Western IPM Center
Fostering responsible pest management for a sustainable future.

The Western Front

NEWSLETTER OF THE WESTERN INTEGRATED PEST MANAGEMENT CENTER February 2013

Director's Comments

Western IPM Center: Communication is Our Most Important Component

Jim Farrar

This is my first newsletter as the new Director of the Western IPM Center, and I am very excited by the challenges and opportunities ahead. Integrated pest management has made unprecedented leaps forward despite these uniquely challenging times.

First, I thank Rick Melnicoe and Linda Herbst for building the WIPMC and establishing a 12-year track record of excellence. Second, I am thankful to Kassim Al-Khatib, Joyce Strand, and Carla Thomas who, in collaboration with Paul Jepson at Oregon State University and Peter Ellsworth at the University of Arizona, secured USDA funding for the WIPMC for the next 4 years. They have guided the WIPMC through a period of uncertainty of funding and personnel while maintaining continuity.

If you care enough about IPM to be reading these comments, then I consider you to be a stakeholder in the WIPMC. I value your feedback, your input, and your active participation in improving adoption of IPM practices throughout the West. The Western Region has the most diverse climate, geography, crops, non-crop landscapes, and social value systems of the four regional IPM centers. This diversity is our strength, and I encourage everyone with a stake in IPM to participate.

The overarching goals of the WIPMC are to increase the economic benefits of adopting IPM practices, to reduce the environmental and human risks associated with managing pests, and to assess our progress in reaching these goals. Our vision statement is "The Western IPM Center is a partnership of stakeholders that will facilitate integrated pest management for the region." As Director, I see three key terms in the vision statement: "partnership," "stakeholders," and "facilitate." Although the Center has a physical office, it is really a system of interconnected people, programs, and organizations working to enhance adoption of IPM as the key approach to pest management throughout the Western Region.

Our most important tool to reach the vision of "a partnership of stakeholders to facilitate IPM" is communication. Communication is two-way and involves listening, responding, and discussing. I will strive to facilitate clear communication both among stakeholders in the Western Region states and territories and between the Western Region and USDA and USEPA. We will be seeking your input to help identify IPM needs in research, extension, outreach, industry, and regulation. The Center will continue to enhance communication between our partners in the West and USDA with regard to pest management issues and with USEPA regarding pesticide issues. We will continue to facilitate communication among USDA pest management program representatives, researchers, commodity groups, natural systems managers, urban planners, and agricultural producers. The guiding document for all four Regional IPM Centers in the United States is the National Roadmap for Integrated Pest Management, which is available as a PDF file from http://www.ipmcenters.org/ipmroadmap.pdf. The Roadmap identifies our agricultural, urban, and natural systems goals.

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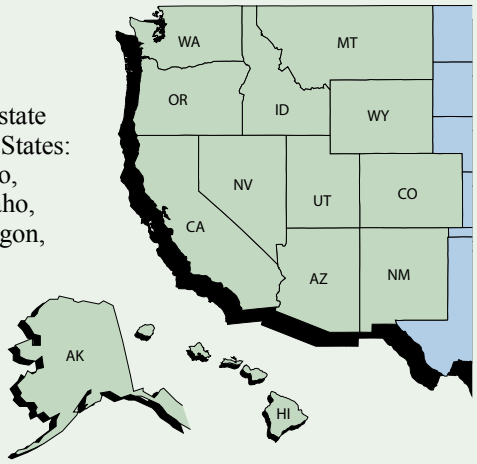
Center Scope

The Western IPM Center enhances communication between federal and state IPM programs in the western United States: Alaska, Arizona, California, Colorado, Hawaii and the Pacific territories, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. It serves as an IPM information network, designed to quickly respond to information needs of the public and private sectors.



What's Inside

Rick Melnicoe

Director's Comments—*from page 1*

The Western Front will continue to be published three times a year. We will include updates on state and regional activities, articles on upcoming or past events, information about funding opportunities, a calendar of events, information about our Advisory and Steering Committees, IPM success stories, and other newsworthy material related to IPM in the West. I welcome your suggestions and feedback. Please contact me at ***jjfarrar@ucdavis.edu*** or (530) 754-8378.

For additional information and resources, please visit the Center Web site at ***www.wripmc.org***.

Jim Farrar

What Does the WIPMC Do?

