored this in their melange of attributes a Forest Entomologist should have. Sam described the 10 educational requirements of forest entomology which essentially combined the training of the forester and an entomologist. I do not think either training or a watered-down combination of both fulfills the requirements of a "Forest Entomologist" as I now visualize him.

To elaborate, I feel we have largely outgrown the need for the forest entomologist as we know him. We still need foresters knowledgeable about the insect world and their potential impact on the forest ecosystem and we still need entomologists to study insects in the forest ecosystem. In the training of both of these, I feel we are not doing an adequate job in training them as ecologists. We have overspecialized. The forester, in general, studies "forest ecology" and ignores the interactions of invertebrates, vertebrates and plant pathogens within the forest ecosystems. The entomologists study insect ecology, largely ignoring the forest ecosystem, and the interactions of the other invertebrates, vertebrates and plant pathogens.

This generalization is true regardless of academic level. The man who comes closest to the definition of a "forest entomologist" that I will eventually define is educated through two routes. He has a Bachelors degree in forestry and holds a graduate degree or degrees in Entomology or he has an undergraduate degree in biology, majoring in Entomology with advanced degrees in Forestry. However, even such well-rounded men suffer educational deficiencies.

Even this limited ideal has been circumvented in academia and largely ignored by the hiring agencies. We thus have foresters with little or poor ecological and entomological training who through indiscriminate hiring practices and the seniority system end up in positions where they make control decisions with no understanding of the ecological ramifications. Or, we have entomologists hired for their specialization in the hopes that they will provide a biological panacea, who rise again as a result of the seniority system or their page productivity who criticize and attack the former without any appreciation of the realities of forest management problems.

In my opinion, we must abandon the simplistic specialized approach to forest entomology where the needs of forest or resource protection are to be met. I believe we should restrict the term forest entomologist to entomologists working on forest insect problems and think in terms of a <u>resource protection manager</u>. This is an individual who must weigh <u>all</u> the factors posed by a real or apparent insect problem to reach a decision on treatment and prescribe that treatment. Most Universities and Colleges are <u>not</u> currently training such men.

The potential ramifications of control decisions in the forest ecosystem

are too great for decisions to be made by ill-trained foresters or entomologists. The complexities of insect population fluctuations and spread are too great for treatment decisions to be made from a single-specialty approach. What is needed now for intelligent protection of our forest resources-- all of them, not just fibre, is a broadly trained resource protection manager.

This leads to our educational needs to train such people and frankly, my thoughts on how this training is to be accomplished lie somewhere between the mixture of ingredients and the oven, some are in the mixing bowl, others still cooking.

The one certainty is that the resource protection manager must be a broadly trained ecologist. He must be an individual who has the ability to consider all variables simultaneously; is sensitive to feedback from ongoing related research, application results and environmental or social reaction, whatever the source; is capable of assessing strategies for the deployment of time and resources; and is able to perceive the relevance of one fact to another and of hypotheses to fact. Most of these attributes cannot be imparted through training but they can be encouraged by academia and recognized by the hiring agencies.

In general, I feel we must get away from "nitty-gritty" courses at the graduate level and concentrate more on the interdisciplinary, conceptual aspects of resource management. In education, we have been preoccupied with our own specialties to the detriment of the education of men capable of making intelligent, ecologically based, protection decisions. We have been aided and abetted in this by hiring agencies.

Over the past 200 years or so foresters and others have been engaged in a positive feedback system with the forest environment in which ever higher use levels encourage economic and technological growth at an over-increasing expense to the diversity, complexity and stability of the whole forest ecosystem. As with any other positive feedback system, this one will self-destruct if it continues long enough.

Outer space travel has popularized what ecologists and many others have recognized for several decades-- that the earth is a single, unified, living ecosystem of incredibly complex inter-relationships among its living and physical components and that what affects one part may have remote ramifications elsewhere in the system. At the same time, there is also a growing individual concern with forest environmental problems such as smog, DDT, excessive use of chemical fertilizers and urbanization.

The development of an ecosystem science of man and the total environment will require the faith that it is possible to deal scientifically with man, the consumer and the ecosystem as a whole. Research and education must be directed towards those structural characteristics and functional processes that are unique at the ecosystem level, including such matters as the psychology of decision-making processes that determine our socio-economic system, the potentialities of unilateral actions, interdisciplinary

regional forest ecosystem conferences and similar matters that affect the forest ecosystem. The involvement of man as part of the system, rather than as a phenomenon which transcends the system, is of basic importance. A foundation of knowledge about the forest ecosystem and its sub-systems is fundamental to the ultimate achievement of protection and continuation of the forest resource.

It is the function of the educational institutions to impart this knowledge, where available, to the resource managers of the future, and to assist governmental research agencies in gaining the knowledge where it is not available.

This development of the ecosystem approach to education and research is the greatest need in education today.

Don R. Hopkins:

Our panel chairman has asked that I discuss the question, "Are we providing useful academic and technical training for forest entomologists?" from the point of view of state organizations. He suggested that I consider this in the light of responsibilities in forest management--both now and in the future.

Since I am appearing on the frass end of the panel, in all likelihood my offerings will have been previously chewed and thoroughly digested before I have had an opportunity to present them to you. Hopefully, there will be advantages to strengthening previous statements through repetition and possibly offering some additional, but not original data in my comments. To better cope with this topic in the area of state organizations, we need first to look at the types of employment that might be available. You are aware, I'm sure, that not all states have comparable responsibilities for insect program solutions. Following are some categories of state activities that might be encountered:

1. Extension Service work--one might be employed full time in Extension type activities where the State Forestry organization has little or no direct land management or insect control responsibilities.
2. A State Forestry organization with major forest land ownership responsibilities.
3. A State Forestry organization with state and private forest land management responsibilities including forest insect control.
4. A state with state-owned forest land, but without direct responsibilities for insect control on private lands.
5. An individual employed by a state who has research responsibilities only.

This latter situation may occur where a state employs more than one entomologist.

To narrow the scope of my comments I am going to assume that the following qualifications apply to an entomologist employed by a state agency managing substantial areas of forest land, with responsibilities for insect control

on both state and private properties, and extension type assignments, a logical area of responsibility for me to review since it represents the situation in the State of Washington.

Areas of competence for this discussion are divided into three primary categories--technical, administrative and public relations.

Under technical aspects the entomologist must have a basic knowledge of forest insects. He must know survey techniques and be able to make surveys employing both ground and aerial observations. An understanding of current insect control methods is essential. He must have research capabilities for individual problem investigation on an applied basis and for cooperation with others such as U. S. Forest Service or University specialists in basic research efforts. He must be able to evaluate insect impacts on growth and yield. He must possess the ability to relate insect damage--existing and potential--to management operations and be able to submit recommendations to the timber manager that will prevent insect destruction by avoiding epidemic population buildup, as well as harvesting schedules that will result in salvage of insect-damaged timber before the losses are excessive. Knowledge of aerial photography techniques useful for entomological purposes is imperative as is an understanding of insect population dynamics. If an individual is capable in the above-mentioned categories and still lacks the ability to effectively report his observations and recommendations orally and in writing, then he will essentially have failed in all of them.

In the area of administration the individual must have supervisory ability. This may involve direction of only one assistant or it may mean the organizing and direction of control efforts involving a number of people and numerous pieces of equipment and many supply items. He must understand budget preparation and cost reporting. The ability to develop research proposals, to recommend priorities, and to complete assignements in time to accomplish objectives of the employing organization is obviously essential. He must have knowledge of computer operations and machine applicability to the problems with which he is confronted. An understanding of instructional techniques and their application in training people directly under his supervision, as well as orientation of forest managers in the field of insect problems, is necessary.

Public relations capabilities include extension type accomplishments. Procedures for working effectively with people individually, as well as collectively must be understood and applied. This is necessary when working with individuals or groups who have a special interest in an insect activity and when establishing effective working relationships with fellow employees. If the individual lacks effective speaking and writing techniques, he will not be able to accomplish his public relations responsibilities.

Undoubtedly there are other characteristics that should be added in each of these three general categories. However, I feel that the individual who has competence in those described possesses the essential ingredients needed to become an effective state forest entomologist.

Bill has asked, as I mentioned earlier, to comment on these responsibilities as they affect the forest management position now and in the future. Actually, I think the time span has a little impact. These characteristics, I believe, are as applicable now as they will be on some future date, although entomologists in administrative positions will need increasing emphasis in the public relations area.

I have also been asked to make specific suggestions regarding the kind of training desired and how it would be accomplished. Since I lack knowledge of individual training methods at the college level, I'll drop a few seeds and hope they germinate into something of value.

I recommend that at the earliest opportunity undergraduates be exposed to the various employment opportunities that exist. New students may have an idea of the subject matter they wish to specialize in, but frequently lack understanding needed to relate their interest to specific job opportunities. For example, if one is interested in research and does not have the desire to indulge in public relations activities, then training emphasis should be oriented differently than for the individual interested in public relations and administration, as well as technical assignments. A prompt review of job opportunities for students who are uncertain about their major courses would be most helpful in orienting their studies along courses of greates productivity and individual satisfaction. Perhaps this is being accomplished in most universities, but continual reappraisal of accomplishments and future goals is warranted.

It is desirable too, that a student's progress be reviewed at regular intervals to determine how he is progressing in the study areas that are considered essential to the type of employment he desires. To most efficiently use the student's time, courses should be flexible to permit intensifying studies in areas where weaknesses appear and decreasing emphasis in those where he has displayed competence.

I suggest too, that the student have opportunity to obtain work experience in his specialty field, preferably in his second or third year of study to give him an opportunity to further determine whether he has made the right selection of major courses.

Unfortunately, from the standpoint of work progress, increasing public reaction--often based on partial or inaccurate information--is absorbing more and more of the specialist's time. Forest insect problems create environmental impacts and their control, the use of pesticides. Need I say more about the need for effective communications?

In conclusion, I want to stress that state-employed entomologists, who have a desire to move from behind their test tubes to administrative or combination administrative-technical positions, must be accomplished in public relations as well as technical specialities.

POTENTIAL DEFOLIATOR PROBLEMS IN EVEN-AGED MANAGEMENT

Moderator: R. R. Mason

Opening remarks centered around the need to recognize when defoliators are a problem. That is, we need to know the population level at which a defoliator becomes a problem and how this level is affected by intensive management practices. Andrewartha and Birch (1954) concluded that population size is usually determined by places to live, other organisms, food and weather. Forest management practices such as planting, site preparation, fertilization, thinning, and rotation time, will all have an influence on the factors which determine population size.

