

**PROCEEDINGS**

**T H I R T Y - N I N T H A N N U A L  
W E S T E R N F O R E S T I N S E C T  
W O R K C O N F E R E N C E**

**FLAGSTAFF, ARIZONA**

**MARCH 7 - 10, 1988**

**Not for Citation**

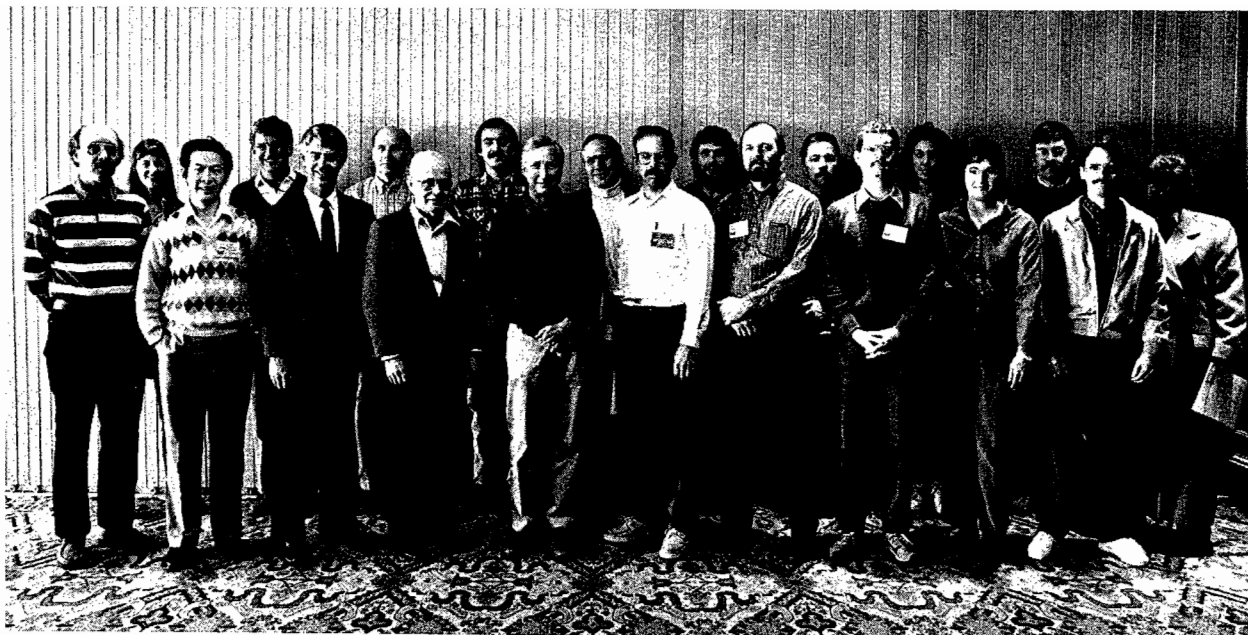
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**Prepared and Printed at**

**State of Idaho**

**Department of Lands**

**Coeur d'Alene, Idaho**



Front Row: Terry Rogers, He Zhong, Douglas Parker, John Moser, Bill Bedard, Ron Billings, Ron Honea, Kenneth Ward, Julie Weatherby, Andy Knapp, Cherry Chandler.

Back Row: Kathy Sheehan, Russ Mitchell, Mitch Miller, Bill Thoeny, Jed Dewey, Dayle Bennett, Ken Gibson, Lorraine Maclauchlan, Ralph Thier.



Front Row: Ming Tu Chang, Karen Clancy, Art Stock, Terry Shore, Rich Goyer, Ben Moody, Felton Hastings, Ladd Livingston, Ed Holsten, Bob Backman, Wayne Bousfield.

Back Row: Mike Kearsley, Staffan Lindgren, Bruce Roettgering, Dave Leatherman, Al Stage, Dave Schultz, Herb Kulman, Andy Eglitis, Dan Kunis, Curtis O'Neil.



Front Row: Tom Warfield, Rene Alfaro, Tom Koerber, Charles Sartwell, LeRoy Kline, John Mexal, John McLean, John Laut, Liz Blake.

Back Row: Peter Hall, Ron Stark, Dick Schmitz, Dan Miller, Scott Salom, Tim Paine, Mike Kearsley, Jim Mitchell, Mike Banfield.



Front Row: Don Kinn, Salma Talhouk, Lise Aangeenbrug, Deirdre Haneman, Ann Lynch, Parshall Bush, John Wenz, George Harvey, Sandy Liebhold, Lynn Rasmussen.

Back Row: Evan Nebeker, Al Hendricks, Steve Dudley, Terry Shaw, Bob Haack, Boyd Wickman, Lorne West, John Dale, Jack Coster, Dave Nielsen.



Front Row: William Randall, Clarence Dunbar, Roger Sandquist, Judith Pasek, Hubert Meyer, Skeeter Werner, Debbie McCullough, Don Owens, Richard Tinus, Ken Hobson, Mike Wagner, Tom Whitham.

Back Row: John Borden, Steve Seybold, David Burns, Gene Amman, George Evans, Pete Lorio, David Frantz, Jerry Beatty, Greg Filip, Alan Berryman, Tim Schowalter.



Bob Mathiasen, Jill L. Wilson, Andy Peavy, Scott Meneely, Steve Burke, Gladwin Joseph, Roy Beckwith.

PROCEEDINGS

THIRTY-NINTH ANNUAL WESTERN FOREST INSECT WORK CONFERENCE

FLAGSTAFF, ARIZONA

MARCH 7 - 10, 1988

Executive Committee (Thirty-ninth WFIWC)

Dick Schmitz  
John McLean  
R. Ladd Livingston  
Dave Overhulser  
Terry Shore  
Chris Niwa  
Michael Wagner

Boyd Wickman  
Russ Mitchel

Chairman  
Immediate Past Chairman  
Secretary-Treasurer  
Councilor  
Councilor  
Councilor  
Local Arrangements and  
Program - 1988  
Program - 1989  
Local Arrangements - 1989

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**FINAL PROGRAM**  
**39th Annual Western Forest Insect Work Conference**  
**March 7-10    Flagstaff, Arizona**

**Monday, March 7**

3:00 PM                    Registration - Regency Room Hallway  
6:00 PM                    Mixer-Fort Valley Experimental Forest  
                              (Vans leave Little America lobby (5:30-6:30))  
8:00 PM                    Executive Meeting - Arizona Room

**Tuesday, March 8**

8:30 AM                    Business Meeting - Ballroom B  
9:30 AM                    Break  
10:00 AM                   Panel: Plant Stress and Insect Herbivory-Ballroom B  
                              Moderator: Bob Haack, U.S. Forest Service  
                              Panelists: Jack Barger, U.S. Forest Service  
  Peter Lorio, U.S. Forest Service  
  Bill Mattson, U.S. Forest Service  
  Tom Whitham, Northern Arizona  
  University

12:00 PM                    Lunch

1:30 PM                    Workshop Session I

1. Measuring stress in plants - Bill Mattson
2. Needs in insect sampling methods - Sandy Leibhold
3. Geographic information systems - Margaret Moore
4. Injection of systemics - Tom Koerber

3:00 PM                    Break

3:30 PM                    Workshop Session II

1. Plant herbivore coevolution/coexistence - Peter Price
2. Seed and cone insects - Roger Sandquist
3. Pest impacts on recreation - Terry Daniels
4. Herbivore/pathogen interactions - Greg Filip/  
  Bob Mathiasen

5:00 PM                    Adjourn

7:30 PM                    Forest insect film festival

**Wednesday, March 9**

8:00 AM                    Workshop Session III

1. Ontogenetic resistance in trees: Is it real? -  
  Mike Kearsley
2. Regeneration/plantation pests - Bill Bedard
3. Tracking historical patterns of insect populations -  
  Tom Swetnam
4. Biological control of forest insects - John Moser



9:30 AM

Break

10:00 AM

Workshop Session IV

1. Asexual propagation and genetic resistance to pests -  
Pat Heidmann
2. Tree and stand growth impact assessment - Rene Alfaro
3. Christmas tree pest management - John Mexal
4. Field trials of bark beetle pheromones - Ron Billings
5. Public interest in pest management - Who will speak? -  
John Laut

11:30 AM

Travel to Grand Canyon National Park  
(Box lunch) (Vans leave Little America lobby)

1:30 PM

Panel: Pest considerations on forest lands managed  
for recreation and aesthetics - Shrine of  
the Ages - Grand Canyon National Park  
Moderator: Dick Marks, Grand Canyon National Park  
Panelists: Lorne West, Yosemite National Park  
Lorraine Maclauchlan, B. C. Ministry  
of Forests and Lands  
Mert Richards, Northern Arizona  
University  
Terry Daniels, University of Arizona

3:00 PM

Field Trip

6:00 PM

Return to Little America

Thursday, March 10

8:00 AM

Panel: Application of biotechnology to forest pest  
management - Ballroom B  
Moderator: Garland Mason, U.S. Forest Service  
Panelists: Stan Krugman, U.S. Department of  
Agriculture  
Ming Chan, U. S. Forest Service  
Ron Sederhoff, North Carolina State  
University

10:00 AM

Break (Photograph)

10:30 AM

Workshop Session V

1. Managing urban forest pests - Dave Nielsen/  
Salma Taihouk
2. Entomology training in forestry curricula -  
John McLean
3. Pest considerations in USDA forest plans -  
Boyd Wickman
4. Ips biology and management - Dan Miller

12:00 PM

Buffet Lunch

1:30 PM Final business meeting

2:30 PM Break

3:00 PM Software Displays:

1. Terrestrial Ecosystems Analysis Systems -  
Larry Young
2. POPSYS Population Fluctuation Model - Alan  
Berryman
3. Gypsy Moth Model - Kathy Sheehan
4. Resource Technology 88 - Display - Bill White

Tours: (Vans leave Little America Lobby)

1. Western Spruce Budworm Rearing Laboratory -  
Karen Clancy
2. Methods of Measuring Cold Hardiness in  
Conifers - Karen Burr
3. Ponderosa Pine Water Stress/Vegetative  
Propagation - Pat Heidmann
4. Pine Sawfly Research at NAU - Mike Wagner

**WESTERN FOREST INSECT WORK CONFERENCE**

**39TH ANNUAL MEETING  
FLAGSTAFF, ARIZONA**

**1988**

**EXECUTIVE COMMITTEE MEETING AGENDA**

**8:00 p.m. MONDAY, MARCH 7**

1. Minutes of 1987 Executive Meeting
  - Determine items requiring action.
2. Minutes of 1987 Initial Business Meeting
3. Minutes of Final Business Meeting
4. Secretary/Treasurer's Report
5. Correspondence
6. Committee Report/Action
  - a. History
  - b. Common Names
  - c. Awards
  - d. Logo
  - e. Future/Image
  - f. Resolution Committee
  - g. Nominating Committee
7. Other Business

WESTERN FOREST INSECT WORK CONFERENCE

39TH ANNUAL MEETING  
FLAGSTAFF, ARIZONA

7 MARCH 88 EXECUTIVE COMMITTEE MEETING

**Present:** Dick Schmitz, Chairman  
John McLean, Immediate Past Chairman  
Ladd Livingston, Secretary/Treasurer  
Dave Overhulser )  
Terry Shore ) Councilors  
Lonnie Sower for Chris Niwa )  
Michael Wagner, Local Arrangements and Program 1988  
Boyd Wickman, Program 1989  
Russ Mitchel, Local Arrangements 1989

Chairperson Schmitz called the meeting to order.

**Minutes of the 1987 Executive Committee Meeting**

Initial Business Meeting

Final business meeting minutes were read and approved (not in proceedings).

**Treasurer's Report**

Proceeds from 1987 Meeting	\$1,453.00
Checks	<5.99>
Interest	53.66
29 Feb. 1988 Check from Prior Treasurer	<u>3,528.29</u>
	<b>\$5,028.96</b>

**Discussion**

1. Location of the 1989 meeting.

Joint with Pathology Group  
Bend, Oregon  
"The Inn of the Seventh Mountain"

September 11-15, 1989

Boyd Wickman has a questionnaire for us to fill out relative to this meeting.

We anticipate that the meeting will emphasize the interaction of forest entomology and pathology.

2. **Chairperson Dick Schmitz** reviewed the problem of the future of forest entomology as outlined by Dave Wood's 1987 panel. A motion was made at the final 1987 business meeting that the Forest Insect and Disease Work Conferences should work together to plan a strategy for improving the situation. Dave Wood was to develop a plan by early fall with suggested course of action.

It was decided that this subject should be brought up during the initial business meeting. We also discussed the idea of planning for additional follow-up at the 1989 joint meeting with the pathologists.

As part of this overall subject, we discussed the trend seen in many universities of not requiring pest management courses in their forestry curriculum. John McLean proposed sending a letter to the SAF outlining our concerns.

3. We discussed the handling of workshop summaries for the proceedings - Mike Wagner has talked to all of the workshop leaders and speakers concerning this - please get them in to Mike promptly.
4. Mike Wagner read a letter from Douglas C. Allen of the College of Environmental Sciences and Forestry at Syracuse asking if there might be support from the WFIWC for a National Forest Insect Work Conference to be held at some future date. The proposal suggested dropping the regional meetings.

The executive committee proposed to mention the letter at the initial business meeting, post the letter on the bulletin board, then ask for discussion and a vote at the final business meeting.

5. Chairperson Schmitz brought up the question of giving honorary awards. After some discussion, we decided that our position as an executive committee would be the same as that suggested by Roy Shepherd and his co-workers, namely that the work conference atmosphere does not lend itself to honorary awards, at least on a regular basis. However, if some work of extra merit was to come along--the idea of presenting an award could be discussed. As a group, we felt there should not be honorary awards given.
6. We discussed the idea of having an official logo to put on the cover of our proceedings, and that we will simply ask for voluntary submissions to be prepared by those that like to draw. These should be sent to the secretary by June 1 of each year (name and address in the proceedings) who will keep a file of the drawings and select one or more to put on the cover of the proceedings each year.

7. No report from the Common Names Committee
8. Reported that Ron Stark will be here for the final business meeting to update us on the historical committee.
9. John McLean handed out a flyer for the 18th International Congress of Entomology. He will be making an announcement about it.

John also distributed two resolutions from the Western States Legislative Task Force. These will be posted on the bulletin board for reading and then discussed at the final business meeting.

**Nominating committee is as follows:**

Gene Amman - Chair

**Adjourn**

**WESTERN FOREST INSECT WORK CONFERENCE**

**39TH ANNUAL MEETING  
FLAGSTAFF, ARIZONA**

**1988**

**INITIAL BUSINESS MEETING AGENDA**

**8:30 a.m. TUESDAY, MARCH 8**

1. Minutes of the Final Business Meeting, 1987
2. Secretary/Treasurer's Report
3. Committee Reports
4. Notice for 1989 Meeting
5. Call for 1990 Meeting Site
6. Notices from Local Arrangements and Program Chairpersons
7. Other Business
8. Chairman's Report

WESTERN FOREST INSECT WORK CONFERENCE

INITIAL BUSINESS MEETING

8 March 88

Chairperson Schmitz called the meeting to order.

Dick Schmitz - Welcome and Introduction

- Called for introductions of new or first timers
- Minutes of Final Business Meeting for 1987 - read and approved
- Treasurer's Report - read and approved - \$5,028.96

Committee Reports -

- Ron Stark - Will be here later for a report of the History Committee.
- Common Names - no report
- Awards - Executive Committee recommended honor awards be dropped.