- Facilitates communication and collaboration among pest management stakeholders in the West
- Identifies regional pest management issues and keeps track of emerging, critical issues
- Advises USDA and USEPA on pest management issues
- Gathers and reports on-the-ground regional information on pesticide use to federal regulators
- Builds IPM information and resources
- Competitively funds multistate work groups, outreach/publications, surveys, research projects, and special projects to address pest management issues in the West
- Manages the Regional IPM (RIPM) Competitive Grants Program for the Western Region

Six Regional IPM Grants Awarded in Western Region, Totaling $642,039

The Regional IPM Competitive Grants Program (RIPM) is administered by the land-grant university system's four regions in partnership with USDA-NIFA. In fiscal year 2012, the Western Region RIPM program supported two types of projects: Research and Joint Research-Extension. The following 2012 proposals have received grant awards:

Research and Extension Grants:

Integration of Bacillus Mycoides Isolate J (Bmj)-Induced Resistance, Roguing, Stylet Oils. and Insecticides in Management Of Potato Virus Y
Award Amount: $130,625
Principal Investigator: Barry Jacobsen, Montana State University

Integrating Biological Control into Management Decisions: Advancing the IPM Continuum through Research and Implementation
Award Amount: $87,636
PI: Peter Ellsworth, University of Arizona

Insect-Attracting Nematodes and Water Conservation Practices as Alternatives to Insecticides for Billbug Control in Intermountain West Turfgrass
Award Amount: $125,697
PI: Ricardo Ramirez, Utah State University

Research Grants:

Evaluating the Efficacy and Impacts of Teramesa romana, a Wasp Introduced for Biological Control of Arundo donax (Giant Reed)
Award Amount: $99,930
PI: Adam Lambert, University of California, Santa Barbara

Optimizing Efficacy of Downy Brome (Bromus tectorum) Biocontrol in Crops and Rangelands: Integration and Implementation
Award Amount: $98,600
PI: Fabian Menalled, Montana State University

Integrated Management of Root-Knot Nematodes in Carrot
Award Amount: $99,551
PI: Antoon Ploeg, University of California, Riverside

Rebekah D. Wallace, University of Georgia, Bugwood.org

Five Lead the Western IPM Center

A director, three co-directors, and an associate director head the Western IPM Center

Jim Farrar, Director

Dr. Jim Farrar joined the Western IPM Center as Director in January and is located at the Center's headquarters at UC Davis. Jim came to the Center from California State University, Fresno (Fresno State), where he was Professor of Plant Pathology in the Department of Plant Science for twelve and a half years.

At Fresno State Jim taught undergraduate courses in plant pathology, plant nematology, diagnosis and control of plant diseases, crop improvement, aspects of crop productivity, mycology, and sustainable agriculture, and he co-taught a graduate course in advanced pest management. Jim's research centered on fungal diseases of vegetable crops, with his most recent work focusing on management strategies for cavity spot of carrot. This research provided carrot growers with disease management tools for cavity spot. Jim also served a 4-year term as Chair of the Department of Plant Science and a 1-year term as Interim Chair of the Department of Food Science and Nutrition.

Prior to becoming a faculty member at Fresno State, Jim was a post-doc in the laboratory of Extension Specialist Mike Davis, in the Department of Plant Pathology at UC Davis. As a post-doc, he worked on epidemiology and control strategies for *Erwinia* (now *Pectobacterium*) spp. diseases on potato and carrot. During that time, Jim authored or co-authored several Pesticide Impact Assessment Program reports for Rick Melnicoe, previous Director of the Western IPM Center.

Jim also taught in the Botany Department at Weber State University, in Ogden, Utah, for two and a half years and conducted research on rock cress plants infected with a rust fungus that causes false-flowers. This rust is closely related to the species that is a potential biological control of the invasive weed, dyer's woad (*Isatis tinctoris*).

Jim's publications include scientific papers, extension newsletter articles, and articles in agricultural industry magazines. He also wrote a chapter in the book *Tomato Health Management* and five disease descriptions in the *Compendium of Umbelliferous Crop Diseases*. Jim just completed a 3-year term as Senior Editor for Feature Articles in the journal *Plant Disease*. Previously, he served a 3-year term as Senior Editor for the online journal *Plant Health Progress*. Jim is a member of the American Phytopathological Society (APS) and the Pacific Division of the APS.

Jim grew up in rural Wisconsin and completed his B.S. and Ph.D. degrees at the University of Wisconsin, Madison. He is proud to be from the Badger State and still misses Wisconsin winters.

Kassim Al-Khatib, Co-Director

Dr. Kassim Al-Khatib is a Co-Director of the Western IPM Center and serves as principal investigator. Kassim is also Director of the University of California Statewide IPM Program and Professor of Weed Science at the University of California, Davis.