In the discussion that followed, it was brought out that defoliator problems cannot be well identified without adequate information on impact. Trees are generally more tolerant of the same population of insects on good sites than on poor sites. The importance of impact information has been recognized by some research groups and programs are being set up to investigate this subject. Intensive management in the future may be concentrated on the better sites, and the poorer sites may continue to have older trees managed less intensively for other purposes than timber.

It was mentioned that management practices can affect the quality of tree foliage and, thus, the feeding behaviour of defoliators. For example, new foliage on balsam fir where budworm larvae feed has more amino acids than old foliage. The affect of intensive management on tree metabolic activities needs to be better understood.

Forest composition as affected by management can influence populations. Fire control, which has perpetuated fir in many areas may be responsible for budworm problems. Similarly, recent outbreaks of the Douglas-fir tussock moth have occurred in young, dense stands of fir which may be the result of efficient fire control practices. It was emphasized that, contrary to popular opinion, even-aged management often results in considerable diversity by breaking up a continuous forest into blocks of different ages. In general, insect outbreaks are a result of many different situations and each needs to be evaluated individually. The opinion was given that pure, even-aged stands may eventually prove to be the best way to minimize insect difficulties.

The forest entomologist is greatly handicapped in giving advice to timber owners because he simply does not know the best course of action. Too often pest control decisions are made because of temporary administrative and/or political expedience, and too little because of sound biological reasons. It was mentioned that especially in the case of Christmas tree growers, insect problems may actually be increased and perpetuated by too rigid spray schedules.

Ultimately, the complexity of our insect problems can be best unraveled through life table analysis. However, life tables are expensive to

develop and may vary considerably so that the same key factors are not operating in every place. Quantitative data on each pest insect collected over a long period of time, similar to that of the Canadian Forest Insect Survey, may prove in the end to be the most useful research information.

POTENTIAL BEETLE PROBLEMS IN EVEN-AGED MANAGEMENT

Moderator: J. M. Schmid (substituting for W. F. McCambridge)

Beetles, particularly the important bark beetles of today, will continue to be a problem in the west but their seriousness will depend on the intensity of management and the management objective. Bark beetle damage will be reduced in stands intensively managed for timber production whether they be even-aged or uneven-aged. Such stands will be under closer scrutiny so that infested trees will be discovered sooner and harvested. Outbreaks should be less frequent. However, intensive management may also create conditions more conducive to serious bark beetle problems. Since this degree of management will require thinnings, road construction and so forth, these disturbances may make the stand more favorable for the beetle. Also, intensive management may lead to an even-aged monoculture, a prime candidate for a serious outbreak if an infestation gets started.

Forest stands managed for purposes other than timber production may develop situations more favorable for beetle outbreak. Since purposes such as recreation may restrict road construction and prohibit regulation of stand density, these stands may become too dense or overmature. They are then no different than the condition of some stands today. Furthermore, if natural events such as fires, windthrow, etc., occur, the damaged timber is not readily salvaged because of accessibility and the stand has more potential for a beetle outbreak. Where such stands are integrated with stands oriented toward timber production, the beetles could easily move into the latter stand.

Increasing demands on forest resources may cause a change in land use policies with respect to beetle infestations. Private landowners who formerly refused to control beetle infestations on their lands may be required to do so in the future in order to prevent infestation of adjacent lands. Human population will so increase the demands on the forest resources that the private landowner will not be able to do with his land what he once did.

IMPORTANT NEW REPRODUCTION INSECTS

Moderator: Karel Stoszek

During workshop discussions Sergei F. Condrashoff reported briefly on the reforestation problem caused by the weevil Steremnius carinatus Boh. Adult

weevils emerging from breeding sites in fresh-cut stumps feed on, girdle and kill seedlings growing near by. High hazard sites are confined to moist locations near the coast of British Columbia. Here over 40% of planted Douglas-fir seedlings are frequently killed by the weevils. It appears that the research on this problem is completed; the results were published.

R. G. Mitchell reviewed his uncompleted work on the Adelges cooleyi aphid. Russ has been primarily working on biological aspects and sampling techniques in a study of population dynamics. It appears that Adelges cooleyi is capable of becoming a problem in Douglas-fir plantations.

J. S. Saunders is working on chemicals to control Adelges cooleyi and other "regeneration" insects especially those in Christmas tree plantations.

Herbert F. Cerezke reported on Hylobius warreni Wood, a root weevil breeding in roots and near the root collar of apparently healthy lodgepole pine, western white pine and spruce. Larval feeding is responsible for decline and deterioration of entire stands in Alberta. Stands on wet sites appear to be most vulnerable to infestation. Work on this problem continues.

Karel Stoszek reported (with a slide show) on damage caused by the Eucosma sonomana Kft. shoot moth in Oregon. The larvae burrow into the pith of developing shoots, stunt growth or kill the terminals of ponderosa pine or lodgepole pine. Karel determined that height growth of infested ponderosa pine terminals is reduced by 30%, and each attack has a carry-over effect on subsequent growth, reducing the leader by 20%.

Increasing infestation rates appear related to increased xericity of sites as indicated by plant association types. Over 70% of terminals are infested yearly on trees growing on most xeric ponderosa pine sites. The data indicate that Eucosma attacks are the main cause of poor growth and form over extensive areas of the ponderosa pine region.

The workshop discussion revealed that the concern about "regeneration" insects--insects affecting tree growth or volume produced per acre per annum (PAPA) increases with intensified forestry.

Our task is to (1) assess a potential pest by determining the damage (growth loss PAPA) it causes under a variety of ecological conditions (soil-habitat type associations; management system, silvical practics...) and (2) derive ecologically sound damage-reducing measures, backed with cost and benefit estimates.

In intensive forestry, factors affecting damage caused by "regeneration" insects must be well understood and become a part of forest managerial decisions. It is up to us as forest entomologists to provide the information.

FIELD TESTING ATTRACTANTS

Moderator: D. L. Wood

The discussion centered around plans for field testing bark beetle

during 1970. The following is a summary of these experiments:

Dendroctonus pseudotsugae--Galen C. Trostle

A field test is proposed on the Boise National Forest in which Douglas-fir trees over 18" dbh will be selected at 2-chain intervals within a clearcut sale area. Every other tree will be baited with a mixture of Frontalin, camphene, and alpha pinene and alternate trees will be used as controls. Other than baiting, no road building or other modification of the stand will be permitted until after the flight has been completed in August. At that time, the selected trees will be cut to determine what trees have been attacked. If the test is successful, it will give us another tool along with infested bolts and trap trees to possibly use in either assessing populations or otherwise manipulating the beetles. There is no attempt in this test to sample the population.

Dendroctonus ponderosae--Gary B. Pitman

There are probably as many ways to conduct field bioassays as there are people working in the field. There are some common denominators irrespective of the type of pheromone under study, whether it be sex attractants of the Lepidoptera or aggregating attractants of the bark beetles. The design of the bioassay is somewhat set by the requirements of the test. These requirements can be broken down into three arbitrary levels; for example, alpha, beta and gamma.

ALPHA--At the alpha level, the tests are concerned with the question more often than not of a simple yes or no. Is the material attractive or not. At this step we are attempting to confirm that we in effect have isolated or for that matter synthesized the correct material. Concern over matters such as the quality or how attractive it is, delivery systems and other vital parameters can be deemphasized. Our mountain pine beetle project was in this stage in 1968.

BETA--When testing at the beta level you have established the legitimacy of your materials and the tests emphasize such factors as the competitiveness of your attractants to known natural sources, sex ratio of responding beetles, methods of dispensing including both highly controlled and simple systems amenable to field application. At this level you are attempting to gather data which might help you predict the effectiveness of the materials on fairly large scale plots. Attention should be directed to optimizing the deployment pattern in order to obtain maximum effectiveness over as big an area as possible. Tests should be initiated to assess various methods to destroy the beetles once you have achieved the capacity to manipulate. I would say the beta level of pheromone research was fairly representative of our 1969 mountain pine project.

GAMMA--The gamma level can probably best be characterized by a full-scale application of synthetic pheromones in an intensive pest management scheme. At this point the intention is not manipulation but control. There are basically two dimensions to control at this point.

Control is used in the context where a population is at a level of economic tolerance. Control can be achieved in two ways, theoretically speaking, by suppression of a full-blown outbreak by trapping with pheromones, or in a similar fashion when the population is low but the stand is highly susceptible to bark beetle depredation.

At this point one must be in command of the variables operative at the alpha and beta levels. We hope to be entering this level of pheromone research in 1970 with the mountain pine beetle. Admittedly there are some residual items, such as spacing between attractant stations, which are yet unresolved. Work on these questions will parallel the large-scale application of pheromones involving approximately 8000 trees and 4000 acres of white pine. At this time, it will be necessary to enter into the evaluation of treatment which may actually represent an even greater level of difficulty. Our immediate plans for treatment evaluation call for aerial surveys of the areas in 1970 and 1971 to assess the actual effect on population trends.

Dendroctonus brevicomis--William D. Bedard, Donald L. Dahlsten and David L. Wood

OBJECTIVES

Suppression: To assess the effectiveness of synthetic pheromones in reducing populations of the western pine beetle.

Survey of in-flight populations: To assess the effectiveness of synthetic pheromones in predicting subsequent tree mortality caused by the western pine beetle.

LOCATION

The field test will be conducted in the Bass Lake area of the Sierra National Forest. The western pine beetle is currently causing high mortality in ponderosa pine over about 30 square miles.

SUPPRESSION AND SURVEY

Suppression: Four one-half-square-mile treatment areas with two one-square mile equivalent check areas will be established within the boundaries of the project. Traps will be established on 8-chain centers in each of the four treatment areas. At each trap, exo-brevicomin, frontalin, and myrcene will evaporate from glass vials at the rate of 10 mg/day in a 1:1:1 ratio during the spring emergence period. About 120 grams of each compound will be required. This figure is based on 50 days of testing, which will provide for unexpected losses. This elution rate is based on the results of 1969 studies, which showed that this concentration was consistently effective in trapping between 100 and 300 beetles during a six-hour test period. The trap utilized was only 8 inches in diameter by 12 inches in length.

Survey: Traps will be established on 40-chain centers throughout the 30-square-mile infestation area. At each trap, exo-brevicomin, frontalin, and myrcene will evaporate from glass vials at the rate of 1 mg./day in a 1:1:1 ratio throughout the entire flight season. About 100 grams of each compound will be required.

