PROCEEDINGS

THIRTY-FIFTH ANNUAL WESTERN FOREST INSECT WORK CONFERENCE

EUGENE, OREGON

MARCH 5-8, 1984

Not for Publication

(For Information of Conference Members Only)

Prepared and Printed at

Pacific Northwest Region

USDA Forest Service

Portland, Oregon

Front Row, l-r: Marion Page, Hec Richmond, Ken Gibson, Dayle Bennett, Dave Holland, Russ Mitchell, Ron Billings, Steve Kohler, Tom Hofacker, Ron Stark, Truman Puchbauer, Jed Dewey, Jack Thompson. Back Row: Mike Haverty, Tom Sterner, Bernie Raimo, Bob Averill, Nick Crookston, John McLean, Paul Joseph, Gene Irwin, Staffan Lindgren, Mike Banfield, Barry Lyons, Boyd Wickman.

Front Row, l-r: Jim Hadfield, Allan Van Sickle, Roger Ryan, Larry Barber, Robert Gara, Dick Mason, John Schenk, Mike Jenkins, Milt Stelzer, Wayne Bousfield, Torolf Torgersen, Bob Dolph, Dick Washburn. Back Row: Gary Long, Bob Bridges, Stan Meso, Gary Pitman, Dave Nielsen, Don Goheen, Dave Bridgwater, Bill White, Bruce McGauley, LeRoy Kline, Jon Sweeney, Tim Ebata, Mike Wagner, Bill Ives.

Front Row, l-r: Bob Thatcher, Beth Willhite, Ralph Hall, Tom Payne, Fred Stephen, Dave McComb, Galen Trostle, Bob Celaya, Tim McConnell, Jan Volney, John Wenz, Larry Stipe, Gary DeBarr. Back Row: David Hunt, Scott Tunnock, Terry Shore, Wade Bowers, Dick S. Smith, Patrick Shea, Kenneth Lewis, Marc Linit, Tim Paine, Jeff Cornell, Kathy Sheehan, Garland Mason, Roger Sandquist, Bruce Morse, Gordon Miller.

Front Row, l-r: Donn Cahill, Lynn Rasmussen, Bill Waters, John Schmid, Charles Sartwell, Molly Stock, Kareen Sturgeon, Bruce Hostetler, Bill Kemp, Paul Buffam, Leslie Chong, Ben Moody, Bob Miyagawa. Back Row: Dave Overhulser, Don Kinn, Don Scott, Peter Hall, Tom Gregg, Dan Miller, Herb Kulman, Bob Campbell, Tara Sahota, Don Dahlsten, Mitch Miller.

Front Row, l-r: Jack Stein, Terry Rogers, Dave Leatherman, Les McMullen, John Foltz, Lonne Sower, Julie Brooks, John Borden. Back Row: Gene Amman, Skeeter Werner, Rick Johnsey, Jack Marshall, Ralph Thier, Molly Sinnott, John Johnsen, Jay Sexton.

PROCEEDINGS

THIRTY-FIFTH ANNUAL WESTERN FOREST INSECT WORK CONFERENCE

EUGENE, OREGON

MARCH 5-8, 1984

Executive Committee (Thirty-Fifth WFIWC)

R. Stark, Portland, OR	Chairperson
P. Buffam, Portland, OR	Immediate Past Chairperson Program Co-chairperson
B. Hostetler, Portland, OR	Secretary-Treasurer
J. Laut, Fort Collins, CO	Councilor (1981)
K. Sturgeon, McMinnville, OR	Councilor (1982) Local Arrangements Chairperson
P. Hall, Victoria, BC	Councilor (1983)
B. Wickman, LaGrande, OR	Program Co-chairperson

CONTENTS

	Page
Technical Program	1
Executive Committee Meeting Minutes	4
Initial Business Meeting Minutes	6
Treasurer's Report	8
Keynote Address:	
Forest pest management: Present perspectives and a look ahead--II	9
Panel Summary:	
IPM--What is it and where are we?	18
Workshop Summaries:	
Legal Implications of IPM	21
Decision models: Are they useful for future IPM?	24
Urban forestry IPM	26
What is the definition of IPM?	27
How does IPM fit into resource management?	29
Marketing IPM: A new perspective	31
The CANUSA budworm population model: Will it ever be used?	33
Quantifying differences in feeding behavior of spruce budworm and other defoliators	*
Insect-disease interactions in IPM	34
Weather effects on populations and incorporating these into IPM programs	35
Federal research (United States and Canada)--Prospects for the future	37
Population dynamics theory and application	38
Hazard rating systems for defoliators	39
Gypsy moth and eradication	41
Teaching forest entomology: Where do we stand?	42
Sequential sampling--Present understanding and use	44
IPM for regeneration problems	45
The status of research on behavior modifying chemicals--The role of host trees, do they communicate?	*
Short- and long-term effects of defoliators--Tree rings and prognosis models	47
Use of pheromones in IPM	49
Management of pine for mountain pine beetle prevention	51
Silviculture and spruce budworm: Where do we stand?	53
State of the art of biological control in IPM	55
Diseases as predisposers of trees to insect attack	56
Panel Summary:	
The Western Forest Insect Work Conference: Past, present and future	57
Final Business Meeting Minutes	60
Treasurer's Report for Eugene Conference	62
Constitution and Bylaws	63
Membership Roster	65

* Summary not submitted.

TECHNICAL PROGRAM

Thirty-fifth Annual Western Forest Insect Work Conference
Eugene, Oregon
March 5-8, 1984

Monday, March 5

4:00 p.m.	Registration
6:00 p.m.	Evening Mixer

Tuesday, March 6

7:00 a.m.	Executive Committee Meeting
7:30 a.m.	Registration
8:30 a.m.	Initial Business Meeting
9:00 a.m.	KEYNOTE ADDRESS: Forest Pest Management: Present Perspectives and a Look Ahead--II. KEYNOTE SPEAKER: William E. Waters
10:15 a.m.	PANEL: IPM--What Is It and Where Are We? MODERATOR: Fred Stephen SPEAKERS: Don Dahlsten Norma Grier Jim Hadfield Mike Kerrick
12:00 Noon	Lunch
1:30 p.m.	WORKSHOPS:

1. Legal Implications of IPM.
   MODERATOR: Dave Fellin
2. Decision Models: Are They Useful for Future IPM?
   MODERATOR: Nick Crookston
3. Urban Forestry IPM.
   MODERATOR: Dave Leatherman
4. What Is the Definition of IPM?
   MODERATOR: Ron Stark
5. How Does IPM Fit Into Resource Management?
   MODERATOR: Ed Holsten

6. Marketing IPM: A New Perspective.
   MODERATOR: Martha Brookes

Wednesday, March 7

8:30 a.m.

WORKSHOPS:

1. The CANUSA Budworm Population Model: Will It Ever Be Used?
   MODERATOR: William Waters

2. Quantifying Differences In Feeding Behavior of Spruce Budworm and Other Defoliators.
   MODERATOR: Jan Volney

3. Insect-Disease Interactions In IPM.
   MODERATOR: Dave Schultz

4. Weather Effects on Populations and Incorporating These Into IPM Programs.
   MODERATOR: Bill Kemp

5. Federal Research (United States and Canada)--Prospects for the Future.
   MODERATORS: Tom Sterner and Gerald Anderson

6. Population Dynamics Theory and Application.
   MODERATOR: Gene Amman

10:30 a.m.

WORKSHOPS:

1. Hazard Rating Systems for Defoliators.
   MODERATOR: Ken Gibson

2. Gypsy Moth and Eradication.
   MODERATOR: Don Dahlsten

3. Teaching Forest Entomology: Where Do We Stand?
   MODERATOR: John Borden

4. Sequential Sampling--Present Understanding and Use.
   MODERATOR: Bob Stevens

5. IPM for Regeneration Problems.
   MODERATOR: Mike Haverty

6. The Status of Research on Behavior Modifying Chemicals--The Role of Host Trees, Do They Communicate?
MODERATOR: David Rhoades

12:00 Noon — Lunch

1:30 p.m. — Informal Sessions and Educational Tours

Thursday, March 8

8:30 a.m. — WORKSHOPS:

1. Short- and Long-Term Effects of Defoliators--Tree Rings and Prognosis Models.
MODERATOR: Alan Van Sickle

2. Use of Pheromones in IPM.
MODERATOR: John Wenz

3. Management of Pine for Mountain Pine Beetle Prevention.
MODERATOR: Jack Thompson

4. Silviculture and Spruce Budworm: Where Do We Stand?
MODERATOR: Jed Dewey

5. State of the Art of Biological Control in IPM.
MODERATOR: Torgy Torgersen

6. Diseases as Predisposers of Trees to Insect Attack.
MODERATOR: George Ferrell

11:30 a.m. — Lunch

1:00 p.m. — Final Business Meeting

2:00 p.m. — PANEL: The Western Forest Insect Work Conference: Past, Present and Future.
MODERATOR: Hector Richmond
SPEAKERS: Ken Wright
Dick Washburn
Bill Ives
John McLean

4:00 p.m. — Adjourn for the Year

THIRTY-FIFTH WESTERN FOREST INSECT WORK CONFERENCE

Minutes of the Executive Committee Meeting
Eugene, Oregon, March 6, 1984

Chairperson Stark called the meeting to order at 7:00 a.m.

Present were:

Ron Stark, Chairperson
Bruce Hostetler, Secretary-Treasurer
Peter Hall, Councilor
Kareen Sturgeon, Councilor and Local Arrangements Chairperson
Paul Buffam, Program Co-chairperson
Boyd Wickman, Program Co-chairperson
Torolf Torgersen, Chairperson of Common Names Committee

Absent was Councilor John Laut. Minutes of the 1983 Executive Committee Meeting and the Treasurer's Report as of March 5, 1984, were read and approved.

Chairperson Stark reminded those present that three positions would need to be filled at the end of the 1984 meeting: Chairperson, Secretary-Treasurer, and the Councilor position held by John Laut. A Nominating Committee consisting of Peter Hall, Paul Buffam, and John McLean was appointed to select nominees.

Bruce Hostetler announced that 1983 WFIWC Proceedings were available for $2.50 each to those who did not attend the 1983 meeting.

Paul Buffam suggested that a special thanks be extended to Temple Bowen of Zoecon Corporation and Ken Lewis of Union Carbide for contributing funds to help cover costs of a scheduled mixer.

Boyd Wickman made a request that members be encouraged to sign up for the tours to the Oregon Coast and to the H.J. Andrews Experimental Forest.

Torgy Torgersen reported that the Common Names Committee of the Entomological Society of America turned down the request of the WFIWC to change the common name of Choristoneura occidentalis from "western spruce budworm" to "western budworm". The ESA committee said that "western budworm" was not descriptive enough and suggested addition of another modifier to the name. Torgy would like WFIWC members to consider using the common name of "western budworm" in their publications even though it is not accepted by ESA, and in that way gain more acceptance of the name.

Chairperson Stark that several special guests were present at the Work Conference: Ralph Hall, Hec Richmond, Dick Washburn, Galen Trostle and Herb Kulman.

Bruce Hostetler asked that the workshop and panel moderators be reminded that they are responsible for writing summaries of their sessions in the proper format for inclusion in the 1984 WFIWC Proceedings.

The meeting adjourned at 8:00 a.m.

THIRTY-FIFTH WESTERN FOREST INSECT WORK CONFERENCE

Minutes of the Initial Business Meeting
Eugene, Oregon, March 6, 1984

Chairperson Stark called the meeting to order at 8:30 a.m. and welcomed members to sunny Eugene, Oregon. A special welcome was extended to Hec Richmond, Ralph Hall, Galen Trostle and Ken Wright all of whom are long-standing members of the Work Conference.

Chairperson Stark announced that Hec Richmond had copies of his newly published book,"Forever Green", available for $9.00 each, and that Hec would be holding an autograph party from 5:30 to 7:30 on Tuesday evening.

A reminder was given to members to sign up for the Wednesday afternoon tours to the Oregon Coast and to H.J. Andrews Experimental Forest as quickly as possible.

Chairperson Stark that a Nomination Committee consisting of Peter Hall, Paul Buffam and John McLean had been appointed to select nominees for the positions of Chairperson, Secretary-Treasurer, and Councilor to be elected at the final business meeting. Larry Freeman was informed that he would be responsible for selecting members to serve on the Ethical Practices Committee.

Torgy Torgersen presented a report of the WFIWC Common Names Committee. He first reported the results of the mail ballot to determine support of WFIWC members for a common name change for Choristoneura occidentalis from "western spruce budworm" (currently accepted by the Entomological Society of America) to "western budworm". There were 145 ballot responses divided as follows: 102 in favor of change to "western budworm"; 33 in favor of retaining "western spruce budworm"; 10 in favor of other names, including "Douglas-fir budworm", "western conifer budworm", and "western fir budworm". Thus, about 77% of the responses favored a name change.

Based on the results of the balloting, a proposal for a name change was submitted to the ESA Common Names Committee, chaired by Dr. J.B. Chapin, Lousiana State Univesity. The ESA committee disapproved the name "western budworm" on grounds that it was "too general to be of any great value for reference to the species" and that "the common name is well entrenched in the literature and one that does not now cause confusion".

Torgy announced that a Common Names Committee meeting open to the general membership would be held during the conference. The Committee members are: Torgy Torgersen, Wayne Brewer, John Moser, Iral Ragenovich, Larry Stipe, Charles Sartwell, Bob Stevens, and Scott Tunnock.

Chairperson Stark informed members that Wally Guy, a former WFIWC member and photographer for the Pacific Northwest Forest and Range Experiment

Station, died in 1983.

Bruce Hostetler announced that additional copies of the 1983 WFIWC Proceedings were available for $2.50 each.

Chairperson Stark announced that a meeting of the newly formed Historical Committee would be held over breadfast on Thursday. This committee is composed of the official WFIWC historian, Dick Washburn, and anyone else who is over 60 and/or retired.

A special thank you was offered to Temple Bowen and Ken Lewis for their monetary contributions to the Monday evening mixer.

Ron Billings extended an invitation for all to the twenty-ninth annual Southern Forest Insect Work Conference to be held in Charleston, South Carolina, August 6-9,1984. He suggested that members contact Gary DeBarr for more information about the conference.

John McLean announced that an IUFRO Reforestation Working Group Meeting would be held on Wednesday evening at 8:00.

Bernie Raimo announced that information concerning the 1985 WFIWC Meeting to be held in Colorado would be presented at the final business meeting.

The meeting was adjourned at 9:00 a.m.

TREASURER'S REPORT

Thirty-fifth Western Forest Insect Work Conference
Eugene, Oregon, March 4, 1984

Balance on hand March 3, 1983	(+)	$2,462.30
Expenses:		
Bank service charge	(-)	3.00
Postage	(-)	184.32
Income:		
Interest	(+)	104.89
Balance on hand December 31, 1983	(+)	2,379.87
Expenses:		
1983 Proceedings publication	(-)	527.00
Hats for 1984 Conference	(-)	400.75
1984 program printing	(-)	43.80
Income:		
Interest	(+)	21.72
Balance on hand March 4, 1984	(+)	1,430.04

KEYNOTE ADDRESS
William E. Waters
University of California, Berkeley

FOREST PEST MANAGEMENT: PRESENT PERSPECTIVES AND A LOOK AHEAD -- II

This meeting is a natural sequel to the one in Monterey 9 years ago. It has been a time of great activity, change, and progress in all aspects of forest resource management. Much of this has been spurred by policy mandates and directives of the National Environmental Quality Act, the Renewable Resource Planning Act, the National Forest Management Act, and other Federal and State statutes that clearly said new, better ways of managing our forest resources had to be developed. This has included the mandate to do a better job of protecting our forests against destructive insects and diseases.

How to do this has been variously interpreted in the federal, state, and private sectors. But there has developed a general consensus that integrated pest management (IPM) is the way to go -- that conceptually, at least, IPM holds the promise of achieving some optimal state of resource protection against the ravages of insects and diseases.

In 1975, however, I am not at all sure that there was a real understanding -- certainly not common agreement -- on just what IPM in forestry meant. To some, it meant simply finding new ways to prevent or suppress outbreaks -- ways to treat the bugs -- with less reliance on chemicals. To others, it was apparent that more than this was involved -- that ultimately the process of managing forest pests had to be fully integrated into all phases of forest management planning and operations. This meant that -- somehow -- we had to have a better accounting of the cumulative, collective effects of insects and diseases on forest growth and productivity -- and better ways of evaluating the impacts of these effects in terms of the resource values actually at stake and the specific objectives of the resource manager. We had to identify and quantify the benefits that would be realized -- and the costs involved -- from alternative management actions. And we had to have the capability to look ahead -- to predict changes in pest abundance, damage, and potential impacts -- to project the results of different treatment strategies and tactics -- and to anticipate possible interactions with other management activities.

How to go about this -- how to achieve this capability -- was not entirely agreed upon in 1975, either. Many researchers in forest entomology and pathology were caught up in their own studies, with little inclination to redirect them to a larger goal. Many in operational positions, having to deal with ongoing pest problems, saw these problems as unique to their territory -- requiring only more effort of the same kind that they were giving to them. People in universities had their own motivations and institutional inducements to follow individual pathways to glory. In the Forest Service, the functional organization of insect

and disease research, the split with pest management, and the traditional autonomy of the Forest Experiment Stations and Regional Offices almost precluded a commitment to any common goal.

However, a significant change had already begun -- the era of the Big Bug programs was underway. In 1971, an accelerated R&D program on the gypsy moth was generated -- with a single program framework, a national planning committee, and, most important, earmarked funding through the USDA. The Pine-Bark Beetle IPM program, funded by NSF and EPA, started up in 1972 -- this was part of a larger program directed at the pests in 6 major crop ecosystems, with direct funding to universities, but including USDA scientists as well. Pine bark beetles -- specifically the WPB in ponderosa pine forests, the MPB in lodgepole pine forests, and the SPB in loblolly pine forests -- were selected to be the forest pest component of this program (an achievement in itself at the time). And in 1974, the Combined Forest Pest Program -- the Big Bug program directed at the gypsy moth, Douglas-fir tussock moth, and SPB -- was begun with an entirely new organizational framework and significant changes in funding and management. There was an additional element in this burst of IPM-related research activity in the early 1970's -- a USDA-funded western regional research project (W-110) on interactions between bark beetles and root pathogens, in which studies on WPB and MPB were closely meshed with those carried out under the NSF-EPA funded program.

All of this attention on the development of the IPM approach to managing major pest insects put forest entomologists in the limelight more that ever before -- it even brought some out of the woodwork. But it did much more than this. The scope of these programs -- the stated objective of developing management systems for the pests involved -- and the obvious need for input from other disciplines and from practitioners required a whole new approach to the planning and organization of the work. It required that there be a system structure to provide a common focus for the research. It required that all of the basic components of the system be addressed, that priorities be established for the information needed, and that the studies follow a logical flow to the final product. And it required that there be some means of integrating the information obtained into a form that could be given to and used by resource managers.

By 1975, the initial planning and organization of these programs was essentially completed -- in a formal, documented sense, at least. How this was done, and the actual status of the research at that time, differed according to the base of knowledge from which they were developed, the spectrum of people involved in the planning process, and certain administrative decisions.