Discussion

- 1) Southern Insect Work Conference gives an award for outstanding entomology work based on a set of established guidelines. This is a valued award received from peers.
- 2) Main problem with WFIWC - no activity from committee.
- 3) Alan Berryman suggestion : Shelve the issue
- 4) Comment : No other forum for recognition of forest entomologists by forest entomology.
- 5) Decision - Shelve for now, get a copy of the WFIWC award guidelines for review.
- 6) Logo : There will not be an official logo at this time. Rather those that are inclined can submit drawings to be considered for use on the cover of the proceedings. Send to secretary.

Nominating  
Committee - Gene Amman, Chairman  
Roy Beckwith, Dave Wood



**1989 Meeting -**

Decision made to go ahead with a joint meeting with Pathology on the date selected by Pathologists. September 11-15, 1989 - Bend, Oregon

Russ Mitchel report on local arrangements.

Boyd Wickman report on the program:

Program will include a full day's field trip.

A questionnaire will be available for soliciting ideas.

Program Committee: Boyd Wickman  
Kathy Sheehan  
Dave Overhulser  
Tim Showalter OSU

**Location of 1990 Meetings -**

Jed Dewey - suggested north Idaho

Dave Wood - Bay Area of California

**Local Arrangements for 1988 -**

Introduced Program Committee: Ann Lynch  
Karen Clancy

Also many staff members and graduate students of Northern Arizona State University have helped.

- Chairman Schmitz:
- 1) Mentioned the letter inquiring about a national meeting. The letter will be posted with discussion during the final business meeting.
  - 2) Also, the resolutions from the Western States Legislative Task Force will be posted for review and discussion.
  - 3) Discussed the question of declining interest in forest entomology. He mentioned that Dave Wood, in 1987, had led a panel outlining this decline. The Canadians have prepared a \$4 million forestry awareness campaign. Invited Dave Wood to summarize the work of his 1987 panel. Two items were mentioned:
    - a) National level participation needed
    - b) Need to communicate with the public

John McLean- Gave a brief announcement concerning the upcoming IUFRO meeting.

Steve Burke - Outlined his perception of the workings of Washington DC.

- 1) Many local support groups are very active on a local level
- 2) Many other forestry related groups exist now that we might tie in with to develop support for forest entomology.
- 3) Communication with other groups is vital-- to inform of the needs of Forest Pest Management and to distribute technical information to legislative staff offices.
- 4) National committees often do not know who the experts are. We need to identify a cadre of qualified speakers to be available for educational presentations.
- 5) We should avoid "lamenting" the present situation but take some positive action.
- 6) We need a consensus of ideas to serve as a basis for the educational forum.

### Discussion

John Laut - Mentioned an editorial by C. Wendell Horne, editor of Journal of Plant Disease on "Merchandizing Forest Pest Management". This is included as Appendix A.

Boyd Wickman - Will advise pathologists of the need for coordination in this subject area.

Terry Shaw - Comments on the subject as a pathologist:

- 1) There is a lack of recognition by universities of the importance of pest management classes.
- 2) Population influence is greatest in eastern states, thus western needs are often second on the list of needs.

John Borden - The essence of a lobbying effort is that it requires repetition. Too often we do not follow up enough. We conduct the project survey or research then drop it and go on to the next problem.

John Borden -  
(continued)

**We need to emphasize that:**

- 1) Forestry is an economic generator
- 2) Identify the impact of pests on the forest
- 3) Identify the value of Forest Pest Management
- 4) Make a positive initiative to tell the story

**Additional Comments:**

- 1) We are not addressing the correct issue - we need to be able to show that what we are doing makes a difference.
- 2) We lack credibility with the Forest Industry. They are not here.
- 3) This organization has become a dinosaur.
- 4) Garlan Mason - In a legislative financial hearing on support for USFS research: only two testimonies were given in support of Insect and Disease research.

Decided on an 8 PM evening meeting Wednesday to further discuss the question and problem of lack of support for forest pest management.

**Meeting adjourned.**

**TREASURER'S REPORT**

**Thirty-ninth Western Forest Insect Work Conference  
Flagstaff, Arizona, March 7, 1988**

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CHAIRPERSON'S REPORT

TO THE 39TH ANNUAL MEETING OF THE  
WESTERN FOREST INSECT WORK CONFERENCE

FLAGSTAFF, ARIZONA  
MARCH 8, 1988

One of the benefits of this annual conclave, aside from providing a forum for the exchange of technical information and professional thoughts, is the opportunity it provides to step outside the press of our daily activities and renew our perspective of the big picture. Today, perhaps more than ever before, we find our profession being shaped by fiscal priorities and environmental policies that often seem beyond control.

Overall, the insects receiving the greatest attention in western North America are much the same as a year ago, but the research and pest control staffs and budgets needed to keep them in check continue to dwindle. One of our most widespread defoliators, the western spruce budworm, has reached intolerable levels in western Oregon and Washington. As a result, Bill Ciesla is not in attendance because he is coordinating a 900,000-acre suppression effort. Terry Shore tells me there has been an upsurge of budworm on the Canadian side. The mountain pine beetle continues in first place on the land managers "most unwanted" list of bark beetle problems. Populations are at outbreak levels in much of western Canada and the northern Rocky Mountains. As a result, the United States and Canada have developed a coordinated research and application program--more about that later.

The Gypsy moth, one of the relative newcomers to our list of problems, has continued to infest new locales throughout the West. In Oregon, Dave Overhulzer tells me they have detected a new spot near Cave Junction, but in infestation areas treated previously, the trap counts showed a decline from 19,000 moths in 1984 to 150 in 1987. In Idaho, Ladd Livingston says a spot infestation near Sandpoint may require treatment. He also notes a new and persistent problem with western pine beetle in second growth ponderosa pine that is causing concern among landowners.

Our members continue to be among those recognized for outstanding efforts and contributions to the profession. Among those is the favorable response Molly Stock has received as editor of her new AI Journal. Les Safranyik was awarded one of two fellowships at the national meeting of the Entomological Society of Canada for his valuable contributions to the science of entomology--more specifically his contributions to the understanding of the mountain pine beetle and spruce beetle population dynamics. Les joins the ranks of only 89 "fellows" (one of only 12 forest entomologists) of the Society--the oldest scientific Society in Canada. David Wood was the recipient of the Founders' Memorial Award given by the Entomological Society of

America at the 1987 annual meeting. He later presented the memorial lecture, entitled "The chemical ecology and sociopolitical impact of bark beetles in coniferous forests," in honor of one of this Conference's founders, Paul Keen. Congratulations Molly, Les, and Dave!

For most of us, the greatest challenge of the past years has been to continue to advance the practice of forest entomology in the face of stricter environmental constraints and declining budgets and staffing. In response to the challenge to us to provide land managers more effective and environmentally acceptable suppression methods, increasing effort is being devoted to determining the optimum deployment of semiochemicals. Peter Hall and John Borden have been integrating the latest available semiochemicals with existing salvage programs in an effort to reduce mountain pine beetle populations to tolerable levels in British Columbia.

South of the border, research and pest management specialists from State and Federal agencies interested in using semiochemicals for bark beetle suppression met in Denver, Colorado, to assess progress made in the Canadian trials. They also evaluated the operational status of available synthetic semiochemicals and set priorities for coordinated field tests to speed the development of environmentally acceptable suppression strategies using these materials. Immediate fallout from that session included a recommendation that a research work unit be created that would spearhead efforts to develop semiochemicals for use in bark beetle suppression. In addition, a plan for a coordinated test of the antiaggregant, verbenone, for mountain pine beetle in lodgepole and ponderosa pine in Forest Service Regions 1, 2, 4, and 6 was formulated. The discussions also resulted in cooperative efforts that will expedite field trials of semiochemicals for western pine beetle to be conducted by Ralph Thier and Bill Bedard, and for the pine engraver beetle by Dan Miller and Ladd Livingston in Idaho.

The call by our legislators and land managers for improved efficiency and creativity to meet the needs of land managers and offset severe limitations on funding has not gone unanswered. Research and application efforts directed toward control of the MPB provide an example of how we are responding to reduced budgets and staffing. In 1982, a Memorandum of Understanding was developed between Canada and the United States to coordinate mountain pine beetle research application efforts, with the intent of maximizing return from severely reduced budgets and staffing by avoiding duplication. This effort has been coordinated by Ross McDonald, and more recently Gordon Miller, on the Canadian side, and Dave Graham for the United States. Despite the fact the program received virtually no new funding, enough progress has been made that Dave Holland and Gene Amman have organized a symposium to be held this July in Kalispell, Montana, on "The management of lodgepole pine to minimize losses to mountain pine beetle." The symposium and resultant proceedings will update the manager on latest management strategies. The Symposium has been targeted to

answer the land managers questions and will include a field trip to see ongoing suppression activities.

Overall, we have done well in meeting the challenges in the face of reduced budgets and staffing. But, despite some increases in FPM budgets for this fiscal year, the end of reduced budgets and staff is not in sight. This brings me to a topic that has dominated much of our discussion during the last year's Conference, "The future of forest entomology," and the role of the WFIWC in determining our destiny.

In 1949, a steering committee of Hec Richmond, Bob Furniss, Paul Keen, and Jim Evenden formulated what became the constitution for the first Western Forest Insect Work Conference, which was held in 1950. The resulting objectives were to:

1. Advance the science and practice of forest entomology.
2. Provide a medium of exchange of professional thought.
3. Serve as a clearing house for technical information on forest insect problems of the western United States and Canada.

Further, they recommended this Conference be conducted with the workshop format as the basic forum for attaining the stated objectives. They felt the Conference would endure if it conducted its deliberations in that format.

Rather prophetic fellows! Without question, the format has enabled this Conference to be among the most successful of its kind. No question but what the Conferences have met the objectives of those founding fathers. But, while we were achieving those successes, the environment governing funding and budgeting was changing drastically. Dave Wood's panel on "The future of forest entomology" at last year's Conference detailed the effects on our profession. Dave's workshop revealed how reduced levels of funding have affected the ability of universities and State, Provincial, and Federal managers in the United States and Canada to meet the land managers needs. Summaries of the workshop have been forwarded to Professor Arthur Kelman, Department of Plant Pathology, University of Wisconsin, Madison. Professor Kelman is a member of the National Academy of Sciences Council and the summaries will be used in the NAS review of the decline in support for forest biology. Time does not permit me to recount those findings in more detail--we have already done that this morning, and the permanent record is in last year's proceedings.

The bigger question is, how did we get where we are? Is our dilemma totally outside our control? I think not. Our problem is part of a larger one--one that besets forestry in general. Overall, most of our citizens (including most legislators) are not aware of the importance of forestry or forest entomology to their economic and social well-being. In support of that contention is an analysis performed by the Canadian Government.

**PLENARY SESSION: PLANT STRESS AND INSECT HERBIVORY**

**Moderator: Bob Haack**

**Participants: Bill Mattson, Pete Lorio, Tom Whitham, Jack Barger**

There are a number of biochemical, morphological, and physiological changes that occur in plants during periods of environmental stress. Understanding how these stress-induced changes influence the interrelationships among plants, herbivorous insects, and their natural enemies may allow development of management strategies that can be implemented during periods of stress. This panel was organized to present current research and theory in the area of insect herbivory as influenced by water stress, nutrient stress, and air pollution stress.

1. The Effects of Drought Stress on Plant Susceptibility to Insects is Mediated Through Two Main Classes of Plant Traits, Those Affecting (a) Plant Acceptability and (b) Plant Suitability.

**Bill Mattson: USDA Forest Service, North Central Forest Experiment Station, East Lansing, Michigan.**

Plant acceptability traits largely affect behavior while plant suitability traits mostly affect the physiology of plant-feeding insects. Little is known about how drought-induced changes in plants affect insect behavior. More, however, is known about drought-induced effects on insect physiology. In the case of insect behavior, drought typically increases levels of plant sugars, amino acids (such as proline), salts, and sugar alcohols. All of these compounds serve as feeding and biting stimulants, and are usually found at levels far below that which elicits a peak feeding response by most herbivores. Considering insect physiology, drought regularly elevates levels of several important nutrients such as soluble carbohydrates, amino acids, and many minerals. On the negative side, drought can also raise the concentrations of many debilitating and toxic compounds, at least until the stress becomes very severe or prolonged. After this point, such defensive compounds decline. Plant temperature, which usually increases during periods of drought stress, can affect both behavioral and purely physiological processes. The sum total of these effects on insects is largely a function of an insect's feeding habit. For example, the net effect on free-feeding folivores may be different than the net effect on endophagous insects such as gall makers or phloem feeders.

Current studies on drought stress with the spruce budworm/white spruce and bronze birch borer/paper birch model systems were discussed.

In order to understand the effects of plant stress on plant-feeding insects, experiments need to be much more carefully executed than in the past, with attention paid to many more interacting variables on both the side of the plant and the insect.



2. How Important is Timing, Degree, and Duration of Water Deficits to Tree Resistance to Bark Beetle Attack?

Pete Lorio: USDA Forest Service, Southern Forest Experiment Station, Pineville, Louisiana.

John Hodges, Evan Nebeker, and Catalino Blanche: Departments of Forestry and Entomology, Mississippi State University.

A 2-year study of loblolly pine in a 35-year-old natural, evenaged stand on moderately-well to well-drained soil revealed greatly different patterns in amount and distribution of precipitation; soil water depletion and accretion; and timing, degree, and duration of water deficits. Tree responses illustrate growth and development based on consideration of plant growth and differentiation balance principles. The seasonal pattern of resin flow was greatly altered from one year to the next and (if resin flow from small wounds is indicative of resistance to bark beetle attack) indicates that seasonal resistance to bark beetle attack may vary greatly with timing, degree, and duration of water deficits. Stress brought about by water deficits that limits growth, but which does not seriously affect photosynthesis and translocation, may enhance tree resistance to beetle attack.

3. Interaction of Stress and Herbivory in Affecting Growth and Reproduction of Pinyon Pine.

Tom Whitham, Neil Cobb, Susan Mopper, and Kerry Christensen: Department of Biological Sciences, Northern Arizona University, Flagstaff, Arizona.

Six major points were discussed.

(1) Pinyon pine growing in the deep ash and cinder fields of Sunset Crater appear to be living in a very nutrient and water-stressed environment relative to the adjacent sandy loam soils.

(2) Five species of insect herbivores show dramatic increases in abundance on pinyons growing in cinder sites relative to pinyons at sandy loam sites and these patterns have existed during each of the previous five years of this study.

(3) Water and fertilizer experiments confirm this pattern. Trees receiving supplemental water and nutrients exhibit significant declines in herbivory.

(4) The presumed water and nutrient stress of Sunset Crater trees has no effect on tree growth as measured by stem growth but it does have a dramatic negative effect on conelet initiation. Thus, even though there is some difficulty in quantifying stress in physiological terms, in the most important terms of plant reproductive fitness, it is clearly present.

(5) These herbivores, particularly a stem and cone-boring moth, have a dramatic effect on plant fitness and may be acting as selective agents of plant evolution in which the genotypes of trees are changing as a result of their stress-induced susceptibility to herbivory.

(6) One of the mechanisms of resistance appears to be an increase in resin flow from wounds. Important interactions with mycorrhizae may also be involved.