TREE MORTALITY ASSESSMENT AND BIOLOGICAL EVALUATION OF WITHIN-TREE POPULATIONS

Assessment of Total Tree Mortality: The following aerial photographic surveys (1:15840) scale) are proposed in order to assess total tree mortality by bark beetle generation: (1) February 1970 (completed), (2) early June 1970, (3) early August 1970, (4) early October 1970, (5) early December 1970, and (6) early June 1971. The first flight will be made to determine the extent of the infestation, to aid in selecting the best areas for the treatments and checks, and to date faded trees. Succeeding flights will be made to determine the number of newly faded trees in each generation.

Biological Evaluation of Within-Tree Populations: Biological evaluations will require sampling of five generations: (1) overwintering (1969-70), (2) spring, (3) two summers, and (4) overwintering (1970-71). Generation sampling includes early larval, late larval, and emergence samples except for the 1969-70 overwintering populations, which will not be sampled in the early larval stage. Early larval samples provide an estimate of the attacking population and their progeny. Late larval samples provide the most valid estimate of parasite and predator numbers. Emergence samples provide an estimate of the adult population available for the next generation and the total brood mortality.

COOPERATING AGENCIES

U.S. Forest Service
Pacific SW Forest and Range Experiment Station
Division of Timber Management, Region 5
Bass Lake Ranger District, Sierra National Forest

University of California, Department of Entomology and Parasitology

Stanford Research Institute

California Division of Forestry

RECENT ADVANCES IN PEST CONTROL EQUIPMENT

Moderator: Lynn Marsalis

1. Missoula Equipment Development Center Pest Control Program.

The Center has been developing equipment for Forest Pest Control and Pest Control Research since 1963. In 1963, the Insecticide Evaluation Project of the Pacific Southwest Forest & Range Experiment Station began a search for a non-persistent and selective insecticide for control of spruce budworm. They found that carbamate insecticides generally have shown a high degree of biological control on spruce budworm. Of the carbamates tested in the laboratory, Zectran was found to be

one of the most toxic.

With budworm infestations and damage increasing in the United States, limited field testing of Zectran was started in 1964. In 1965, 335 acres were sprayed in Western Montana. Conventional spray equipment was used to apply 12-hundredths-pounds of Zectran in one-half gallon of carrier per acre. Analysis showed that 98 percent mortality was obtained.

2. Ford Tri-Motor spraying.

In 1966, a pilot test was again set up in Western Montana. The area comprised two units totaling 4,500 acres. The application rate was 15-hundredths pound of Zectran in one gallon of carrier (kerosene, Bentone 34, Ethanol) per acre. Mortality to the budworm was 87 percent and 77 percent in the test areas. The Ford tri-motor was equipped with conventional spray equipment which produced droplets with a maximum of 360 microns and a mass median diameter of 164 microns. By using fluorescent particles to trace the spray, we found that droplets over 100 microns were not causing budworm mortality but were falling to the ground. As a result, the Development Center was given requirements to develop a spray system which produced droplets with a mmd of 20 microns, a maximum droplet size of 50 microns and a flow rate of 45 gpm.

3. Bi-Fluid nozzle system on C-47

This C-47 bi-fluid nozzle system was used on the Big Smokey Project in Idaho in 1967. Application rate was six-hundredths pound of Zectran per pint of Dowanol per acre. On the 2,300 acres that were sprayed, budworm populations were reduced 94 percent. Field measurements of droplet size indicated a D-max of 120 microns and mmd of 70 to 80 microns was produced by the spray system. One problem was encountered with this system--excessive drag caused by the dual booms limited aircraft performance.

4. C-47 spraying.

For the 1968 Zectran pilot test, the spray system was redesigned. Additional testing determined that Freon does go into solution with Dowonol, but a nozzle with an expansion chamber is essential for producing small droplets. Six-thousand acres were sprayed during the test. Zectran was applied at one ounce per pint of Dowonol per acre. Budworm mortality was 70 percent and 48 percent on the two units sprayed. The reason for low mortality isn't completely understood. Climatic conditions are probably partly responsible. The spray equipment performed without malfunction.

5. C-47 tank from Pilot's compartment.

The pilots indicated that this system is one of the cleanest spray systems that they have used. At the front of the tank is a liquid sight gage and the boom feed line. The 700-gallon tank is loaded with 294 gallons of Freon and 406 gallons of insecticide and carrier.

The boom control valve is located inside the aircraft in the cargo compartment near the tank. (This location reduces the chance of malfunction by keeping it out of the air stream and reduces drag.) Tie-downs for the tank are connected to existing cargo hooks on the aircraft. The tie-downs are designed to withstand 9g forces in the event of crash landings.

6. Boom feed line exterior of aircraft.

   One of three modifications that have to be made to the aircraft structure is a hole for the boom feed line. The boom feed line is two-inch pipe and high-pressure hose.

7. Spray boom for C-47

   The spray boom for the C-47 aircraft is 65 feet long. There are 238 nozzles spaced 3 inches apart. The standard TX-26 nozzles are manufactured by Spray Systems, Inc. The 11-boom mounts are fastened to existing nut plates. As a result, no modification is necessary. The pressure gage is used to measure boom pressure.

8. Outlet for emergency dump.

   The second modification needed on the aircraft is installation of the emergency dump system. With this system, the 700-gallon tank can be emptied in 10 seconds.

9. Nitrogen tanks inside aircraft.

   Three nitrogen cylinders are required to operate the system. The forward tank provides pressure to the valves and the two on the side maintain tank pressure at 75 psi.

10. Valves on top of tank.

    On top of the tank from left to right are: the nitrogen inlet valve, liquid level sight gage, and pressure relief valve and pressure gage.

11. Rear of tank in aircraft.

    The hose on the right is the two-inch fill hose. Both Freon and insecticide are loaded with this hose. The insecticide is loaded first, followed by the Freon. The pipe on the left is part of the emergency dump system.

12. Pilot control panel.

    The pilot control panel has three switches and two light indicators. The left switch controls the boom. The center switch is the master power supply switch. The switch on the right, with the red cover, is for the emergency dump. The top light indicates tank liquid level and the lower one indicates that the system has electric power.

13. Ground handling tanks.

The insecticide comes premixed with Dowonal in 55-gallon drums. The insecticide is then pumped directly into the aircraft tank. With this procedure, insecticide spillage is minimal. Presently, Freon comes in 183-gallon cylinders. The small orifice on the cylinders has caused some problems in ground handling. To cope with this problem, four Freon cylinders are manifolded together and are transferred into these 400-gallon ground tanks.

14. Aircraft hose feed line.

Using an air compressor, the Freon is then transferred into the aircraft. This takes about 3 minutes. To allow for aircraft maneuverability, the aircraft feed line is 150 feet long.

15. Fork lift loading nitrogen.

The two nitrogen cylinders that are used to pressurize the tank must be changed with each load. Total loading time for the insecticide, Freon, and nitrogen is about 20 minutes.

16. Smoke plane.

A smoke plane has been used on all of the spray projects. The plane is used to determine atmospheric conditions over the spray area. The smoke plane is usually over the spray area at daylight each morning. An entomologist in the plane makes the decision to spray or hold. The spray plane is not loaded until word is received from the smoke plane. The smoke also guides the spray craft into the proper flight path.

17. C-47 taxiing.

This spring, 8,000 acres were sprayed with Zectran. Two C-47 aircraft were used. By using two aircraft, the 4,000-acre blocks were sprayed by ten A.M. With this sytem, a fully loaded aircraft can maintain altitude with 75 percent power on one engine. As a result, when one aircraft developed engine trouble over the spray area, the pilot was able to return and land without having to dump the load.

18. C-47 spraying.

The application rate for the 1969 test was 15-hundredths-pound of Sectran in one-half gallon of carrier per acre on one 4,000-acre block. The other 4,000-acre block was sprayed with two applications of 75-thousandths-pound of Zectran in one-half gallon of carrier per acre on succeeding days. Droplets produced by the system have a maximum diameter of 120 microns and a mmd of 50 to 70 microns.

19. Budworm hanging on strand.

Results from the 1969 tests indicate a budworm mortality of 66 percent

and 67 percent. Future plans for using Zectran on an operational basis has not been decided. If the decision is made to go ahead with Zectran, the Center will modify the C-47 spray system for use without Freon and complete designs for a helicopter and TBM spray system.

20. High volume microbial spray system on Bell Helicopter.

The Center has been working with Forest Service Research at Corvallis on development of spray equipment to apply biological agents to control forest insects. This system was designed to apply in high volume, polyhedrosis virus for control of tussock moth. This system will probably be used in small-scale tests this spring to apply pyrethins for control of spruce budworm.

21. Mark VI Toter.

This Mark VI Toter made by Washington Scale has been modified so that bark beetle infestations can be treated. The Toter has been fitted with a 50-gallon slip-on tank. Preliminary test indicate that the Toter is a versatile cross-country vehicle.

22. Close up of Toter

The Toter can be used just as an insecticide ferry vehicle to the crews spraying or it can be used as a spray vehicle. An ECO pump powered by the Toter engine provides pressures to enable to spray up to heights of 35 feet with a 6-ft wand. We hope to make arrangements to field test this vehicle this spring.

23. Bark Beetle detector.

Rather than waiting until insect damage becomes obvious from a distance to reveal an epidemic of bark beetles, the Center is developing instruments to measure beetle populations. In cooperation with LTV Corporation, we have recorded sounds of beetles chewing which offers some promise for measuring their numbers.

24. Army helicopter.

The Center is looking into this concept for producing small droplets sizes. This concept uses a Thermal-mechanical system. Studies done by the Army for us indicate that this system does not cause thermal breakdown of Zectran. This development effort is still in the preliminary stages.

25. Dry liquid blender.

Dry liquid appear to be a very promising method of producing and disseminating aerosol-size particles. There are three basic requirements for uniform liquid-solids blending: Liquid and solids must be finely divided; both must be suspended in space; and liquid and solid must be kept in motion so that fresh material is continually exposed. This blender will produce finely divided liquid coated particles that retain

the appearance and characteristics of free flowing dust. We have blended dry liquid insecticides for IEP at Berkeley using Zectran and Pyrethins.

26. Mity-Mite sprayer duster.

As long as dry liquids retain the characteristics of a free flowing powder, we believe that conventional aircraft and ground dispensing equipment for dusts can be utilized for dissemination. For laboratory use we have purchased this Buffalo Turbine Mity-Mite backpack spray duster. This unit with minor modifications is in operational use by the Army for dispensing chemical agents in the dry liquid state. (Pass around dry liquid sample).

27. The End.

I have very briefly covered the Pest Control program at the Center. Do you have any questions?