The initial gypsy moth program, for example, had a program structure, with major information needs or targets specified, and a time schedule of R&D activities that was developed by a planning team made up of people from the three major USDA agencies involved (FS, ARS, APHIS).

For the Pine-Bark Beetle IPM program, a great deal of time and effort was spent at the outset by the principal investigators in each of

the subprograms to develop a conceptual system model, and to organize the work around such a model. Several versions were proposed -- some dealing only with a conceptualization of the bark beetle population system -- but at the Monterey meeting in 1975, I described the model structure of a forest pest management system developed by the WPB group, which was adopted as the planning and organizational framework for each of the 3 subprograms.

The same system structure was used for the Expanded SPB Research and Applications Program and, in a slightly different configuration, by the Douglas-fir tussock moth program management team. Interestingly, the notion of a system structure -- and the general idea of a systems approach -- was rejected by the Expanded Gypsy Moth program planners and managers. They adhered, generally, to the targets specified for the earlier program, with no explicit linkages or overall system model to tie things together. The manner in which the vast amount of information obtained -- including new treatment techniques -- was intended to be integrated and applied in diverse situations remains somewhat a mystery.

A new element in the planning and organization of IPM-related research and development programs was brought into play for the Big Bug programs. A systematic research planning method -- called convergence analysis -- was used to determine primary and secondary priorities and the sequence of studies to be carried out in the time span of the programs. Also, purely research activities were to be extended into operational trials, pilot tests, and demonstrations.

The Canada-U.S. Spruce Budworms Program, officially started in 1978, also was preceded by an intensive planning effort, using the same system structure as the Pine-Bark Beetle and Tussock Moth Programs to define the major components, or targets, and the convergence technique to determine priorities and the flow of activities to be followed.

What is so extraordinary about this new approach to planning and organization of such multidisciplinary programs -- aside from the commitment and support given to it by the funding agencies -- is the success that it had in bringing together the divergent views of people from different disciplines, different institutions, and different kinds and levels of experience to establish common goals and rules for working together. One can argue about how well the rules were followed -- and how well the working relationships were maintained. It certainly was not a smooth and uneventful process. In all of the programs, some old feuds were rekindled, some new ones generated, and disagreements sometimes seemed to outnumber agreements. But somehow key people continued to communicate, and mechanisms were found to resolve the issues. And, by and large, the courses of the programs were maintained.

Communication has been a key word. I think it's fair to say that more meetings have been held and more person-to-person contacts made in the field of forest entomology since 1970, say, than in the entire history of forest entomology up to that time. New dimensions of learning and experience have been added by the accelerated communication with researchers from other disciplines. And the involvement of practitioners and potential users in the planning and conduct of these programs has

helped maintain a realistic focus. Also, there has been an unprecedented opportunity for young people to become involved in some aspect of forest insect research -- and (despite current conditions in the job market) more career opportunities have been opened than in any comparable period before. Witness the number of publications -- in scientific journals, symposia proceedings, and Forest Service and other publications -- authored by new people in the field.

One result -- an important result -- of all this activity is that today there is a much better understanding -- and a more general consensus -- of what forest pest management is all about. What basic information is needed on the dynamics of pest populations and their effects on the dynamics of forest growth and development -- how assessments of the impacts on resource values and on management objectives should be made -- how to evaluate the benefits and costs, and the risks and uncertainties, of different treatment alternatives (including the no-treatment option) -- and, most important, how to bring this information more effectively to resource managers and other users. In this regard, we have made remarkable advances since 1975 -- and the doubting Thomas' of that time can now take renewed hope from the improved understanding and communication that has been achieved.

In one aspect, however, we have fallen short of my hopes, at least. The Monterey meeting was a joint meeting of the Western Forest Insect and Western Forest Disease Work Conferences. At that time, I said that I hoped it would be the beginning of a permanent relationship -- that it was time to join forces to exchange information on a regular basis and provide a mechanism for closer coordination in IPM-related research. The formal union has not occurred, and there has not been a joint meeting since then. The majority of forest entomologists and pathologists appear to hold to the old ties. There has not been a complete void. Some consideration was given to certain forest disease interactions in most of the programs that I have mentioned -- notably WPB and root pathogens, MPB and dwarf mistletoe, gypsy moth and root diseases, and, to a very limited extent, SPB and root disease. And some effort is being made now to integrate insect and disease considerations in prescriptions for silvicultural treatments and other management activities in some instances. We have a long way to go in this regard, however.

What about actual accomplishments -- what new knowledge and technology has been gained for managing these major insect pests -- what is being implemented?

I am not going to attempt to answer these questions in a specific or detailed way. What are considered to be accomplishments -- a synthesis of new findings and prior knowledge -- are well described (glowingly described) in the accomplishment reports of the respective programs, in the general information and how-to-do-it manuals that have been produced, in several compendium volumes, and in the many journal articles, symposia proceedings, etc. that have been published. Many of the new developments have been reported at previous WFIWC meetings -- and some will be mentioned and discussed at the Workshops of this meeting.

There are some advances in learning common to all -- improved techniques of monitoring, of pest population and damage assessment and

prediction, of impact evaluation, and treatments. But there are some interesting differences in what I perceive to be the motivation and present ability to really manage these pests -- and I will offer some commentary on this.

First, the gypsy moth. It continues in an unstable state in its established area of infestation in the Northeast, it continues its slow but steady spread into surrounding areas, and it is appearing at an increasingly rapid rate in new, far-flung areas, including the western states. In these instances, a familiar scenario (familiar to those in the Northeast) is being followed -- proposals for, arguments about, and then compromise attempts at eradication. Otherwise rational entomologists and other scientists with limited expertise and strong views of the feasibility of different approaches to eradication -- or suppression -- get caught up in this, along with regulatory entomologists and other non-scientists. The fly-swatter approach has to be attempted and experienced -- however costly it may be. And the syndrome persists. The gypsy moth is largely a people problem -- a problem of individual, institutional, and statutory conflicts. Even in its established area of infestation, no system of management has been proposed. The tools are available -- for assessment, prediction, treatments -- the largest set of tools that we have for managing any forest pest. But if, where, and how these should be applied is a matter of very diverse opinion. As the manager of the gypsy moth program put it, we have a socio-political management system for this pest, not a scientifically determined pest management system. As the gypsy moth becomes established in California, Oregon, and elsewhere in the West -- and I am quite sure that it will -- I fully expect the same pattern to develop.

The tussock moth. When the program began, relatively little was known of the factors affecting the occurrence of outbreaks, its natural enemies, and other aspects of its population dynamics. Its interrelations with host stands and the effects of outbreaks on physical stand parameters and their socioeconomic impacts were not well understood. Treatment options were limited. Outbreaks of the recent past had been dealt with in a crisis response mode -- by insecticidal spraying. And there was the spectre of the 1974 DDT treatment fiasco.

In the 5-year span of the tussock moth program, many of the voids in knowledge of the insect's basic biology and ecology and its effects on host trees and stands were filled. Methods of stand hazard assessment were developed. The potential usefulness of a synthetic attractive pheromone for early detection of outbreaks was demonstrated. Registration was obtained for several new insecticidal chemicals, Bt, and an NPV formulation (the second such virus registered for operational use against a pest insect). A population outbreak model was developed and combined with a modified and extended form of Stage's Stand Prognosis Model. The combined model is now on line at the Fort Collins Computer Center.

The tussock moth is down now -- but how prepared are we for the next outbreak? How much of the susceptible forest area has been hazard-rated? Is any egg mass or larval sampling being carried out? Is a supply of the pheromone available -- is it being put out in a systematic way, even in high hazard or high value areas? How many people have been

trained -- or are being trained -- in the use of the combined outbreak model? How reliable, in fact, is it? A start has been made in developing a supply of the tussock moth virus. Special funding was provided to Region 6 in FY 83 for a Virus Production Facility at Corvallis -- this project will terminate at the end of FY 86, or when 50,000 acre-equivalents of the virus are produced.

However, I suspect that the budworm, MPB, and other pressing FPM activities have put the tussock moth on the back burner generally, and despite the new technology available, we again are essentially in a wait-and-see situation -- with all of the risks and shortcomings, then, of a crisis response when the next outbreak occurs.

The WPB story is somewhat unique. As of 1975 a great deal of research had been conducted on this insect. Most features of its life history, natural enemies, and the role of pheromones in the attack and colonization of host trees were known. There was strong evidence of an association of the beetle with root diseases (primarily black stain root disease) and photo-oxidant induced stress in ponderosa pine. Procedures for sampling beetle populations and estimating beetle-caused tree mortality by aerial photographic and ground techniques had been developed, and put to use in -- among other ways -- large-scale field testing of an attractive pheromone mixture for survey and suppression of beetle populations.

Since then, additional information has been obtained on the role of both attractive and inhibitory compounds in the population dynamics of the insect, predisposition of ponderosa pine to beetle attack by root disease, and the use of lindane and other chemicals for individual tree protection. Some fine tuning of what is now called the California Pine Risk Rating System has been done, but its applicability to second-growth pine stands throughout California and elsewhere in the ponderosa pine region is questionable. A pest damage inventory system, based on a multi-stage sampling design and including WPB-caused tree mortality, has been developed by the Forest Pest Management staff of Region 5 for statewide assessment of timber losses. It can be applied to smaller units -- National Forests or individual private holdings -- but this hasn't been done, and it isn't clear just what inducement would be needed to step up its use.

No working model of WPB population dynamics, or of beetle-caused tree mortality, has been developed. Nor has the available information been synthesized into an operational guideline for management of this pest in the second-growth pine forests that now predominate. Real management of WPB -- and bark beetles generally -- is given lip service at best in California -- on the National Forests, at least, because the Region is far behind in its harvesting to meet allowable cut quotas (due primarily to overriding constraints from other resource management objectives). And outbreaks such as occurred in connection with the 1976-77 drought provide the opportunity for a big salvage operation excluded from the constraints. This is considered a bonanza. I expect that this attitude will continue until a realistic adjustment is made in the allowable cut targets and in other management operations for ponderosa pine. It certainly is putting a damper on any enthusiasm for preventive

measures and other IPM-related activities.

The advances toward management of MPB and SPB have been far more striking and real.

In the case of the SPB, this is due largely to the expanded program and the emphasis given to coordination of the research and applications studies to meet specific needs for an operational program. Research findings have been quickly extended into validation tests and operational trials. There have been some tough problems -- relating to both the beetle and people. But as of today, there are a variety of recommended procedures in the process of testing or in use for essentially all elements of a management program -- for monitoring, assessment, and prediction of beetle populations and tree mortality -- for economic analyses -- for preventive silvicultural treatments -- and, to a limited extent, for direct control. A great deal of information has been distributed to potential users through bulletins, handbooks, and other media -- and many training sessions have been held. This activity is continuing at a high level. The latest summary of technology transfer activities supported by the current program lists over 40 individual projects involving universities, state organizations, Forest Service research units, and Forest Service-Region 8 FPM personnel. Importantly, the states are taking a major responsibility in generating the cooperation of private landowners in implementing recommended practices. With feedback from users, and continuation of the effective working relationships that have been established, I fully expect that management of the SPB will become an increasingly viable reality.

The advances in management of the MPB in lodgepole pine forests have come about through a combination of efforts under the Pine Bark Beetle IPM Program and concurrent Forest Service research and FPM activities. Much of the basic biology and ecology of this insect in both lodgepole and ponderosa pine ecosystems was known in 1975. That knowledge, and new information obtained to fill voids in the management system that was envisioned, have been rapidly synthesized into what now is probably the most advanced operational program for any major forest pest insect. Significantly, essentially all elements necessary for planning and decision-making -- from stand hazard rating and other monitoring activities to consideration of silvicultural and other treatment options -- have been developed through procedures that are fully compatible with general management practice. This focus, and continuing interaction with resource managers on the ground, has generated much better understanding and willingness to integrate MPB-related concerns into regular practice.

The MPB program had a unique early advantage -- a stand prognosis model developed for and with resource managers that had the capability of incorporating and projecting the effects of MPB-caused tree mortality on lodgepole pine stands under different management regimes. Much credit is due Al Stage and his colleagues at the Intermountain Station for providing not only the model, but also the initiative in making it the core of the program. It was, in effect, the funnel into which much of the information on beetle population dynamics and stand/site relations was directed. It served the same function in the tussock moth program, and it presently is a major hub of the CANUSA budworm program.

A significant contribution to the management of MPB has come from the studies of Walt Cole, Gene Amman, and co-workers at the Intermountain Station -- including, among other things, a new model by Cole and Mark McGregor (FPM-Region 1) that effectively combines beetle population and stand factors in a form that can be used directly by resource managers. This, too, has generated much interest and cooperation from people on the ground -- in the Northern and Intermountain Regions, at least -- who now are in the fortunate position of having several ways of integrating MPB considerations into operating guidelines and schedules for lodgepole pine management.

I am not going to offer any commentary on the status of budworm management. Alot of information remains to be synthesized from within and outside the CANUSA program, and the transfer and acceptance of much of the newest technology remains to be accomplished. Some of the newest developments -- and certain problems relating to current outbreaks -- will be discussed in several workshops here.

What is ahead?

We need first to implement what is now known -- continue to move ahead in implementing the knowledge and technology gained on the MPB, WPB, SPB, DFTM, GM, and SBW.

We need to integrate disease and insect considerations more effectively into FPM planning and decision-making. This was spoken for at the Monterey meeting.

We need a yet broader approach -- to learn how to deal with the entire complex of pests affecting growth, productivity, and use of forest stands in major forest types.

This idea also is not new -- it was given as our ultimate goal at the Monterey meeting, and it was addressed explicitly earlier at a Forest Service conference on insect and disease impacts at Marana, Arizona in 1972.

A primary need in this regard is to learn how to manage the insects and diseases affecting young growth -- from seed through the sapling stage. What happens in this time period may largely determine the potential quality and productivity of a forest stand. This is one of the frontiers of forest insect and disease research now.

Final commentary. Because FPM in the Forest Service is the largest organization of its kind in the world -- because it is the major source of funding and technical assistance in the United States -- it has a tremendous influence on progress in this field and on the quality of forest pest management activities generally. How it operates -- and the initiative that it takes in bringing FPM more effectively into the resource management process -- therefore is of vital interest to all of us.

I requested -- and was generously provided information on comparative budget and staffing levels for FY 74 and FY 83 in all of the Regions

and the Northeastern Area. I also requested and received an indication of the views of the FPM Directors in the different Regions and the WO-FPM staff as to progress so far and their needs and priorities now and in the future.

There wasn't -- and there isn't time here now -- to fully analyze this information. Suffice it to say, although professional staffing has increased by over 50%, and actual dollars have increased about 80%, the dollar increases for survey, technical assistance, and suppression in terms of 1974 dollars has been very slight or has decreased in the different Regions -- and the overall budget actually has decreased slightly. What this means is that their ability to make programmatic shifts and improvements -- and to support the new advances in FPM -- remains limited. Increased contributions from other Forest Service functions, and increased state support, will help greatly -- but differing priorities and other uncertainties pose many problems.

Also, it is apparent that despite a positive view of the importance of FPM and the progress being made, there remains an unevenness in the kind and degree of motivation behind the regional efforts. There certainly are some inconsistencies in how they do business.

Strong support and pressure from the states and private organizations -- and continuing close working relations with research -- are needed to maintain the momentum that has been generated. It may be that the WFIWC can -- and should -- play a role in this.

It seems pretty clear that we have alot of things to finish up -- to fulfill commitments already made. More, we haven't been getting all of the answers we need, and alot of new questions have come up. What amount to whole new frontiers of research are beckoning to us.

Most challenging perhaps, are the opportunities that are developing to get FPM really accepted by resource managers, and putting it to work step-by-step.

I see exciting productive times still ahead. And I am as optimistic of the coming decade as I was in 1975, looking ahead toward today.

PANEL: IPM - What is it and where are we?

Moderator: Fred Stephen

Panelists: Don Dahlsten, Jim Hadfield, Mike Kerrick and Norma Grier

Don Dahlsten

Pest management has gone from an era of optimism introduced by the synthetic organic insecticide, DDT, in 1946 to an era of doubt created, by and large, by Rachel Carson's Silent Spring in 1962. The modern integrated pest management (IPM) era began around 1976 so we are only eight years into the IPM approach.

In forest pest management, as well as other types of pest management, we too often forget why we have moved so rapidly from the era of optimism. Basically, chemicals were not the panacea to pest control they were supposed to be because of resistance, resurgence and the creation of secondary pests. In addition, there were serious doubts regarding human safety and a mounting list of deleterious environmental effects due to chemicals used for pest control. Finally, the economics of using chemicals is in question. With global inflation the cost of petroleum has been steadily increasing as has the cost of producing, developing and registering pesticides. The efficacy of pesticides is also in question as more insecticide is being used per pound, bale or bushel of crop produced.

IPM is based in large part on understanding basic relationships between pest and host population dynamics. Many claim that the approach is not new and there is some truth to this as the application of ecological principles to pest control goes back to Stephen Forbes in the late 1800's. IPM was defined by Stern, Smith, van den Bosch and Hagen in 1959. Their definition was basically an integration of biological and chemical controls. The cornerstone of the whole approach was to maximize reliance on natural enemies IPM is an approach not a technique and has four basic principles as follows: 1) Know the biology and ecology of the pest and host, 2) Consider the ecosystem, 3) Utilize economic levels, and 4) Avoid disruptive actions.

Many are giving lip service to IPM but few are really practicing this ecological approach to pest management. Many pest managers are doing the same old thing and calling it IPM. The situation has gotten to the point where ecology must be put back into IPM and I propose that EPM - Ecological Pest Management is more indicative of the approach. The approach may not be new but many changes have taken place so that we can really consider the era of IPM (EPM) as beginning in 1976. For example, humans have created conditions favorable to pests (extensive monocultures, and in forestry seed orchards, plantations, etc.); in agriculture we are dealing with smaller and smaller gene pools and the same may be true for forestry in the future; transportation by air has made for efficient though not intended movement of pests; and finally the introduction of the synthetic organic pesticides has created numerous problems as alluded to above.

Forests tend to be more complex than agroecosystems and therefore there is a critical need for an ecologically sound pest control approach. I also feel that the complex nature of forests provides more avenues for innovative pest control. The problem is will we as forest pest managers and forest managers seek to develop true IPM programs? There are few if any IPM systems in existence in forestry at present. Funding agencies and control agencies seem to be only slightly interested in the biology and ecology of pests much less the cornerstones of IPM - the natural enemies. Sampling and monitoring studies are not common nor is the relationship of insect numbers to damage and growth loss so that economic levels can not be developed. The majority of pest managers are still looking to modern technology to solve their problems and the first choice for control is usually a chemical.

We are still approaching forest pest management with a firefighting or crisis approach. We should begin to practice the principles of IPM and begin to focus on biology and ecology rather than technology as a means to solving our pest problems in forestry.

Jim Hadfield

Forest pathologists and forest disease management are farther along in practicing IPM than entomologists and forest insect management. This is attributable to the unavailability of pesticides for control of diseases in commercial forests. Unavailability of pesticides has forced pathologists to consider an array of disease management tactics with the most emphasis being placed on cultural practices. Disease management has had to consider both the hosts and the pathogens. Dieases are managed by manipulating the hosts or host-pathogen environment rather than by killing pathogens.