#### 4. Role of Atmospheric Deposition in the Suitability of Various Elm Hybrids for Elm Leaf Beetle.

**Jack H. Barger:** USDA Forest Service, Northeastern Forest Experiment Station, Delaware, Ohio.

**Richard W. Hall:** Department of Entomology, The Ohio State University, Columbus, Ohio.

**Alden M. Townsend:** United States National Arboretum, Washington, D.C.

Beginning in 1985, the USDA Forest Service Research Work Unit "Effects of Atmospheric Deposition on Forest Trees in the Eastern United States," at Delaware, Ohio, was assigned research to determine roles that insects play in the acid rain-air pollution problem. Our objective is to develop procedures for using resident insects as early warning indicators of atmospheric deposition stress on host trees. We chose the elm leaf beetle (ELB), Xanthogaleruca luteola, and several elm hybrids as the indicator insect and host trees. We needed an insect that was available in the appropriate life stage, and a host plant that was genetically controlled to reduce variability. In 1985, we screened pollutant stresses using two elm hybrids, 'Homestead' and 'Pioneer'. We screened for the effects of simulated acid rain at or near ambient levels. Fumigations were sulfur dioxide, ozone, and combinations of both pollutants in open-top chambers. Acid rain treatments and ozone fumigations showed significant effects. Because of these trends, we increased the pH of acid rain treatments, the concentration of ozone fumigations, and the number of open-top chambers. But in 1986, only ozone showed significant differences. Thus, in 1987, we conducted an ozone-dose response study. Our hypothesis was that ozone fumigation of elm influences fecundity and leaf-area consumption by ELB. After fumigation, leaves were bioassayed and then harvested to determine number of eggs laid/ELB female and the leaf area consumed for food. Results showed that as ozone was increased, fecundity was significantly reduced. However, total leaf area consumed by ELB against ozone dose did not follow the clear-cut results obtained for fecundity. Only at the highest ozone level was leaf area consumed by ELB reduced. Increased insect attack on host trees stressed by atmospheric deposition is being supported by a growing body of evidence. Thus, subtle changes in forest productivity, forest plant diversity, and general forest decline attributable in part to atmospheric deposition may be best addressed by examining the role of host plant insects.

WORKSHOP: CURRENT NEEDS IN INSECT SAMPLING

Moderator: Sandy Liebhold

Participants: Bill Ravlin, Lonnie Sower, Charlie Sartwell, Terry Rogers, Doug Parker, Bill Bedard, Ralph Hall, Fred Stephen, Al Stage, Joe Fox

Bill Ravlin described his work with gypsy moth pheromone traps. He explained that more information than just the number of males trapped can be used from traps. Trap catch alone is not always a good indicator of population density. He showed that males trapped from high density populations tend to have shorter wings than males from low density populations. Consequently, Bill proposed that the distribution of wing lengths of trapped males may be used to predict population trend. This generated a discussion of the effect of moth migration on trap count. It was proposed that it would be valuable to develop a trap that is selective for or against dispersing vs. non-dispersing moths.

Lonnie Sower described the state of the art in tussock moth sampling. Pheromone traps and cryptic shelters are useful for monitoring low density populations. High counts using these techniques are used to trigger other techniques, such as mid-crown larval sampling.

Charlie Sartwell described the status of the use of pheromone traps for predicting defoliation and for evaluating spray treatments for the western spruce budworm. He said that a narrow release rate "window" is tailored to the density of the population that is being monitored. Higher release rates are appropriate for monitoring low density populations than for high density populations. Charlie proposed that blank traps may be the appropriate tool for monitoring high density populations.

In a discussion of sampling needs for assessing defoliator spray programs, Terry Rogers noted that it is difficult to compare different programs because they often express density in terms of different sampling units. It was proposed that a protocol for defining sampling units and for converting from one unit to another should be established. Doug Parker stated that in spray programs, the need for different types of information, necessitates different sampling techniques. Assessment of application success can be assessed using spray cards. Estimation of percent kill necessitates pre- and post-spray larval samples. Assessment of success in terms of management necessitates only a post-spray count or defoliation estimates.

Bill Bedard described a need for different methods for estimating low vs. high bark beetle densities. Low and high density populations are distributed differently both within and among trees. New sampling schemes must be developed to address this issue.

Ron Billings described great success in using pheromone traps (funnel traps) to assess Southern Pine Beetle population density. He has found that SPB counts in traps from only a 2 week period in the early spring is a good predictor of populations for the entire season. He also found that the ratio of SPB to clerids is indicative of population trend. Ralph Hall pointed out that this sort of technique will be very useful in assessing treatment efficacy.

Fred Stephen described his work in assessing the relationship of 13-year periodical cicada emergence to bird predation on canopy arthropods. He found that even though birds predate heavily on cicadas, this did not significantly increase survival of other canopy arthropods.

Al Stage proposed a new method for estimating mountain pine beetle mortality from aerial surveys. He suggested that distance sampling could be used to estimate the number of red-tops in a mortality cluster. Distance can be expressed as a proportion of tree height so as to eliminate an effect of observer altitude. The method should be more efficient than counting.

**WORKSHOP: GEOGRAPHIC INFORMATION SYSTEMS**

**Moderator: Margaret M. Moore**

The workshop on Geographic Information Systems (GIS) was well attended with approximately 40 participants representing several agencies. Many of the participants were entomologists, pathologists or foresters with the U.S. Forest Service, Bureau of Indian Affairs, and the Canadian Forest Service. There were also several knowledge engineers, biotechnologists, operation research analysts and university professors. The participants' knowledge and experience with GIS varied. An informal poll indicated that the majority had little familiarity with the subject. Approximately 10 participants had a significant amount of experience with one or more GIS systems.

The workshop began with the moderator presenting a brief overview of GIS as a tool for collecting, storing, retrieving, manipulating, and displaying geographically-referenced data. Computer-based systems may allow for more efficient analytical operations and modelling. It was suggested that GIS may be a practical tool for forest pest management to predict spatial and temporal changes in pest populations and the extent of the resulting outbreak damage.

Much of the participant discussion emphasized three major areas:

1) The inadequacy of current forest inventory data for Integrated Pest Management (IPM) needs; 2) Ability of models to predict pest outbreak; and 3) The role that GIS will play in IPM, which includes the type of data layers and the scales required for IPM and risk rating models. These three areas of emphasis will be discussed separately:

Forest inventory data - Many participants felt that current forest inventory data are inadequate (sometimes useless) for the forest pest manager's purposes. The emphasis of most forest inventories continues to be for timber volume estimates, therefore, the methodology and the information for a pest manager are often not appropriate. This situation will not change simply because the data are entered into a GIS.

Ability of models to predict pest outbreak - There needs to be a plan in place to test the predictive capabilities of these various models (with and without the spatial analysis of a GIS). For example, in northern Idaho, someone developed a model to predict Tussock moth outbreaks. This model divided the area into high, moderate and low risk. No defoliation by the moth occurred in the areas where the model predicted high risk. Other models dealing with southern pine bark beetle have been able to predict outbreak with a much higher degree of accuracy.

The role of GIS in IPM - Many participants felt that the U.S. Forest Service would probably not consult the pest manager when choosing a particular GIS system. The pest manager needs to know (or find out) how many data layers will be devoted to pest information. Perhaps a feasibility study should be conducted to determine the most important variables and scales needed to meet pest needs. More research needs to be conducted in the relationship between micro- (fine) and macro- (course) scale and pest outbreaks.

Workshop Report

Injection of Systemics

Tom Koerber moderator

Fifteen people attended and everyone participated in the discussion.

John McLean is using rubidium chloride in studies of spruce budworm dispersal. Medicap or Mauget implant or injection systems are used to place the material in the sapwood. The foliage accumulates concentrations of 100+ P.P.M. Larvae feeding on the foliage from third instar to maturity pick up rubidium chloride which can be detected to identify moths and egg masses which originated on the injected tree.

Bill Thoeny is using rubidium and strontium solutions injected into standing trees. Southern pine beetles breeding in the trees pick up the material. The objective is to identify and trace beetles emerging from trees in cut and leave treatments.

Roger Sandquist reported on implanted acephate treatments for control of spruce budworm on Douglas-fir seed trees. Early spring treatments are more effective than last spring treatments. Fall treatments are equal to spring treatments in effectiveness and are less costly, \$20/tree compared to \$37, due to easier road access in the fall. Effects of repeated treatments and the need to treat clusters of trees to provide a pollen source to avoid inbreeding are being studied.

Jed Dewey reported on operational demonstrations in which B.t. treatments were used on 700 acres Douglas-fir prior to logging to improve tree condition and encourage seed production. Leave trees were implanted with acephate to protect the cone crop and increase seed fall after logging.

Jed Dewey reported for Mike Jenkins and Roy Shearer who tested acephate implants for protection of western larch cones from insects. The treatment provided good control of larch casebearer and Adelges viridis.

Lorne West reported acephate implant treatments provided good control of lodgepole needleminer. Results were equal to malathion or acephate sprays and better than metasystox injections. Treatments gave partial protection in the year following treatment.

Tom Koerber summarized results of experimental and operational implant and injection treatments for Douglas-fir cone insect control. Metasystox injections resulted in seed yield increases in 18 of 20 applications but increases were statistically significant at the .05 level only 4 times. Seed yield increases ranged up to 55 percent. Acephate implants resulted in seed yield increases in 11 of 12 projects and foliage protection in another three projects when cone crops were lost to frost. Seed yield increases ranged up to 465 percent. Increases were significant at the .05 level five times. Late treatments were judged to be the cause of failure in 1 metasystox and 2 acephate projects.

Don Kinn and Mitch Miller described a treatment using Rotanicide, a soil fumigant also known as Vapam, for southern pine beetle control in a trap tree scheme. The material is applied to wounds made in standing green trees. The trees are attacked by beetles but brood development is abnormal and survival very low due to the reaction of the trees to treatment. The method is useful in cut and leave treatments.

WORKSHOP: PLANT HERBIVORE COEVOLUTION/COEXISTENCE

Moderator: Peter Price

Participants: Alan Berryman, Chris Sacchi

Price made the argument that two kinds of coevolution need to be considered: 1. The Arms Race proposed by Ehrlich and Raven (1964) which is a large scale family level phenomenon, and 2. The Gene-for-Gene Concept where mutually induced genetic changes occur in tightly evolving systems. The problem with the arms race concept is that there is enormous phylogenetic inertia in plant evolution such that chemical defense traits correlate with floral traits, and both remain characteristic of whole families. Why are there such large gaps between families in floral traits, when selection for divergence need not be very strong, and smaller gaps in chemistry so that chemotaxonomy can be revealing for family relationships? The arms race concept predicts the opposite. Therefore, The Phylogenetic Inertia Hypothesis can explain the patterns: as plant families radiate, a small number of herbivores follow the radiation and are trapped onto this radiation. They become so strongly adapted to the radiating group that they cannot shift from this taxon to another. Examples include diprionid sawflies on conifers, adelgid gallers on conifers, Pemphigus gallers on poplars, and cynipid gallers principally on oaks. This hypothesis invokes no evolutionary responses of plants to selection by herbivores, but results in the same pattern.

Indeed, for woody plants there may be so much phenotypic plasticity in response to environmental heterogeneity and plant age that genotypically based resistance may be masked. An example of willows and shoot galling sawflies was provided. Chris Sacchi expanded on the willow (Salix lasiolepis), sawfly (Euura lasiolepis) example arguing that fecundity selection on adult plants is weak relative to viability selection on seedlings. Therefore, we should devote more effort to the study of genetically based resistance in seedlings.

Alan Berryman argued that plants evolved first to resist pathogenic microorganisms, and the radiation of land plants was permitted by an infallible defense of multicellular organisms against unicellular organisms. This was causing death of cells in advance of the invasion, so the parasite could not invade living tissues.

**WORKSHOP: SEED AND CONE INSECTS**

**Moderator: Roger Sandquist**

**Participants: 20**

After introductions, several short presentations were made to indicate recent research findings, current needs of resource managers, and direction of cone and seed insect research.

Judy Pasek outlined her findings on conelet mortality and insect damage to second-year cones and seeds of ponderosa pine in southeastern Nebraska. Together, Rhyacionia spp. and Retinia metallica caused conelet losses averaging 14% annually. Dioryctria auranticella annually damaged about 14% of second-year cones. The western conifer seed bug apparently caused about 13% of conelets to abort or disappear, and up to 41% of ovules or seeds were damaged by harvest time. Conelet survival averaged 20%, and about 77% of second-year cones appeared healthy at harvest; however, mean annual seed yields from unprotected cones ranged between 0.4 and 8 seeds per cone.

Roger Sandquist summarized Mike Jenkins' initial findings on insects of larch cones. Rearings from larch cones have identified western spruce budworm, larch cone maggot, a wooly adelgid, and midges as probable important pests. Future work will focus on the impact of western spruce budworm and adelgids.

Ernie Collard, Silviculturist from the Wallowa-Whitman National Forest in Oregon, outlined the need for protection of superior trees in their tree improvement program against defoliators like western spruce budworm. He also showed how hazard rating stands can be used in developing silvicultural prescriptions.

Bill Randall, Geneticist for the Siuslaw and Willamette National Forests in Oregon, described the nature of the need for research on cone and seed insects in the Cascade and Coastal Ranges in Oregon and Washington. He described the weaknesses of current technology to reduce insect damage in wild stands and seed orchards. Sampling methods to determine need for control of insects are needed.

Garland Mason described the scope of cone and seed insect research as 14 scientists, 7.5 to 8.5 scientist years, at 5 locations in the USDA Forest Service nationally. There is an emphasis on continuing work on control including pheromones, chemical and microbial insecticides, application scheduling, and application techniques. A national pesticide research plan is being developed.

The need for accepted common names for various cone and seed insects was suggested by Judy Pasek. After discussion, it was suggested that the topic be brought up before the entire work conference.



WORKSHOP: HERBIVORE/PATHOGEN INTERACTIONS

Moderators: Greg Filip and Bob Mathiasen

Participants: 26

The workshop discussion began with a brief summary of examples of several known herbivore/pathogen interactions. Possible discussion topics mentioned included ungulate damage/fungal diseases, bark beetles/stain fungi, bark beetles/root disease fungi, bark beetles/stem decay fungi, bark beetles/dwarf mistletoes, defoliators/dwarf mistletoes, and defoliators/root pathogens. An additional topic proposed was how can forest managers use information on herbivore/pathogen interactions.

Most of the discussion was concentrated on current or recent studies related to a few of the above topics. Research at UC Berkeley is underway using blue stain fungi isolated from bark beetles to determine the extent of sapwood blockage in pole-size ponderosa pines. The fungi are being introduced into trees with different vigor ratings by female beetles using different attack densities. The idea that bark beetle outbreaks may be related to the virulence of the fungal flora associated with beetles at different times was also discussed.

The discussion next moved to bark beetle/root disease interactions. Transmission of black stain root disease by Hylastes has been demonstrated under field conditions, but not for other possible vectors. Precommercial thinning of Douglas-fir in the Northwest shortly after beetle flight in June or July appears to be the most promising procedure for preventing the spread of black stain root disease at the present time.

The interactions between bark beetles and dwarf mistletoes are still poorly understood. In some cases, dwarf mistletoes appear to increase susceptibility to bark beetles. Predisposition of trees to attack by the red turpentine beetle in California was discussed as an example of this situation. In other instances, there seems to be little connection between beetle attacks and dwarf mistletoe infection. For example, heavily infected Douglas-firs in the Southwest are seldom attacked by bark beetles. It was also mentioned that dwarf mistletoe-infected trees may be less susceptible to beetle attack because of reduced phloem thickness.

Little information is available on the interactions between defoliators and dwarf mistletoes. During outbreaks of the western spruce budworm there does not appear to be an preferential feeding on dwarf mistletoe-infected trees. However, there may be preferential feeding by budworm on mistletoe-infected trees at endemic population levels. A positive correlation between heavy dwarf mistletoe infection, heavy pandora moth defoliation, and mortality of ponderosa pine has been observed in northern Arizona.