USE OF COMPUTERS IN FOREST INSECT RESEARCH AND SURVEY

Moderator: John W. E. Harris

The advantages of computers in forest insect research were discussed briefly, but most of the session was concerned with the computer as a data retrieval tool, particularly for insect survey. It was obvious that there was room for considerable improvement in technique and organization, because progress has been slow. It was recalled that the same comments were being made 10 years ago and there seemed to have been little change in our ability to draw out simple data where needed.

A number of people and organizations in the U. S. are beginning to computerize insect collection data, patterned at least in general, after the Canadian Forest Insect and Disease Survey system, but so far there appears to be little general coordination and systems are proliferating. Systems mentioned in discussion were a forest pathology query system at the Washington State University, and MIAS, a Map Information Assembly System. Computerized data compilation is underway at Regions 6 and 2, at the NE and SE Stations and probably at others. Data on special insect collection are being prepared for computer filing at the U. of Idaho. Wisconsin and Michigan were believed to have computerized insect survey data systems.

There is sometimes the feeling that data from various sources can be indiscriminately "computerized" and then retrieved by anyone by simply phrasing a question. It is not that simple, of course, and successful output usually is dependent upon properly planned input. Careful planning of analyses is a necessity for any research or survey operation, and this should be considered early in a program and followed through to its completion.

It was felt that entomologists should not do their own programming at this

was most inefficient when done on an occasional basis...hardware and systems change too quickly. Adequate facilities should be made available to the researcher, however. And programmers, statisticians, key punch operators and the necessary hardware need to be right at hand, not across town. In-lab. terminals help overcome the lock of a computer in every laboratory, although long waiting at in-line terminals sometimes makes them little better than cross-town courier service to some central point.

The question was asked: "How good are 10 or so years of data?" The conclusion was that it depends on the insect. The general consensus was that 20 to 100 years are needed.

One problem recognized with mass collection data was that there was a wide range of accuracy. However, it was felt that this was largely overcome by the quantity of data usually available. It was concluded, nevertheless, that there was a danger in trying to get too much from mass data files.

PROSPECTS FOR IMPROVED CONTROL OF DEFOLIATORS

Moderator: Dick Washburn

Twenty-nine persons attended. The moderator opened by declaring the objective of the workshop was to have an open and free discussion with opportunity for all to participate. He stated he thought maximum input from the various interests and specialties represented could be achieved if the discussion centered around the idea that to improve defoliator control requires consideration of all factors that could contribute to the development of optimum control strategy. No objection to this approach was recorded.

The statement was made that nobody really asked if the insect in question is a pest. In the past, the answer seems always to have been automatically in the affirmative. The discussion brought out that today, and in the future, the question must be asked and answered for each outbreak in terms relevant to the total picture. Our history of defoliator control has been one of squirting and counting. Discovery and development of better means of squirting and counting is only one of many essential ingredients needed to improve defoliator control.

It appeared to be the concensus of the group that the greatest knowledge gap exists in the area of assessing and predicting the impact of infestations. There is a great need for accurate and rapid means for determining effects of a defoliator infestation, not only on the host tree but on the total ecology. To be most useful, data needs to be in the form that land managers can transform into meaningful terms as it relates to all of the various uses of the area. Prospects for improved defoliator control are dim unless reliable means are developed to measure and predict the impact of an infestation.

To sell a defoliator control program to the public today requires among other things a definite commitment from the entomologist, backed with facts, on what the pest population will do if not reduced by chemicals. It was

It was generally agreed that at least some chemical control will continue to be needed. Chemical control in the future will probably be on a reduced scale of that experienced in the recent past. New chemicals and improved methods of application can and will be developed. As expressed by one industry forester, what is needed is a chemical method that is acceptable from the environmental viewpoint. To be acceptable, it must be possible to predict any adverse effects to the ecosystem and the projected use of the area involved.

The idea of the integrated approach to control was discussed. It was pointed out to be acceptable the requirements for integrated control were the same as for chemical control. However, to be successful integrated control requires a detailed knowledge of the biology of the pest, especially the factors that control population fluctuations. It was brought out that we should stop talking about control methods; that it implied a short-term point of view. The major research effort in the future should be directed towards development of flexible procedures that will permit the regulation of pest defoliator populations within the tolerable limits established for each given situation. In all work, we must be conscious of the possible adverse effects of the ecosystem.

EVALUATING HOST RESISTANCE TO BARK BEETLES

Moderator: Les Safranyik

Participants: G.B. Pitman, W.P. Nagel, R.W. Stark, A.A. Berryman, D.L. Wood, F.W. Cobb, K. Graham, D.M. Shrimpton

Discussion at this workshop centered around the following broad topics:

1. Physiological and biochemical aspects of host resistance to bark beetles.
2. Development of techniques for evaluating the relative resistance of stands and individual trees to attack by bark beetles.
3. Physiological changes associated with disease in relation to host resistance to bark beetles.

The workshop begun with a 15 minute slide talk by D.M. Shrimpton who discussed the philosophy and objectives of current research at the Forest Research Laboratory in Calgary, Alberta, into the physiological and biochemical aspects of host resistance in lodgepole pine to the mountain pine beetle-blue-stain fungi complex. Following the slide talk, invited participants and other members of the workshop gave brief accounts of their work, or expressed their views on aspects of host resistance as related to bark beetles.

Lodgepole pines resist attack from the mountain pine beetle by the deposition of resinous compounds in the sapwood around the point of attack. During this process of resistance there is a net increase in the terpene fraction but there is no change in the relative composition of this fraction. The methanol solubles, which include sugars and animo acids,

show a net decrease. Non-resistant responses also have a net decrease in methanol solubles, but the terpene fraction shows little change in amount. Fully resistant tree responses also measure larger than non-resistant responses.

For a resistant tree the size of the resistant response is greatest in the lower 20' or so of the stem. The number of resistant trees varies during the year, the greatest number being resistant in early July in the East Kootney region of B.C.

Field techniques for appraising the relative resistance of stands and individual trees received considerable attention. Work by R.W. Reid at the Forest Research Lab in Calgary, Alberta, indicated that the radial expansion-contraction characteristic of the stem is a reliable external indicator of the relative resistance of individual lodgepole pine trees. Trees, which were found to be resistant by stick-inoculation with blue-stain fungi, increased in bole diameter throughout the growing season while susceptible trees had no change or shrunk in bole diameter within the same period. Diameter expansion was measured with tree dendrometer bands at breast height. On the average, resistant trees had longer growth periods than susceptible trees but there was no difference between the average diameter of trees within the two categories. Similarly, there was no relation between bole expansion or contraction and the size of the annual radial increment of the sample trees. Starch content in the outer sapwood of the bole decreased following periods of drought but the reliability of starch as an indicator of host resistance has not been fully explored. Moisture stress, as measured by the pressure bomb was found to be unreliable for indicating the relative resistance of individual trees largely because measurements are affected by local climatic conditions within the crown. Consequently, under these conditions resistant and susceptible stands will be readily identified. Reid's work is currently being summarized. Ron Stark reported that oleoresin exudation pressure (OEP) is generally unreliable for indicating the relative resistance of individual ponderosa pine trees to attack by the mountain and western pine beetles. During the time of attack, just as many high pressure trees become infested as trees exhibiting low or medium OEP. However, it is significant that those trees which resist attacks generally have high OEP. G.B. Pitman suggested that some of the effects of the herbicide cacodylic acid on trees (i.e., shuts stomata rapidly and cause an increase in the moisture content of the bole) should be investigated in relation to host resistance to bark beetles. Following stem injection, cacodylic acid is rapidly translocated to the needles of loblolly pines, living tissues are killed, guard cells loose their turgor and transpiration quickly subsides. Water uptake appears to continue for a period of time after transpiration has stopped and, thus, the water content of the xylem soon exceeds that of a living tree. This abnormal condition has very deleterious effect on 1st instar D. frontalis broods.

In discussing the evolutionary aspects of resistance, W.P.Nagel questioned the very existence of host resistance to bark beetles. He wondered that if a resistance mechanism exists and there is natural selection for resistant

trees, why do we not have a higher level of resistance in our second growth stands than in our virgin forests? M. Shrimpton remarked that host specificity is one manifestation of resistance. In the case of Dendroctonus and Pinus, some feature of the living tree enables it to resist attacks by certain species of Dendroctonus. A. Berryman felt that certain characteristics of the dynamics of bark beetle populations can only be explained in terms of changes, due to host resistance, in the quantity and quality of host material which is available to the population during the attack period. K. Graham stressed the importance of genetical changes in the quality of insect populations during the course of an infestation. Changes in the electrophoretically resolvable patterns of serum proteins can be used for detecting qualitative changes in populations of some bark beetles.

Several participants felt that, to date, the role of diseases (i.e., root disease, photochemical oxidant injury, etc.) in predisposing host trees to attack by bark beetles received little attention. F. Cobb stated that fungi are sensitive indicators of the physiological state of a tree and most of the physiological changes associated with disease can be discussed in relation to current hypotheses on the mechanism of host resistance to bark beetles.

General discussion:

1. What is resistance? It was, I believe, generally accepted that by resistance, we generally do not mean immunity but only a greater ability than normal to withstand some pest.

Resistance to Dendroctonus species is generally indicated by extensive resinosis and deposition of resinous and resin-like compounds in the sapwood at and around the point of attack. Certain antibiotic and physical properties of the various constituents of oleoresin may prevent gallery establishment egg hatching, brood development or the colonization of host tissues by the blue-stain fungi.

2. Can dead trees be resistant? - The general thought was that only living organisms have resistance mechanisms but dead trees can be "attractive" or "unattractive" in the Painterian sense of preference - non preference. Preference - nonpreference "refers to a group of plant characters and insect responses that leads to or away from the use of a particular plant for oviposition, food, shelter or the combination of all three."

THE BALSAM WOOLLY APHID IN THE WEST

Moderator: R. G. Mitchell

Fourteen people attended the workshop. Two main topics were discussed: (1) Prospects and problems associated with spread of the BWA into the Rocky Mtn. and Intermountain true fir forests, and (2) the need and direction for new research on the BWA.

It was noted that the people in the Rocky Mtn. ecotypes are concerned about the prospects of the aphid moving into their lands. It was further noted

that an embargo on firs being brought into non-infested areas would help buy some time, but probably not halt eventual establishment in the Rocky Mtn. area if environment is suitable for the pest. This elicited considerable discussion about embargos and quarantines, particularly experiences with the European pine shoot moth in Washington and the BWA in British Columbia. Also discussed were survey techniques and the value of establishing probable zones of infestation risk based the aphid's thresholds of lethal and developmental temperatures.