Disease management is less crises-oriented than insect management. Because of the unavailability of pesticides, short-term losses are regretably accepted and long-term cultural solutions are sought. Disease management is at least 90 percent prevention and less than 10 percent suppression. Forest disease management in the Pacific Northwest has become more IPM-oriented, but not because of recent publicity of the concept. Most professional foresters probably cannot appropriately define IPM, but most are practicing it. Silveiculturists are better trained to recognize and manage pests now than in the past. Multidisciplinary teams help focus attention on multiple resources and alternative strategies. The high cost of timber stand manipulations forces foresters to integrate many treatments, including those for disease management, into one stand entry. Lots of IPM is being practiced, but the people doing it are not consciously calling it IPM.

Entomologists and pathologists are hired to provide technical advice on insect and disease management. They are not responsible for deciding how forest will be managed. That is the responsibility of foresters. Foresters are responsible for integrating information from several disciplines. Entomologists and pathologists will be most successful in IPM efforts if they provide information on practical insect and disease manage-

ment techniques and economic impacts to foresters, especially if the information is carefully packaged for understanding. Entomologists and pathologists need to work more closely to achieve a common goal - forest protection.

Mike Kerrick

Summary not available

Norma Grier

IPM will work only if fundamental changes are made by those who are responsible for pest management. IPM is an ecological management approach, and managers who suffer from tunnel vision will not be able to see IPM to its fruition. A multi-technique program that lacks long-term preventive measures is not an IPM program. Forest management practices must utilize better concepts of competition, economic thresholds, and overall forest health and must implement preventive measure. Research points the way for forest management, but the research commitment is predominantly to chemical programs and a forest management strategy that depends on repeated, artificial inputs. To accomplish IPM, we need data bases that are local and species-specific. The chemical companies exert an inordinant amount of pressure and influence on public land management agencies and educational institutions. The concerned public has the right to know the effects of programs that are carried out as well as a guarantee that decision-makers make sound, reasoned decisions. Public groups and citizens are willing to cooperate on long-term solutions to pest management problems.

WORKSHOP: LEGAL IMPLICATIONS OF INTEGRATED PEST MANAGEMENT
Moderator: Dave Fellin, Forestry Sciences Laboratory, Missoula, MT
Participants: Dave Fellin, Bill Waters, Truman Puchbauer, Tom Bible, Bruce Hostetler, Mike Kerrick, Peter Hall, Paulette Pyle, Sam Hitt, Dayle Bennett

Moderator Dave Fellin introduced the workshop by discussing an article entitled "How to avoid litigation--keeping corn, carrots and complaints out of court," which was written by John E. Marcroft and appeared in the January 1984 issue of Agriculture Consultant and Fieldman. Though directed toward agriculture, many of Marcroft's points apply to forestry. He suggests that the first step to avoid litigation is "don't do anything wrong." In all cases, one hopes that court trials can be avoided since it is unusual when the "survivor" of the litigation process is an actual winner. Some of the procedures that seem to trigger litigation are poor timing of pesticides, application in a manner not intended by the label, or treatment of a species not represented on the label.

Bill Waters, University of California, Berkeley, CA, served as an expert witness for Boise Cascade Co. in a lawsuit filed against the U.S. Forest Service - Region 4. The Company maintained that the Forest Service had failed to take direct action (spray) against a western spruce budworm outbreak on the Payette National Forest. The trial was in May 1983. Regarding the decisions on the use of insecticides against forest insects, Dr. Waters discussed the resource manager's "catch 22" situation in which he is "damned if he does and damned if he doesn't." Bill elaborated on the element of acceptable risk, which he felt has to be brought into the decision-making process.

Truman Puchbauer, timber management staff on the Boise National Forest, also served as an expert witness in the Boise Cascade Co. vs. Forest Service trial. He described infestations and boundaries of some areas treated. Mr. Puchbauer discussed several laws and asked, "What do arbitrary and capricious decisions mean?" (The words "arbitrary, capricious, and abuse of discretion" are taken from sections 702 and 704 of the administrative procedures act.) He reminded us that there must be a certain level of involvement by all parties concerned, a timely sharing and not witholding of information, and a full disclosure of all data. If these things are not done, either party could be guilty of arbitrary and capricious decisions. Truman concluded that all land managers must use discretion in their decisions.

Dr. Tom Bible, Oregon State University, Corvallis, OR, also served as an expert witness in the Boise Cascade Co. vs. Forest Service trial. He has studied the economic analyses in many EIS's and has seen none that were willfully bad or capricious. But several have flags built in that could lead to litigation. Tom said the Forest Service must standardize the methods and procedures used in economic analyses for EA's; otherwise they can expect more litigation. However, EA analyses should also reflect differences in regional objectives. While regional differences may seem to imply different economic analysis methods, different methods used in each analysis can lead to separate litigation testing each analysis. Within a system of jurisprudence built upon precedent, the implications of a common, accepted methodology for economic analyses should be evident. He complimented the recent R-6 EA and said that if all were as good as that, we would have fewer legal problems. In fact, although there were challenges to that EA, none were directed at the economic analysis. Tom generated considerable discussion on the cost-benefit aspect of spraying

for recreational amenities such as is/was planned for the Lincoln National Forest in New Mexico. Some participants felt that without CB's there would be more irrational fears, but others said that in many cases those fears were well founded. Considerable discussion was generated relative to the "battle of the experts" that often arises in trial testimony.

Bruce Hostetler, FIDM - R-6, generated much discussion on what kinds and age of data were used in EA's. Two appeals were filed against the 1982 EA because R-6 did not involve some of the public as well as they should have. Only one appeal was filed in 1983 due, in part, to efforts to increase public involvement in the analysis process. The decision by R-6 not to spray in 1984 was based on a newly prepared EA in which new data were considered and preparers used the stand prognosis model and a WSBW damage model in their projections of stand growth. Some workshop participants expressed concern that it took a decision of the Chief of the Forest Service to have current data used in the R-6 EA, since the previously used 1980 resource planning act data were outdated.

Mike Kerrick, Supervisor, Willamette National Forest, discussed the chronology of litigation involving herbicides in the last eight years. As a result of public involvement, Mr. Kerrick says he is doing a better job and his decisions are better, but the actions as a result of these decisions cost more. Therefore, other management activities may not get done and forest receipts may be affected. Mike reminded participants that we are at times enamored with analysis (paralysis of analysis) and not really the seriousness of the problem. His managers are now using alternatives to herbicides such as hand grubbing and hand cutting of competitive vegetation. Mr. Kerrick hopes for a "front-end approach"--good site preparation, perhaps fertilization and care in planting. Survival and early rapid growth are the keys to staying ahead of the brush. He said his managers are continually on the alert to new developments in herbicides but that there is little herbicide and vegetation management research going on at present.

Peter Hall, British Columbia Ministry of Forests, generated considerable discussion about the differences in philosophy on pest problems between the United States and Canada--for example, the use of 2-4-5-T in British Columbia. Mr. Hall noted that there are few conflicts and little litigation over the use of pesticides in western Canada. He indicated that there is good land use management cooperation and when folks do end up in court, it is usually not too great a problem and often due to inexperience on the part of managers. Peter compared the differences in legal problems between western Canada and the maritime provinces and suggested that three elements may be responsible for the differences: (1) differences in populations and metropolitan areas, (2) large areas of privately owned land in eastern provinces, and (3) the large-scale spray programs that have been conducted in the maritime forests.

Paulette Pyle, Oregonians for Food and Shelter, Salem, OR, summarized her thoughts by saying that important decisions are being made based on political climates, rather than on scientific knowledge. Ms. Pyle discussed the 2-4-D issue in Oregon, the series of court hearings and the strong decision of the judge in demanding that a worst case analysis be made--or go to jail! Paulette said that she and her group were searching for a balance between those on both sides of issues, and were polling citizens' concerns to determine if public opinion was contributing to more rational--or to more irrational--decisions. She concluded with a plea that science prevail in these resource management decisions.

Sam Hitt, Committee for Integrated Pest Management (CIPM), Santa Fe, NM, discussed the suit his group had filed against the U.S. Forest Service, Region 3. The basis of the litigation is that no EIS (only an EA) was prepared for spray treatments in R-3 and that the Forest Service has not followed the NEPA process in arriving at the decision to spray. Mr. Hitt and his group also are concerned that the Forest Service is making an irrational decision to spray WSBW infestations on the Lincoln National Forest based on visual qualities and recreational amenities, because there is no cost-benefit basis. The trial is scheduled for March 13. (Note: This issue was terminated in an out-of-court settlement signed by both parties on March 9.)

Dayle Bennett, FIDM, R-3, Albuquerque, NM, reminded everyone that his group was not planning to spray for budworm on the Lincoln National Forest based only on esthetic values. Dayle said there are volume losses, some possible mortality and that regeneration needs to be protected. He indicated that his group believed they could also get some benefits by treating in the early stages of an outbreak, such as exists on the Lincoln National Forest. Mr. Bennett concluded by stating that there are no guides for how long an EA has to be.

WORKSHOP: DECISION MODELS: ARE THEY USEFUL FOR FUTURE IPM?
Moderator: Nicholas L. Crookston
Participants: 25 people attended.

The moderator opened discussion with a round of introductions which included a statement of interests from the participants. Most people were interested in simulation models, a few in statistical analysis, the Prognosis Model (Wykoff and others 1982), and Decision Support System (DSS). Even though there was great interest in simulation models, the conversation centered on the subject described by the title.

An example of a "Decision Model" is the non-computerized decision-making procedure laid out in the National Forest Management Act and the RPA process. The information needs of forest planning are large and varied. The RPA process represents one way of organizing information for a decision maker. Another way to organize information in a retrievable format is through the use of Expert Systems, such as the medical diagnostic system called MYCIN (Duda and Shortliffe 1983). At this point, the group felt that the term "Decision Model" was inappropriate and chose DSS as a substitute.

With this introduction to the topic, Bob Coulson gave an impromptu presentation of the Southern Pine Beetle DSS developed at Texas A&M. The problem analysis component of this system is similar to MYCIN and is composed of a series of menus that question the user regarding the precise nature of his problem. The choices the user makes determines the pathway taken through the problem analysis routine. The pathway taken is acted upon by the control program which accesses components of the knowledge system (mostly narrative information), and the model system (currently 12 models including stand growth and yield, SPB population dynamics, economics, and hazard rating models) to deliver to the user the best and most pertinent technology available to deal with the problem. A report generator writes a summary of the relevant information and presents the outputs of the model simulations for use in decisionmaking. There are currently 24 unique pathways through the problem analysis routine; each linked to a unique subset of the models and information. Skillful users can bypass problem analysis, go directly to a solution algorithm, and access more than 30 models in the expanded model base (Rykiel and others, in press).

Crookston described how the Prognosis Model was built and how it can be used to house other models of related resources and incorporate pest damage models. This model is being used to estimate yields for pest infested forests and is being used as a DSS. It is more like a classical simulation model than an Expert System.

Bousfield described modeling the effects of spruce budworm on height increment. This work successfully related aerial detection surveys of budworm-caused damage to height increment that was measured during standard timber inventories (Bousfield 1980).

Wagner asked the participants for recommended methods of doing model validation. Which statistical procedures can be used to compare

simulation model output to real measurements and to alternative models? Crookston supplied the following references: Ek and Monserud (1979) and Freese (1960). Albert Stage (personal communication) said that Freese's method is preferred by him because it will not lead to acceptance of models which are inaccurate (leading to a high variance of the difference between models) and the rejection of models which may be better, yet biased.

The workshop then turned to general concerns managers have when using models. These include the development of user-friendly interactive systems, model maintenance, employee training, and managing change in this rapidly changing field. Continuous communication between developers of decision support systems, their users, and the managers of users must be maintained. Thus a balance between supplying the state-of-the-art in analysis and information retrieval technologies and the ability to train people to use these technologies can be maintained. Without such a balance, the systems will not be used in resource management.

The need for continued fundamental research which may use simulation models as a tool was also voiced. Such models need not feel the "real-world" restrictions imposed on DSS's because they are primarily research tools. Developers should look to DSS's as an outlet for completed component models. Such DSS's may be larger, user-friendly simulation models like Prognosis, or Expert Systems like the Southern Pine Beetle DSS.

REFERENCES

Bousfield, Wayne E. 1980. The effects of height growth loss on stands damaged by the western spruce budworm. USDA Forest Service, Northern Region, State and Private Forestry, Forest Insect and Disease Management, Missoula, MT. Report 80-11.

Duda, Richard O., and Edward H. Shortliffe. 1983. Expert Systems Research. Science 220(4594):261-220.

Ek, Alan R., and Robert A. Monserud. 1979. Performance and comparison of stand growth models based on individual tree and diameter-class growth. Can. J. For. Res. 9:231-244.

Freese, F. 1960. Testing accuracy. Forest Science 6:139-145.

Kykiel E. J., M. C. Saunders, T. L. Wagner, D. K. Loh., R. L. Turnbow, L. C. Hu, P. E. Pulley, and R. N. Coulson. 1984. Computer-aided decision-making and information accessing in pest management systems, with emphasis on the southern pine beetle. J. Econ. Entomol. (In press).

Wykoff, W. R., N. L. Crookston, and A. R. Stage. 1982. User's guide to the stand prognosis model. USDA Forest Service, Gen. Tech. Rep. INT-133, 112 p. Intermt. Forest and Range Experiment Station, Ogden, UT.

WORKSHOP: URBAN FORESTRY IPM
Moderator: Dave Leatherman

At least 28 people of varying backgrounds and job responsibilities attended this workshop. An agenda was not pre-selected. Informal, open exchange was our objective.

Early agreement suggested the concept of "urban forestry" not be limited to traditional cities, but include "residential forests". Residential forests are loosely defined as those of natural origin in which concentrations of human residences have been added. In essence they are mountain subdivisions, and the trees within are subject to much the same value systems, abuses, and unique considerations as city trees.

A common thread running through the afternoon was that of education. Foresters, arborists, educators and homeowners alike must view the learning process as both essential and never ending. Foresters must learn to adapt and apply knowledge of commercial stands to smaller aggregations of noncommercial trees. Arborists must stay solvent yet grow out of the "spray and prune" stereotype. Educators must glean and assimilate tools from diverse disciplines like tree physiology, landscape design and sociology into programs enabling the close coexistence of trees and people. Landowners must learn tolerance of certain pests or certain levels of pests. They must be shown how to prevent problems through proper planning, to detect problems that do occur, to assess plant pest associations free of panic, and to control unacceptable pests by rational means.

Some confusion and disagreement among the group surfaced over the issue of whom is responsible for urban forestry. A few felt this profession should lie wholly within the private sector and only be regulated by government. Others believed a legitimate nonregulatory role exists for government from federal to local in urban forestry.

If we have a role, right or wrong, our efforts could be made more efficient by a clarification of responsibilities. Much overlap with resulting turf disputes is common.

Specific discussions (not always reaching succinct conclusions) were held on: (1) Innovative arborist programs, including Swingle Tree Company's pilot offering in Denver and Dave Nielsen's "Arbor Tracking" computer package. (2) Gypsy moth eradiciation efforts in the West and the associated resistance to Bt campaigns. (3) The use of pheromones and preventive sprays for proper spray timing and protection of individual trees, respectively. (4) The EPA certification training process and how it is basically good but could stand improvement. (5) The increased use of volunteers and trained laymen ("Pest Scouts", "Master Gardeners", etc.) in delivering IPM information to the public. (6) The identification and use of specific publics (for example the Teacher Federations in Canada) to hear and spread the IPM message.

Following our three-hour session, Dick Hunt (California Division of Forestry) presented an excellent slide-tape on the do's and don't's of construction work in and around trees. An accompanying publication was also distributed.

PANEL: WHAT IS THE DEFINITION OF IPM?
Moderator: R. W. Stark
Participants: Nineteen highly intellectual and articulate WFIWC members participated.

Integrated Pest Management (IPM) has been defined by many authors and quite different "official" definitions have been published by the Department of Agriculture (Federal Register) and the U.S. Forest Service Manual. The term has been used to define a successful spray operation - suppression alone -- silvicultural prescriptions to reduce hazard -- prevention alone -- and, more correctly, the process of integrating pest management objectives and strategies into forest & planning and management. Considerable confusion obviously exists.

The participants dismissed the need for a new name or acronym for IPM -- although acknowledging the confusion -- on the basis that IPM is well established. The definition is more important but more importantly, there is a need for users of the term to appreciate its meaning and to avoid using it incorrectly -- for a unilateral tactic for example.

There are at least four key issues embedded in the concept of IPM. 1) It rests on principles of ecology -- the key elements involved in natural regulation of populations of biological organisms such as climate, weather, host resistance, edaphic factors, natural enemies and so on. 2) It is a component of, and must be fully integrated with, the total resource management process in both planning and operation. 3) The functional goal of IPM is to obtain optimum benefits with acceptable costs -- acceptable in a social and ecological sense as well as economic. The decision to implement regulatory tactics must be based on the establishment of realistic economic or social thresholds. 4) Methodology for regulating populations can range from a conscious decision to do nothing to the use of any suitable tactic or combination of tactics -- suppressive and/or preventive.

The participants considered the two "official" definitions of IPM. The one appearing in the Forest Service Manual was deemed too brief -- so brief as to leave its definition to the user and contributing to confusion. The definition agreed upon is an amended version of that appearing in the Federal Register (1982).

> A process to assist forest management in selecting strategies to regulate forest pests in which all aspects possible of a pest-host system are studied and weighed. A basic principle is that choice of strategy be ecologically acceptable. The information considered in selecting appropriate strategies includes the impact of pest on various resource values, alternative regulatory tactics and strategies, and benefit/cost estimates for these alternative strategies. Regulatory strategies are based on silvicultural practices and ecology of the pest-host system and may consist of a combination of tactics not excluding pesticides or herbicides.

When the integration of pest management evaluation and planning with forest management planning is completed, Pest management is invoked, Pest management is directed to holding pest impacts at tolerable levels.

WORKSHOP: HOW DOES IPM FIT INTO RESOURCE MANAGEMENT?
Moderator: Ed Holsten
Participants: Bob Averill, Ron Billings, Don Curtis, Dave Holland

This was a three hour workshop attended by about 35 people. The workshop was kept as informal as possible and discussion was invited from all attending.

DAVE HOLLAND of Region 4 initiated the discussion with a brief description of why IPM fails in many cases. We tend to emphasize pest management rather than resource management, and infer management of the pest is primary and resources are secondary. Dave went on, however, and discussed the successes they have had with implementing IPM into resource management as evidenced by numerous examples of pest management practices being incorporated into the Land Management Planning process. FPM personnel in Region 4 feel their successful involvement with the LMP process opened the door to closer involvement in all other areas of resource management. Some of Region 4's implemented IPM practices include Mountain Pine Beetle, Dwarf Mistletoe, Vegetation Management, Musk Weevil, and Western Budworm. There are two important factors responsible for Region 4's successes: (1) Forest Pest Management personnel have been closely involved with the resource managers in both the planning process and the day to day activities, (2) Resource managers are held accountable for implementing IPM on their forests. This last point is of utmost importance if IPM is to be implemented into resource management.