Severe defoliation may be related to mortality of trees which are infected by root pathogens. Defoliation may cause an increase in root sugar content which favors growth of the pathogen. However, the actual cause of mortality is usually correlated with the professional training (entomology or pathology) of the investigator examining the interaction.

Workshop: ONTOGENETIC RESISTANCE IN TREES -- IS IT REAL?

Moderator: Mike Kearsley

Participants: 17 Brave souls provided an enjoyable discussion.

The ontogeny of forest trees and other long-lived species involves a series of changes in the expression or potential expression of genes in cells laid down by the apical meristems. The mechanism responsible for the orderly activation or suppression of genes remains unknown. Proposed timing mechanisms for these changes in traits include the progressive methylation of cytosine and deamination of adenosine in highly repetitive sections of nuclear DNA.

This ontogenetic aging of meristems, or meristem maturation, affects many tree traits, not simply the degree of flowering or the readiness to flower. Leaf size and shape, phyllotaxy, bark thickness, and stem thorniness are morphological traits which commonly change with developmental stage. Physiological traits, such as rooting capacity and phenology also may be subject to ontogenetic effects.

Several specific implications of this phenomenon for forest insects and entomologists were discussed. First, sampling of insect populations or tree characteristics may have to be altered to include the effects of host plant ontogeny. Both within and among plants in a population, gradients of maturation can affect plant defensive traits and insect distributions. It was decided that depending on the research question, if host ontogeny has been shown to have important effects on the insects or traits of interest, samples can be stratified, to include only certain areas of the hosts or expanded to include more host plants.

Second, while defensive traits may not be changing within plants, within-plant maturation processes may affect the behavior of forest insects. Cases were discussed in which bark beetles which normally stratify vertically within trees colonized downed trees. The fact that they occupied the same relative positions in these trees as they would have in a standing tree indicates that cues used by the beetles during colonization may be changing during host plant's ontogeny.

Third, other (hairy) forest species may respond to plant ontogeny as well. Blacktail deer, elk, hares have been shown to browse preferentially on stockings propagated from mature parent trees, and leave seedlings or stockings from juvenile parents relatively untouched. The case of deer browsing was related to higher levels of chlorogenic acid and methyl sylvan pinyll ether in juvenile source stockings.

Finally, propagated plants from different aged parent trees may respond differently to air pollutants and other forms of stress. A case was discussed where stockings from stress-resistant parent trees retained their stress tolerance, although the source of the stress resistance was not mentioned.

Finally, it was pointed out that topophysis, or within-plant ontogenetic patterns, are only one part of the "maternal effects" referred to in the clonal propagation literature. Water and nutrient relations, temperature, and light regimes experienced by the parent tree will have effects on cuttings taken from them for the first one to three years of the stockings' growth. These differ from ontogeny in that they are not directional, and are not stable to a second bout of propagation.

WORKSHOP: REGENERATION/PLANTATION PESTS

Moderator: Bill Bedard

Participants: 34 attended and most participated

Pissodes strobi Host resistance has been observed by Alfaro and Borden. Overhulser advised that genetic resistance, if feasible, is the ideal approach. The Sitka x white spruce hybrid appears to be resistant in Oregon. McLean mentioned that shade grown spruce is less prone to attack than is open grown. Biological control has been enhanced by bagging infested terminals in mesh sized to allow the escape of parasites but not of weevils. Alfaro has developed a growth model to predict the impact caused by P. strobi injury. Because the number of eggs laid in any one terminal is limited there may be a beetle produced ovipositional deterrent. If so, such a semiochemical could be used in pest management.

P. terminalis In the Kamloops area of B.C., Maclauchlan reported P. terminalis seems to attack some strains of lodgepole pine more than others and that taller trees in the open of a certain age appear to be most attacked. Most trees are weeviled at least once and 20% are weeviled more than once. Spacing, achieved through thinning, may provide some relief from weevil injury. Gibson reported high mortality of overwintering broods. Growth loss caused by P. terminalis injury is an important, unanswered question.

Eucosma sonomana Koerber reported that by using pheromone-based mating disruption, ponderosa pine were protected from attack. Their height and diameter growth were compared with those of attacked trees using the growth model PROGNOSIS. Mean volume loss was found to be 25%/year. Additionally, the shoot borer tends to attack the tallest trees in the stand and to cause forking.

Zelleria haimbachi has been more prevalent than usual in Oregon and Idaho on ponderosa pine and in B.C. on lodgepole pine.

Cecidomyia pininopsis Bedard reported that the injury of this midge does not cause reduced growth where trees growth is slow and where midge-caused injury is obvious, but does cause growth loss in faster growing trees where injury is not as obvious. The midge could become an important pest if a high proportion of susceptible trees are planted in areas where midges are abundant.

Principals: Many felt that as more plantations of different species were established and matured on new and different sites, many new, apparent pest problems would occur. Impact, the actual socio-economic loss, caused by insect injury remains a crucial research need for many pest of young stands. Site index values frequently incorporate growth loss caused by insect injury thus understating the true growth potential. Pest management, therefore, could result in growth rates that exceed the index of some sites. Progeny test sites of the tree improvement programs are a valuable asset in determining pest impact as they are designed, planned experiments where the effects of the various sources of variability in growth can be evaluated. All pest management methods discussed were of means other than the use of toxic pesticides. Shoot diameter is important in the biology of pest/host interaction. It may determine the "window of susceptibility" and the amount of impact caused by a given level of attack. The development of appropriate pest management strategies and tactics depends on interdisciplinary research where silviculturists, tree improvement people, economists, pathologist, physiologists, etc. are involved.

**WORKSHOP: Tracking Historical Patterns of Insect Outbreaks**

**Moderator: Tom Swetnam**

**Participants: Mike Banfield, Ann Lynch, Marc Abrams, Debbie McCullogh, Boyd Wickman, Scott Anderson, Ed Holsten, Andy Eglitis, Doug Parker, Lynn Rasmussen, Dick Schmitz, Roy Beckwith, George Harvey, Andy Peavy, Albert Stage, Donald Kinn, Lynne Thompson, Andy Knapp, Dayle Bennett, Jim Linnane, Terry Rogers, Rene Alfaro, Sandy Liebhold, Mitch Miller, Bill Thoeny, Sam Hitt, Alan Berryman, Tom Whitham, and others**

Swetnam began the session by reviewing his work on tree-ring reconstruction of western spruce budworm outbreaks since 1700 in mixed-conifer stands of Colorado and New Mexico. Some of the main observations of this work are that outbreaks have occurred repeatedly in the past at intervals from 15 to 35 years, and that outbreaks in the twentieth century seem to be more synchronous and more severe than outbreaks occurring before 1900. A "gap" without budworm activity is apparent in the first few decades of this century. Swetnam suggests that this evidence is supportive of the argument put forth by Dave Fellin, Clint Carlson, Wyman Schmidt and others in the Northern Rockies that a change in forest structure and composition brought about by harvesting practices and fire control has led to a change in the budworm outbreak regime.

Al Stage offered an alternative hypothesis that may explain observed changes in budworm outbreak patterns - namely climatic change. Al pointed out that some tree-ring studies cannot detect long term climate change because these trends are removed in data processing procedures. Swetnam responded that many tree-ring studies have used only very conservative detrending techniques that should only remove age trends from tree-ring width series, while other tree-ring series, such as those from bristlecone pine are often not detrended at all. Thus, information on climate changes on the scale of decades to centuries derived from tree-ring series might be used to compare with budworm outbreak chronologies. Stage said that he could accept that observed increases in outbreak severity may be due to changes in forest structure and composition, but not the change in synchronicity. Swetnam proposed that a decrease in the patchiness of forest stands in this century has led to more continuity across the landscape which would favor insect dispersal. Also, similarity in forest type and condition across large areas, and a climatic trigger such as dry warm conditions that may favor budworm but weaken trees, could act to synchronize populations of budworms throughout a region.

Rene Alfaro and Boyd Wickman pointed out that insect outbreak data for periods before the 1940s is difficult to find. Very little documentation in forestry records is available, and in some areas tree-ring sources are also unavailable. Alfaro and Wickman also reported that budworms and Douglas-fir tussock moth may now be appearing in stands where it has never been recorded before. Alfaro suggested that livestock grazing, in addition to fire control, may be another factor that has led to stand structure changes. Alfaro also remarked that sampling strategies for reconstructing history of past insect populations must consider the general biology and typical patterns of population dynamics of insects. Douglas-fir tussock moth, for example, generally occurs as a very patchy outbreak and infestations often appear on dry ridgetops. Thus, tree-ring sampling for reconstructing these outbreaks may have to include many more stands than would be necessary for other widespread insect outbreaks.

A general discussion of the role of historical perspectives in forest insect management followed.

WORKSHOP: BIOLOGICAL CONTROL OF FOREST INSECTS

MODERATOR: John Moser

PARTICIPANTS: 26

John Moser presented a brief overview of the subject followed by a review of five papers on the biological control of forest insects that had been published in the past year (Miller et al. Ann. Entomol. Soc. Am. 80:417; Moser et al. Int. J. Acarol. 13:141; Moser and Branham. For. Farmer 47:17; Ryan. J. For. 85:29; Ryan. J. For. 85:33).

Discussion was then opened to the participants to report any events of interest. George Evans discussed a forthcoming publication by Jens Roland in J. Anim. Ecol. showing that population declines of the winter moth in Canada were not, as previously supposed, due to the effects of introduced hymenopterous parasitoids alone. Rather, they were caused by the interaction of the parasitoids with native and, possibly, non-native beetle predators that attack the pupae. Apparently, neither the parasitoids or the predators acting alone are able to effect control, but their combination was effective. George emphasized that one must be careful in citing credit for biological control successes because subtle interactions are often at work.

LeRoy Kline reported that parasites of the larch casebearer (LCB) in Oregon have proved to be very effective, and that damage from the moth has been acceptable. But biologicals were not the only factor in control; adverse environmental factors such as early frost also helped. Wayne Bousfield said that populations of LCB have also declined to very low levels in Montana and Idaho. Agathis pumila was introduced there in the 1960's, but Chrysocharis laricinellae, not introduced there, was found in 1972. Also, some native parasites have adapted to LCB. George Evans cited the need to look closely at hyperparasites and their use, and the possibility that a primary parasite might be so successful that it goes extinct.

John Moser played a tape and showed slides compiled by Colin King (British Forestry Commission, Farnham) reviewing the progress of their efforts at controlling the spruce beetle, Dendroctonus micans, using the introduced predator Rhizophagus grandis. John Moser then gave a slide talk on progress being made in Louisiana in an attempt at an inoculative release of R. grandis for the black turpentine beetle, D. terebrans. LeRoy Kline asked if the predator might also be effective against D. valens. Moser replied that he thought it would; moreover Jean-Claude Gregoire is scheduled to arrive at Berkeley this fall to pursue this problem with Don Dahlsten.

WORKSHOP: ASEXUAL PROPAGATION AND GENETIC RESISTANCE TO PESTS

Moderator: L. J. (Pat) Heidmann

Participants: Greg Phillips, Tom McCoy

The normal method of plant propagation is from seeds formed as the result of the fusion of egg and sperm cells. Many plants, however, may be reproduced vegetatively (asexually) by bypassing this process. Trees, especially conifers, are more difficult to propagate vegetatively than herbaceous plants. Many conifers, however, have been propagated vegetatively primarily from cuttings. The best example is Pinus radiata in New Zealand and Australia where thousands of hectares of cuttings have been planted. Trees may also be reproduced using tissue culture methods. Tissue culture may be defined as the cultivation in vitro of any plant part, whether a single cell, a tissue, or an organ, under aseptic conditions. Using tissue culture procedures, a plant part such as a terminal bud may be induced to elongate, produce adventitious buds, and form roots. This procedure is available for a number of conifers and hardwoods. The various growth stages are manipulated by the use of plant hormones. Cytokinins such as 6-benzylaminopurine (BA), kinetin, and others are used to induce bud proliferation. For elongation, a nutrient medium without hormones is used. For root induction, auxins such as indole-3-butyric acid (IBA) and 1-naphthaleneacetic acid (NAA) are added to the medium. In addition, whole plants may be produced from a single somatic cell or from various plant tissues and organs by manipulation of hormones. However, this technique has been limited in conifers. With plants such as alfalfa, callus masses are grown from ovary tissue or other plant parts in a liquid medium supplemented with kinetin and 2,4-D. When the hormones are removed from the media, differentiation occurs and plants are produced. To study disease resistance, suspension cells are plated onto agar media to which pathogens or pathogen-extracts containing toxins are added. Cells resistant to the pathogen or its toxins are allowed to grow and differentiate into resistant plants. The improvement of conifers is made difficult because of long life cycles, slow rates of propagation, long evaluation cycles, and limited opportunities for hybridization between species. However, tissue culture offers some tools that help to alleviate these problems. Tissue culture techniques can be used to clone elite lines, screen cultures for known segregating traits, obtain new hybrids through the fusion of somatic cells from two different species, and recently, recombinant DNA transfers of isolated genes from a variety of source organisms have been demonstrated in several model plant systems. With Pinus eldarica, callus tissues have been maintained for long periods of time and then induced to differentiate into plants. This offers new opportunities to perform genetic manipulations at the cellular level in conifers, including the possibility of selecting cells that overproduce chemical insect repellants, as well as achieving cell fusion hybrids. The opportunity to achieve resistance to tip moth in conifers by recombinant gene transfer of B.t. toxin genes was discussed.

WORKSHOP: TREE AND STAND GROWTH IMPACT ASSESSMENT

MODERATOR : RENE I. ALFARO, Canadian Forestry Service, Victoria, B.C. V8Z 1M5

Participants: Approximately 25 people representing a broad geographic and interest area attended this workshop.

The focus of this workshop was to discuss and review how insect damage is quantified.

The discussion centered on the meaning of the term damage. An insect is a problem if it damages a product that man expects from the land. Because in forestry the multiple use concept applies, the term damage has a more complex meaning than in agriculture (where damage appraisal concepts first developed). In multiple-use forestry different, sometimes antagonistic, resources are expected from the same unit of land. This is the case in large areas of the North American Northwest, where timber, forage and recreation are the objectives of management. In a multiple use situation, the effects of an insect must then be examined with respect to each of the resources expected from the land, taking into account all positive and negative impacts.

The question of the level at which damage must be measured was also discussed. Damage can be measured at the individual tree level, at the stand level and at the forest level. At the tree level we assess the number of trees dead, top-killed, etc. Losses at the stand level become a reality at harvest, when the manager obtains less wood than expected. A stand that is damaged before rotation must be projected to rotation age. Stand models are used for this purpose. At this point Albert Stage, from the USDA, Moscow, Idaho, presented a summary of the Stand Prognosis Model and of the status of the various extensions that have been developed (Budworm, Bark beetle, root rot, DF Tussock moth and others).

The forest is the administrative unit used by managers. It consists of groups of stands administered as a unit for planning purposes. Based on this unit, the manager attempts to coordinate the operations on the entire forest, thereby making more efficient use of forestry equipment, manpower, road construction. At the forest level is where the allowable cut is determined and provisions are taken to ensure that a sustained yield is obtained. Insect pests upset the forest plan and, therefore, create a loss.

The group felt that this is a very important area of research.