Research needs for the balsam woolly aphid proved the more difficult subject to discuss. One suggestion was that if we are to establish meaningful risk zones of infestation, better information is needed on the aphid's temperature and moisture preferendums. Also, it may be necessary to do this for populations in eastern North America as well as western, since introductions can come from either direction.

Other areas of research suggested were development of host resistance, through genetic solutions and chemical treatments. Little optimism was expressed that these areas would yield solutions in the near future. However, the consensus seemed to be that the problem is, and will continue to be, serious and that failure of research to date to discover an acceptable overall answer to the problem of the aphid should not discourage continued investigation --it should, perhaps, encourage more serious consideration of unconventional approaches.

REMOTE SENSING

Moderator: John F. Wear

Forest entomologists and forest managers continue to find more applications and wider use of remote sensing techniques to solve forest protection problems. Comprehensive aerial detection surveys, supplemented with field examination of critical areas, are widely accepted in Western regions and Canada. More in-place information is being gathered. Computer recording systems are being implemented by R-6 and R-2. An effort is focused on standardizing tree mortality or damage data so that interregional communications on forest pests can be improved. All regions are improving their remote sensing knowhow and show interest in direct volume estimates rather than areas of infestation.

Wear presented a brief overview of remote sensing techniques ranging from the visible to the infrared portion of the spectrum, illustrated with slides. An unusual phenomenon observed by the entire workshop was the 3-D appearance of a projected EK IR slide. This false stereo effect is apparently the result of striking color differences on the slide and the registry of different colors to the eye at various planes. An outline of the various remote sensing research and operational surveys that have been recently completed, or are in progress, indicates the broadening application to forest protection problems. Current remote sensing research studies including forest insects, forest disease, and forest pollution problems were outlined. The new probability and multistage sampling techniques were briefly described. Operational survey examples of the Apollo 9 photo and multistage forest inventory survey in the SE, the Douglas-fir beetle survey in NW California, and the

Black Hills beetle survey in the Black Hills of South Dakota were mentioned.

Bill Klein, R-4, gave an illustrated talk on the 35 mm. aerial oblique photographic technique. Oblique 35 mm. photos only provide supplemental information on the general size and intensity of forest insect outbreaks, not area or tree-size estimates. The aerial photographic system for taking oblique stereo 35 mm. and step-by-step method of mounting 35 mm. prints were explained. Forest entomologists and forest managers, particularly at the District level, optimize the added pictorial information. Forest insect regional reports make good use of 35 mm. color prints.

Bob Stevensen, Calgary, Alberta, outlined survey aspects for the Central area in Canada (the size of the United States) and the need for greatly expanded aerial remote sensing techniques. Visual reconnaissance surveys supplemented with vertical and oblique photography of infestations, the possibilities of large area coverage with high flights or an integrated multiple-stage photo sampling system with ERTS were suggested for Central Canada. Visual surveys with small-scale oblique photos appear to be the least expensive.

Bill Bailey, R-2, briefly described the R-2 aerial detection surveys and the developing computer recording system. Ken Swaine, R-5, explained the tremendous increase in recreational demands on forest areas, especially in southern California. Land values increase $500 an acre upward when trees are present on recreational sites. Land developers are beginning to ask for help in R-2 to plan homesites so that forest insect problems are minimized.

The discussion for the workshop was originally intended to review cost/benefit ratios of remote sensing surveys to multiple-use forestry values. Data from Western Regional I & DC representatives were not available for the remote sensing workshop this year but should be considered for the future. The discussions on new and currently available remote sensing techniques and the recent aerial operational surveys were of considerable interest to all workshop participants.

NEW DEVELOPMENTS IN ARTIFICIAL DIETS AND INSECT REARING - INSECT PATHOLOGY

Moderators: Bob Fisher
Hank Thompson

1) Insect Diet and Rearing Developments (Fisher)

Artificial diets are well enough developed to be useful with slight modifications for several members of a group, and also for members of other groups. A spruce budworm diet was successfully used to rear wood boring insects.

No ingredients were discussed as necessary to add to present diets, except for linolenic acid. No diet ingredients seem to be harmful to the extent that they should be omitted from present diets.

Sanitation was emphasized to cut down as much as possible on mold inhibitors and general antibiotics.

There is a need for a medium that can be autoclaved without loss of diet ingredients.

Frozen diet was mentioned as a convenience for field studies.

Mass production of insects for virus propogation and other large scale uses has made insect diets generally useful and inexpensive. Artificial diets are not yet available for particular problems such as predator and bark beetle rearing.

2) The Insect Pathology Problem Discussions (Thompson)

1. Virus Production and FDA Approval. The possibilities of production of insect viruses by both the Forest Service and Industry were discussed. By any method, it appears that viral insecticides will be costly but not necessarily prohibitively so. General concern was expressed over the lack of progress in achieving FDA approval for any of the insect viruses.

2. Insect Pathology and Intensive Management of Even-age Young Forest Stands. An opinion was expressed that microbial control research should be more closely integrated with population ecology research.

3. Public relations. "Virus" and "bacteria" seem to be red-flag words. A public relations effort to portray forest insect pathogens as natural factors in population ecology must be carried out before any large-scale application of these pathogens is carried out.

SAMPLING FLYING INSECT POPULATIONS

Moderator: Malcolm Furniss, Moscow, Idaho

Purposes of sampling flying insects include the investigation of dispersal in respect to height, time, and effects of wind and other weather factors; survey of abundance for damage forecasting; and bioassaying attractants. Problems involved are the small size of some insects (inability to identify or observe them directly), large volume of air to be sampled, difficulty of suspending traps and stratifying catch timewise at heights, especially above the forest.

Discussion touched upon use of glass window traps by Dick Mason and sticky traps by Les Safranyik for sampling Ips beetles of southern pines and mountain pine beetles in Canada. Glass traps were sometimes broken by impact of birds but provided data closely related to abundance of beetles in nearby slash.

Bias may be introduced by airflow around solid surface traps. Also, some

insects may respond to or avoid traps that they can see. Material such as "Stickem Special" is superior to material such as "Tanglefoot" because it remains tacky longer. However, fragile specimens are difficult to identify or to recover intact from such material. Adhesive materials may conceivably influence results (that is, attract or repel) by their chemical composition. Use of solid cylinders coated with vaseline to study aphid mite dispersal in New England was described by Jim Lowe. Traps were suspended on pulley ropes from four, 100-foot towers arranged in a circle. Aphids were released in the center.

Torgersen described three towers placed 14 feet apart which he used to support scaffolding from which defoliators could be observed in tree crowns in Alaska. Roy Shepherd used sea gulls as biological traps to identify tent caterpillar moths observed flying above the forest. Retrieved gulls were found to contain males and spent females.

A crude classification of types of devices for sampling flying insects was devised as follows:

1. Low level
    - A. Fixed, passive
        1. Window
        2. Sticky
        3. Malaise
    - B. Fixed, active
        1. Attractant, chemical
        2. Attractant, light (emitted, reflected)
        3. Rotating, moving
        4. Vacuum

II. High, fixed
    - A. Tower
    - B. Pulley line

III. Above forest
    - A. Planes, robot or piloted
    - B. Kites
    - C. Balloons

IV. Snow fields

V. Biological
    - A. Birds

METEOROLOGY AND ITS USE.

Moderator: Leo Fritschen

The panel moderator presented a 15-minute discussion of the results of an

atmospheric tracer study designed to depict air flow within a Douglas-fir forest. This discussion was used to illustrate the effect of wind and atmospheric stability upon dispersion of aerosols and gases which might effect insect flight. The application of the material presented to entomology and aerial application of pesticides was discussed by the group.

Meteorological instrumentation requirements for entomological research were discussed. The availability of a 20-channel magnetic tape data logging system costing about $4,000 which would operate on 12-volts was announced.

EFFECTS OF FOREST FERTILIZATION ON INSECT POPULATIONS (Joined by the Participants of the Cone and Seed Insects Workshop)

Moderator: Paul Heilman

Co-leader: Stan Meso

Twenty-five members, excluding the leaders, attended this workshop.

Two aspects of the effects of forest fertilization on insect populations were proposed for consideration - 1) the effect of large-scale application of fertilizer (primarily nitrogen as urea, as is being practiced in the Pacific Northwest) to commercial forests for the purpose of increasing wood production and 2) the use of fertilizers to minimize or offset insect damage to trees.

Response obtained from fertilization trials in Douglas-fir has resulted in the initiation of commercial application of nitrogen to forest lands. The benefit to large timberland owners may be considered in terms of a potential increase in their sustained timber harvest and, consequently, their interest in this practice appears to be growing rapidly. Currently between 75- and 90-thousand acres of Douglas-fir forest in the Pacific Northwest are being fertilized annually. Rates of 330 to 440 pounds of urea per acre (150 and 200 pounds of N, respectively) are being applied using helicopters. Most of the fertilizer is spread in late fall and winter months. Stands chosen for fertilization vary in age from about 15 years (closed canopy is desired) to 45 years or more and a wide range of site quality is being treated. Growth plots are being installed concurrently to these applications in order to assess response to treatment. Plans are that stands showing favorable response will be retreated at about 5-year intervals.

In spite of rapid increase in the use of fertilizers in our forests, there has been little study of the possible effects on insects. Failure to know the consequences of fertilization on insects and other factors prior to widespread usage was of concern to the participants.

Some generalizations can be made regarding effects on insects based primarily on European work. Whereas defoliators are reduced by nitrogen, sucking insects are increased. It was reported that egg production of balsam woolley

aphids has been increased by nitrogen. For these reasons, and because balsam woolly aphids seem to prefer more vigorous trees, nitrogen fertilization of true firs may be harmful. Effects of fertilization on other insects were cited; tip weevils (species ?) were increased, perhaps through effects on time and duration of shoot elongation in response to treatment, and weight of spruce budworm individuals was increased but consequences of larger insects are not known.

The possibility was mentioned that nitrogen, because it increases the quantity of foliage in a forest stand, may increase drought damage in stands during dry years and that this in turn may increase insect damage. Increase in shoot-root ratios of tree seedlings with nitrogen is known to occur and reduction in survival on droughty sites was reported. No study of this question in timber stands was known.