BOB AVERILL of Region 2 discussed the challenge of fitting pest management practices into resource management. Region 2 has diverse user groups of forest resources, many of them with the potential for conflicts. Public perceptions of the forested resource and the biological realities are often at odds until an outbreak is well underway. Mountain pine beetle infestations over large areas are the most current visible challenge. Bob discussed the necessity of effective public involvement as well as an aggressive technology transfer program in order to implement IPM practices into resource management.

RON BILLINGS of the Texas Forest Service discussed the unique problems associated with implementing IPM in the south. Over 60% of forested lands in Texas are owned by small, non-industrial landowners, 30% by industry, and less than 10% is federal. This is similar to most southern states. With this mosaic of ownership, it is quite difficult to implement IPM expecially when most land managers have such a wide variety of reasons for owning land. However, in recent years the supply and demand for timber products is becoming equal, especially with private industry. Texas forest industry are beginning to accept IPM practices into their management programs as they cannot afford losses due to insects and diseases. This situation, the increase in demand due to a decrease in supply, has favored implementation of IPM practices into resource management--its worth their while. National

forest lands in Texas, particularly those areas designated for proposed wilderness are being plagued by southern pine beetle outbreaks due to the abundance of dense, mature pine sawtimber. On non-preserve areas, more attention is being given to hazard rating and preventive treatments for southern pine beetle.

DON CURTIS stated that in Alaska the question "How IPM fits into resource management", may be considered mute. There are those who would say what IPM? Suffice to say opportunities for integrating pest managment into a resource management system have been rather limited. Initial efforts regarding what we might call IPM began in the late 1960's with an attempt to control spruce beetles in developed recreation sites. During the past 15 years little has been done to capitalize on that early opportunity. Much emphasis has been placed on land conveyance. Now that the initial impact of the Land Claims Settlement has passed, managers will begin to get down to the business of managing resources. Interest in IPM concepts is beginning to emerge as urban dwellers and recreation managers take notice of recent losses caused by spruce beetle.

Some reasons for lack of emphasis for IPM in resource management include:

-A lack of understanding about pest-host interactions.
-A lack of commitment on the part of the "manager" to implement IPM. This is perceived to be a pest management role.
-Available funding through the Forest Service (FPM) has been mostly for suppression. Very little money is appropriated for prevention.
-Training for land managers to heighten awareness about IPM opportunities is largely lacking.
-There are very few demonstrations showing IPM success in resource management.

Bill Waters was correct in saying that entomologists have been talking to each other more and more. Unfortunately, not too much communication has been going on between entomologists and managers. Much information is available - known mostly to entomologists - that must be offered and demonstrated to land managers.

In summary, the workshop stressed that IPM is an integral part of resource management. In order to implement IPM practices, it must be understood that resource management is the primary goal, not IPM. Factors that are important for successful IPM implementation are: (1) involvement in the political arena, (2) successful and strong technology transfer, (3) close association between FPM personnel and forest and district resource managers, (4) if possible, a close supply-demand scenario for the resource to be managed, (5) more expenditures and funding directed towards prevention rather than suppression, and (6) accountability on the part of the resource managers. Training (or awareness) of the IPM process is needed to effect all of the above points.

WORKSHOP: MARKETING INTEGRATED PEST MANAGEMENT: A NEW PERSPECTIVE
Moderator: Martha H. Brookes
Participants: M. G. Banfield, John Borden, Bob Campbell, Lu Clark, Jeff Corneil, Andy Eglitis, John Johnson, Paul Joseph, Bill Kemp, Le Roy Kline, Sandy Liebhold, Judy McPike, Lisa Morgan, Chris Niwa, Charlie Sartwell, Don Scott, Kathy Sheehan, Susan Tait, Galen Trostle, Jan Volney, Lorna Youngs.

Because obstacles to IPM appear to arise less from failure to spread the word than from institutional resistance, economic and political constraints, and misunderstandings, newcomers to both research and pest management were invited to discuss these barriers with the goal of identifying ways of overcoming them. Those attending were asked to separate into two groups--researchers and pest managers--to list and rank the major barriers. In descending order of importance, researchers listed:

- Lack of (or poor) education in pest management for forestry personnel, which contributes to other barriers because those who do not understand the role of pests in their forests are less likely to be interested in research on pests, to allocate money or personnel to pest-related problems, and so on.

- Lack of communication between managers and researchers. Managers often do not tell researchers what information is needed, and researchers often fail to put results in forms that managers can use.

- Lack of money for technology transfer. Finding funding for "hybrid" projects--part research and part management--is especially difficult.

- Misdirected information. Legislators and the public should be better informed about the IPM approach.

- Lack of commitment by researchers. Some researchers have no interest in IPM, or are unwilling to participate in the multidisciplinary research required.

- Few (or no) pest-management personnel in positions of authority. In the USDA Forest Service, for example, pest managers usually provide advice only when asked by forest managers.

- Lack of rewards to researchers for IPM work. Publications aimed at transferring results to managers are not considered as "good" as publications for other scientists. Researchers are not encouraged to work directly on implementing results of their research.

- Social pressure by peers. The stigma of "applied" rather than "pure" research is sometimes felt by scientists working on IPM.

- Negative attitude created by IPM "preachers." Some managers have been put off by scientists who either promise too much when many questions are unanswered, or are condescending and antagonistic.

- Lack of needed biological and ecological information.

Managers listed:

- Lack of consensus on definition of IPM and its products among managers themselves, as well as interest groups and the public.
- Uncertainty about what IPM can deliver. Do we have a sufficient research base to provide managers with effective programs? Are the IPM programs good enough to sell?
- IPM may not be appropriate for all groups. Too much emphasis has been placed on selling IPM to everyone; the audience needs to be identified more specifically.
- Need for trained persuaders to provide better education on IPM programs. Managers are not always the best teachers.
- Problem of selling IPM to managers in face of political, sociological, and economic constraints on their decisions and the need to integrate IPM with shortand long-term goals.
- Problem of credibility of agencies implementing IPM program.
- Lack of consensus on whose job is the implementation of IPM programs.

A short discussion followed. Observations included the following:

- Researchers appear to see managers as their clients; managers appear to see the public in that role.
- Researchers need to distill the critical pieces of information from their research for managers to use.
- Pest managers should have authority to make decisions.
- Each forest management team should have a pest-management specialist, as they have fire specialists, silviculturists, and so on.
- IPM requires a change (which appears to be happening) in the old attitude of waiting until a crisis occurs and then designating a team to deal with it.
- Success of programs for tree improvement could serve as a model for marketing IPM.
- Formal training sessions on forest-pest management (with accompanying professional recognition) would help; perhaps such sessions could be incorporated with the existing training program for silviculturists.

WORKSHOP: THE CANUSA BUDWORM POPULATION MODEL: WILL IT EVER BE USED?
Moderator: Bill Waters
Participants: Kathy Sheehan, Nick Crookston, Terry Rogers, Dave Overhulser, Donn Cahill, Bernie Raimo, Larry Stipe, Martha Brookes, Tom Gregg, Wayne Belles, John Foltz, Jim Colbert

The present status of the development of the western spruce budworm population model, and the general structure and components of the current version, were described by Kathy Sheehan of the CANUSA -- West program management staff. It consists of two major parts: (1) a model of budworm population processes, including dispersal, that accounts for initial densities (egg stage), survival to adults, and potential egg deposition; (2) a routine that converts budworm population densities into defoliation, stand growth loss, and mortality by a linkage with the stand prognosis model. The combined model projects these effects to estimate future yields and productivity. It can be used either for simulation of potential events or for empirical short-term prediction of population change and related damage. For the latter purpose, reliable data are needed from surveys to initialize and update the model.

A number of questions were asked on certain details of the model and its practical application, with discussion of specific situations. Questions of training and the responsibility of FPM staff in the Forest Service Regions were addressed. The intent is to have the combined model on-line at the Fort Collins Computer Center, with trained persons and equipment for accessing the model available in each Regional Office. Presumably, it will be similarly accessible to state and private organizations.

The general consensus appeared to be that this model will be most useful for simulation of outbreak occurrences and potential effects for longer term planning by the resource manager. A considerable amount of empirical data on budworm populations, weather, and stand conditions on a site-specific basis are needed for valid, reliable short-term projections. Its primary use in this regard will be for decisions on control alternatives.

WORKSHOP: INSECT DISEASE-INTERACTIONS IN IPM
Moderator: Dave Schultz
Participants: John Borden, Bob Scharpf, George Ferrell, Dave Wood, Dave Holland, Don Goheen

A group of over 30 people discussed the concept of insect-disease interactions for 1½ hours. Most of the group seemed to agree on the following points. Insects and diseases, as well as stocking and weather, interact to influence tree mortality. The influence of various factors on tree mortality vary with place and time. A site specific survey to determine the important factors contributing to tree mortality is critical to the design of an IPM program. Some information about pests is being collected during surveys of the timber resource but the utility and accessibility of the data varies tremendously. Very few forest IPM demonstration areas exist, but foresters and silviculturists in some regions routinely apply the principals of IPM during timber management activities. Some forestry curricula may not adequetly prepare graduates to implement IPM.

WORKSHOP: WEATHER EFFECTS ON POPULATIONS AND INCORPORATING THESE INTO IPM PROGRAMS

Moderator: William P. Kemp

Participants: Approximately 35 persons present

The workshop began with a short introduction by moderator Bill Kemp. The group approved a suggestion by the moderator to proceed toward a goal of "bringing together those interested in weather and integrated pest management (IPM) to discuss current research and future collaboration." Jeff Corneil agreed to act as the recorder of discussion. Two guest presentors, Dr. Brian Croft (Dept. of Entomology, Oregon State University [OSU]), Dr. Alan Murphy (Dept. of Atmospheric Sciences, OSU), and guest participant Dr. Charlotte Hopper (USFS - Aviation and Fire Management) were introduced. The moderator then explained that both Drs. Croft and Murphy would first present informal discussions for the purpose of stimulating interchange. Following these brief topics, the group could proceed in whatever direction it thought was profitable.

Dr. Croft started off by briefly describing his background and expertise with agricultural crops and tree fruits. He reviewed the use of simplistic models for host-pest interactions using phenological development. Work on codling moth phenology which led to the development of the Predictive Extension Timing Estimator (PETE) model was discussed. This model was described as a generalized approach to the problem of host-insect phenology modelling. The PETE model couples host-pest development with weather data and predicts local and regional phenological events for the purpose of timing procedures such as sampling and control. Dr. Croft noted that in Oregon, when compared to other states (i.e. Kansas, Indiana, etc.), it is more difficult to predict phenology because of the wide range of microclimates within the state. In addition to this fact, current literature debates the various factors that contribute to and interact with host-pest phenology. At the close of this presentation, the moderator introduced the second informal speaker.

Dr. Murphy explained briefly that he was involved in statistical and applied meteorology in addition to his work as the State Climatologist for Oregon. He reviewed the availability and the types of weather data currently housed at the Climatic Research Institute (CRI) at OSU. Among those data available at CRI, there were 4 major groups. First, summary of the day data contained maximum and minimum temperatures and 24 hour precipitation were available from about 200 statewide stations. Data on wind, temperatures, cloud cover, visibility, precipitation, humidity, pressure, etc., were available from 8 operating locations. Twice daily upper air mass data were available from only 2 stations in Oregon. Lastly, Dr. Murphy described the "real time" network of approximately 40 locations (a mixture of agriculture and forestry sites) supported by APHIS (USDA) which provided information on current maximum and minimum temperatures. He indicated that "real-time" data were currently utilized in some pest management programs. In addition to the 4 major data groups described, Dr. Murphy indicated that a number of other

agencies do collect and store weather data. However, these data sets are extremely variable.

Following the short presentations by Drs. Croft and Murphy the group moved into a discussion of a number of interesting topics. It was generally agreed that whenever there exists precise "windows" for the timing of management strategies, there is a use for weather data and phenology modelling. Further discussion indicated that the accuracy of phenology models based only on temperature data may in some cases be variable. This is particularly true in more subtropical areas where the number of other factors which influence phenology increases. In response to this fact, however, it was noted that positive management results have been obtained even with the use of crude phenology models. The importance of improving phenology models in insect pest and disease management was generally accepted by the group.

Discussion next shifted from the need for phenology modelling and its uses to the availability of weather data required by these models. Present applications as well as potential uses of both historical and real-time weather data in IPM systems were considered. Applications to forest regeneration, western spruce budworm, Douglas-fir tussock moth, pathological agents, seed and cone insects and fire management were discussed. Several members of the group expressed concern over what they thought was inadequate treatment of weather effects in current management systems. The group showed a good deal of interest in the possibility of expanding the real-time and historical weather station networks to include more forested sites. From discussion throughout the workshop, there appeared to be a number of ways in which individuals interested in pest management could cooperate with meteorologists to improve IPM systems.

WORKSHOP: FEDERAL RESEARCH (UNITED STATES AND CANADA) PROSPECTS FOR THE FUTURE

Moderators: Gerald W. Anderson, United States
Tom Sterner, Canada

Participants: John Schenk, Bob Meijagaum, H. Richmond, Marion Page, Bob Bridges, Kenneth Lewis, Garland Mason, Larry Barber, Bob Thatcher, Laura Merrill, Peter Hall, Paul Buffam, Boyd Wickman, Wayne Belles, Nancy Rappaport, Temple Bowen, Michael Haverty, Gary DeBarr, David Hunt, Mike Banfield, John Stein, Lynn Rasmussen, Dave Fellin, Ron Stark, Lula Greene, Gary Daterman

A wide-ranging and open discussion was held by participants attending this workshop. The variety and range of subjects reflected the diverse backgrounds and interests of those in attendance. Informality was the rule with effort to involve all participants in the discussion. No serious attempts were made to actually predict the future either in terms of detailed research needs or specific programs likely to emerge.

The workshop began with a briefing on Federal forestry research in Canada for the benefit of those unfamiliar with the organization and its activities. The United States and Canadian organizations were contrasted and some of the many areas of commonality and examples of cooperation between the two were identified. For most of the participants this introduction provided an enhanced perspective of the two organizations.

The general workshop discussion was broad with several subjects introduced. Examples included an expressed need for more spray application technology which would include information on dosage, equipment, and application procedures. A second subject involved need for research on endemic insect populations with emphasis on sampling techniques, factors which hold populations in check, and technology needed to be able to predict outbreak potential. A third subject concerned technological needs related to population assessment. One of the last issues discussed and one which all participants seemed to consider as very important is the situation regarding age structure of our scientific workforce. With relatively few recent hires by either Federal organization, a situation has developed where vigor and overall expertise may not be keeping pace with our needs. While future employment prospects could not be predicted, there was strong support among the participants for a program to recruit qualified young scientists as a means of maintaining organizational vigor in the Federal research organizations in both the United States and Canada.

WORKSHOP: POPULATION DYNAMICS THEORY AND APPLICATION
Moderator: Gene Amman
Participants: Thirty participants from Universities, Canadian Forestry Service, and U.S. Forest Service attended the workshop.

The process of going from a theory about population dynamics to the application of that theory by the land manager was discussed. This process starts with conception of the theory, testing and modification of the theory, field study to test application, field demonstration including cost/benefit analysis, and finally full-scale application by the land manager.

Various theories of population regulation and specific cases where application is operational were discussed. Until fully investigated in population dynamics studies of any given species, no theory of population regulation should arbitrarily be discarded. Also, it is essential to look for different regulating factors, depending upon phase of the infestation--endemic, epidemic. A factor may be responsible for holding a population in check during endemic population periods, whereas another may be responsible for bringing epidemic populations down to the endemic level.

WORKSHOP: HAZARD RATING SYSTEMS FOR DEFOLIATORS
Moderator: Ken Gibson
Participants: Twenty-four individuals representing most western Regions (Forest Service), Canadian Forestry Service, Canadian researchers, State agencies, universities in both Canada and U.S., and Forest Service Research Stations (INT, RM, and PNW) participated.

The workshop began with an introduction of each participant, and an explanation of workshop format. Formal presentations were neither anticipated, nor allowed. Each person was asked to contribute any information with which he or she was familiar relating to hazard rating systems for defoliators. Questions regarding any existing or proposed systems were also solicited.

Our discussion began with an analysis of the two hazard rating systems currently being proposed for western spruce budworm in mixed conifer stands. Variables being identified to define both "susceptibility" and "vulnerability" were discussed. Both hazard rating systems concentrate on identifying stand "susceptibility" which is defined as the likelihood that a stand will be infested. Some stand characteristics thus far identified, which appear to define that stand's susceptibility to budworm, are: percent host, stand structure, and site factors (habitat type, elevation, aspect, and slope). Questions relating to these proposed systems were: How far are we from using these systems? How will any system developed be validated? How applicable will these systems be outside areas for which they are developed? What resolution of "predictability" is necessary? Will population assessment (pheromone trapping, e.g.) be an integral part of future hazard rating systems? Finally, will these or any systems be usable? All agreed that several important questions remain unanswered. Answering those questions will determine the ultimate success of these systems.

We discussed the hazard rating system for Douglas-fir tussock moth, and its use. Though limited in scope, it is finding acceptance in those areas for which it was developed. Wayne Bousfield has developed a program for hand-held programable calculators, which incorporates Stoszek's predictive model for defoliation in northern Idaho. It can be used by foresters as an indicator of those stand conditions which can be altered to lessen susceptibility to tussock moth infestations.

Bruce Morse described one additional system--that for yellow-headed spruce sawfly in white spruce stands in Minnesota. Of the several independent variables tested, steepness of slope and aspect were the two most affecting the dependent variable, defoliation. The hazard rating model identifies stand conditions conducive to population buildups and resulting damage. That information, coupled with pheromone trapping to estimate population levels, enables the pest manager to predict the probability of an infestation.

WORKSHOP: TEACHING FOREST ENTOMOLOGY. WHERE DO WE STAND.

MODERATOR: J.H. BORDEN

Six objectives in the teaching of forest entomology were outlined by the workshop as follows:

1. To ensure that students are familiar with insect biology.

2. To develop an expertise in the identification of forest insects and the quantification of their damage.

3. To instill an understanding of how forest entomology fits into the broader field of forest pest management and further into the practice of forestry.

4. To develop communication skills with reference to forest entomology.

5. To familiarize students with research on the biology and management of forest insects.

6. To develop problem solving skills in forest insect management.

In discussion, much emphasis was placed on the last objective, the need to develop good problem solving skills, rather than to ensure that students have a great assemblage of facts at their disposal. It was noted that the draft forest entomology exam for the American Registry of Entomologists did not include one question that dealt with problem solving, despite the fact that this is the main job of a professional entomologist. This need was judged to be particularly acute for "dirt" foresters, who must handle insect problems in the course of the normal practice of silviculture, and who are often ill equipped to do so. However, the opinion was expressed by a student that the first three objectives would be more

than sufficient goals to meet in a first course in forest entomology. For forestry students, experience in problem solving could be met in required "forestry camp" instruction. Otherwise, professional courses given in the field, such as at the University of California, Berkeley, and at Simon Fraser University, appear to provide adequate exposure to problem solving.