## Workshop: Christmas Tree Pest Management

Moderator: John G. Mexal, New Mexico State University

Participants: Bob Backman, Washington DNR  
Cherry A. Chandler, Arizona Commission of Agriculture & Horticulture  
David Frantz, Arizona State Land Dept.  
Tim Paine, Univ. of California, Riverside  
Rich Phillips, New Mexico State University  
Tom Warfield, Arizona State Land Department

In 1987, 12.1 kk Christmas trees were harvested in the Western U.S. Over 90% of the trees came from California, Oregon and Washington. The West supplies about one-third of all Christmas trees. In 1987, over 18 kk trees were planted. Nationwide, 86 kk Christmas trees were planted. The predominant species in the West are Douglas-fir, Monterey pine and Noble fir. Increase production will likely reduce profitability and increase the incidence of pest problems. The result will be a need for most cost effective pest management.

*Rich Phillips*, NMSU, discussed Nantucket pine tipmoth (NPTM) on Pinus eldarica in New Mexico. There are 3 flights per year beginning in early April. The moth was introduced to southern NM about 4 years ago. It has become a serious economic threat to the Christmas tree industry. The moth can be effectively controlled by monitoring flights and spraying insecticide 7 days after the peak. Terminal damage in protected treatments was less than 5%. Damage in the unprotected block was 70%. Damaged trees are unsaleable as Christmas or landscape trees.

*Tim Paine*, UC Riverside, discussed the NPTM in California. The pest was introduced from Georgia in 1967. There are four generations per year beginning in late February. The physiological time period between first moth catch in pheromone traps and peak flight for generations 2-4 is 1033 day-degrees (lower threshold of 42°F and an upper limit of 99°F). The first peak of adult flight is often a double peak. Insecticide is sprayed 200 day-degree after all 4 peaks. Parasites are used to control NPTM in landscapes.

*T. Paine and B. Backman* recommended insecticides be varied to minimize the buildup of resistance to selected pesticides. Mavrik and Dimilin work well in California. Sevin and Orthene have been used effectively in New Mexico.

Other pests in Christmas trees include aphids, mites, grasshoppers, and Douglas-fir needle midge.



WORKSHOP: Field Trials of Bark Beetle Pheromones

MODERATOR: Ronald Billings

PARTICIPANTS: Richard Werner, John Borden, Scott Salom, Staffan Lindgren,  
and Robert Haack

Following the moderator's introduction, six speakers briefly discussed their recent research or pest management applications involving bark beetle pheromones.

Richard "Skeeter" Werner, Pacific Northwest F&RES, Institute of Northern Forestry (USFS), Fairbanks, Alaska. - Skeeter discussed the use of pheromones to bait trap trees for Ips species in Alaska. Baited trees had increased attack density of Ips perturbatus, compared to unbaited, felled trees. The implications for direct control were mentioned.

John Borden, Department of Biological Sciences, Simon Frazer University, Burnaby, B.C. - John described studies to explore optimal methods for baiting lodgepole pine stands with pheromones for containment of mountain pine beetle populations. Emerging beetles are induced to attack baited trees in the vicinity of brood trees; the stand is then scheduled for harvest prior to emergence of the subsequent generation. John reported that tree baits do not require registration as pesticides, according to a recent EPA ruling.

Scott Salom, University of British Columbia, Vancouver, B.C. - Scott, a graduate student of John McLean's, reviewed his thesis research on dispersal characteristics of the ambrosia beetle, Trypodendron lineatum. Pheromone traps placed on grid patterns were used to monitor the dispersal of marked beetles with respect to different forest and environmental conditions.

Staffan Lindgren, Phero-Tech Inc., Vancouver, B.C. - Staffan discussed field trials with different formulations of (-)-verbenone as an inhibitor for mountain pine beetle in lodgepole pine. Verbenone is promising for protection of high value stands.

Robert Haack, North Central Forest Exp. Sta. (USFS), East Lansing, MI - Bob discussed how pheromone-baited traps were being used in the Dominican Republic to monitor the seasonal abundance of Ips calligraphus (= interstitialis). He found that Dominican Ips populations respond preferentially to a 50:50 mix of (+) and (-)-ipsdienol.

Ronald Billings, Texas Forest Service, Lufkin, TX - Ron discussed a method he has developed to forecast southern pine beetle (SPB) infestation trends, based on numbers of SPB and clerids (Thanasimus dubius) that respond to pheromone-baited traps in early spring. The method was tested in 11 southern states in 1987 with excellent results. In a cooperative study with Tom Payne (VPI), Ron is evaluating the use of (-)-verbenone for disrupting SPB infestations. The most effective treatment tested to date involves felling freshly-attacked trees and applying a sustained release formulation of (-)-verbenone to a buffer strip of adjacent uninfested trees. Aerial applications of (-)-verbenone were applied to two SPB infestations in Texas in 1987 with less conclusive results.

Some 40 persons attended this workshop.

WORKSHOP: PUBLIC INTEREST IN PEST MANAGEMENT-WHO WILL SPEAK?

Moderator: John G. Laut

Participants: 20 members

This workshop had its genesis in a panel presented at the 1987 work conference that pointed out an apparent decline in our profession. It was further focussed by two editorials in the journal Plant Disease, one by Professor Kelman, on the Status of Support for Forest Pathology Research in the May, 1987 issue and the other on Merchandising Plant Pathology, by Dr. C. Wendell Horne, December 1987.

The workshop title asked the question WHO? The group did not answer that question but it was obvious, especially in the sense of the Horne editorial- WE must all accept responsibility. We don't know who will but we all must.

The next question was - WHERE? There are many different audiences with many different opportunities. Forestry school administrators must be sold on the importance of pest management disciplines; politicians must be convinced to continue financial support; environmentalist groups must be sold on our science - we are more than nozzleheads. These are only examples of the different needs/opportunities to merchandise our profession.

The next discussion point centered on WHAT - what message do we need to project? Just as for the previous questions there was no single answer. Just as there are many needs, there are as many themes. We must be careful however. There seemed to be a consensus for a need for some orchestration. We must sell as a symphony not as a cacophony.

The final question posed by the moderator was left for further discussion later that evening, and for the final business meeting - Can (should) WFIWC take an active role in developing and coordinating a "merchandising" program for our profession? Will the members market their products (see Horne)? The participants seemed to agree that no one will do it for us.

**PANEL: Pest Considerations on Forest Lands Managed for Recreation and Aesthetics.**

**Grand Canyon National Park, Arizona**

**Moderator: Dick Marks, Grand Canyon National Park**

**Participants: Lorne West, Yosemite National Park  
Lorraine Maclauchlan, Canadian Forestry Service  
Merton Richards, Northern Arizona University  
Terry Daniel, University of Arizona**

This panel focused on the value of our natural resource v.s. user values in both US and Canadian national parks. The administrative agencies try to balance the needs and perceptions of park users and the natural biological system within the park.

**Lorne West-Yosemite National Park.**

In 1960, the U.S. Park Service reduced their efforts to control natural occurrences within all parks. Endemic insect pests and wildfires were only controlled when campgrounds, visitor facilities, and other high value/high use areas were threatened. In turn, a natural, healthy forest system was created where tree species composition was maintained and insect and disease problems were reduced.

Three reasons were given for not applying insecticides to high value/high use areas:

- 1.) if the areas were not heavily infested, little impact would be evident,
- 2.) environmental activists were concerned about the impact on humans, animals, and the biological system, and
- 3.) a good public interpretation program to educate visitors on the natural occurrences in the Park made it unnecessary to apply drastic control measures.

As the public became more aware of how the natural forest system operates, they were less likely to demand direct control measures that would upset the balance of the system.

One example of this conservative management program in Yosemite National Park is the lodgepole needle-miner. The insect population was allowed to build to epizootic levels, resulting in some tree mortality. Now areas of even-aged reproduction are found under those dead lodgepole pines.

An example of a pest management program that results in unforeseen impacts on the forest system is a bark beetle control program undertaken in Yosemite National Park. Beetle infested and killed trees were removed, resulting in stump infection by Heterobasidion annosum (Fomes annosus) root rot. The disease spread through root contact to other trees in developed sites. The loss of healthy root support resulted in windthrown and fallen trees which damaged facilities and developed sites, and posed a hazard to visitors. This illustrates the need to thoroughly assess the impacts of control programs.

This is not to say that control is not necessary. Hazardous trees are routinely removed from high use sites to protect the public and visitor facilities. Exotic pests are also controlled to prevent catastrophic impacts on the natural forest system. Yosemite National Park cooperates with California State and County officials in a gypsy moth control program. The program consists of an extensive trapping program to monitor gypsy moth populations and implementation of direct insecticidal control when no

feasible alternative exists. Environmental assessment of the insecticide alternatives is necessary before any application is undertaken. Bacillus thuringiensis (Bt) is an alternative presently being tested against gypsy moth.

#### Lorraine Maclauchan-Canadian Forestry Service

Parks Canada has a policy not to control "natural" insect infestations, but must prevent their spread to adjacent non-park lands. The constraints to pest management include public opinion, costs/benefits, and the purpose or goal of the individual park. The question must be asked, Is the problem contributing to the natural process or is the presence of the park aggravating the problem?

Pest control is undertaken if the outbreak is causing a major impact on park vegetation or high use areas, or is threatening non-park lands. Tree removal, by permit only, is often used as an insect control measure.

Examples of insect control by Parks Canada include two high use areas in British Columbia, Manning Park and Paul Lake. In 1979, a mountain pine beetle infestation broke out at the east gate of Manning Park. By 1982 the infestation had spread westward to near the lodge and high use areas, creating unsightly areas and hazard problems. The decision was made to control the beetle. Infested and dead trees were cut and burned, or shipped to nearby mills. The openings created by the tree removals increased wildlife habitat and provided areas for tree reproduction. In 1985, no beetles were found in the area; in 1987, a small population was found.

In 1986, an application of Bt was used to control spruce budworm on 860 thousand hectares in Paul Lake. Unfortunately, it rained shortly after the application and insect control was minimal. Bt was applied again in May 1987, resulting in a 74% population reduction and good control in the overstory.

The policy of Parks Canada to control natural insect outbreaks only when necessary to prevent their spread or damage to high value/high use areas is consistent with the demands of a healthy forest system.

#### Merton Richards-Northern Arizona University

Dr. Richards, in conjunction with the Grand Canyon National Park, conducted a study to determine if the National Park Service Policy of Natural Occurrence was recognized and appreciated by the public. The study was conducted on the Walhalla Plateau at Cape Royal Overlook in Grand Canyon National Park. The area had a recent history of defoliation by the pandora moth, Coloradia pandora, and, based on the insects' life history, a heavy defoliation was expected to occur in June 1987. Unfortunately, the defoliation levels that occurred did not provide the dramatic impact hoped for by the researchers.

To aid the public in evaluating defoliation levels, photographs of non-defoliated and defoliated forest areas not readily seen from the common visitor sites were shown to survey participants. The visitors were then asked to rate the photos according to their perception of scenic beauty. The extreme levels of defoliation were easily rated, however the answers fluctuated between the no defoliation and the low defoliation levels, and between the low and the moderate-severe defoliation levels.

The respondents were then asked to relate the photographs to the amount of defoliation at the Cape Royal Overlook. Most respondents did not realize the area had been defoliated.

The visitors were asked their opinion about the Park Service Policy of Natural Occurrences. Most respondents agreed that it was a good policy for all the National Parks to follow, especially for short term problems and for long term problems in the backcountry. However, more than 50% disagreed with the Policy for long term problems around cabins and developed areas.

In general, the study concluded that the public values forest scenes and will pay more, in terms of entry fees, travel time, and dollar costs, for less defoliation.

#### Terry Daniel-University of Arizona

Dr. Daniel is attempting to quantify public perception of scenic beauty in relation to insect infestation. He uses a consumer evaluation approach where panels of samples with views of forested areas under various conditions are shown to the public and they are asked to quantitatively rate the scenic beauty of the forest areas.

Near view-In near view situations the participants view a forested area under the canopy and rate it according to their perception of scenic beauty. Models have been developed to relate scenic situations (i.e., open forest, doghair thickets, recently logged areas) to the public's viewpoint.

Far View-To evaluate public perceptions for far view situations, digitized base scenes of vista areas are manipulated to approximate various damage levels. The use of Geographical Information Systems (GIS) and perspective view software to computerized damage through image processing (greening up or down) provides a realistic picture for evaluating public perception of far view scenic beauty.

Insect infestations have a significant impact on public perception of scenic beauty. At vista areas, looking at the scenery is an integral part of the recreation activity, and western spruce budworm defoliation and bark beetle damage are critical factors in the viewers perception. These insects are also a factor in areas of major tourist and recreation activity (i.e., severe western spruce budworm defoliation or bark beetle killed trees). At low levels of defoliation or visible insect damage, it is difficult to precisely measure changes in public perception.

Quantitative models have also been used to model and computerize air pollution scenes. The models are based on actual and projected pollution figures, numbers of cars, factory pollution output, weather, etc. Dr. Daniel would eventually like to model quantitative insect damage figures in this same way.

## WORKSHOP: MANAGING URBAN FOREST PESTS

Moderators: Dave Nielsen and Salma Talhouk

Participants: Tom Koerber, Lorne West, Dan Kunis, Cherry Chandler, Mike Kewsky, Judy Pasek, Hubert Meyer, Andy Knapp, Dave Burns, Tim Payne

Our workshop considered the notion that the best way to approach urban forest pest management (UFPM) is through the concept of tree health care (THC). A conceptual model was presented as an example of how pest management is a natural part of and can be implemented through THC programs.

Participants agreed that there are several reasons why this concept has not been widely implemented, including: (1) the General public is not interested in spending money for tree work until a problem develops; (2) most people are not aware of the availability and benefits of THC; (3) arborists and other practitioners are often not trained in concepts and implementation of cultural practices, monitoring trees for problems, and using integrated control strategies to optimize efficiency in pest control.

We need better assessment of the impact of pests on urban tree vitality, aesthetics, and longevity, and how practices that enhance and maintain tree vitality influence pest populations and the damage they cause. There is also need to instill awareness of trees and their values within children and their parents, emphasizing the need for proper maintenance to protect and improve urban forests.

It is apparent that many urban forest problems are caused when trees are planted on sites to which they are not well adapted. Landscape architects, nursery personnel, and others who specify plants for landscapes and municipal parks can contribute to the stability of the urban forest by matching trees to sites. Entomologists, plant pathologists, and landscape horticulturists can make important contributions to this process.

We agreed that THC should begin with careful use of equipment near trees located on construction sites, proper tree choice and planting techniques, and scheduled maintenance, including pest management, to promote establishment and growth.

Liability associated with trees that fail and destroy personal property or cause bodily injury may stimulate a move toward THC and UFPM. As this occurs, a major educational effort will be required for both the public and urban forest managers.

## WORKSHOP: ENTOMOLOGY TRAINING IN FORESTRY CURRICULA

Moderator: John McLean

Participants: Alan Berryman, Jack Coster, George Evans, Rich Goyer, Peter Hall, LeRoy Kline, Herb Kulman, Dave Leatherman, Anne Lynch, Tim Schowalter, Ron Stark.

After round-the-table introductions, we examined the current state of Forest Entomology in Forestry Curricula. The first major lament was that biological topics in general are given minimal treatment in the curriculum. We accepted that Forestry is a diverse profession and includes a need to deal with multiple-use aspects of the resource. There is however a need to be sure of the ecological relationships, Ecology and Silviculture need their fair time.

The Accreditation standards of the Society of American Foresters (SAF) are seen as restrictive and stifling, especially as they do not require Entomology courses as part of the core curriculum. A student is in a bind if (s)he wants to work for the US Forest Service - they must graduate from an accredited school!