Problems of determining effects of fertilizers on insects were discussed. Although laboratory feeding studies may be useful for certain aspects, this approach did not receive much encouragement. The limitations of using small plots was also discussed. Results with fertilization of seed orchards exemplify this problem. In natural stands good cone crops are usually produced only every 3 to 5 years, but with fertilization seed orchards can be induced to produce cones much more consistently. During good cone years, cone and seed insect levels in the seed orchard are reduced because the population is absorbed in the natural crop. During years with few cones in natural stands the cone and seed insects will concentrate in the seed orchard cones (and control measures must be used). Thus it was concluded that study of effects of fertilization on insect populations must be made where large areas have been treated. Hence problems of site and soil variability become important and must be taken into account.

Other factors involving the characteristics of tree response to fertilizers should be considered. Rate of uptake of nutrients, their cycling within the forest, magnitude and duration of response, differences between nutrient elements and between forms of fertilizer used are important. Furthermore, crown class, crown condition and growing space, competing vegetation, age and size of tree all affect response to treatment.

Concern was also expressed by several participants for the apparent neglect of possible adverse effects of urea application. It was pointed out that evaluation is being made of the nitrogen content of streams following fertilizer treatment. In the work thus far, only very minor increases in nitrogen content of streams have been detected - amounting roughly to the quantity of urea that actually falls into stream water. It was stated that possible beneficial effects on fish production of application of nitrogen to lakes and streams is being investigated by Canadian workers. However, fertilizer practices in agriculture were cited as having led to nitrate contents above pollution levels of both stream and ground water in certain instances and therefore why not the same from forest fertilization? The validity of such a comparison was questioned since such an agricultural practice likely involves much higher rates of nitrogen use, rapid nitrification, irrigation with excess water, and hence considerable leaching, occasional fumigation of the soil, repeated cultivation and fallow periods,

and a plant system that does not occupy the soil for as long a period during the year nor as completely as does a forest stand. Furthermore, cycling and lysimeter studies of fertilized plots have shown Douglas-fir forests to be conservers of nitrogen with very little of the applied urea found to be leached out of the soil profile.

The practice of forest fertilization was criticized on two other points. The first was that nitrogen was being applied without regard to the nutritional condition or status of the soil. Rather than merely defining stand conditions, evaluation should be made of the soil content of nitrogen and other nutrient elements and identification of soil type should be made. It was stated that European fertilization practices, using this approach, have a more sound basis than ours.

The use of fertilizer to minimize or offset damage caused by insects was given limited discussion. Several points already mentioned have some bearing on this question. For instance, the adverse effect of nitrogen on defoliators. The question was asked whether a feasible approach to this problem would be more complete knowledge of nutritional requirements of insects. The problem of the likelihood of insects being able to adapt to a diet altered by fertilizer treatment was mentioned.

INSECT PESTS OF ORNAMENTALS

Moderator: J. L. Saunders

Participants: Cameron, Collman, Curtis, Dahlsten, Donley, Frye, Germain, Houseweart, Howard, Hunt, Pettinger, Rivas, Stelzer, Swain, Tunnock, Wenz

In recent years, insect problems on shade trees and woody ornamentals in metropolitan areas have been increasingly brought to the attention of forest entomologists. Growing public and political pressures to do something about these problems together with housing trends that create a contiguous and continuous "wild land: sub-urban" forest condition have created the need for "urban forest entomologists". These problems have been dealt with primarily by university extension groups and other state agencies in the past.

Ben Howard discussed a bill (H.R. 15723) now before congress to amend the Forest Pest Control Act by authorizing the Secretary of Agriculture to conduct work concerning insect pests and diseases in urban and other community areas. The discussion group believed that such extension of USFS jurisdiction may facilitate combating insect problems that extend through both forest and community areas but additional funds would be an absolute necessity.

Damage and control concept differences between forest and urban conditions were discussed. Damage that may be insignificant in the forest may be considered intolerable by home owners and the general public who desire

aesthetically perfect trees and shrubs - at any cost. In the past this attitude has dictated use of chemical control programs consisting of several sprays per year and in some cases this approach must be continued to obtain the desired aesthetic excellence. It was generally felt, however, that other means should be investigated, emphasized and made known to the public. Alternatives to chemical control discussed were selection of plant species relatively free of insect problems, more use of varietal resistance, environmental regulation favoring natural control agents, plant species diversification including interplanting of repellant plants or trap plants, mulching, and other cultural practices.

Three prominent areas, brought out in this session's deliberations, where future emphasis is warranted are:

1) Investigations to broaden the number and kinds of cultural practices that can be conducted by home owners, gardeners and other individuals or organizations with limited areas, plant material and resources.

2) Investigations to develop better pesticide recommendations and application methods that would minimize hazards and detrimental effects to the total environment.

3) PUBLIC EDUCATION programs by knowledgeable workers to enlighten the people of presently known methods and alternatives to control or to "live with" insects and other organisms.

RELATIONSHIPS OF POLLUTION AND DISEASE TO INSECT PROBLEMS

Moderators: Fields Cobb and Jim Lowe

Recorder: Lewis Edson

The discussion opened with a brief summary of diseases and other environmental factors known to predispose forest trees to insect, especially bark beetle, attack. The role of fire, drought, flooding, lightning, windthrow and logging activity that leave weakened trees or fresh slash in which beetles breed is well documented. However, with a few exceptions, the role of diseases in providing brood material has been largely discounted as an important factor in the population dynamics of bark beetles.

Studies in the U.S. now indicate that the occurrence of several diseases may have an influence on beetle populations, at least in some areas. Air pollution injury on ponderosa pine in southern California predisposes the affected trees to both the western and the mountain pine beetles. Preliminary observations have indicated that brood development is substantially reduced in many of the affected trees, however, probably because the trees are "starved" and do not represent a good feeding substrate for the larvae. Other diseases in our western conifers for which we have some data regarding the association with bark beetles include those roots diseases caused by (1) Fomes annosus, which predisposes pines to Dendroctonus and fir to

Scolytus,= (2) Verticicla diella wagenerii, which predisposes ponderosa, jeffrey, and pinon pines to various beetles, (3) Armillaria mellea, which predisposes several conifers, (4) Poria weirii, which appears to be involved in association with the Douglas-fir beetle, and (5) Phytophthora lateritium, which attacks Port Orford cedar. In addition, diseases such as the mistletoe and Elytroderma needle cast have been found to predispose trees to beetles when infection became severe.

The Regional Project (W-110) entitled "Relationships between Root Pathogens, Their Hosts, and Attack by Bark Beetles" was outlined. The objectives of the project are (1) to determine what diseases are important in predisposing trees to beetles and to determine the influences of disease incidence on beetle populations, (2) to determine the mechanisms by which diseases lower host resistance to beetles and (3) to study the ecology of the disease-causing organisms that have an important role in predisposition with the ultimate goal of reducing or eliminating these organisms as factors leading to bark beetle epidemics. As implied, the emphasis is on root pathogens and bark beetles, but studies of other diseases or insects that will assist in an overall understanding of the problem are not excluded. The project has been approved and all interested persons are invited to participate.

The discussion on the broader aspects of environmental pollution began with the definition of pollution as "anything that causes an adverse effect on any forest ecosystem". In addition to pollution by pesticides, this could include fertilizers that upset the nutrient balance in the soil affecting both tree physiology and the soil fauna. The populations of some tip-feeding, sucking, and defoliating insects increase when forests are fertilized. Much of the research on fertilization effects is European; we need much more information before we accept fertilizers for widespread use in the forest. Air pollution, besides its role in predisposition, can cause direct adverse effects on insect populations. A problem with sucking insects has arisen in the Missoula, Montana area where frequent atmospheric inversions occur, and problems with tussock moths are found around smelters. These problems may be associated with reductions in populations of parasitic flies and wasps.

INSECT SURVEYS AND DAMAGE EVALUATION

Moderator: Peter W. Orr

Detecting and evaluating forest insect outbreaks over vast areas of inaccessible areas in the West requires exploitation of all available aerial photo techniques and sampling procedures. Some recent aerial photo methods are in operational use now, but continual research and development is needed in this field to meet the demand for more accurate information about insect outbreaks.

The survey program in Western Canada has been greatly affected by reorganization. It is anticipated more emphasis will be placed on aerial techniques for surveying the vast inaccessible areas.

Remote sensing techniques employing satellites was discussed. Imagery from ERTS (Earth Resource Technical Satellite) will have a minimum resolution of about 1,000 feet from an altitude of about 500 miles when it becomes available in the future. This will be the first stage in multi-stage sampling procedure for evaluating impact of forest insects.

Use of Automatic Data Processing equipment to summarize and report the results of annual aerial insect and ground surveys in Oregon and Washington was discussed. Programs are available for summarizing these data on a Control Data Corporation (CDC) 3100. A great interest was shown by all western Regions to establish a standardized reporting procedure.

NEMATODES AS BIOLOGICAL CONTROL AGENTS

Moderator: John M. Webster

Participants: Barbara Barr, Allan Berryman, Bill McCambridge, Gwen Crossley, Malcolm Furniss, Hank Thompson, Cyril Thong, Milton Steltzer

The discussion opened with a review of the main criteria which must be satisifed in order for nematodes to be successful biological control agents.

Criteria for nematodes as bio-control agents

1. Cause a high degree of mortality, sterility of the adult insect or a change in behaviour pattern of the insect such that it fails to feed or reproduce.

2. The nematode pathogen must act rapidly and/or build up a nematode population which effectively keeps the pest population at an economically acceptable level over a long period.

3. Resist adverse environmental conditions.

4. Be easily cultured in media or reared on laboratory insects and be stored and transported in large quantities.

5. Be easily and economically applied.

6. Not harmful to beneficial insects.

It was agreed that the degree of efficacy of the nematode on the insect was very variable depending on species. Thousands of Contortylenchus in the haemocoel of Ips confusus may decrease the host fat body and so decrease survival but not necessarily sterilize or kill the host. However, a single Mermithid nematode in a defoliating insect can be lethal. Many Aphelenchids and Tylenchids cause significant reduction in fecundity and even sterility in many of the bark beetles. There was considerable discussion about the bark beetle's ability to withstand large populations

of nematodes and as to how this ability could be challenged. Methods should be examined whereby the environment can be manipulated to facilitate the introduction of nematode species into insects which are not their normal host because the resulting physiological imbalance is more likely to be harmful to the host. Further use of the nematode as a natural hypodermic syringe whereby it introduces harmful bacteria, viruses or fungi into the insect should be examined. Neoaplectana carpocapsae (DD136) has shown considerable promise as a nematode bacterium complex for killing agricultural pests and this and others such as Diplogaster spp., may prove useful in control of forestry insects. A method of application of the nematodes so that they are most infective to the insect is important. A Gelgard-bombing technique with DD136 has been tried for larch sawfly but a access of the nematode to bark beetle galleries is more difficult.