The need for communication skills was judged to be universal, and the opinion was expressed that forest entomology courses stress both written and oral communication. One instructor suggested that papers be edited once with no grading (so as not to discourage students) and that only revised papers be graded. Exposure to research in forest entomology was considered to be a principal function of graduate courses, although all instructors might be expected to lace their instruction at any level with their own research experience.

The need to reach both undergraduate and graduate students in biology, entomology and forestry was evident. However, it was also stressed that forest entomology instruction should be available for professionals wishing to upgrade their education and capabilities.

It was noted that there are still many deficiencies, particularly in the failure to establish mandatory instruction in forest pest management in undergraduate forestry curricula. Nonetheless, one potential employer remarked on the extremely high quality of graduating professionals in forest entomology, and there was a general lament over the lack of employment opportunities for them.

WORKSHOP: SEQUENTIAL SAMPLING--PRESENT UNDERSTANDING AND USE
Moderator: Bob Stevens

Some 25 participants discussed the current state of sequential sampling activities in western forest entomology. In addition, Bill Waters presented a brief review of early (1950's-1960's) work in northeastern United States. In formal sequential plans were in use at that time for 20-25 species of forest insect pests.

Douglas-fir tussock moth and western spruce budworm account for most of the contemporary sequential sampling activity in the western United States and Canada. Bob Campbell and Dick Mason presented information on their work in developing sequential sampling plans for these two species, and several other workshop participants discussed their use of these plans.

Other species for which plans were reported include Pissodes weevils in Sitka spruce (Rick Johnsey), Contarinia midges (Gordon Miller), and Eucosma sonomana .

WORKSHOP: IPM FOR REGENERATION PROBLEMS
Moderator: Michael I. Haverty
Participants: Dave Overhulser, Gordon Miller, Gary DeBarr, Jed Dewey, Richard S. Smith, Stan Meso

The workshop was introduced by the moderator with a general discussion of the scope of the problem. We are faced with developing IPM practices for problems of the future. The management of cone and seed insects will be necessary in seed orchards, yet we have relatively few producing seed orchards for some of the conifer species. Many of the pest problems in plantations are undefined because we are still in the initial phases of establishing plantations through artificial regeneration. For some conifer species, successful survival of recently planted seedlings is still a major obstacle. The cost/benefit ratio of pest management activities in young plantations might be extremely high if these costs have to be amortized over 60-100 years before the value of the crop is realized.

Seed Orchards

The selection of seed orchard sites is done without pest problems in mind. The primary consideration is the production of flowers and the elimination of pollen contamination. A major problem in seed orchard pest management is that many of them are now located in close proximity to housing. These situations can limit the extent pesticides are used because of the anxiety of local residents about the use of pesticides. Placement of seed orchards in areas to reduce pollen contamination and increase flower production has had no effect in reducing pest problems. Resistance of insects to pesticides from preventative treatments was discussed. It was generally agreed that development of resistance is not likely to occur because the insect problems are primarily from invading, or immigrating individuals which are not subject to selection pressure. Sanitation (picking all cones from the orchard) will not solve the problem of pest immigration, however, it could help prevent insect pest buildup in young seed orchards.

Current research includes pheromone identification and evaluation for Contarinia oregonensis, Barbara colfaxiana, Dioryctria abietivorella and D. pseudotsugella; validation of Miller's decision system for C. oregonensis in a Douglas-fir seed orchard in Oregon; evaluation of fenvelarate in seed orchards in Oregon and Idaho against a variety of cone and seed pests. Research needs for IPM in seed orchards include: IPM system for Megastigmus, phenology of activity for Leptoglossus. Even with the years of insecticide tests, few insecticides are available and consistantly effective. Phytotoxicity may be a problem with some insecticides. Concerns of unknown consequences are toxicity of insecticides to pollen, mutagenicity of insecticides and potential damage to trees from repeated use of injected and implanted insecticides.

Nurseries

Diseases appear to be the primary problems in nurseries. Problems apparently are peculiar to individual nurseries. Some nurseries seem to have all soil diseases whereas others have exclusively airborne foliar diseases. Most problems in nurseries are either environmental or disease related. Insects very seldom play a significant role. Fumigation and/or application of fungicides generally keep pest problems under control.

Plantations

Two interesting problems were discussed before time ran out. In areas which were burned, grass is often planted to hold the soil. Since regeneration is unplanned, seedlings need to be planted in the nurseries after the burn. This gives the grass several years to get established. Unfortunately, a resident grasshopper population becomes established also. The seedlings are planted in a grass field and when the grass cures, the grasshoppers go to the only green plants left on the site--i.e. pine seedlings. The result: exit seedlings!

Another emerging problem in plantations is black stain root disease which is believed to be vectored by one or more insect species. This disease accelerates in intensity after the initial thinning of a plantation. The State of Oregon will be experimenting this year with chemical thinning of plantations to reduce the attractiveness of the site by not leaving cut stumps.

Of interest to the group was the discussion of continued work on pest management of eastside sites. It appears that no more is planned by some industrial concerns because intensive management of these sites is no longer considered economically justifiable. Emphasis has shifted to selective cutting and natural regeneration.

WORKSHOP: SHORT- AND LONG-TERM EFFECTS OF DEFOLIATORS--TREE RINGS AND PROGNOSIS MODELS
Moderator: Allan Van Sickle
Participants: Wayne Bousfield, Nick Crookston, Andy Egiitis, Tom Gregg, Paul Hennon, Bill Kemp, Herb Kulman, Bob Mathiasen, John McLean, Ben Moody, Joe Pase, Mike Wagner, Boyd Wickman, Bob Wilkinson, Jan Volney

This group freely discussed problems and progress in quantifying the relationships between foliage reduction, levels of the responsible agent, and growth loss. Emphasis was on radial growth although height growth, decay, defect, taper and stand growth were also mentioned. The discussion was enthusiastic with almost as many participants returning after coffee break and discussion even continued over lunch. Collectively, the group had a wide range of experience including sawflies, budworm, tussock moth, hemlock sawfly, pandora moth and Douglas-fir dwarfmistletoe.

The workshop started with a brief mention of the most recent loss studies of western spruce budworm and Douglas-fir tussock moth, drawing attention to:

- different approaches to predicting growth in the absence of the pest,

- the need for monitoring during the recovery as well as the infestation period,

- problems with partial or missing rings (a photo of a missing ring was even circulated),

- expressions of reduction as percent of previous growth, of expected growth, or total growth reduction,

- indexed and filtered dendrochronological approaches compared to the specialized form of forest mensuration (i.e., damage mensuration),

- use of prognosis model to estimate growth in the absence of a pest, and

- potential and magnitude of compensatory growth by surviving host or non-host trees.

The difficulty of detecting effects on dbh disks prompted discussion of the need for markers or key rings to determine missing rings, optimization of sample locations along the bowl, desirability of nondestructive sampling techniques, possible threshold levels of defoliation which trees can tolerate, the timing of defoliation relative to tree growth periods which may minimize effects, and the interaction of stress and other factors with insect and disease defoliators which complicate tree growth studies.

Concern was expressed that the inventory basis for growth models may be contaminated with previous outbreaks and would therefore underestimate potential growth when used to model non-budworm (or other pest) growth. Outbreak history is a significant variable to be considered.

As computer modelling has become more sophisticated and an entire discipline of its own, there was the admonition to remember the very limited data base from which numerous key relationships were initially derived, and the intentions to confirm them with further studies. There was also a plea to relate remaining foliage (not defoliation) to budworm populations and ultimately tree growth. The effects of tree flowering, priority allocation of limited food reserves to different types of buds, large variations from branch to branch, and recovery of full foliage complement were recognized as related factors.

In concluding, it was noted that several other workshops also identified quantitative impact data to be one of the biggest information gaps. Long-term, complete stand studies are necessary to obtain initial estimates of losses which may be refined as required. Even if cost benefit analyses indicate certain pest conditions are not economically controllable, the need still remains for precise studies to understand the pest/stand dynamics and for modelling purposes.

WORKSHOP: Use of Pheromones in IPM

MODERATOR: John Wenz

PARTICIPANTS: Approximately 40-45; those most vocal included: Ron Billings, John Borden, Gary Daterman, Gary DeBarr, Bill Ives, Staffan Lindgren, Charles Sartwell, Ron Stark, Larry Stipe and Dave Wood.

Workshop participants exhibited little reticence in discussing the use of their favorite pheromone(s). The current status of the west-wide "early warning" detection system for the Douglas-fir tussock moth was reviewed. Usefullness has not been clearly demonstrated since a large-scale outbreak has not yet occurred in areas where the system has been implemented; indications are that there are geographical differences in "threshold" pheromone trap catch levels that trigger initiation of larval sampling the following spring. Another early warning system utilizing pheromones is currently being developed/implemented in loblolly pine seed orchards where trap catch counts are used to predict when and where webbing coneworm (Dioryctria spp.) damage is likely to occur. Such information reduces the need for regularly scheduled preventive insecticide treatments and increases the efficacy of suppression applications. The detection trapping program for gypsy moth was discussed along with the possibility of using mating disruption as part of eradication efforts in the west (Oregon and California). Evaluation of the mating disruption technique is being conducted in areas of California, Idaho and Montana with respect to the western pine shoot borer in plantations and progeny test sites. Results to date look promising.

A number of projects utilizing bark beetle pheromones were also considered. In response to a situation involving extensive Douglas-fir blowdown on the Clearwater National Forest, FPM in the Northern Region plans to use the antiaggregation pheromone MCH to prevent/reduce attacks by the Douglas-fir beetle until salvage operations can be substantially completed. A number of questions surfaced concerning various aspects of this project, including determination of efficacy. It was suggested in regards to large-scale projects such as this, that coordination with interested cooperators be encouraged to utilize the opportunity to extend our knowledge of the effects of semiochemicals on population dynamics. Experiments have been conducted in Texas and Georgia to halt or disrupt Southern pine beetle spot growth using aggregation pheromones within an infestation. Studies are planned to ascertain reasons for the different results. Several different uses of pheromones, including successful monitoring and trap-out strategies and an unsuccessful spot eradication program were summarized for the mountain pine beetle in British Columbia. Also in British Columbia, the on-going operational use of semiochemical-baited suppression traps in or near sawmills and dryland sorting areas to reduce ambrosia beetle populations and damage was described.

The question of the practicality of using pheromones to reduce populations (mating disruption/suppression trap-out strategies) was considered. Factors of relevance in evaluating the potential for successful application include the density of population to be treated and the dispersal capabililty of the target species as well as the size and degree of isolation of the areas to be treated. In general, situations that evidence low population levels over relatively large but isolated areas involving species with low dispersal capabilities offer the best chance for success. Examples include the western pine shoot borer and increasing, but low populations of the Douglas-fir tussock moth.

The related question of what constitutes valid measurements of efficacy also surfaced periodically throughout the workshop. Is it justifiable to only use damage levels (relative to some management objective) or do treatment effects on populations also have to be demonstrated to document a "successful" operation? Given the difficulties and logistical realities that are often involved in conducting and evaluating large-scale projects, should such projects be undertaken if a "non-scientific" as opposed to a "scientific" approach must be taken? The workshop fell somewhat short of providing definitive answers to these questions.

WORKSHOP: MANAGEMENT OF PINE FOR MOUNTAIN PINE BEETLE PREVENTION

Moderator: Jack Thompson

Participants: Twenty-nine participants representing the Canadian Forestry Service, U.S. Forest Service (several Research Stations and most western Regions), Provincial and State agencies, and Canadian and U.S. Universities attended the workshop.

Following introduction of each participant, workshop moderator defined workshop's objectives. They were: (1) Discussion of preventive strategies--silvicultural, chemical, etc.--to reduce the likelihood of mountain pine beetle infestations. (2) Management alternatives in use or being developed to control, contain, or prevent beetle infestations. Discussion focused primarily on lodgepole pine. Different strategies for other pine species were discussed briefly.

Discussion began with a general treatment of beetle status and preventive management strategies employed in the various Canadian Provinces and Forest Service Regions. Infestation histories are similar in Alberta, British Columbia, and the northern U.S. Infestations beginning in the early 1970's began receiving treatment in Canada around 1980. Early methods centered around control measures--cutting and burning or direct chemical applications. Some of these, e.g., cutting and burning, are still being used for small spot infestations. Foresters are now hazard rating more stands and exploring preventive silvicultural treatments such as partial cutting to influence age, size, and species diversity in new or residual stands. Recent techniques being developed include the use of pine-oil as a preventive treatment and semiochemicals (beetle pheromones in combination with host terpenes) to contain beetle populations and reduce future losses.

Regions 1, 2, 4, and 6 in the U.S. are still experiencing serious beetle infestations. Over the past several years, a number of hazard rating systems have been developed and tried in different parts of the country. At the same time, and in conjunction with Forest Service research, various silvicultural strategies were developed which would reduce beetle-caused mortality in susceptible stands. In general, we have learned that partial cutting in lodgepole pine stands can effectively reduce mortality when compared to uncut areas of similar conditions. Some problems exist in partial cutting of lodgepole pine stands--economics, windthrow, and longevity of lodgepole pine. These factors need to be analyzed on a case-by-case basis in conjunction with other resource considerations before specific recommendations are made. Most Regions have employed preventive chemical sprays--usually using carbaryl. In Regions 1 and 2, preventive sprays using pine-oil have been tested with good results with one formulation (Norpine 65). During 1984, semiochemicals will be used to contain or control beetle populations in several areas in Montana.

A general discussion of thinning practices and preventive treatments to reduce losses to the beetle followed. It was pointed out that while lodgepole pine stands have been successfully protected from beetle

depredations through thinning, some stands thinned as long as 20 years ago are now experiencing heavy beetle attacks. Other examples exhibiting just the opposite were cited. Some of these problems may be the result of working in mature stands. More research is needed regarding developing stands. Conflicting results may be products of stand conditions, site factors, infestation intensities, or combinations of these factors. There was consensus that many questions remain unanswered and that quite likely we will never be able to make general statements regarding beetle management that are applicable in every situation.

Regarding preventive sprays, a number of existing and potential problems were discussed. Carbaryl, though currently registered and quite effective, is not finding wide acceptance because of public resistance to chemical pesticides. Pine-oil is effective in one commercial formulation (Norpine 65), but less so in another (BDR-2). Some tests suggest that BDR-2, as it degrades over a season, may even act as a beetle attractant! Several application techniques for pine-oil are currently being evaluated. More testing remains before its use may ultimately be registered. The recent successes experienced using semiochemicals for beetle management in Canada hold promise. Particularly attractive are the possibilities of using combinations of semiochemicals and preventive sprays to manipulate beetle populations.

A final topic concerned the need for public information as beetle infestations develop, are controlled, or prevented. An information program developed in Region 6 has found success there and in Region 4. People from throughout the U.S. and Canada expressed interest in that program.

WORKSHOP: SILVICULTURE AND SPRUCE BUDWORM: WHERE DO WE STAND?
Moderator: Jerald E. Dewey

The workshop was participated in by 25 people representing pest management, research, forest management, and environmental groups.

Although we agreed that in the broad context pesticides are a part of silviculture, for the purpose of this workshop we eliminated pesticides from the discussion.

For background we began with a discussion of what is currently being done regarding "budworm and silviculture."

Regions 1, 3, and 4 have each established demonstration areas for monitoring the influence of several silvicultural systems on budworm populations and subsequent feeding injury. As an example, on the Gallatin National Forest (Region 1), the following regeneration cuts have been made in a budworm-infested area:

--group selection
--shelterwood and planting
--shelterwood with advanced regeneration
--overstory removal
--clearcut and planting
--unharvested

All blocks are about 40 acres in size. Budworm larval and egg populations and defoliation levels are being measured annually to determine if variations in population and defoliation levels exist among treatments.

Cutting strategies will be evaluated using Prognosis projections with the budworm model for each stand to determine if a particular silvicultural treatment is more effective than another. The demonstration areas will also be used to validate the combined model. None of the demonstration areas has been in place long enough to provide definitive data.

Boyd Wickman (PNW) and Clint Carlson (INT) are both evaluating the influence of different cutting strategies, including thinning, on budworm populations.

The second topic addressed was "How is budworm being addressed in Forest Plans and silvicultural prescriptions?"

In general, Forest Plans give very little attention to influences of budworm other than to make reference that budworm is a problem. The Plans do not project volume differences with and without budworm outbreaks, nor do they address management approaches aimed at ameliorating impacts. Silvicultural prescriptions on some Forests are strongly influenced by budworm. In the absence of proven approaches, foresters are applying the best information they have. A forester in the group stated, "Treatment goes on, with or without hard data. We're forced to apply the best information we have."

On the Boise and Payette National Forests in Idaho about 50,000 acres of budworm-infested forest will be harvested within 5 years with strategies aimed at reducing stand susceptibility and budworm-caused impacts.

A third topic discussed was "What are silvicultural alternatives for reducing impacts or preventing outbreaks?"

Although we were in agreement that there will probably always be outbreaks, we concluded that overall impacts can be significantly reduced silviculturally.

During an outbreak presalvage and salvage are about the only silvicultural alternatives available to a manager, and these approaches are quite limited in scope. However, prior to an outbreak much more can be done. Using systems that are being developed, stands should be hazard rated for risk of budworm injury. Then concentrating on areas of greatest risk, actions can be taken to reduce stand susceptibility and vulnerability. These actions were spelled out in the recent CANUSA Handbook 83-2, "Spruce-fir Silviculture and the Spruce Budworm in the Lake States." Such actions include (1) increasing stand productivity and vigor; (2) shortening rotation age; (3) altering species composition; (4) reducing the proportion of overmature host trees; (5) maintaining a variety of age classes (spatial diversity of even-aged stands).

Though much research is still needed to quantify such things as optimum species mix, appropriate size and shape of cutting unit, etc., there currently exists enough information that land managers should carefully consider the alternatives when contemplating management actions in budworm-prone forests.

Western Forest Insect Work Conference

March 5-8, 1984 - Eugene, Oregon

Workshop Report

State of the Art of Biological Control in IPM

(or How are the Bird, Bee, and Bunny Lovers Doing?)

R. Luck, University of California, Riverside, the originally scheduled discussion leader who was unable to attend the meetings, was replaced by T. Torgersen, Range and Wildlife Habitat Laboratory, La Grande, Oreg. The session was attended by about eighteen participants representing a broad spectrum of involvement or interests in biological control--educators, students, pest managers, researchers, technicians, and administration.

The statement made by D. Dahlsten, University of California, Berkeley, at the opening conference panel discussion, that "natural enemies are the cornerstone of IPM," was reiterated. Nonetheless, a census of participants indicated that there are few ongoing studies applying biological control techniques to IPM for forest pest problems. Participants felt that research administrators did not recognize that biological control strategies commonly came only after extended periods of study aimed at understanding pest dynamics and peripheral interacting life systems. Although large programs (Gypsy Moth, DFTM, Spruce Budworms, and MPB) have a favorable record of support for work on natural enemies, needed followup funding in the wake of such Programs is poor.

Ultimately, the major concern expressed in the session was the difficulty in getting long-term commitments of personnel and/or funding to develop, execute, and monitor biological control studies.