It was suggested that it was high time that Forestry Schools took some **leadership** and revamped the Curriculum to do it their way. In this "new" approach, the ecological foundations of Forestry should be firmly established to enable a solid foundation for the management, recreation, wildlife and business aspects of professional forestry.

We agreed that we could not do this alone and that if there was a National Meeting of Insect Work Conferences in the near future, then one panel should consider the place of all the "protection" courses (Entomology, Pathology and Fire) and rational approaches to these subjects in the modern curriculum. We should also have a panel on the place of pest management in the curriculum at our joint meeting with the Pathologists. Perhaps we are moving into an era when Pest Management should be an integral part of Silviculture so that we contribute to the design of the Forest and thus plan to minimize the impacts of insects on the next rotation.

It is clear that no one part of the forest exists in isolation from another and it was recommended that we assemble case studies where failure to recognize one pest problem has led to some incorrect decisions and plantation failures.

Members from the SFIWC have also had experience in dealing with the Accreditation Committee of the SAF and they will forward copies of their correspondence for the information of WFIWC members.

WORKSHOP: PEST CONSIDERATIONS IN USDA FOREST PLANS

Moderator: Boyd E. Wickman

Participants: Philip Hunkins, Jeff Blackwood, Ken Knauer, and Al Stage. Discussion by 37 participants.

Phil Hunkins, Forest Planner for the Kaibab National Forest, set the stage with an excellent overview of the Forest Service planning process using the Kaibab National Forest as an example. In their planning process pest considerations were part of their silviculture considerations. There were not specific actions addressing specific pests included in the forest plan.

Jeff Blackwood, a group leader for planning in Region 6, Portland, Oregon followed with a regional perspective of the forest planning process. Jeff emphasized that to obtain the best plans the forests should form strong partnerships with entomologists and pest managers. He made the following points: (1) Forest plans will be revised continuously, (2) Pest research needs should be an integral part of the plans and this is often not the case with the current plans, (3) Plans will be an important part of the budgeting process in the future, (4) We should explore positive as well as negative values of forest insects, (5) We need more emphasis on pest prevention techniques and, (6) We need to play the game together in a better fashion.

Ken Knauer gave some views from the Washington Office, Forest Pest Management. Their perspective is that there is a definite deficiency of pest considerations in many forest plans. Research did not seem to be considered at all in many plans. Because of low visibility of pest problems and the interest in pest management by Washington Office leaders, Forest Pest Management has been developing a "Forest Health" issue paper. This paper recognizes that we must use the pest suppression mode to get through the problems of today, but in the future we must use the pest prevention mode. We must also focus on the hosts and the complex of pests affecting them. The major issue for Forest Service forest pest management over the next decade will be forest plans.

Al Stage, from the Intermountain Research Station in Moscow, Idaho made the following statement regarding research issues in using pest impact information in forest plans. "Omission of pest considerations from land management plans can easily result in plans that are infeasible, or which may require unreasonable investments in pest control to achieve the planned outputs. Barriers to incorporating pest effects include lack of biological and spatial resolution in the formulation of the planning model." Al made a pitch for more precise yield forecasts based on integration of pest impact models.

Some good discussion followed on the need for better pest training for future planners. This in turn could influence the pest consideration in forest plans. Knauer replied that Forest Pest Management planned to make training a high priority item. Others stated that pest training in forestry schools is becoming woefully lax and that is where it should start. And the need to monitor our pest management activities and results was discussed.



WORKSHOP: IPS BIOLOGY AND MANAGEMENT

Moderator: Dan Miller

Participants: 35

The workshop addressed three fundamental questions:

1. Do we have pest problems with Ips?
2. Do we have solutions?
3. Do we need more solutions?

Bob Haack described an ips situation in the Dominican Republic. Drought conditions have facilitated high losses of pine to I. calligraphus.

Skeeter Werner described the impact of I. perterbatus in Alaska. Extensive areas of mature spruce are being killed by I. perterbatus in the absence of spruce beetles.

Dan Miller described the losses of lodgepole pine in the Caribou region of British Columbia due to I. pini. Residual trees in spaced stands and extensive areas surrounding winter cut operations are being killed, in the absence of mountain pine beetles.

Ladd Livingston and Ralph Thier discussed control tactics for I. pini in spaced stands of Ponderosa pine. If cutting occurs between 1 Dec and July of the following year, a 'green chain' of fresh slash must be maintained. They have had very effective control of I. pini using this technique. It should be noted that these 'green chains' are supported financially through timber sales.

Mark McGregor discussed the use of small cats to tear up the bark on slash material in ponderosa pine.

Ips lecontei was discussed as the major bark beetle problem in Arizona. As with all other ips attacking pine, drought conditions seem to be the single, most important factor associated with mortality of trees by ips.

In summary, the participants seemed to be in agreement that pest situations involving Ips can be significant. There are good tactics for the control of some species of ips in some forest types. The participants agreed that new tactics are required for other species and alternatives for existing tactics. The use of pheromones seems to be the most promising but may be some time before it is cost-effective. As well, it was evident that a greater dissemination of existing tactics is needed.

WESTERN FOREST INSECT WORK CONFERENCE

FINAL BUSINESS MEETING

10 MARCH 88

Chairperson Schmitz called the meeting to order.

Committee Reports

Historical Committee - Ron Stark

Your chairman was relatively inactive in the past year for various reasons, but fortunately one of our members, Mal Furniss, was very active.

There was little input from our field representatives - one of my first tasks this coming year will be to remind them of their "obligation to history" (i.e., kick butts).

Mal Furniss has edited the oral history interview of his brother, Robert Livingston Furniss (1908-1980) that was taped by Ronald C. Larson in 1977. The interview has been transcribed but was not edited by RLF before his death. A copy will be available from the University of Idaho Special Collections Department (WFIWC Archives).

When time permits, Mal's next venture into history will involve Andrew Delmar Hopkins (1857-1948), first Chief of Forest Insect Investigations, Bureau of Entomology, USDA (1902-1922). I have seen some of his material, and it promises to be a fascinating story. The primary period covered is from 1907-1917, with emphasis on the Northern Rocky Mountains region and involving Josef Brunner and James C. Evenden. If any of you know of photos or other material relating to those persons, please contact Mal at (208) 882-7961.

Another goal of your History Committee is to acquire subject indexes, and eventually to catalog the pre-1953 Bureau of Entomology/B.E. & P.Q. photo files originally at Berkeley, Portland (now LeGrande), Coeur d'Alene (now Missoula), and Fort Collins. A subcommittee of Mal, Dave Fellin, Charlie Sartwell, Tom Koerber, and John Schmid has been formed to accomplish this goal. They will report at the 1989 meeting. When the historically significant photos have been identified, we will prepare a proposal for having them copied and deposited in the University of Idaho Archives.

Boyd Wickman recently had an interesting article published in the Oregon Historical Quarterly on the early days of the Ashland Laboratory. Copies may be obtained from Boyd.

I was chagrined to learn that in spite of all the importunings of various members of the History Committee, there are still people (to remain nameless) in high places who do not know what to do with historical material. (Makes me wonder if anyone reads the Proceedings!)

Once again--where does historical material go? To the archives. And where

are the archives of the Western Forest Insect Workshop and Forest Entomology? At the University of Idaho. To whom do we send it? To Terry Abraham, Head, Special Collections, University of Idaho Library, Moscow, ID 83843. What constitutes historical material? Anything pertaining to your career or your interactions with others in forest entomology EXCEPT YOUR REPRINT COLLECTION. An exception to the exception--sometimes reprints have comments on them written in the margins which are of great interest. I remember one reprint of a paper by a bark beetle specialist from Utah with marginal annotations by a Professor from Washington that will be of great value when the history of bark beetle research is written! When submitting such material, the archivist should be warned to preserve. Reprints other than those of the sender are generally trashed.

[Footnote here to avoid confusion--alternatively you can send material to me or Mal.]

I proposed that Mal Furniss be appointed Co-chairman of the History Committee. Approved unanimously by the members.

At the request of Mal Furniss and with my hearty endorsement, I proposed that the Chairman of the Work Conference send a letter of commendation to Ralph Hall for his outstanding efforts in promoting the history project and in particular, for his early efforts in preserving written and oral histories of various members of the Work conference. Approved unanimously by the members.

Thanks to Dick Washburn having contributed his copies, the U of I archives has a complete set of the Proceedings through 1985. We have now updated the holdings through 1987 and requested the secretary to add the U of I Library Special Collections to the permanent mailing list for future Proceedings.

Respectfully submitted,

/S/

R. W. STARK, Co-chairman

#### Common Names Committee - Judy Pasek

Purpose of WFIWC committee - screen proposals prior to submission to ESA.

Three proposals:

<u>Dioryctria Auranticella</u> (Grote)	Ponderosa pine cone worm
<u>Leptoglossus Occidentalis</u> Heidmann	Western conifer seed bug
<u>Rhyacionia Bushnelli</u> (Busk)	Western pine tip moth

Moved and seconded to approve the listed common names for the listed pests.

**Nominations Committee - Gene Amman, Chairman  
Roy Beckwith and Dave Wood, Members**

The members of the committee nominated the following:

John Wentz	Chair
Jim Payne	Council
Judy Pasek	Common Names Committee

Moved and seconded  
Motion for unanimous ballot.  
Passed.

**Resolutions Committee - Dave Overhulser**

I have three resolutions to present to the membership.

The first concerns accommodations:

1. WHEREAS rooms and a roof are required for the exchange of ideas and concepts between forest entomologists in the land of seven wonders.

AND WHEREAS these requirements were met in a superior manner at a single hostelry in the scenic and sunny city of Flagstaff, Arizona.

AND WHEREAS centralized meeting rooms and restaurants coupled with convenient phones provided opportunity for professional exchanges at any moment.

AND WHEREAS many members were unable to locate the swimming pool, thereby encouraging attendance at workshops and panel discussion.

AND WHEREAS there was ample food and entertainment to satisfy the needs and desires of our members.

THEREFORE, let it be resolved that attendees at the 39th Annual Western Forest Work Conference thank the staff of the Little America motel for its hospitality.

The second resolution concerns the program:

2. WHEREAS a varied and stimulating program is needed to satisfy our members and attract attendees from afar.

AND WHEREAS providing structure and organization to our meeting requires a written program.

AND WHEREAS a written program is required by administrators before authorizing travel to Arizona in the winter.

AND WHEREAS developing a program requires many favors to be asked of colleagues which will be exacted in kind at some later date.

AND WHEREAS all these critical tasks were accomplished with great success.

THEREFORE let it be resolved that attendees at the 39th Annual Western Forest Work Conference thank Karen Clancy, Ann Lynch, and Mike Wagner for their efforts in providing a stimulating and educational program.

(Let's show our appreciation for their efforts)

The third resolution concerns local arrangements:

3. WHEREAS a smooth running meeting is a function of excellent facilities, attention to detail, and preparation for all contingencies.

AND WHEREAS all this occurred as well as a scenic and informative field trip.

AND WHEREAS professional endeavors require periodic breaks for food and drink in a pleasant social setting, all of which were provided in an area of great natural beauty.

BE IT RESOLVED that we extend our thanks to Mike Wagner, Liz Blake, and assistants for their excellent work.

(Let's show our appreciation to Mike and Liz.)

**FURTHER BUSINESS:**

1. Resolve Western States Legislative Forestry Task Force (received from John McLean) asking us to endorse their two resolutions.

Discussion a) Our group is not in position to take a political stand.

b) Who are these resolutions going to?

c) Explanation - western legislators looking for support to help solve WSBW problems.

Comment: CANUSA produced many answers that are not yet implemented. Let's get this into action first.

Comment: (Disagree) Research still needed - let's not turn down support.

Comment: We can offer support, but we are not a resolving group.

Comment: Much research started, much not finished.

Motion: Move work conference, write a letter to the Western States Legislative Task Force offering our informational support in favor of their resolutions.

Seconded and passed.

2. The letter proposing a national forest pest meeting - with the dropping of regional meetings, was read.

Discussion: Suggest we support; we already have (to a degree) a national conference.

Would it get too big to have a workshop-type conference?

Difficulty in getting travel authorization.

Motion: We should support the idea with a suggestion that it not be held until 1991 or later and that it be held in the west.

30 for - 14 against

3. Question of declining support for forest entomology:

Dave Wood's panel in 87 was discussed.

Comments from the initial business meeting were reviewed.

Notes from the special meeting Wednesday night were reviewed.

From this discussion a suggestion was made that a letter be sent to Deputy Chairman of Research of USFS offering informational support; and that this work conference appoint an ad hoc committee to develop a public involvement activity plan to be presented for consideration of the membership at our next meeting.

Motion made by John Laut that we write such a letter.

25 in favor, 7 opposed

1989 Meeting - Boyd - again asked for input.

1990 Meeting - North Idaho. Check on prices \$ 40-45/night

Logo - Send in ideas.

Mike Wagner: - Discussed the program and remaining tours and demonstrations. Discussion leaders need to send in their program summaries.

Motion to adjourn

Seconded and passed

MEETING REPORT

157 Registrants

135 Grand Canyon

RLL/mc  
4/26/88

**TREASURER'S REPORT**

**Thirty-ninth Western Forest Insect Work Conference  
Flagstaff, Arizona, March 10, 1988**

Balance on hand March 7, 1988	\$5,028.96
Expenses:	
Payment for Shrine of the Ages	( 25.00)
Receipt Books	( 9.07)
Mugs for WFIWC	( 222.54)
Three days screen rental	( 45.00)
WFIWC Hats	( 378.34)
Vehicle Costs	( 741.60)
Refunds	( 150.00)
Little America Bill	(3,079.91)
Group Photos	<u>( 13.50)</u>
	(4,664.96)
Income:	
Registration Deposits	6,065.00
Balance on hand March 10, 1988	\$6.429.00



CONSTITUTION  
OF  
WESTERN FOREST INSECT WORK CONFERENCE

Article I Name

The name of this organization shall be the Western Forest Insect Work Conference.

Article II Objects

The objects of this organization are (1) to advance the science and practice of forest entomology, (2) to provide a medium of exchange of profession thought, and (3) to serve as a clearing house for technical information on forest insect problems of the western United States and Canada.

Article III Membership

Membership in this organization shall consist of forest entomologist and other interested in the field of professional forest entomology. Official members shall be those who pay registration fees.

Article IV Officers and Duties

The Officers of this organization shall be:

(1)A Chairman to act for a period of two meetings, whose duties shall be to call and preside at meetings and to provide leadership in carrying out other functions of this organization.

(2)An immediate Past Chairman, who shall assume office immediately upon retiring as Chairman without further election; whose duties shall be to fill the chair at any meeting in the absence of the Chairman; to act until the election of a new Chairman.

(3)A Secretary-Treasurer to act for a period of two meeting whose duties shall be to keep a record of membership, business transacted by the organization, funds collected and disbursed and to send out notices and reports. The Secretary-Treasurer is charged with the responsibility of preparing the proceedings for the conference in which his term of office is terminated (amended Feb. 28, 1967, Las Vegas, Nevada).

(4)An Executive Committee of six members consisting of Chairman, Immediate Past Chairman, Secretary-Treasurer, and three Counsellors elected from the membership. Terms of office for the three Counsellors shall be staggered and for a period of three meetings each. The duties of the Committee shall be to carry out actions authorized by the Conference; to authorize expenditures of funds, and to establish policies and procedures for the purpose of carrying out the functions of the organization. The

Conference registration fee will be set b the local Arrangements Committee in consultation with the Secretary-Treasurer and Chairman (amended March 4, 1965, Denver, Colorado).