There is considerable intra- and interspecific variability in the intensity of nematode infestations in forest insects, especially in bark beetles. However, the reasons for this variability are not known. There is some evidence that nematodes are one of the causes of the natural crashes in isolated insect populations. In order to utilize the nematode's potential as a biological control agent more research is urgently required in order to understand the physiological and ecological relationships between specific, named nematodes and their insect host(s). Only then will it be possible to change successfully the natural balance of the host-parasite relationship to the detriment of the insect and to the benefit of the nematode, ourselves and - the forest trees.

EFFECTS OF CULTURAL PRACTICES ON BENEFICIAL INSECTS

Moderator: D. L. Dahlsten

Recorder: K. M. Swain

This workshop was attended by 19 members. Initially the group tried to pursue just what was known about the effects of cultural practices on beneficial insects. It was concluded that little was known about the effects of these practices on beneficials and not much more on the pest insects themselves. The point was made at this time that basic long-term population studies were a must if we are going to find out.

The discussion then turned to a theoretical consideration of what the intensively managed third forest would mean in terms of effects on beneficial insects and natural control of forest insect pests. Ecologically the most stable community, to most ecologists, is the most diverse and yet the third forest as discussed by the forest managers is to be simplified. It was pointed out that agriculture is now becoming more diverse, i.e., interplanting cotton with alfalfa and strip-cutting of alfalfa, in order to combat insect pests. These practices favor natural enemies and perhaps the forest manager should think twice prior to moving into the intensively managed and simplified forest community. It was also pointed out that the new approach would probably create many new insect problems, perhaps many that we don't even know of as yet.

The larch casebearer program was considered next and biological control attempts will be intensified during the next year.

It was announced that a task force of experts would analyse the problem in the field this year in an attempt to discover some of the previous difficulties with the program.

The group concluded the deliberations for the day with a consideration of the natural enemy and the effects of various facets of the environment on these organisms. It would be helpful if more were known about these effects prior to recommending any cultural practice. It was also pointed out that a pest problem should be looked at from many angles prior to control and this should include some consideration of the natural enemies. It may even be possible to manipulate the forest environment for no other reason than to favor various beneficial organisms. Christmas tree plantations were suggested as a possible lead to what intensive management may mean to the forest entomologist of the future.

In summary, this session was more theoretical than factual because of the lack of knowledge of cultural practices on forest insects generally.

CULTURAL CONTROL OF FOREST INSECTS AND POTENTIAL TERMINAL WEEVIL PROBLEMS IN YOUNG STANDS

Co-moderators: Hec Richmond
Les McMullen

The workshops on cultural practices and potential tip weevil problems were combined because of a lack of people signing up for the workshops. However, over 30 members attended.

Hec Richmond discussed the role of cultural practices in control of forest insects indicating that they had a place in, if not controlling insects, reducing losses. Man-made problems should be controllable through management.

Ambrosia beetle and woodborer problems lend themselves to such control. One cannot write off the damage caused by these insects and knowledge of how to minimize losses is important. There is a lack of information in relation to losses following fire. In Alberta, woodborers are a serious problem, particularly in fire-killed timber. In salvage operations with spruce where Tetropium damage is major, edging removes much of the damage. Also suggested was the use of polyethylene sheets over decks along with paradichlorobenzene.

In British Columbia there is a voluntary restriction on the movement of logs from balsam woolly aphid infested areas through or to uninfested areas, until the logs have been felled long enough that the aphid population on them has died.

Washburn indicated that plot treatment with nitrogen resulted in increases in budworm populations, whereas other treatments did not. It was also

mentioned that Adelges on young Dougls fir increased with nitrogen fertilization.

Alan Cameron indicated that in California, even at high levels of weevilling of lodgepole pine by Pissodes terminalis, there is not serious loss. However, there is concern regarding this insect in Idaho where the damage appears to be related to site. Bob Stevenson suggested that stand density may be associated with different levels of damage.

The Sitka spruce weevil was discussed at length. In British Columbia its damage is negligible on the extreme western coast and northern tip of Vancouver Island and does not occur in the Queen Charlotte Islands. A similar situation exists on the west coast of Washington. It was felt that this might be related to weather conditions or site.

Sergei Condrashoff discussed some of the results of his work.

Spruce weevil oviposited on excised terminals of the Douglas fir and hemlock as well as those of Sitka spruce in the laboratory but broods could not be established on 3- to 4-year-old potted Sitka spruce or on 12- to 14-year-old western white pine growing outdoors. Broods established by caging in the field late in the oviposition period were relatively unsuccessful. Adults caged in the field in the fall of 1968 survived better at ground level than in the crown. Flight trapping of adults in the spring indicated that they landed near the top of the tree but rarely, if at all, on the terminal.

McMullen expressed concern over the problem of spruce weevil in the interior of British Columbia where large acreages have been recently logged and plans are for an intensive planting of spruce. It was suggested that mixed species might be helpful.

Mention was made that Sitka spruce had been used to prevent browsing but rabbit damage had occurred.

Joe Saunders discussed Cylindrocopturus furnissi. In western Washington it is a problem on Christmas trees and may actually kill. It is not a problem on trees over 10 feet tall. It is most severe in open stands on poor sites that are subject to drought. They are interested in the effect of nitrogen fertilization on the insect.

EFFECTS OF SCALE INSECTS ON YOUNG TREES

Moderator: David E. Donley

Scale, and other sucking insects, have long been recognized as important enemies of trees. Their effects are manifested in three general responses on the part of their hosts: the trees die, they are distorted, or are devitalized. The effects of most sucking insects are directly proportional to their numbers. Injury is accomplished by piercing the external plant tissue and removing sap from underlying layers.

Various species of scales, and other sucking insects, may attack leaves, buds, stems and roots of trees. Most sucking insects are kept in check and at endemic levels through control by "natural" factors such as weather, parasites and predators. Often the activities of man, such as with insecticide spray programs, can result in epidemic levels of sucking insect numbers. Artificial control methods are rarely warranted in forest conditions but may often become necessary in park and shade tree situations.

Key control factors are early detection and appraisal of sucking insect epidemics. Mechanical means of removing sucking insects were felt to be the most desirable method of direct control followed by control with precisely timed, short-lived, contact insecticides.

A number of specific sucking insect/tree host situations were mentioned and the need for an accurate population estimate and economic loss method were deemed essential to future work with scales and other sucking insects.

Methods of counting established and migrant populations were discussed and a method of quantitative honeydew measurement was presented.

In summary, the group felt that sucking insects would become the subject of future work as public awareness, coupled with financial support, forced us to consider the forest resource as more than a group of trees suitable for lumber production.

RESEARCH AND CONTROL PRIORITIES

Moderator: Bill Turnock

Secretary: Don Schmiege

Bill Turnock started by speaking of the difference between suppression and control, and the importance of this distinction in assigning priorities.

Boyd Wickman stated that they are organizing on life table approaches to their work. Turnock brought out that a problem needed to be attacked with sufficient manpower and effort - too many failures have been caused by superficial actions.

Hank Thompson said that his entire project plus help from others has been put on tussock moth. Population decline has caused trouble in doing this work.

Crash approach to problems have caused trouble. Tokenism research and placation of the public have disrupted the long-term research effort needed to bring us closer to pest management. Research today involves more than the old "squirt and count" approach.

Do we have to follow the mistakes of agriculture? Intensive monoculture can create problems in agriculture and forestry. Monoculture is ecologically

bad but agriculture will probably have to stick with it because it is efficient.

When we initiate a program it is probably for at least five years so it should be carefully planned. How can flexibility be built into a research program?

Boyd Wickman brought out that the gap between the research leaders and the managers is increasing. The forest managers usually don't recognize the long-term problems that require research. The important problem for research is growth and survival - in the absence of more specific problem identification by managers.

Digression - on environmental "nuts". As professionals we must talk to these people and not simply speak a "party line".

Bureaucratic departmentalization is preventing interaction between disciplines.

If research managers are to bridge the gap between researchers and field managers they must include people from both groups in their program planning. Research managers should attend meetings such as this one - unfortunately they rarely do. However, if these managers do come, they should come to contribute, not merely to fill a chair and listen.

CONCEPTS IN MANIPULATING SCOLYTID POPULATIONS

Moderator: Gary B. Pitman

The moderator introduced the topic, stating that we stand on the threshold of exciting developments in pheromone research, especially for the forest entomologist who enjoys field work. Pheromone complexes have been identified for at least 3 species, and partially identified for 2 others. In 2 - 4 years it seems probable that pheromones for many of the North American scolytid pests will be known. The actual implementation of the pheromones is another matter. There may exist several points of view regarding their potential uses; they may be limited to survey, or, as some believe, they may be useful in some sort of suppression program.

Pitman outlined BTI's work in Idaho with the mt. pine beetle in white pine. Up until this year the group was primarily concerned with the concepts and techniques of manipulation, determining whether or not attacks could be directed rather exclusively to baited trees. Trans-verbenol and alpha-pinene were the compounds used, both being necessary to elicit attacks. Deployment of the materials was accomplished by use of small-bore polyethylene tubing, plastic caps or plastic bottles. 725 white pine were baited, on 2-chain centers, over an area of 320 acres; if a mature host could not be found within 1 chain of the center that site was left unbaited. Baited plots alternated with unbaited control plots in a semi-checkerboard fashion with 40 acres in each plot. The 2-chain center was an arbitrary decision as dosage-response information needed to maximize effectiveness of each station was not available. Prior to the tests the attack rate averaged 1/2 mature tree/acre. Approximately 2.5 times that many trees were baited. Of these, 133

trees were mass attacked, or about what would have been expected if there had been no treatment. Out of approximately 7,000 potential host trees in the 320 acres, only 21 unbaited trees were attacked and 11 of these were within 10 - 15 feet of baited trees. The outer borders of the baited plots received more attacks than the interiors, apparently as a result of drawing beetles in from unbaited plots. These results led to the conclusion that manipulation of the mt. pine beetle in white pine with pheromones is possible.

This year BTI, on Potlatch Forests land, will attempt unit management, of which there are 2 levels: (1) suppression of an epidemic population to economically tolerable levels, (2) maintenance of a population at a tolerable level. Ideally we would like to work at the maintenance level; however, presently in Idaho the suppression level will be the principal goal. In an area of known attack history, several thousand trees will be baited. Attacked trees will be salvaged where possible, felled and sprayed, or treated in some other manner to achieve brood suppression. Aerial and ground surveys will be conducted in '70 and '71 to relate effect to treatment.