DISEASES AS PREDISPOSERS OF TREES TO INSECT ATTACK

George Ferrell
USDA Forest Service, Berkeley, CA

Recognizing that diseases can predispose trees to insects, participants cited the frequent difficulty of determining just where, when, and how this occurs because of the many other environmental stresses on trees that often obscure or complicate the situation. Jack Stein, U.S.F.S., Berkeley, described the role of root disease, soil, weather, and the Ohia borer in the Ohia decline in Hawaii. Peter Lorio, U.S.F.S., Pineville LA, discussed the "pimple-mound", root disease, weather, bark beetle relationships in southern pines. Bob Scharpf, U.S.F.S., Berkeley, reviewed past and recent interpretations of the role of flathead borers, dwarf mistletoe, and drought in pine mortality in the Laguna Mountains of southern California. Nor are the relationships neccessarily the same in different regions. Don Goheen, U.S.F.S., Portland, discussed observations in Oregon indicating that Annosus root disease spreads neither from pine to fir nor in the reverse direction. In California, though, R.S.Smith, U.S.F.S., San Francisco, cited observations indicating spread from pine to fir, but not the reverse. Adding to the complexity, insects not only attack diseased trees but also sometimes vector the disease to the trees in the first place. Jill Lownsberry, U.C. Berkeley, and Jeff Witcosky, O.S.U., discussed their studies on the vectoring of black-stain root disease in Douglas-fir by root-infesting beetles. Discussion next examined the possibility that diseases may cause trees to become attractive to insects, but the diseased tissues themselves may be unsuitable for the insects. Don Owen, U.C. Berkeley, described observations indicating that red turpentine beetles are attracted by the resinosis associated with Annosus root-disease in pines but avoids infesting the diseased portions of the tree. Discussion ended on the note that more research is needed on the physiological mechanisms by which diseases predispose trees to insects.

PANEL: WESTERN FOREST INSECT WORK CONFERENCE: PAST, PRESENT AND FUTURE.
Moderator: Hec Richmond
Panelists: Ken Wright, Dick Washburn, Bill Ives and John McLean

KEN WRIGHT: The Past.
The Western Forest Insect Work Conference was founded October 13, 1949, in Seattle. The first organizational committee consisted of Bob Furniss (Portland), Jim Evenden (Idaho) and Hec Richmond (Victoria, B.C.). The Constitution and By-laws were drawn up and approved at the first official meeting in Portland on December 9, 1949. At this meeting the name "Western Forest Insect Work Conference" was approved and the first executive committee was elected consisting of: Hec Richmond (Chairman), Phil Johnson (Secretary), George Hopping, Les Orr, Noel Wygant, Bill Wilford and Alex Jennick.

During its formative years the predominate question was under what terms of reference should it operate and what was the definition of a "work" conference. Also, just who was qualified to become members.

This was the era of promoters of aerial spraying and chemical control and by some outsiders the organization was looked upon as a good instrument for the promotion of such interests. Others in the forest industry saw it as a potential pressure group useful in pursuing certain political interests. Thus, the objectives of this new organization became a very live issue.

Because those on the original executive were ;unanimous in restricting it to a pure work conference, and discouraged membership of outsiders involved in promotional activities of commercial interests, the same initial executive committee was retained throughout the first five years.

It was through those five years that the foundation was laid for the work conference as we have today.

DICK WASHBURN: Committees.
As one of the original members, Dick Washburn reported on the various committees that have operated within the organization since its inception.

Program and Arrangements: Charged with responsibility of putting together detail of annual meetings.
Unpublished Reports and Material: The fear was that much useful and historical material housed in various laboritories could be lost with the passing of early forest entomologists.
Common Names: Reviews, accepts or rejects proposed names and supmits with explanations and justification for acceptance by the Entomological Society of America.
Education: Established in 1952 and originally headed by Ron Stark, this committee researched the needs for entomological training for foresters.
Foreign Translation: Functioned for a number of years and was successful in finding ways to obtain some difficult-to-get translations.
History: Formed in 1984 with Dick Wasburn as chairperson. Will attempt to publish history of western forest entomology and entomologists. Dick is

Interested in volunteer participants. They can write to him at P.O. Box 1011, Westport, Washington.

Ethical Practices: The reason for, and logic of, this name is unknown. Established in 1954 to recognize deeds and accomplishments over and above other committee descriptions (e.g., moving a piano by elevator to a hotel's seventh floor until interrupted by police, and other such contributions to a successful work conference). Member must "earn" his or her right to be delegated as chairperson. Created as a result of member participation at a show in Berkeley by Tempest Storm, the "Grande Dame of Burlesque". This award has been bestowed 29 times, twice to Ken Wright with the first award going to Jim (who else but) Kinghorn. The 1984 award went to Skeeter Werner.

BILL IVES: The Present.

The need for such a get-together is as great now as at any time since its onception. One advantage of such a conference is the free expression of ideas by members relative to problems and research, even though incomplete. Active participation of is encouraged by the workshop approach these problems. This is of special benefit to the new and younger members. Some of the past sessions have deviated from a workshop approach and tended toward the presentation of scientific, formal research papers and slide presentations. This to me is disappointing and tends to defeat the whole concept of a "work" conference.

The 1984 conference programmed toward the reinstatement of the informal workshop concept has reinforced the spirit behind this approach and demonstrates again how much can be ga;ined in this type of session.

Another advantage of our conference is its relatively small size which encourages closer contact between participants. Large gatherings of entomologists are o;ften dominated by workers in problems of peripheral interest which, to many, detracts from benefits of the meeting.

From a fiscal viewpoint, there is a prevailing tendency toward restrictions to travel for scientific gatherings. Workshops, on the other hand, are often considered as a part ofnormal work travel and, consequently, organizations are less restrictive in providing travel expenses.

JOHN MCLEAN: The Future--Are We Still Needed?

John outlined his experiences as faculty member in forestry at the University of British Columbia in relation to the Western Forest Insect Work Conference. It fills the student/researcher gap, permitting an exchange of information and ideas and an opportunity for both the student and the seasoned researcher to meet operational persons and discuss their problems. It is a time for sharing those unpublished and unprintable results of both successful and not-so-successful experiments.

As we move away from the "nozzle-head" days and come off the "fire fighting" mode, and seriously consider long term rotation length control operations, we can see that we must put our shoulder to the wheel with the pathologists, weed specialists, vertebrate ecologists, fisheries biologists and silviculturalists.

Moving forward we find a new breed of forester, the women forester. She

often turns in superior work and sets a high standard in the profession for her male counterparts.

With these advances come the startling developments in the educational requirements and for the need of increasing involvement in continuing education.

Finally, with the advent of the women forester there looms the doubtful future for the Ethical Practices Award, andan open challenge for the first woman forester to fqualify for the honorary membership. It is hoped we can ensure that the spirit of the award lives on and that we can maintain a lively, healthy and interactive insect work conference in the west.

HEC RICHMOND: Conclusion.
Hec summarized the hearings urging all members to keep in mind the purpose and objectives envisaged by the founders of this organization, and NOT to misinterpret it as a philosophical presentation of research findings.

He mentioned the normal evolution of most organizations whereby the original ideal or spirit that gave it birth is forgotten in the ambition of new officers to create a bigger and different organization. Instead of the organization being servant to the ideal the reverse ensues with the objective modified to promote the organization.

In conclusion he reminded the membership that this is a truely unique organization, inspired by the need for inter-communication between forest entomologists on common problems in common forests of western North America.

THIRTY-FIFTH WESTERN FOREST INSECT WORK CONFERENCE

Minutes of Final Business Meeting
Eugene, Oregon, March 8, 1984

Chairperson Stark called the meeting to order at 1:00 p.m.

Torgy Torgersen reported that the Common Names Committee held an afternoon workshop on Tuesday, March 6, to discuss the desirability of submitting an alternate name change to replace the disapproved name "western budworm". The Committee presumed that, on the basis of the WFIWC ballot, the desire of the membership was to replace "western spruce budworm" with an appropriate name that would adhere to the rules of the ESA Common Names Committee. In the ensuing discussion, arguments for the following common names were heard: "western budworm", "Douglas-fir budworm", "western conifer budworm", "western fir budworm", and "western forest budworm".

In a breakfast meeting on Wednesday, March 7, the WFIWC CNC nominated "Douglas-fir budworm" as the most appropriate name to replace "western spruce budworm". A bulletin to that effect, including statements in favor and opposed to the name, was posted on the gallery bulletin board.

In further business the CNC discussed the single negative response to the provisional approval by ESA of the new name "six spined ips" for Ips calligraphus. Our Committee deemed the response contesting the new name to be inadequate and voted for reasserting our desire for the name as submitted.

Based on an editorial by M. Kosztarab (Science, Vol. 223, No. 4635), the CNC voted to support a resolution requesting that the federal government provide funds for a comprehensive Biological Survey of the United States.

The general membership then unanimously approved a resolution in support of a Biological Survey of the United States. The CNC will write to Dr. Kosztarab, VPI, Blacksburg, Virginia, coordinator of scientific support for BISUS, to express our interest in such a survey.

A discussion of the desirability of "Douglas-fir budworm" as a common name for C. occidentalis ensued. A vote from the floor resulted in a tie of 31 to 31 (which included Chairperson Stark's vote). Since many members had already left the workshop, it was decided that a mail ballot should determine the desire of the membership for "western spruce budworm" or "Douglas-fir budworm" as the preferred common name.

A report of the Historical Committee was presented by Dick Washburn, Chairperson. Dick indicated that the committee consisted of himself, Ron Stark, Galen Trostle, Bill Ives, Hec Richmond, Ken Wright, and anyone else that is interested. Dick called for information from anyone regarding the history of forest entomology in the west and the WFIWC. This information should be sent to the Historical Committee's recording secretary, Ron Stark.

Larry Freeman presented a report of the Ethical Practices Committee. Larry indicated that 1984 had produced a lower than average number of candidates qualified for nomination for the Award. He suspected that this apparent show of good behavior is due to the fact that some of the former perennial candidates had learned to be more discreet. At least one person, however, has not acquired these skills of discretion. Skeeter Werner was observed while exhibiting lewd, lascivious, obscene behavior one evening, along with the slurring of speech and the mistaking of a lighted dance floor as a landing field. Although his behavior does not qualify him as number one on the all-time list, it was felt that he was best qualified in 1984. Skeeter, a two-time winner, was not present to accept the Award as he had already departed for Alaska to rest and plan for future WFICWC meetings. Ken Wright, another of those rare animals, the two-time winner, said he would deliver the Award to Skeeter.

Jim Colbert reminded members that 1984 was to be the final year of the CANUSA Spruce Budworms Program and that several technology transfer workshops were being planned for 1984: WSBW Sampling and Evaluation, May 1-2, Portland, OR; Modeling of WSBW, May 21-25, Moscow, ID; and three unscheduled as yet silvicultural workshops in Idaho, Montana, and New Mexico.

Bernie Raimo gave a special invitation for everyone to come to the 1985 WFIWC to be held in beautiful Boulder, Colorado.

Chairperson Stark called for invitations for the 1986 WFIWC. Tom Sterner, after thanking the organizers of the current meeting, extended an invitation for the members to come to British Columbia in 1986. This invitation was accepted by all those present.

Paul Buffam presented the candidates selected by the Nominating Committee: John McLean, Chairperson; Ben Moody, Secretary-Treasurer; and Nick Crookston, Counsilor. All nominees were elected by acclamation of the general membership.

John Mclean thanked those responsible for the 1984 program and local arrangements and asked for a round of applause. He then made a last request for any unfinished business.

The meeting was adjourned at 1:30 p.m.

TREASURER'S REPORT

Thirty-fifth Western Forest Insect Work Conference
Eugene, Oregon, March 8, 1984

Balance on hand March 4, 1984	(+)	1,430.04
Expenses:		
Coffee and soft drinks	(-)	461.15
Meeting room rental	(-)	761.00
Food and drink for social mixer	(-)	409.43
Income:		
Registration (174)	(+)	3,240.00
Sale of 1983 Proceedings	(+)	5.00
Donations for social mixer	(+)	300.43
Balance on hand March 8, 1984	(+)	3,343.89

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 practica of forest entomology, (2) to provide a medium of exchange of professional 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 entomologists and others 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 meetings 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 this 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 by 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 an executive meeting, to appoint an alterrnate 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 laast 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.

WESTERN FOREST INSECT WORK CONFERENCE MEMBERSHIP ROSTER

Name	From	Address	City, State, Zip Code	Country	Phone Number
Adams, W.T.	Oregon State University	Forest Science Dept.	Corvallis, OR 97331	U.S.A.	
Akers, Patrick	University of California	Dept. of Entomology	Berkeley, CA 94720	U.S.A.	415-642-5806
Alexander, Norman E.	B.C. Institute of Technology	3700 Willingdon Ave.	Burnaby, B. C. V5G 3H2	CANADA	604-434-5734
Alfaro, Rene I.	Pacific Forest Research Centre	506 W. Burnside Rd.	Victoria, BC V8Z 1M5	CANADA	604-388-3811
* Amman, Gene D.	Int. Forest & Range Experiment Sta.	507 25th St.	Ogden, UT 84401	U.S.A.	801-625-5394 (Comm.) 586-5394 (FTS)
* Anderson, Gerald W.	USDA Forest Service	3716 Acosta Road	Farifax, VA 22031	U.S.A.	
Atkins, Michael D.	Safer Agro-Chem, Inc.	13910 Lyons Valley	Jamul, CA 92035	U.S.A.	714-464-0775
* Averill, Bob	USDA-Forest Service	P.O. Box 25127	Lakewood, CO 80255	U.S.A.	303-234-4877
Babcock, Richard	USDA-Forest Service	Bitterroot NF	Hamilton, MT 59840	U.S.A.	
* Barber, Larry R.	USDA-Forest Service	159 Beverly Road	Asheville, N.C. 28805	U.S.A.	704-259-0625
Barr, William F.	University of Idaho	Dept. of Entomology	Moscow, ID 83843	U.S.A.	208-885-6595
Barry, John W.		3123 Beacon Bay Pl.	Davis, CA 95616	U.S.A.	
* Beavers, Jim	USDA-Forest Service	P.O. Box 25127	Lakewood, CO 80255	U.S.A.	303-234-7280
Beckwith, Roy C.	Range & Wildlife Habitat Lab	Rt. 2, Box 2315	LaGrande, OR 97850	U.S.A.	503-963-7122
Bedard, W. D.	Pacific Southwest Forest & Range Experiment Station	P.O. Box 245	Berkeley, CA 94701	U.S.A.	415-486-3572
* Belles, Wayne	Sandoz	Rt. 2, Box 284A	Moscow, ID 83843	U.S.A.	208-882-3040
* Bennett, Dayle	USDA-Forest Service	517 Gold Avenue, S.W.	Albuquerque, NM 87102	U.S.A.	505-766-2440
* Bentz, Barbara	University of Idaho	Forest Resources	Moscow, ID 83843	U.S.A.	208-882-6444
Berryman, Alan A.	Washington State Univ.	Dept. of Entomology	Pullman, WA 99164	U.S.A.	509-335-3711
* Billings, Ronald F.	Texas Forest Service	P.O. Box 310	Lufkin, TX 75901	U.S.A.	713-632-7761
Blake, Elizabeth P.	N. Ariz. Univ., School of Forestry	P.O. Box 4098	Flagstaff, AZ 86011	U.S.A.	602-523-3031
Blasing, Larry B.	Inland Forest Resource Council	110 E. Broadway, Rm. 320	Missoula, MT 58902	U.S.A.	
* Borden, John H.	Centre for Pest Management	Simon Fraser University	Burnaby, BC V5A 1S6	CANADA	604-291-3646
* Bousfield, Wayne	USDA-Forest Service	P.O. Box 7669	Missoula, MT 59807	U.S.A.	406-329-3281 (Comm.) 585-3281 (FTS)

* Members registered at the thirty-fifth WFIWC, Eugene, Oregon.

* Bowen, Temple	Zoecon Corporation	23 Sherbrook St.	Augusta, ME 04330	U.S.A.	207-622-7258
* Bowers, Wade	Simon Fraser University	201-3890 Carrigan St.	Burnaby, B.C. V5A 1S6	CANADA	604-291-4163
Brassard, Dan	USDA-Forest Service	Dayton Street	John Day, OR 97845	U.S.A.	503-575-1731 (Comm.)
Brewer, Mel	Chevron Chemical	P.O. Box 743	LaHabra, CA 90631	U.S.A.	213-694-7398
Brewer, Wayne	Montana State Univ.	Dept. of Entomology	Bozeman, MT 597170523	U.S.A.	
* Bridges, J. Robert	USDA-Forest Service	2500 Shreveport Hwy.	Pineville, LA 71360	U.S.A.	318-473-7236
* Bridgwater, David R.	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727
Bright, Donald E.	Biosystematics Research Institute Canada Agriculture	K. W. Neatby Building	Ottawa, ON K1A 0C6	CANADA	613-996-1665
Brockmann, Dave		Rt. 1, Box 75	Eureka, MT 59917	U.S.A.	
* Brookes, Martha H.	Pacific Northwest Forest and Range Experiment Station	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4335
* Brooks, Julie	Simon Fraser University	2-2068 Turner Street	Vancouver, B.C. V5L 2A3	CANADA	604-291-4163
* Buffam, Paul E.	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-423-2727 (FTS) 221-2727 (Comm.)
Bullard, Allan T.	USDA-Forest Service	180 Canfield St.	Morgantown, WV 26505	U.S.A.	304-291-4133
Burnell, Donald G.	Washington State University		Pullman, WA 99164	U.S.A.	509-332-7577 (Comm.)
Butterfield, Anne	Simon Fraser University	Dept. of Biological Sci.	Burnaby, B.C. V5A 1S6	CANADA	
* Cahill, Donn B.	USDA-Forest Service	1750 Front St.	Boise, ID 83702	U.S.A.	208-334-1347 (FTS)
Cameron, R. Scott	Texas Forest Service, Pest Control Section	P.O. Box 310	Lufkin, TX 75901	U.S.A.	713-632-7761
Cameron, E. Alan	Pennsylvania State University	Dept. of Entomology 106 Patterson Building	University Park, PA 16802	U.S.A.	814-863-2867
* Campbell, Robert W.	Pacific Northwest Forest and Range Experiment Station	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4422
Cane, James	University of California	Dept. of Entomology	Berkeley, CA 94720	U.S.A.	415-642-5806
Carlson, Clint	Int. Forest and Range Experiment Station	Drawer G	Missoula, MT 59806	U.S.A.	
Carlson, Jerry	University of British Columbia	Dept. of Forestry	Vancouver, B.C. V6T 1W5	CANADA	
Cates, Rex	University of New Mexico	Dept. of Biology	Albuquerque, NM 87131	U.S.A.	505-277-3614