The officers shall be elected at the Annual Meeting. Their periods of office shall begin at the conclusion of the meeting of their election.

The Chairman shall have the power to appoint members to fill vacancies on the Executive Committee occurring between meetings. The appointment to stand until the conclusion of the next general meeting.

It is the responsibility of a Counsellor, should he be unable to attend and executive meeting, to appoint an alternate to attend the executive meeting and to advise the Chairman in writing accordingly. The alternate shall have full voting privileges at the meeting to which he is designated.

Article V Meetings

The objectives of this organization may be reached by holding of at least an annual conference and such other meetings as the Chairman, with the consent of the Executive Committee, may call. The place and date of the annual shall be determined by the Executive Committee after considering any action or recommendation of the conference as a whole. The Secretary-General shall advise members of the date and place of meetings at least three months in advance.

Article VI Proceedings

A record of proceedings of conference shall be maintained and copies provided to members in such form as may be decided as appropriate and feasible by the Executive Committee.

Article VII Amendments

Amendments to the Constitution may be made by a two-thirds vote of the total conference membership attending any annual meeting.

Prepared by Richard Washburn  
March 20, 1969.

<u>Name</u>	<u>Address</u>	<u>Phone #</u>
Aangeenbrug, Elizabeth	National Association of State Foresters 444 N. Capitol St. NW Washington D.C. 20001	(202) 624-5416
Abrams, Marc D.	Pennsylvania State University Ferguson Building School of Forest Resources University Park, PA 16802	(814) 865-4901
Alfaro, Rene I.	Canadian Forestry Service Pacific Forestry Centre 506 W. Burnside Rd. Victoria, B.C.	(604) 388-0600
Amman, Gene D.	Intermountain Research Station 507 25th St. Ogden, UT 84401	(801) 625-5393
Anderson, R. Scott	Northern Arizona University Bilby Research Center Box 6013 Flagstaff, AZ 86011	(602) 523-5821
Backman, Robert W.	Department of Natural Resources Forest Pest Mgt. MQ11 Olympia, WA 98504	(206) 753-0671
Banfield, Michael G.	Consep Membranes, Inc. P.O. Box 6059 Bend, OR 97708	(503) 388-3688
Barger, Jack H.	USDA Forest Service 359 Main Road Delaware, OH 43015	(614) 369-4475
Bartos, Dale	860 N. 1200 E. Logan, UT 84321	(801) 752-1311
Beatty, Jerome S.	517 Gold Ave, SW Albuquerque, NM 87102	(505) 842-3289 FTS 476-3289
Beckwith, Roy C.	Forestry Sciences Laboratory 3200 Jefferson Way Corvallis, Oregon 97331	(503) 757-4328
Bedard, Bill	US Forest Service P.O. Box 245 Berkeley, CA 94701	(415) 486-3572 FTS 449-3572
Bennett, Dayle	517 Gold Ave S.W. Albuquerque, NM 87102	(505) 842-3190

Berryman, Alan A.	Wash. St. Univ. Dept. Entomology Pullman, WA 99164	(509) 335-3711 Mess. 335-5504
Billings, Ronald F.	Texas Forest Service P.O. Box 310 Lufkin, TX 75901	(409) 639-8170
Blake, Elizabeth A.	Northern Arizona University Box 4098 Flagstaff, AZ 86011	(602) 523-6648
Bordeu, John H.	Simon Fraser Univ. Bumaby, B.C. Canada V5A-156	(604) 291-3646 or 4475
Bousfield, Wayne	2516 Highwood Dr. Missoula, MT 59803	(406) 251-2722
Bowen, A. Temple, Jr.	Novo Laboratories Inc 33 Turner Rd. Danbury, CT 06810	(203) 790-2632
	Home: 149 West Grayling Lane Suffield, CT 06078	(203) 668-6104
Burke, Stephen	1140 Clark Drive Vancouver, B.C. Canada V5L3K3	None given
Burns, David M.	California Dept of Forestry & Fire Protection	(916) 322-0127
	Home: 5100 Mt. Rainier Drive Sacramento, CA 95842	(916) 331-6825
Bush, Parshall	University of Georgia 110 Riverbend Res. Athens, GA 30605	(404) 542-9115
Celaya, Bob	AZ State Land Department 1625 W. Adams Phoenix, AZ 85007	(602) 255-4627
Chandler, Cherry A.	AZ Comm. of Ag. & Hort. 1688 W. Adams Phoenix, Arizona	(602) 255-4373
Chang, Ming Tu	U.S. Forest Service 359 Main Rd. Delaware, OH 43015	(614) 369-4476
Clancy, Karen M.	Forestry Sciences Laboratory 700 S. Knoles Drive Flagstaff, AZ 86001	(602) 527-7315

Collard, Ernest B.	Wallowa-Whitman NF P.O. Box 907 Baker, OR 97814	(503) 523-6391
Coster, Jack E.	West Virginia University P.O. Box 2941 Morgantown, WV 26506-6125	(304) 599-4343
Coulson, Robert N.	Department of Entomology Texas A&M University College Station, TX 77843	(409) 845-9725
Curtis, O'Neil	12635 Grove St. Broomfield, CO 06804	(303) 466-8794
Dale, John W.	USDA Forest Service, FPM 603 Sansome Street San Francisco, CA 94111	Not given
Dewey, Jed	U.S. Forest Service P.O. Box 7669 Missoula, Mt. 59807	(406) 329-3637 FTS 585-3637
Doane, Charles C.	Scentry, Inc. P.O. Box 426 Buckeye, AZ 85326	(602) 233-1772
Dudley, Steve	Mormon Lake Ranger District 4825 S. Lake Mary Rd. Flagstaff, AZ 86001	(602) 774-1147
Dunbar, Clarence	Northern Arizona University Box 4098 Flagstaff, AZ 86011	(602) 523-3031
Eglitis, Andris	P.O. Box 21276 Juneau, AK 99802	(907) 586-8883 Home: 364-3393
Evans, W.G.	University of Alberta Dept. of Entomology Edmonton, Alta. Canada T6G 2E3	(403) 432-3376
Filip, Greg	Forestry & Range Sci. Lab 1401 Gekeler Ave. La Grande, OR 97850	(503) 963-7122
Fox, Joseph	UC Berkeley 2100 Wellman Hall-Entomology Berkeley, CA 94720	(415) 642-5806
Frantz, Dave	AZ State Land Department 3650 Lake Mary Rd. Flagstaff, AZ 86001	(602) 774-1425

Gibson, Ken	TCFPM P.O. Box 7669 Missoula, MT 59807	(406) 329-3278
Goyer, Richard A.	Louisiana State University Department of Entomology Baton Rouge, LA 70803	(504) 388-1634 or 388-1827
Haack, Bob	USDA Forest Service 1407 S. Harrison Rd. E. Lansing, MI 48823	(517) 355-7740
Hain, Fred P.	N.C. State University Dept. of Entomology Box 7626 Grinnells Lab Raleigh, N.C. 27695	(919) 237-3804
Hall, Peter M.	B.C. Forest Service 1450 Government St. Victoria, B.C. Canada	(604) 387-8742
Hall, Ralph C.	72 Davis Rd. Orinda, CA 94563	(415) 254-3759
Haneman, Deirdre	US Forest Service 11177 W. 8th Ave. Lakewood, CO 80225	(303) 236-8000
Hart, Dennis	630 Sansome St. San Francisco, CA 94111	(415) 556-6520
Harvey, George T.	Canadian Forestry Service Great Lakes Forestry Centre Sault Ste. Marie, Ontario Canada P6A 5M7	Not given
Hastings, Felton L.	Forestry Sciences Lab. P.O. Box 12254 Research Triangle Park, N.C. 27709	(919) 549-4051
He, Zhong	Oregon State University Entomology Dept. Corvallis, OR 97331	(503) 754-4392
Heidmann, LeRoy J. (Pat)	29 West Silver Spruce Flagstaff, AZ 86001	(602) 779-1972
Hitt, Sam	Ecological Pest Management 80 E. San Francisco Santa Fe, NM 87501	(505) 988-9126
Hobson, Ken	1614 Edith St. Berkeley, CA 94703	(415) 848-6194

Holsten, Ed	4311 Butte Circle Anchorage, AK 99504	(907) 333-1666
Honea, Ronald C.	Mississippi State University Department of Entomology P.O. Drawer EM Mississippi State, MS 39762	(601) 325-2085
Hostetler, Bruce B.	USDA forest Service, FPM P.O. Box 3623 Portland, OR 97208	(503) 221-2727
Huebner, Dan	1109 S. Plaza Way #280 Flagstaff AZ 86001	(602) 774-8906
Joseph, Gladwin	Oregon State University Entomology Department Corvallis, OR 97331	(503) 754-4392
Kearsley, Mike	Northern Arizona University Department of Biological Science Box 5640 Flagstaff, AZ 86011	(602) 523-5823
Kinn, D.N.	USDA Forest Service 2500 Shreveport Hwy. Pineville, LA 71360	(318) 473-7238
Kline, LeRoy N.	Oregon State University Department of Forestry 2600 State St. Salem, OR 97310	(503) 378-2554
Knapp, Andy	USDA Forest Service 1750 Front St. Boise, ID 83702	(208) 334-9022
Koerber, Thomas	Pacific Southwest Forest and Range Experiment Station P.O. Box 245 Berkeley, CA 94701	(415) 486-3574
Kraske, John	AZ State Land Department 3650 Lake Mary Rd. Flagstaff, AZ 86001	(602) 774-1425
Kulman, Herbert M.	University of Minnesota Dept. of Entomology Saint Paul, MN 55108	Not given
Kunis, Dan	8060 Niwot Rd. #30 Longmont, CO 80501	(303) 652-2483

Laut, John	Colorado State Forest Service P.O. Box 2189 Dillon, CO	(303) 468-7681
Leatherman, David A.	Colorado State Forest Service Colorado State University Fort Collins, CO 80523	(303) 491-6303
	Home: 2048 Whiterock Ct. Fort Collins, CO 80526	(303) 484-5445
Liebhold, Sandy	USDA Forest Service Northeastern For. Exp. Stn. 180 Camfield St. Morgantown, WV 26505	(304) 294-4816
Lin, Yiqun	Northern Arizona University School of Forestry Box 4098 Flagstaff, AZ 86011	(602) 523-6648
Lindgren, Staffen	1140 Clark Drive Vancouver, B.C. Canada V5L3K3	None given
Linit, Marc	University of Missouri Entomology Dept.	(314) 882-7779
Linnane, Jim	517 Gold Ave., SW Albuquerque, NM 87102	(505) 842-3191
Livingston, R. Ladd	P.O. Box 670 Coeur d'Alene, ID 83814	(208) 664-2171
Long, David	Northern Arizona University Box 4098 Flagstaff, AZ 86011	(602) 523-2689
Lorio, Peter L., Jr.	2500 Shreveport Hwy. P.O. Box 5500 Pineville, LA 71360	(318) 473-7231
Maclauchlan, Lorraine	Ministry of Forests and Lands 515 Columbia Street Kamloops, British Columbia Canada V2C 2T7	(604) 828-4177 Home: 579-9951
Mason, Garland N.	USDA Forest Service P.O. Box 96090 Washington, D.C. 20090-6090	(703) 235-8206
Manthei, Michael E.	Coconino NF 2323 E. Greenlaw Lane Flagstaff, AZ 86001	(602) 527-7426

Mathiasen, Robert	Northern Arizona University Box 4098 Flagstaff, AZ 86011	(602) 523-5874
McCullough, Debbie	University of Minnesota Dept. of Entomology Hodson Hall St. Paul, MN 55108	(612) 624-5380
McGregor, Mark	1916 - 35th St. Missoula, Montana 59801	None given
McLean, John & Shona	University of British Columbia Faculty of Forestry 2357 Main Mall Vancouver, B.C.	(604) 228-3360
Meneely, Scott C.	U.S. Bureau of Indian Affairs Branch of Forestry, Box 209 San Carlos, AZ 85550	(602) 475-2329
Mexal, John	New Mexico State University Dept. of Agronomy & Horticulture Las Cruces, NM 88003	(505) 646-3335
Meyer, Hubert	2532 Highwood Dr. Missoula, MT 59803	(406) 251-5800
Miller, Dan	Simon Fraser University Dept. of Biological Science Burnaby, B.C. Canada V5A 1S6	(604) 291-4163
Miller, Mitchel C.	Southern Forest Experiment Stn. 2500 Shreveport Highway Pineville, LA 71360	(318) 473-7235 FTS 497-7235
Mitchell, James C.	Box 900, Rt. #4 Flagstaff, AZ 86001	(602) 779-2556
Mitchell, Russ & Evie	Silviculture Lab 1027 NW Trenton Ave. Bend, OR 97701	(503) 388-7424
Moody, Ben	Canadian Forestry Service 351 St. Joseph Blvd. Hull, Quebec, CANADA	(819) 991-1107
Moore, Margaret M.	Northern Arizona University School of Forestry Box 4098 Flagstaff, AZ 86011	(602) 523-7457



Moser, John C.	USDA Forest Service Southern Forest Experiment Stn. 2500 Shreveport Highway Pineville, LA 71360	(318) 473-7242
Nebeker, T. Evan	Mississippi State University P.O. Drawer EM Department of Entomology Mississippi State, MS 39762	(601) 325-2085
Nielson, David G.	Dept. of Entomology OSU - OARDC Wooster, OH 44691	(216) 263-3729
Orr, David	Alaska Division of Forestry P.O. Box 10-7005 Anchorage, AK 99501	(907) 762-2127
Overhulser, David L.	Oregon State Dept. of Forestry 2600 State St. Salem, OR 97310	(503) 378-2218
Owen, Donald R.	California Dept. of Forestry 6105 Airport Rd. Redding, CA 96002	(916) 347-4610
Paine, Timothy D.	University of California Dept. of Entomology Riverside, CA 92521	(714) 788-2774
Parker, Douglas	USDA Forest Service 517 Gold Ave. SW Albuquerque, NM 87102	(505) 842-3280
Pasek, Judith E.	Rocky Mt. For. & Range Expt. Stn. Forestry Sci. Lab E. Campus, UNL Lincoln, NE 68583-0822	(402) 437-5178 FTS 541-5178
Payne, Thomas L.	Virginia Tech. Dept. of Entomology Blacksburg, VA 24061	(703) 961-6341
Peavy, Andrew T.	P.O. Box 0 San Carlos, AZ 85550	(602) 475-2326
	Home: 1215 N. Basil Cir Payson, AZ 85541	(602) 474-9349
Phillips, Gregory C.	New Mexico State University Plant Genetic Engineering Lab Dept. of Agronomy & Horticulture Las Cruces, NM 88003-0003	(505) 646-5113