Panel member David L. Wood was asked to comment on his program. He stated the top priority of his group's work is to deadtrap D. brevicomis (using a mixture of brevicomin, frontalin and myrcene) with the goal to take beetles out of the population and try to determine the effect. Sampling was cited as the key needed to determine effect of a direct control effort. This has never been done on a population basis in bark beetles. Damage assessment has been the primary tool used to date. With the population information available on the western pine beetle, Wood feels they are now able to make an assessment of the effects of mortality achieved by trapping. No basic information is available on how much material should be released, what kind of effects to expect from release of large amounts of material, distance between traps, effectiveness of compounds through space. Arbitrarily a concentration was chosen which is known to be accurate, it will be released from certain points in 2 plots and effects will be determined.

Panel member Bill Waters was asked to comment on the application of a model to this type of study. He stated he was concerned as to whether or not the approach was feasible; there is a need to determine at what population levels it would be feasible. He questioned that enough insects could ever be deadtrapped, within economic and physical limits, to have any effect on tree mortality. He expressed surprise that no one has attempted to mathematically assess the feasibility of this type of program from the data available. Waters stated sufficient data are probably available on the western pine beetle, and perhaps on the mt. pine beetle, to construct a crude model relating numbers trapped to different initial population densities. It would be possible to utilize simple predator/prey models, where traps would be the predator, and put in other parameters on which data are available. Other parameters which might be considered in establishing a more precise model might be reproductive rate, dispersal distance, patterns of dispersal, relationships between insect and age/size distribution of trees, spatial distribution of trees, etc. He feels data are available to assess feasibility of mass trapping and predict effects of some experimental arrangements and treatments.

In the discussion session, the spacing mechanism which limits the number of beetles which will infest a tree was considered. It was stated the mechanism appears to be independent of and cannot be overridden by attractants in an induced attack on a living host tree. This was pointed out as an advantage of deadtrapping rather than using living trap trees. Due to the absence of the beetles' employment of the spacing mechanism, a deadtrap will trap more insects than the living tree where the insects simulate a natural attack, complete with spacing mechanism.

Concentration effects were discussed. It was pointed out that large quantities of attractant released from a point source may produce a spill-over from the trap, and nearby trees will be attacked. Especially, beetles coming upwind to the source of attractant may be arrested by and attack trees located downwind from the trap. It was suggested greater numbers of traps releasing lower concentrations of attractants over a wider area might avoid unwanted mortality of trees adjacent to and downwind from the traps. It appeared to be the concensus that more work on dosage-response is needed.

MINUTES OF FINAL BUSINESS MEETING

March 5, 1970

The Chairman called the meeting to order at 10:10 a.m. in the Concord Room, Washington Plaza Hotel, Seattle, Washington.

1. Minutes of the initial business meeting were adopted as read upon motion by Bill McCambridge, seconded by Galen Trostle.

2. Meeting sites
   a) 1971. Bill McCambridge, Program Chairman, discussed the possibilites of Glenwood Springs as a specific meeting site.

   b) 1972 and '73 - There was no further comment on the decision to hold the 1972 meeting in Edmonton or on the invitation to the Arizona-New Mexico area in 1973.

3. Committees
   a) Committee on Current Research: Al Rivas, Chairman, indicated that Dave Dyer, as well as the original member Bill McCambridge, was serving on the committee and discussed the possibilities of a list of current research projects. Discussion from the floor re other sources of information ensued.

      Motion that the committee continue for one year to explore the need for and the manner in which a list of current research could be brought to the members. Moved by Dick Washburn, seconded by Mal Furniss.
      Amendment - and that the committee include in the roster of this work conference a three to four word description of what the members are doing. Moved by Alan Cameron, seconded by Boyd Wickman. Carried
      Motion as amended carried.

   b) Committee on Common Names of Western Forest Insects: Bob Stevenson, Chairman, read the report. Moved by Bob Stevenson, seconded by Bill McCambridge that the report be accepted. Carried.
      Dave McComb is the new chairman and Bill Ives replaces Bob Stevenson on the Committee.
      The report noted that the scientific names of the spruce beetle and the Mexican Pine beetle are now Dendroctonus rufipennis (Kirby) and D. approximatus Hopkins, respectively, rather than D. obesus and D. parallelocollis.
      Moved by Gerry Lanier, seconded by Dave Wood that this body support in principle the suppression of rufipennis in favour of obesus. Carried.
      Lanier agreed to take the necessary action on behalf of the Conference.

   c) Ethical Practices Committee: Chairman Alan Berryman presented a voluminous report listing many outstanding nominations for the award of this Committee. For his ethical activities Russ Mitchell was

honoured as the new chairman. Acceptance moved, seconded, and carried.

d) Nominating Committee: Mal Furniss presented the following slate -

Chairman - Dave Wood
Secretary-Treasurer - Tom Koerber
Councillor - Walt Cole

Hearing no further nominations from the floor, the chairman instructed the secretary to cast a vote for the slate as presented.

4. Vote of Thanks
The Chairman thanked Rick J.hnsey for his efforts in organizing this meeting. Rick Johnsey expressed gratitude and thanks to members who participated and to his program committee. The Chairman then thanked the members and the executive for their support during his tenure of office.

5. The authority of the chair was given to Chairman-elect Dave Wood who extended thanks for the efforts of the outgoing officers.
Alan Berryman suggested that the Program Chairman pay heed to the "total ecosystem" in deciding whether or not to have a banquet. Pete Orr made similar remarks regarding the field trip.

6. The meeting adjourned at 11:30 upon motion by Galen Trostle, seconded by Donn Cahill. Carried.

TREASURER'S REPORT
1969 - 70

Balance on hand March 10, 1969		$ 349.75
Received from Registration, 1969	$2,275.50	2 625.25
Expenses for 1969 meeting	2 042.90	582.35
Bank charges	0.45	581.90
Balance on hand March 2, 1970		581.90

REPORT OF COMMITTEE ON COMMON NAMES

OF WESTERN FOREST INSECTS

WESTERN FOREST INSECT WORK CONFERENCE

One formal submission was received for the common name "western spruce budworm" for Choristoneura occidentalis Freeman. This proposal was accepted by the committee and the WFIWC membership and was submitted to C.C. Blickenstaff of the Entomological Society of America. Four additional proposals, for "midges" were received at the Seattle meeting.

Douglas-fir scale midge	Contarinia washingtonensis Johnson
White Douglas-fir needle midge	Contarinia pseudotsugae Condr.
Green Douglas-fir needle midge	Contarinia cuniculator Condr.
Red Douglas-fir needle midge	Contarinia constricta Condr.

These requests are now in the process for review. The membership will be informed on their status at the next meeting.

A new chairman (D. McComb) for this committee was elected to replace R. E. Stevenson whose term expired at the Seattle meeting. In addition, W. F. Ives was appointed by the conference chairman to fulfill the committee vacancy left by R. E. Stevenson.

A general expression of thanks was extended by the outgoing chairman to the committee members for their assistance during the past 3 years.

Respectfully submitted

Committee on Common Names of
Western Forest Insects

M. M. Furniss, Moscow, Idaho	(1971)
J. A. Schenk, Moscow, Idaho	(1971)
L. H. McMullen, Victoria, B.C.	(1972)
D. D. Dahlsten, Berkeley, Calif.	(1973)
H. W. Flake, Albuquerque, New Mexico	(1974)
W. F. Ives, Edmonton, Alberta	(1974)
D. McComb, Portland, Oregon	(1973)

MINUTES OF COMMON NAMES COMMITTEE MEETING

March 1, 1970

Members in attendance: Dave McComb, Jack Schenk, Mal Furniss, Don Dahlsten, Les McMullen, Bob Stevenson.

Documentation along with a general voice of support was expressed by the group for the common name Western spruce budworm for Choristoneura occidentalis Freeman. This was the only submission received by the committee during the past year.

The group was alerted to a "newsy" piece of information regarding Steve Wood's recent work in Great Basin Naturalist 29 (3): 116, 121 and scientific name changes of two Dendroctonus species. The common "Spruce Beetle" is now D. rufipennis (Kirby) not D. obesus and the "Mexican Pine Beetle" is now D. approximatus Hopkins (not D. parallelocollis).No real concern was expressed by the committee with this change.

With the termination date at this meeting of the present chairman's role a new chairman, Mr. Dave McComb was acknowledged and accepted by the committee. In a similar fashion Mr. Bill Ives of Edmonton was appointed to the committee.

A vote of thanks to the outgoing chairman was expressed by the committee members.

No further business, meeting adjourned 10:30 p.m.

R. E. Stevenson (signed)

R. E. Stevenson, Chairman (1970)

MINUTES OF EXECUTIVE COMMITTEE MEETING

March 1, 1970

The meeting was called to order by Chairman Dave Dyer at 8:25 p.m. in Room 1402, Washington Plaza Hotel, Seattle.

Present were:	Chairman:	Dave Dyer
	Past Chairman:	Dick Washburn
	Secretary-Treasurer:	Les McMullen
	Councillors:	Don Dahlsten, Paul Lauterbach, Bill McCambridge (for Bob Stevens)
	Program Chairman:	Rick Johnsey
	Common Names Committee Chairman:	Bob Stevenson

Paul Buffam - to extend an invitation to the 1973 Conference

Minutes of the Executive Committee Meeting of March 9, 1969 were read and approved.

The Treasurer's report was submitted and accepted.

Registration fees for the 1970 Conference as set by the Program Committee and approved by the Chairman and Secretary were endorsed by the Executive Committee.

The response to attendance questionnaires was discussed and suggested that the membership be asked to please answer. These are necessary for planning.

Meeting Places: The 1971 meeting has already been decided upon in the Fort Collins area. A formal invitation from Rob Reid for the 1972 meeting in Edmonton was read. An invitation from Paul Buffam for the 1973 meeting in Arizona or New Mexico area was received for consideration.

Field trips were discussed. The concensus of the executive was in favour of field trips particularly if they dealt with our field or an allied field.

Appointment of Program Chairman: recommended that it was a good procedure to appoint the program chairman for the ensuing year in time to attend the current executive committee meeting.

Chairman discussed 1) appointment of Nominating Committee
2) appointment of a Committee on Current Research

Current Program arrangements were discussed.

Upon a motion by McCambridge, the Chairman adjourned the meeting at 10:17 p.m.

MEMBERSHIP ROSTER

WESTERN FOREST INSECT WORK CONFERENCE

NOTE: Active members registered at the Conference in Seattle, Washington, March 2-5, 1970, are indicated by an asterisk. Notations on field of interest prepared by the Committee on Current Research follow the addresses.

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