* Celaya, Robert	State Land Department	1624 W. Adams St.	Phoenix, AZ 85007	U.S.A.	602-255-4633 (Comm.)
Cerezke, Herb	Northern Forest Research Centre	5320 122nd St.	Edmonton, AB T6H 3S5	CANADA	403-435-7210
Chase, Al		Rt. 1, Box 493	Clinton, MT 59825	U.S.A.	
Chavez, Mike	USDA-Forest Service	517 Gold Avenue	Albuquerque, NM 87102	U.S.A.	
* Chong, Leslie	Simon Fraser University	Dept. of Biological Sci.	Burnaby, B.C. V5A 1S6	CANADA	
Christiansen, Chris	University of California Dept. of Forestry & Resource Mgt.	145 Mulford Hall	Berkeley, CA 94720	U.S.A.	415-642-6370
Churcher, Joe	University of British Columbia	Dept. of Forestry	Vancouver, B.C. V6T 1W5	CANADA	
Ciesla, William M.	USDA-Forest Service	Suite 350			303-223-5025 (Comm.)
		2625 Redwing Road	Fort Collins, CO 80526	U.S.A.	323-5265 (FTS)
Colbert, Jim	CANUSA-West	809 N.E. Sixth Ave.	Portland, OR 97232	U.S.A.	503-231-2034 (Comm.) 429-2034 (FTS)
Cole, Dennis M.	Intermountain Forest & Range Experiment Station	Box 1376	Bozeman, MT 59717	U.S.A.	406-994-4852 (Comm.) 585-4242 (FTS)
Cole, Walt	Intermountain Forest & Range Experiment Station	507 25th St.	Ogden, UT 84403	U.S.A.	
* Corneil, Jeffrey A.	Oregon State Dept. of Forestry	Route 2, Box 357	Prineville, OR 97754	U.S.A.	503-447-5658
Coster, Jack E.	West Virginia University	Division of Forestry	Morgantown, WV 26506	U.S.A.	304-293-3480
* Coulson, Robert	Texas A&M University	Dept. of Entomology	College Station, TX 77801	U.S.A.	713-845-9725 (Comm.)
* Crookston, Nicholas L.	USDA-Forest Service	1221 S. Main St.	Moscow, ID 83843	U.S.A.	208-882-3551 (Comm.)
* Curtis, Don	USDA-Forest Service	2221 E. Northern Lights Bl.	Anchorage, AK 99504	U.S.A.	
* Dahlsten, Don	University of California	Div. of Biological Control 1050 San Pablo Ave.	Albany, CA 94706	U.S.A.	415-642-7191 (Comm.)
* Dale, John W. M.	USDA-Forest Service	630 Sansome Street	San Francisco, CA 94111	U.S.A.	415-556-4321 (Comm.) 556-4321 (FTS)
* Daterman, Gary	Pacific Northwest Forest and Range Experiment Station	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4334
Davis, James H.	New Mexico Dept. of Agriculture Div. of State Forestry	Box 2167	Santa Fe, NM 87501	U.S.A.	505-827-3182

DeAngeles, Jack	Mississippi State University	Dept. of Entomology Drawer EM	Mississippi State, MS 39762	U.S.A.	601-325-2085
* DeBarr, Gary L.	Forestry Science Laboratory	Carlton Street	Athens, GA 30602	U.S.A.	404-546-2467
DeBenedictis, John	University of California	Dept. of Entomology	Berkeley, CA 94530	U.S.A.	415-642-7381
DeBoo, Robert	B.C. Ministry of Forests	1450 Government St.	Victoria, B.C. V8W 3E7	CANADA	
DeMars, C. J.	PSW Forest & Range Experiment Sta.	P.O. Box 245	Berkeley, CA 94701	U.S.A.	415-486-3576
Devitt, Bruce	Pacific Forest Products Ltd.	468 Belleville	Victoria, BC V8V 1W9	CANADA	604-386-2171
* Dewey, J. E.	USDA-Forest Service	P.O. Box 7669	Missoula, MT 59807	U.S.A.	406-329-3637 (Comm.) 585-3637 (FTS)
Dix, Mary Ellen	Rocky Mountain Forest and Range Experiment Station	Forestry Sciences Lab.	Lincoln, NB 68583	U.S.A.	
* Dolph, Robert E.	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727 (Comm.)
Downing, George	USDA-Forest Service	11177 West 8th Avenue	Lakewood, CO 80225	U.S.A.	303-234-4877 (Comm.) 234-4877 (FTS)
Dresser, Richard		953 Hilltop Dr.	Fortuna, CA 95540	U.S.A.	707-725-4413
* Duncan, David H.	N.W. Petrochemical Corp.	1316 Avon Allen Road	Mt. Vernon, WA 98273	U.S.A.	206-293-3176
* Dupre, Rob	Simon Fraser University	Dept. of Biological Sci.	Burnaby, B.C. V5A 1S6	CANADA	604-291-4163
Eager, Tom	University of Idaho	Forest Resources	Moscow, ID 83843	U.S.A.	
* Ebata, Tim	University of British Columbia	2932 E. 43rd Avenue	Vancouver, B.C. V5R 2Z3	CANADA	604-228-4488
Eder, Bob	USDA-Forest Service	P.O. Box 7669	Missoula, MT 59807	U.S.A.	406-585-3285 (FTS) 329-3285 (Comm.)
* Eglitis, Andy	USDA-Forest Service	P.O. Box 1628	Juneau, AK 99802	U.S.A.	907-586-7510
Emenegger, Don		1830 N.W. 17th St.	Corvallis, Oregon 97330	U.S.A.	503-752-3033
Evans, W. G.	University of Alberta	Dept. of Entomology	Edmonton, AB T6G 2E3	CANADA	403-432-3376 (Comm.)
* Fellin, David G.	Int. Forest & Range Exp. Station	Drawer G	Missoula, MT 59806	U.S.A.	
Ferguson, Dennis	USDA-Forest Service	1911 Orchard	Moscow, ID 89843	U.S.A.	
* Ferrell, George T.	PSW Forest & Range Exp. Station	Box 245	Berkeley, CA 94701	U.S.A.	415-486-3577 (Comm.)
Finlayson, Thelma	Simon Fraser University	Dept. Biological Sci.	Burnaby, BC V5A 1S6	CANADA	604-291-3540 (Comm.)
Flanagan, Paul		P.O. Box 8851	Moscow, ID 83843	U.S.A.	

* Foltz, John L.	University of Florida Dept. of Entomology	3103 McCarty Hall	Gainesville, FL 32611	U.S.A.	904-392-1440 (Comm.)
* Freeman, W. L.	USDA Forest Service	630 Sansome Street	San Francisco, CA 94519	U.S.A.	415-556-6520
Furniss, Malcolm M.		1515 Orchard Ave.	Moscow, ID 83843	U.S.A.	208-882-7961 (Comm.)
* Gara, Robert I.	University of Washington	College Forest Resources	Seattle, WA 98195	U.S.A.	206-543-2788 (Comm.)
* Garner, C. F.	Mobay Chemical	P.O. Box 4913	Kansas City, MO 64120	U.S.A.	816-242-2478
* Gibson, Ken	USDA-Forest Service, FPM	P.O. Box 7669	Missoula, MT 59807	U.S.A.	406-329-3278 (Comm.) 585-3878 (FTS) 672-0625 (FTS)
* Goheen, Donald J.	USDA Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727 (Comm.)
* Green, Lula E.	USDA-Forest Service, PNW	1960 Addison Street	Berkeley, CA 94701	U.S.A.	401-486-3861
* Gregg, Tommy F.	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727 (Comm.)
Grez, Osvaldo Ramiacz	Corporacion Nacional Forestal	Avda Bulnes 285-D703	Santiago, Chile	CHILE	722-7569
* Hadfield, Jim	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727 (Comm.)
Hagen, Bruce W.	California Dept. of Forestry	4811 Ponderosa Drive	Santa Rosa, CA 95404	U.S.A.	707-938-8585
Hain, Fred	N.C. State University	Dept. of Entomology	Raleigh, NC 27650	U.S.A.	919-737-3804 (Comm.)
* Hall, Peter M.	British Columbia Ministry of Forests	1450 Government Street	Victoria, BC V8W 3E7	CANADA	604-387-5965
* Hall, Ralph	Consultant	72 Davis Road	Orinda, CA 94563	U.S.A.	415-254-3759
Hamel, Dennis R.	USDA-Forest Service, FPM	P.O. Box 2417	Washington, D.C. 20013	U.S.A.	
Hard, John S.	Institute of Northern Forestry	308 Tanana Drive	Fairbanks, AK 99701	U.S.A.	907-474-6715 (Comm.)
Harris, John W. E.	Pacific Forest Research Centre	506 West Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811
Harvey, George	Great Lakes Forest Research Centre	P.O. Box 490	Sault Ste. Marie, ON P6A 5M7	CANADA	705-949-9461
* Haverty, Michael I.	Pacific Southwest Forest & Range Experiment Station	P.O. Box 245	Berkeley, CA 94701	U.S.A.	415-486-3372 (Comm.) 449-3372 (FTS)
Hedden, Roy	Clemson University	Dept. of Forestry	Clemson, S.C. 29631	U.S.A.	803-656-3302
Heller, Robert C.		21 Eastwood Dr.	Orinda, CA 94563	U.S.A.	415-376-0505
Hertel, Gerard D.	Northeastern Forest Exp. Station	370 Reed Road	Broomall, PA 19008	U.S.A.	215-461-3037 (Comm.) 489-3037 (FTS)

* Hitt, Sam	Ecological Pest Management	872 Don Cubero	Santa Fe, NM 87501	U.S.A.	505-988-9126
Hobson, Ken	University of Washington	6015 33rd N.E.	Seattle, WA 98115	U.S.A.	206-543-5767
* Hofacker, Thomas	USDA-Forest Service, FPM	P.O. Box 2417	Washington, D.C. 20013	U.S.A.	709-235-1555 (FTS)
* Holland, David G.	USDA-Forest Service	324 - 25th Street	Ogden, UT 84401	U.S.A.	801-586-3400
* Holmes, Matt	Bend Research Inc.	64550 Research Road	Bend, OR 97701	U.S.A.	503-382-4100
* Holsten, Ed	USDA-Forest Service	2221 E. Northern Lights Bl.	Anchorage, AK 99504	U.S.A.	907-276-0939
Honea, Ron	Mississippi State University	Drawer EM	Mississippi State, MS 39762	U.S.A.	
Honing, Fred W.	USDA-Forest Service, FPM	P.O. Box 2417	Washington, D.C. 20013	U.S.A.	703-235-8209 (FTS)
Hosman, Kevin	CANUSA	507 Adams	LaGrande, OR 97850	U.S.A.	503-963-8247
* Hostetler, Bruce B.	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727
Hulme, Michael	Canadian Forestry Service	506 West Burnside Road	Victoria, B.C. V8Z 1M5	CANADA	604-388-3811
* Hunt, David W.A.	Simon Fraser University		Burnaby, B.C. V5A 1S6	CANADA	604-291-4163
* Hunt, Richard	California Dept. of Forestry	1416 - 9th Street	Sacramento, CA 95814	U.S.A.	916-422-5501
* Irwin, Eugene A.	Oregon State Dept. of Forestry	2600 State Street	Salem, OR 97310	U.S.A.	503-373-1853
* Ives, William	Northern Forest Research Centre	5320 - 122nd Street	Edmonton, AB T6H 3S5	CANADA	403-435-7337
* Jenkins, Mike	Utah State University	Dept. of Forest Resources	Logan, UT 84322	U.S.A.	801-750-2531
* Johnsen, John O.	New Mexico Dept. of Agriculture	1873 Camino Lumbre	Santa Fe, NM 87505	U.S.A.	505-827-8080
* Johnsey, Richard L.	Washington State Department of Natural Resources	6132 Glenwood Drive S.W.	Olympia, WA 98521	U.S.A.	206-753-0671
Johnson, Harry J.	Canadian Forestry Service	5320 122nd Street	Edmonton, AB T6H 3S5	CANADA	403-435-7630
* Joseph, Paul	Oregon State Dept. of Forestry	East Adams at 20th	LaGrande, OR 97850	U.S.A.	503-963-3168
* Joy, Donald N.	Uniroyal Chemical	4205 Barge Street	Yakima, WA 98908	U.S.A.	509-966-5472
Joy, John	USDA-Forest Service	Box 400	Butte, MT 59701	U.S.A.	
* Kemp, William	University of Idaho	Forest Resources	Moscow, ID 83843	U.S.A.	
Kessler, Bruce	University of Idaho	Forest Resources	Moscow, ID 83843	U.S.A.	
* Kinn, D. N.	Southern Forest Experiment Station	2500 Shreveport Highway	Pineville, LA 71360	U.S.A.	318-473-7238
Kirkbride, Dale	Northern Arizona University	School of Forestry	Flagstaff, AZ 86011	U.S.A.	602-523-3031
* Kline, LeRoy N.	Oregon Dept. of Forestry	2600 State Street	Salem, OR 97301	U.S.A.	503-378-2554 (Comm.)
Knopf, Jerry A. E.		11921 Reutzel Dr.	Boise, ID 83709	U.S.A.	208-362-1094 (Comm.)

Koerber, Thomas W.	USDA-Forest Service	P.O. Box 245	Berkeley, CA 94701	U.S.A.	415-486-3574
* Kohler, Steve	Montana Div. of Forestry	2705 Spurgin Road	Missoula, MT 59801	U.S.A.	406-728-4300 (Comm.)
* Kulman, D. H.	Dept. Entomology, Fisheries and Wildlife	Hodson Hall, Univ. of Minn.	St. Paul, MN 55108	U.S.A.	
Lanier, Gerry	SUNY College of Environmental Science and Forestry	Dept. of Entomology	Syracuse, NY 13210	U.S.A.	315-473-2751
Laut, John	Colorado State Forest Service Forestry Building, Room 215	Colorado State Univ.	Fort Collins, CO 80523	U.S.A.	303-496-6303
* Leatherman, Dave	Colorado State Forest Service	Forestry Bldg., CSU	Ft. Collins, CO 80523	U.S.A.	303-491-6303 (Comm.)
Lessard, Gene	USDA Forest Service	5941 Windy Street	Golden, CO 80401	U.S.A.	303-234-4877
* Lewis, Kenneth R.	Union Carbide	P.O. Box 12014	Raleigh, NC 27709	U.S.A.	919-549-2196
* Liebhold, Sandy	University of California	Dept. of Entomology	Berkeley, CA 94609	U.S.A.	415-642-4347
* Lindgren, B. Staffan	University of British Columbia	Faculty of Forestry	Vancouver, BC V6T 1W5	CANADA	604-228-5569 (Comm.)
* Linit, Marc	University of Missouri	Department of Entomology	Columbia, MO 65211	U.S.A.	314-822-7647
Linnane, Jim	USDA Forest Service	517 Gold Avenue SW	Albuquerque, NM 87102	U.S.A.	505-766-2440
Lister, Ken	USDA-Forest Service	P.O. Box 25127	Lakewood, CO 80225	U.S.A.	303-234-4877 (Comm.) 234-4877 (FTS)
Livingston, Ladd	State of Idaho, Dept. of Lands	P.O. Box 670	Coeur d'Alene, ID 83814	U.S.A.	208-664-2171
* Long, Garrell E.	Washington State University	Dept. of Entomology	Pullman, WA 99164	U.S.A.	509-335-5504
* Lorio, Peter L., Jr.	SO Forest Experiment Station	2500 Shreveport Highway	Pineville, LA 71360	U.S.A.	318-473-3222 (Comm.) 493-7232 (FTS)
* Lownsbery, Jill W.	University of California Division of Biological Control	1050 San Pablo Ave.	Albany, CA 94706	U.S.A.	415-642-7191
Luck, Robert F.	University of California	Div. of Biological Control	Riverside, CA 92521	U.S.A.	714-787-5713
Ludeman, Wayne	Inland Forest Resource Council	320 Savings Center Bldg.	Missoula, MT 59812	U.S.A.	406-728-1710
Lundberg, Renee	USDA-Forest Service	Lolo NF	Seeley Lake, MT 59868	U.S.A.	
Lyon, Robert L.	USDA-Forest Service	Box 2417, RPE-605	Washington, D.C. 20013	U.S.A.	703-235-8206
* Lyons, Barry		P.O. Box 490	Sault Ste. Marie Ontario	CANADA	
MacDonald, D. Ross	Dir., Canadian Forestry Service Pacific Forest Research Centre	506 West Burnside Road	Victoria, B.C. V8Z 1M5	CANADA	604-388-3811

Madden, John	University of Tasmania		Hobart, Tasmania 7006	AUSTRALIA	
Maher, Tom	Northwood Pulp & Timber, Ltd.	P.O. Box 9000	Prince George, B.C. V2L 4W2	CANADA	562-2590
Marcandier, Sylvie	University of California				
	Division of Biological Control	1050 San Pablo Ave.	Albany, CA 94706	U.S.A.	415-642-7191
Markin, George P.	USDA-Forest Service	2810 Chiles Road	Davis, CA 95616	U.S.A.	916-798-7851
* Marshall, Jack P.	USDA-Forest Service	1750 Front Street	Boise, ID 83702	U.S.A.	208-334-1345
* Mason, Garland N.	USDA-Forest Service	2500 Shreveport Highway	Pineville, LA 71360	U.S.A.	318-473-7250
* Mason, Richard R.	Range & Wildlife Habitat Lab	Rt. 2, Box 2315	LaGrande, OR 97850	U.S.A.	
Matson, Pamela	North Carolina State University	Dept. of Entomology	Raleigh, NC 27650	U.S.A.	919-737-3804
McCambridge, William F.		1905 Richards Lake Rd.	Ft. Collins, CO 80524	U.S.A.	
McComb, David		P.O. Box 163	Winthrop, WA 98862	U.S.A.	
* McConnell, Timothy	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727
* McCullough, Debbie	Northern Arizona University	406 E. Birch	Flagstaff, AZ 86001	U.S.A.	602-523-3031
McElderry, Sue	USDA-Forest Service	240 W. Prospect Street	Fort Collins, CO 80526	U.S.A.	303-221-4390
McFadden, Max W.	USDA-Forest Service	P.O. Box 2417, RPE-605	Washington, D.C. 20013	U.S.A.	703-235-8206 (Comm.)
* McGauley, B.H.	Ministry of Natural Resources	Pest Control Sec.	Maple, ONT L0J 1E0	CANADA	416-832-2761
McGregor, Mark	USDA-Forest Service	P.O. Box 7669	Missoula, MT 59807	U.S.A.	406-329-3283 (Comm.)
					585-3283 (FTS)
McKnight, Melvin E.	USDA-Forest Service (CANUSA)	P.O. Box 2417, RPE-605	Washington, D.C. 20013	U.S.A.	703-235-8230
* McLean, John A.	University of British Columbia	Faculty of Forestry	Vancouver, B.C. V6T 1W5	CANADA	604-228-3360 (Comm.)
* McMullen, L. H.	Pacific Forest Research Centre	506 West Burnside Road	Victoria, B.C. V8Z 1M5	CANADA	604-388-3811
Meadows, Max	California Dept. of Forestry	5064 Silva Road	Mariposa, CA 95338	U.S.A.	209-966-3622
Mendoza, Martin	University of Idaho	Forest Resources	Moscow, ID 83843	U.S.A.	208-885-6444
* Merrill, Laura	University of California	Dept. of Entomology	Berkeley, CA 94720	U.S.A.	415-642-5806
* Meso, Stanley W., Jr.	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727
Meyer, Hubert	USDA-Forest Service	2532 Highwood Drive	Missoula, MT 59803	U.S.A.	406-251-5800
* Miller, Dan	Simon Fraser University	Dept. of Biological			
		Science	Burnaby, BC V5A 1S6	CANADA	604-291-4163
* Miller, Gordon	Canadian Forestry Service	506 W. Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811
Miller, Ken	Northern Arizona University	School of Forestry	Flagstaff, AZ 86011	U.S.A.	602-523-3031