Phillips, Richard	New Mexico State University Dept. of Agronomy & Horticulture Las Cruces, NM 88003	(505) 646-3335
Price, Peter W.	Northern Arizona University Dept. of Biological Sciences Box 5640 Flagstaff, AZ 86011	(602) 523-7224 Home: 779-3547
Randall, William	US Forest Service P.O. Box 1148 Corvallis, OR 97339	(503) 757-4550
Rasmussen, Lynn A.	Intermountain Research Stn. 507 25th St. Ogden, UT 84401	(801) 625-5393
Ravlin, F. William	VPI & SU Department of Entomology Blacksburg, VA 24061	(703) 961-6826
Roettgering, Bruce H.	USDA-FS-FPM San Francisco, CA  Home: 580 Middlebury Dr. Sunnyvale, CA 94087	(415) 556-6520
Rogers, Terry	517 Gold SW. Albuquerque, NM 87102	(505) 842-3287
Rousi, Matti	Finnish For. Res. Inst. 58750 Punkaharvu Finland	none given
Saarenmaa, Hannu T.	Finnish For. Res. Inst. Unioninkatu 40A 00170 Helsinki, Finland	011-358-0-661-401
Sacchi, Christopher F.	Northern Arizona University Dept. of Biological Sciences Box 5640 Flagstaff, AZ 86011	(602) 523-2381 Home: 526-4952
Salom, Scott M.	University of British Columbia Faculty of Forestry 2357 Main Mall Vancouver, B.C.	(604) 228-5569
Sandquist, Roger	USDA Forest Service P.O. Box 3623 Portland, OR 97208	(503) 221-2727
Sartwell, Charles	USDA Forest Service Pacific NW Research Stn. 3200 SW Jefferson Corvallis, OR 97331	(503) 757-4351

Schmitz, Dick	507 25th St. Ogden, UT 84401	(801) 625-5394
Schowalter, Tim	Oregon State University Entomology Dept. Corvallis, OR 97331	(503) 754-4392
Schultz, Dave	USDA Forest Service 630 Sansome St. San Francisco, CA 94111	(415) 556-4322
Seybold, Stephen J.	UC-Berkeley 218 Wellman Hall Berkeley, CA 94720	(415) 642-5806
Shaw, Judith C.	Scentry, Inc. P.O. Box 426 Buckeye, AZ 85326	(602) 233-1772
Shaw, Terri	400 Ridgewood Ct. Ft. Collins, CO 80524	(303) 493-8805
Sheehan, Katherine A.	USFS, Forestry Sciences Lab P.O. Box 3890 Portland, OR 97208	(503) 231-2098
Shelton, Les	P.O. Box 1146 Flagstaff, AZ 86002	(602) 526-0168
Shore, Terry	Canadian Forestry Service 506 W. Burnside Rd. Victoria, B.C. Canada V8Z-IM5	(604) 388-0666
Sloan, Terry	AZ State Land Dept. Prescott District 899-C Gail Gardner Way Prescott, AZ 86301	(602) 778-9567
Sower, Lonnie L.	USDA For Serv. For Sci. Lab 3200 SW Jefferson Way Corvallis, OR 97333	(503) 752-1834
Stage, Albert R.	1221 S. Main St. Moscow, Idaho 83843	(208) 882-3557
Stark, R. W.	520 S. First Sandpoint, ID 83864	(208) 263-3406
Stephen, Fred	University of Arkansas Dept. of Entomology Fayetteville, AR 72701	(501) 575-3377

Stock, Arthur J.	Simon Fraser University Dept. Entomological Sciences Burnaby, B.C. Canada V5A-156	(604) 291-4163 Home: 420-5318
Swetnam, Thomas W.	University of Arizona Lab of Tree-Ring Research Tucson, AZ 85721	(602) 621-2112
Talhok, Salma N.	OSU-OARDC Dept. of Entomology Wooster, OH 44691	(216) 263-3725
Thier, Ralph	USDA Forest Service 1750 Front St. Boise, ID 83702	(208) 334-1345
Thoeny, William T.	USDA Forest Service Southern Forest Experiment Stn. 2500 Shreveport Hwy. Pineville, LA 71360	(318) 473-7202
Thompson, Lynne	UAM Dept. of Forest Resources Monticello, AR 71655	(501) 460-1052
Tisdale, Bob	Northern Arizona University School of Forestry Box 4098 Flagstaff, AZ 86011	(602) 523-3031
Wagner, Michael R.	Northern Arizona University School of Forestry Box 4098 Flagstaff, AZ 86011	(602) 523-6646
Ward, Kenneth	Mississippi State University Dept. of Entomology P.O. Drawer EM Mississippi State, MS 39762	(601) 325-2085
Warfield, Tom	AZ State Land Dept. White Mt. District P.O. Box 1859 Pinetop, AZ 85935	(602) 367-0313
Weatherby, Julie	USDA Forest Service, FPM 1750 Front St. Rm. 202 Boise, ID 83702	(208) 334-9021
Weldy, Walter E.	Bureau of Indian Affairs P.O. Box 1131 Globe, AZ	(602) 475-2329

Wenz, John M.	USDA Forest Service 630 Sansome Street San Francisco, CA 94111	(415) 556-0121
Werner, Richard A.	Institute of Northern For. 308 Tanana Dr. Fairbanks, AK 99775-5500	(907) 474-6711
West, Lorne	P.O. Box 577 Yosemite, CA 95389	(209) 372-0319
Whitham, Thomas G.	Northern Arizona University Dept. of Biological Sciences Flagstaff, AZ 86011	(602) 527-7215
Wickman, Boyd E.	For. & Range Sciences Lab 1401 Gekeler Lane La Grande, OR 97850	(503) 963-7122
Wilson, Jill Lowensbery	P.O. Box 105 Hermiston, OR 97838	(503) 567-0712
Wood, Alan	Boyce Thompson Inst. Tower Road Ithaca, NY 14850	(607) 257-2030
Wood, David L.	University of California Dept. of Entomological Sciences Berkeley, CA 94720	(415) 642-1603
Zhang, Zhao Yi	Northern Arizona University Box 4098 Flagstaff, AZ 86001	(602) 523-7875

# Merchandising Plant Pathology

C. WENDELL HORNE, Editor-in-Chief, *Plant Disease*



Those of us who work in the areas of knowledge generation and dissemination sometimes lose sight of the fact that we produce tangible products and that these products must be sold to the consuming public in competition with other knowledge products. This natural oversight occurs because most of us generate knowledge in the public domain and do not experience the immediate exchange of money or other tangible products. Any and all consumable products must be merchandised by bringing together individuals who have need of the product with those who

either possess or can produce the product.

A high percentage of plant pathologists work in institutions of higher learning and have grown to expect an instant outlet for services performed in the areas of research, teaching, and extension along with consistent support for same. Change in the system often goes unnoticed unless a shortfall occurs in monetary support. This shortfall has occurred in the past, is presently occurring, and will likely continue to occur unless we become more competitive in the art of merchandising.

Traditionally, we plant pathologists have excelled at selling our product to each other. This is done at annual meetings, through journals, and in the halls of our workplaces. There is nothing wrong with this exercise except that it falls short of the goal of effectively selling our product and the need for it to the ultimate consumer.

Believing in one's product is critical in making a sale. Even a cursory review of historical records should convince us that we in plant pathology can take pride in past accomplishments and look forward to a bright future. Phytopathologists have an enviable record for making discoveries leading to control procedures for disease problems of all major crops. The microscopic nature of plant pathogens is in itself enough to capture the imagination of most laypersons. One who knows the microscopic world and how to manage it possesses knowledge that is in constant demand.

As a discipline, we may need to adopt a special form of "plant pathology pride" to boost the spirits of those now on board and to heighten the anticipation of students entering our discipline. If every practicing plant pathologist spoke with enthusiasm and pride about our discipline and its accomplishments, we could surely create a high level of visibility and recognition. One could then predict with almost absolute certainty that support levels would increase markedly.

Much concern has been expressed recently about declining support from state and federal sources. A decline in representation from rural constituencies in favor of urban areas is indeed occurring, but the implied assumption that all urban elected officials are against agriculture is untrue. We must convince these individuals that urban dwellers have an even greater stake in the security of the nation's food supply than those residing in rural areas.

Many raise the issue of surpluses that tends to cast a pall over all of agriculture as if we should cease every such development activity. H. J. and R. L. Nicholson noted in their book *Distant Hunger* (1979, Purdue University, West Lafayette, IN) that developed nations can make equivalent exchange among food, money, and other resources to meet their national needs and

goals. An adequate food supply is a pillar of strength for the United States, and it makes no more sense to diminish technology supporting the food production industry than it would to weaken the banking system.

Like our clientele the agricultural producers, we have on occasion "bought retail and sold wholesale" by releasing information through the production disciplines instead of our own extension channels. The production disciplines rightfully take credit for their activities, and those hard-earned research and development dollars for plant pathology fail to regenerate. There is nothing wrong with our sister disciplines championing plant disease control when our contribution is credited.

I believe that enthusiastic merchandising of plant pathology will cause most negatives to disappear. In recent years, the American Phytopathological Society has aggressively marketed the discipline by publishing compendia and, through APS Press, a number of books and by starting two new scientific journals—*PLANT DISEASE* and *Molecular Plant-Microbe Interactions*.

As individual plant pathologists, we must convince those in our sphere of influence about the importance of plant pathology and how it serves their needs and interests. This can be done best by selling with substance and having something truly beneficial to offer. Almost every layperson has some interest in plants accompanied by a desire to learn new information. If benefited by the encounter, that person will return with renewed enthusiasm for more assistance.

Competition is as alive and well in the information marketplace as it is for automobiles, toothpaste, and designer jeans. Individuals have a finite amount of time to listen, read, and view information, and they establish personal priorities about what is of interest. We compete best by having factual and creditable information pertinent to their needs and appropriately designed for a particular audience.

One of the greatest shortcomings of our discipline is in the area of well-prepared popular articles. Most of us have been taught to prepare scientific journal articles but may or may not have experience in writing popular articles. Those who do not have outlets for popular articles may want to convince a journalist to do an article in a specified area of plant pathology.

At some time in our careers, most of us hope that an organization such as APS will sell our product and make us indispensable to society. This wish never seems to come true because these organizations are designed to support the individual professional and advance certain professional goals. They can furnish a collective voice in some instances and perform services such as publishing journals, books, and compendia and managing national meetings—but it is still up to the individual to sell plant pathology on a day-to-day basis.

The discipline of plant pathology will develop to its full potential when we plant pathologists commit ourselves individually and collectively to effective merchandising of the discipline. If every professional plant pathologist will develop a wholesome discontent about discipline advancement and become committed to pursuing attainable excellence, we will see young people clamoring to enter the profession and investors wanting to buy stock in its future.

Individual plant pathologists need to make a personal commitment to doing those things well that sell the discipline. Departments also need to be more conscious of the need to sell the discipline and to posture themselves favorably for doing it. Finally, our Society should publish good science, serve as a resource base for individual scientists, and do everything possible to raise discipline visibility.

Plant pathology will be merchandised when we—individually and collectively—deliberately invest sufficient time and effort to sell our services and the need for them to the consuming public.

WFIWC Film Festival  
Source of Films

Operation WHIP (28 minutes)

Audience Planners, 5107 Douglas Fir Road, Calabasas,  
California 91302 (818) 884-3100

Condition Red (13 minutes)

Forest Pest Management, USDA Forest Service, 630 Sansome  
St., San Francisco, California 94111 (415) 556-4322

The Gypsy Moth: A Dilemma (14 minutes)

Audience Planners (above)

An Enemy In Our Forests

Produced at Oregon State University - no longer available

Pandora Moth (14 minutes)

Forest Pest Management, USDA Forest Service, 517 Gold Ave.  
SW, Albuquerque, New Mexico 87102 (505) 842-3280

Reversing the Trend (31 minutes)

Produced by CANUSA Program, Pacific Northwest Station, USDA  
Forest Service, P.O. Box 3890, Portland, Oregon 97208

Spruce Budworm Program - Quebec

Department of Entomology and Pathology, 1530 Blvd de  
L'Entente, Quebec, Quebec Province, Canada 615-457

Forests in the Balance: A Fight Against Time (28 minutes)

Audience Planners (above)

WESTERN FOREST INSECT WORK CONFERENCE

SPECIAL EVENING MEETING

WEDNESDAY, MARCH 9, 1988

Chairperson Schmitz called the meeting to order.

What should be our Course of Action for gaining support

Discussion

Q. What is the real problem?

A. 1) There is a general decline of human resources in the applied fields of entomology and pathology and in biological and scientific research.

2) Society sees pest management as "use of chemical pesticides". There is a lack of tech transfer and positive image. The public doesn't see pest management as beneficial. Practitioners are not doing an adequate job of tech transfer even to foresters.

Basic Premises: We need to do a better job of tech transfer.

There is a dropping emphasis on the part of industry. There is a reduced activity by the Pest Action Councils and Western Forestry relative to forest pest management.

The problem may be that we have sold a "bill of goods" to managers. Until we have basic ecological research we don't get answers. The Big Bug Programs did not solve the problems.

Response:

We just need to do a better job of tech transfer of techniques being developed.

John Wenz - We are having good success in technology transfer to foresters in California.

Main Problem - We are really doing a good job but we need to continually advertise that we are good.

Perhaps there are other forums that would better serve the purpose of educating managers. There is a hierarchy of "managers" each with their unique tech transfer requirements. Somehow we need to provide this to each level.



Various "publics" exist; we need to identify each and then address the needs of each, i.e.:

- a) Foresters
- b) Fund providers and legislators - these have a dearth of factual information as they make decisions.

Motion: For WFIWC to form an ad hoc committee to develop a public information action plan. Committee to be ready for a report by next meeting.

Motion seconded.

#### Discussion

The Academy of Sciences is developing an initiative based on a study of forest biology and sciences and the quality of life. Funding for the study is in hand. We need to prepare a letter from this group offering assistance and help, addressed to Deputy Chief of USFS for Research.

Steve Burke made a proposal of things to do.

#### A. Information gathering:

- 1. Learn all congressional Representatives and staff. Identify those that support; develop a profile of these; determine their track record on forestry issues.
- 2. Identify states favored in Committee structures.
- 3. Identify special interest groups.
- 4. Other Forest Practice Managers and Forest Managers.
- 5. Public Groups.

#### B. Other things to do

- 1. Develop a consensus from the group.
- 2. Form an ad hoc committee.
- 3. Communicate
  - a) Internally - Newsletter
  - b) Externally - " "
- 4. Free Press - use forestry related or forestry favoring trade journals, newspapers, etc.
- 5. Create an image (logo).
- 6. Deal with issues of responsibility.

#### C. Future Strategies

- 1. Support more active and visible groups.
- 2. Expert testimony is needed on many fronts.
- 3. Get to the public.

Vote: In favor of motion - motion carried. 42 present.

Question: Since most here work for government agencies, is it appropriate to conduct business in this type of group,

to lobby for support?

The question was not resolved. Some said no. Some said this is an ad hoc group and can be treated as such.

Suggestion: We should involve other similar interest groups nationwide in this effort.

Suggestion: We should not think we should not get involved in forming a plan just because we work for an agency.

A motion was made to write the letter to National Academy of Science offering support for forest biology.

Motion passed.

Meeting adjourned.

Special Interest Groups That Could Aid  
and Support FPM Issues

**Forestry**

American Forest Association  
American Forest Council  
Council of Western State Foresters  
Forest Farmers Association  
Forest Disease Work Conferences  
Forest Insect Work Conferences  
Forest 2000 Task Force  
National Association of State Foresters  
National Association of Woodland Owners  
National Forest Products Association  
Society of American Foresters  
Western Forestry and Conservation Association  
Western State Legislature Task Force

**Education**

National Association of Land Grant Colleges  
National Association of University Deans

**Science**

Numerous organizations exist but we need a comprehensive list. Then we should narrow it down to those with bearing on FPM issues and consider our approach.

**National Office of NASF**

This group is involved in decision making at the Washington D.C. level.

There is a 51% cut in state and private proposed for Federal fiscal year 1989. Phone calls and letters make the greatest impact. These can be directed to state offices.

**Reversing trends:**

Talk to grass roots groups, trade journals  
Use basic levels (4th grade) of communication  
Public Broadcasting System  
Newspaper articles  
Television  
Talk to forestry groups