* Miller, Mitchel	USDA-Forest Service	2500 Shreveport Hwy.	Pineville, LA 71360	U.S.A.	318-473-7235
Miller, Ross	Washington State University	Dept. of Entomology	Pullman, WA 99164	U.S.A.	509-335-5504
Millstein, Jeffrey A.	Washington State University	1142 Markley Drive, #4	Pullman, WA 99163	U.S.A.	509-334-4339
* Mitchell, Russ	PNW Forest and Range Experiment Sta.	809 N.E. Sixth Avenue	Portland, OR 97232	U.S.A.	503-231-2034 (Comm.) 429-2034 (FTS)
Mitton, Jeff	University of Colorado	Dept. EPO Biology	Boulder, CO 80309	U.S.A.	303-492-8956 (Comm.)
* Miyagawa, R.	Alberta Forest Service	10625-120 Avenue	Edmonton, Alberta	CANADA	403-427-6807
Moeck, Henry	Pacific Forest Research Centre	506 West Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811
* Moody, Ben	Northern Forest Research Centre	5320 122nd St.	Edmonton, Alberta T6H 3S5	CANADA	403-435-7330
Moore, Lincoln M.	North Central Forest Experiment Station	1407 S. Harrison Road	East Lansing, MI 48823	U.S.A.	517-355-7740
Morgan, Gavin	Oregon State University	Forest Science Dept.	Corvallis, OR 97331	U.S.A.	
* Morgan, Lisa	University of Washington	10720 Riviera Pl. NE #3	Seattle, WA 98125	U.S.A.	206-367-7846
Morrison, West	Bureau of Land Management	1241 Lewis	Billings, MT 59102	U.S.A.	
* Morse, Bruce W.	University of Minnesota	Dept. of Entomology	St. Paul, MN 55108	U.S.A.	612-373-1737
* Moser, John C.	SO Forest Experiment Station	2500 Shreveport Highway	Pineville, LA 71360	U.S.A.	318-473-7242 (Comm.)
Muldrew, Jim	Northern Forest Research Centre	5320 122nd St.	Edmonton, AB T6H 3S5	CANADA	403-435-7630
Murphy, Christopher	CANUSA	421 SW 10th	Corvallis, OR 97331	U.S.A.	503-757-4445
Myhre, Richard J.	USDA Forest Service	2625 Redwing Road, Suite 350	Ft. Collins, CO 80526	U.S.A.	303-223-5025
Namkona, Gene	North Carolina State University	Genetics Dept.	Raleigh, NC 27607	U.S.A.	
Nathanson, Richard	University of Idaho	Forest Resources	Moscow, ID 83843	U.S.A.	
Neale, David	Oregon State University	Forest Science Dept.	Corvallis, OR 97331	U.S.A.	
* Nebeker, Evan	Mississippi State University	Drawer EM	Mississippi State, MS 39762	U.S.A.	601-325-2085 (Comm.)
Nichols, Tom		6425 65th Ave. N.E.	Seattle, WA	U.S.A.	206-524-3310
* Nielsen, Dave	Dept. of Entomology	OARBC-OSU	Wooster, OH 44691	U.S.A.	216-264-2540
Nijholt, W. W.	Safer Agro-Chem., Ltd.	3334 Fulton Rd.	Victoria, BC V9C 2T9	CANADA	604-659-9169
* Niwa, Christine	USDA-Forest Service	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4347
Oakes, Robert	USDA-Forest Service	P.O. Box 7669	Missoula, MT 59807	U.S.A.	406-329-3168 (Comm.) 585-3168 (FTS)

Ollieu, Max	USDA-Forest Service	324 - 25th Street	Ogden, UT 84403	U.S.A.	501-625-5257 (Comm.) 586-5257 (FTS)
* Olson, Arden	Dept. of Natural Resources	Public Lands Bldg.	Olympia, WA 98504	U.S.A.	206-753-5315
Otvos, Imre	Canadian Forestry Service	506 W. Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811
* Overhulser, Dave L.	Oregon State Dept. of Forestry	2600 State Street	Salem, OR 97310	U.S.A.	503-378-2218
* Owen, Don	University of California	Dept. of Entomology	Berkeley, CA 94720	U.S.A.	415-642-5806
* Page, Marion	USDA-Forest Service	P.O. Box 245	Berkeley, CA 94701	U.S.A.	415-486-3471 (Comm.) 449-3471 (FTS)
* Paine, Timothy D.	University of Arkansas	Dept. of Entomology	Fayetteville, AR 72701	U.S.A.	501-575-3348
Parker, Douglas	USDA-Forest Service	517 Gold Avenue SW	Albuquerque, NM 87102	U.S.A.	505-766-2440
* Pase, Herbert A.	Texas Forest Service	P.O. Box 310	Lufkin, TX 75901	U.S.A.	409-632-7761
* Payne, Tom	Texas A & M University	Dept. of Entomology	College Station, TX 77843	U.S.A.	713-845-3825 (Comm.)
Perry, Dave	Oregon State University	Dept. Forest Science	Corvallis, OR 97331	U.S.A.	503-753-9166 (Comm.)
Peters, Kay	UniRoyal Chemical Division	32 Spencer St.	Naugatuck, CT 06770	U.S.A.	
Pettinger, Leon	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727 (Comm.) 423-2727 (FTS)
Pierce, Donald A.	HC-30	P.O. Box 909	Prescott, AZ 86301	U.S.A.	
Pierce, John	USDA-Forest Service	630 Sansome St.	San Francisco, CA 94111	U.S.A.	415-556-4321 (Comm.)
Pitman, Gary B.	Oregon State University	Dept. of Forest Science	Corvallis, OR 97331	U.S.A.	503-753-9166 (Comm.)
* Puchbauer, Truman C.	USDA-Forest Service	3662 Ticonderoga Way	Boise, ID 83706	U.S.A.	208-334-1668
Ragenovich, Iral	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727 (Comm.)
* Raimo, Bernie	USDA-Forest Service	P.O. Box 25127	Lakewood, CO 80255	U.S.A.	303-234-7304
* Rappaport, Nancy	USDA-Forest Service	P.O. Box 245	Berkeley, CA 94701	U.S.A.	415-486-3573
Raske, Arthur	Canadian Forestry Service	P.O. Box 6028	St. Johns, Newfoundland A1C 5X8	CANADA	709-772-4826
* Rasmussen, Lynn A.	Intermountain Forest & Range Experiment Station	507 - 25th St.	Ogden, UT 84401	U.S.A.	801-625-5392 (Comm.)
Rhoades, David F.	University of Washington	Dept. of Zoology	Seattle, WA 98195	U.S.A.	206-543-1058
* Richmond, Charles E.	Pacific Southwest Forest and Range Experiment Station	1960 Addison St.	Berkeley, CA 94701	U.S.A.	415-486-3185

* Richmond, H.A. (Hec)		Lofthouse Road, R.R. 2	Nanaimo, B.C. V9R 5K2	CANADA	604-722-2727
Robertson, Allen		851 Moraga Road	Lafayette, CA 94549	U.S.A.	415-283-8600
Robertson, Jacqueline H.	USDA-Forest Service	P.O. Box 245	Berkeley, CA 94701	U.S.A.	415-486-3107 (Comm.)
Roettgering, Bruce H.	USDA-Forest Service	630 Sansome Street	San Francisco, CA 94111	U.S.A.	415-556-6529 (Comm.)
* Rogers, Terry	USDA-Forest Service	517 Gold Avenue	Albuquerque, NM 87102	U.S.A.	
* Rohlfs, W. Mitchell	Abbott Laboratories	25068 Oro Valley Road	Auburn, CA 95603	U.S.A.	916-269-1025
* Ryan, Roger	PNW Forest & Range Exp. Sta.	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4351 (Comm.)
Ryker, Lee	Oregon State University	Entomology Dept.	Corvallis, OR 97331	U.S.A.	503-754-4833 (Comm.)
Safranyik, Les	Pacific Forest Research Centre	506 W. Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811
* Sahota, Tara S.	Pacific Forest Research Centre	506 W. Burnside Road	Victoria, B.C. V8Z 1M5	CANADA	604-388-3811
* Sandquist, Roger E.	USDA-Forest Service	P.O. Box 3623	Portland, OR 97208	U.S.A.	503-221-2727
* Sartwell, Charles	PNW Forest and Range Experiment Station	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4351 (Comm.) 420-4351 (FTS)
* Scharpf, Robert F.	USDA-Forest Service	P.O. Box 245	Berkeley, CA 94701	U.S.A.	415-486-3156
* Schaupp, Willis C., Jr.	University of California	Dept. of Entomology	Berkeley, CA 94720	U.S.A.	415-642-4347
* Schenk, John A.	University of Idaho	College of Forestry	Moscow, ID 83843	U.S.A.	208-885-7952 (Comm.)
* Schmid, John M.	USDA-FS Forestry Sciences Lab.	Northern Arizona Univ.	Flagstaff, AZ 86001	U.S.A.	
Schmidt, Wyman	USDA-Forest Service	Forestry Sciences Lab	Bozeman, MT 59717	U.S.A.	
* Schmitt, Jeffrey J.	Mississippi State University	Drawer EM, Dept. of Ento.	Mississippi State, MS 39762	U.S.A.	
Schmitz, Dick	Intermountain Forest & Range Experiment Station	507 - 25th Street	Ogden, UT 84401	U.S.A.	801-625-5395 (Comm.) 586-5395 (FTS)
* Schowalter, Timothy D.	Oregon State University	Dept. of Entomology	Corvallis, OR 97331	U.S.A.	503-754-4392
* Schultz, David	USDA-Forest Service	630 Sansome Street	San Francisco, CA 94111	U.S.A.	415-556-4322 (Comm.)
* Scott, Donald W.	USDA-Forest Service	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4352
* Sexton, Jay M.	Oregon State University	5475 N.W. Oak Creek Dr.	Corvallis, OR 97330	U.S.A.	503-753-6097
* Shea, Patrick	USDA-Forest Service	2810 Chiles Road	Davis, CA 95616	U.S.A.	916-758-0497 (Comm.) 448-3445 (FTS)
* Sheehan, Katharine	USDA-Forest Service	180 Canfield Street	Morgantown, WV	U.S.A.	

Shepherd, Roy F.	Pacific Forest Research Centre	506 West Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811
* Shore, Terry	Pacific Forest Research Centre	506 West Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811 (Comm.)
* Sinnott, Molly	Nevada Division of Forestry	885 East Lake Road	Carson City, NV 89701	U.S.A.	702-849-2500
Smith, Richard H.	PSW Forest & Range Experiment Sta.	Box 245	Berkeley, CA 94701	U.S.A.	415-486-3573 (Comm.)
* Smith, Richard S., Jr.	USDA Forest Service	630 Sansome St.	San Francisco, CA 94519	U.S.A.	415-556-6520
Smith, Tony	N.M. Dept. of Agriculture	P.O. Box 6	Albuquerque, NM 87103	U.S.A.	505-766-3914 (Comm.)
* Sower, Lonne L.	PNW Forest & Range Experiment Sta.	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4373
Stage, Albert R.	Int. Forest & Range Experiment Sta.	1221 S. Main St.	Moscow, ID 83843	U.S.A.	208-882-3557 (Comm.)
* Stark, R. W.	CANUSA-West	P.O. Box 3141	Portland, OR 97232	U.S.A.	503-231-2034 (Comm.) 429-2034 (FTS)
* Stein, John	Pacific Southwest Forest and Range Experiment Station	1960 Addison St.	Berkeley, CA 94701	U.S.A.	415-486-3100
* Stelzer, Milton J.	PNW Forest & Range Experiment Sta.	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4327
* Stephen, Fred	University of Arkansas	Dept. of Entomology, A-317	Fayetteville, AR 72701	U.S.A.	501-575-3377 (Comm.)
* Sterner, Thomas E.	Pacific Forest Research Centre	506 West Burnside Road	Victoria, B.C. V8Z 1M5	CANADA	604-388-3811
Stevens, Robert E.	RM Forest & Range Experiment Sta.	240 W. Prospect St.	Ft. Collins, CO 80526	U.S.A.	303-221-4390
Stewart, Alan	Simon Fraser University	P.O. Box 585	Gibsons, BC VON 1V0	CANADA	604-298-9242
Stewart, Kathy	USDA-Forest Service	P.O. Box 7669	Missoula, MT 59807	U.S.A.	
* Stipe, Larry	USDA-Forest Service	P.O. Box 7669	Missoula, MT 59807	U.S.A.	406-329-3285 (Comm.) 585-3285 (FTS)
Stock, Art	British Columbia Forest Service	General Delivery	Smithers, BC V0J 2N0	CANADA	604-847-4511
* Stock, Molly	University of Idaho	Dept. of Forest Resources	Moscow, ID 83843	U.S.A.	208-885-6444
Stoszek, Karel	University of Idaho	Dept. of Forest Resources	Moscow, ID 83843	U.S.A.	208-885-6444
* Sturgeon, Kareen B.	Linfield College	Biology Department	McMinnville, OR 97128	U.S.A.	503-472-4121
Svihra, Pavel	University of California	Department of Forestry	Berkeley, CA 94720	U.S.A.	415-527-3564
Swain, Ken	USDA-Forest Service	1720 Peachtree Road	Atlanta, GA 30367	U.S.A.	404-881-2961 (Comm.) 257-2961 (FTS)
* Sweeney, Jon	University of British Columbia	Department of Forestry	Vancouver, BC V6T 1W5	CANADA	604-228-4488
* Tait, Susan	University of California	2445 California St.	Berkeley, CA 94703	U.S.A.	415-843-1025
* Thatcher, Robert	Southern Forest Exp. Sta.	2500 Shreveport Highway	Pineville, LA 71360	U.S.A.	318-473-7250

* Thier, Ralph W.	USDA-Forest Service	1750 Front Street	Boise, ID 83702	U.S.A.	208-334-1345
Thompson, Alan	Pacific Forest Research Centre	506 West Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811
* Thompson, Jack	USDA-Forest Service	P.O. Box 7669	Missoula, MT 59807	U.S.A.	406-329-3280
* Tilles, David	Swedish Univ. of Agriculture Norrsalje 1:7		74047 Harbonas	SWEDEN	0292-21062
* Torgersen, Torolf R.	Range & Wildlife Habitat Lab	Rt. 2, Box 2315	LaGrande, OR 97850	U.S.A.	503-963-7122
Toya, Dan		Rt. 2, Box 187A	Blackfoot, ID 83221	U.S.A.	
* Trostle, Galen G.		Rt. 2, Box 377	Otis, OR 97368	U.S.A.	503-994-2888
* Tunnock, Scott	USDA-Forest Service	P.O. Box 7669	Missoula, MT 59807	U.S.A.	406-329-3638 (Comm.) 585-3638
Vandenburg, Jim		P.O. Box 147	Kalispell, MT 59901		
* Van Sickle, Allan	Pacific Forest Research Centre	506 West Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811
* Volney, W. Jan A.	University of California	Dept. of Entomol. Sciences	Berkeley, CA 94720	U.S.A.	415-642-1414
Von Rudloff, Ernst	National Research Council	3480 Upper Terrace	Victoria, BC V8R 6E7	CANADA	
* Wagner, Michael R.	Northern Arizona University	School of Forestry, Box 4098	Flagstaff, AZ 86011	U.S.A.	602-523-3031
Wallner, Doug	National Park Service	P.O. Box 12, Ash Mountain	Three Rivers, CA 93271	U.S.A.	209-565-3341
Warkentin, Dennis	University of Washington	College Forest Resources	Seattle, WA 98195	U.S.A.	
* Washburn, Richard I.		P.O. Box 1011	Westport, WA 98595	U.S.A.	206-268-0627
* Waters, William E.	University of California	201 Wellman Hall	Berkeley, CA 94720	U.S.A.	415-642-7561
* Wenz, John M.	USDA-Forest Service	630 Sansome Street	San Francisco, CA 94111	U.S.A.	415-556-6520 (Comm.)
* Werner, Richard A.	Institute of Northern Forestry	308 Tanana Drive	Fairbanks, AK 99701	U.S.A.	907-474-7443
West, Lorne W.	National Park Service	P.O. Box 206	El Portal, CA 95318	U.S.A.	209-372-4461
* White, William	USDA Forest Service	2625 Redwing Road, Suite 350	Fort Collins, CO 80526	U.S.A.	303-223-5025
* Whitmore, Mark	University of California, Berkeley	1275 University Ave. #6	Berkeley, CA 94702	U.S.A.	415-642-7191
Whitney, H. Stu	Pacific Forest Research Centre	506 West Burnside Road	Victoria, BC V8Z 1M5	CANADA	604-388-3811
* Wickman, Boyd	PNW Range & Wildlife Habitat Lab.	Route 2, Box 2315	La Grande, OR 97850	U.S.A.	503-963-7122
* Wilkinson, Bob	University of Florida	Dept. of Nematology & Entomology	Gainesville, FL 32611	U.S.A.	904-352-1440

* Willhite, Beth		2176 Egarose Rd.	Roseburg, OR 97470	U.S.A.	503-673-8973
* Williams, Daniel J.	USDA, APHIS, PPQ, CNPPSOP	3200 Jefferson Way	Corvallis, OR 97331	U.S.A.	503-757-4375
Wilson, George	Glacier View RD	Box W	Columbia Falls, MT 59912		
Wissenbach, Mike	University of Idaho	Forest Resources	Moscow, ID 83843	U.S.A.	
* Witcosny, Jeff	Oregon State University	Dept. of Entomology	Corvallis, OR 97330	U.S.A.	
Witter, John	University of Michigan	School of Natural Resources	Ann Arbor, MI 48109	U.S.A.	313-764-1432 (Comm.) 764-1412 (FTS)
* Wolfe, Robert L.	USDA-Forest Service	2221 E. Northern Lights Bl.	Anchorage, AK 99504	U.S.A.	907-276-0939
* Wood, David L.	University of California	Dept. of Entomology Sci.	Berkeley, CA 94720	U.S.A.	415-642-5538 (Comm.)
Wood, Steve	Brigham Young University	Zoology & Entomology Dept.	Provo, UT 84602	U.S.A.	
* Wright, Kenneth H.	PNW Forest & Range Experiment Sta.	809 N.E. Sixth Avenue	Portland, OR 97232	U.S.A.	503-231-2057
Wulf, N. William	USDA-Forest Service	P.O. Box 9013	Missoula, MT 59807	U.S.A.	406-329-3839 (Comm.) 585-3839 (FTS)
* Youngs, Lorna	Oregon State University	1021 NW 30th	Corvallis, OR 97330	U.S.A.	503-757-4445
Zanuncio, Jose Cola	Universidade Federal de Vicosa	Dept. Biologia Animal-CCBS	Minas Gerais 36570	Brazil	011-31-891-1790
* Zimmer, Sara	University of Idaho	Forest Resources	Moscow, ID 83843	U.S.A.	208-882-8418