Kassim's multi-faceted research program focuses on various aspects of weed physiology, including herbicide-resistant plants, basic herbicide mode of action, weed-environment interactions, nontarget-plant responses to herbicides, and the ecological impacts of herbicide programs on different cropping systems. Notable research accomplishments during the past 10 years include development of grain sorghum that is resistant to two types of herbicides (ACCase and ALS herbicides); first confirmation of common waterhemp resistance to a type of herbicide known as a protox-inhibitor; research on gene flow among related sunflower species; and research on interspecific hybridization and gene flow of ALS resistance in *Amaranthus* species.

Kassim has been the principal or co-principal investigator on grants and gifts totaling more than $9 million during his research career and has guided the research programs of more than 25 graduate students. He has authored or co-authored more than 100 refereed journal articles, more than 220 abstracts and proceedings, 24 extension and research publications, and three book chapters, and he has two patents.

Kassim serves as an associate editor for the *International Journal of Agronomy*. He was president of the nonprofit Council of Agricultural Science and Technology (CAST). He also served as president of the Western Society of Weed Science, has been active in the Weed Science Society of America and the North Central Weed Society, and has been a member of several other professional societies. Kassim has received a number of honors and awards, including Fellow of the American Society of Agronomy, Fellow of the Weed Science Society of America, Fellow of the Western Society of Weed Science, and Fellow of the North Central Weed Society. Kassim is stationed at the Western IPM Center headquarters at UC Davis.

Peter Ellsworth, Co-Director

Dr. Peter Ellsworth is a Co-Director of the Western IPM Center. He is also Professor and IPM Specialist in the Department of Entomology, University of Arizona (UA) and Director of the Arizona Pest Management Center (APMC) at UA. In addition, he is the State IPM Coordinator and the State Pesticide Coordinator for Arizona. Peter received degrees in entomology from the University of New Hampshire (B.S., minor in Latin), the University of Missouri (M.S.), and North Carolina State University (Ph.D., minor in Crop Science).

With his split extension-research appointment at UA, Peter develops science-based solutions for IPM through applied ecological investigations and organized outreach programs of Cooperative Extension. His principal focus is on *Bemisia tabaci, Lygus hesperus,* and *Pectinophora gossypiella* in the cotton agroecosystem, in new crops, and in cross-commodity interactions. He has special interests in the integration of chemical and biological controls and landscape processes that control pest and beneficial insect distributions. Growers around the world in Australia, Brazil, Colombia, Mexico, and Israel have used his work in managing *Bemisia tabaci.*

Peter was awarded the Distinguished Achievement Award in Extension by the Pacific Branch of the Entomological Society of America in 2011, the Ag 100 Council's Faculty Member of the Year award in 2002, and he received special recognition in 1996 by the Arizona Cotton Growers Association for his role in assisting the industry's recovery from the disastrous whitefly problems of the early 1990s.

Peter established the APMC in 2003 as a multidisciplinary consortium of pest management scientists focused on research, outreach, and implementation of IPM in Arizona. In 2012, the APMC was awarded the U.S. Environmental Protection Agency's Pesticide Environmental Stewardship Program Gold Tier Shining Star award.

Peter is stationed at the Maricopa Agricultural Center, in Maricopa, Arizona, and resides in the Phoenix area.

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Five Lead the Center—*from page 3*

Paul Jepson, Co-Director

Dr. Paul Jepson is a Co-Director of the Western IPM Center, Director of the Integrated Plant Protection Center (IPPC) at Oregon State University (OSU), and Professor in the Department of Environmental and Molecular Toxicology at OSU. He is also State IPM Coordinator for Oregon.

Paul completed a B.Sc. ARCS (Associateship of the Royal College of Science) in Zoology and Applied Entomology at Imperial College, London, and a Ph.D. in Applied Insect Ecology at Cambridge University.

Paul's research interests in IPM include the study of pest and natural enemy population dynamics in agricultural systems. He has focused particularly on pesticide management and side effects, biological pest control, and the development of ecological risk assessment for beneficial invertebrates. He has worked in Europe and North America within numerous temperate and Mediterranean IPM systems, in West Africa on locust and grasshopper management, and in Peru on insect pest resistance management. Partners in these programs included the Food and Agriculture Organization (FAO) (a United Nations organization), the United Kingdom's Natural Resources Institute, Wageningen Agricultural University, the Institute of Environmental Sciences at the Jagiellonian University, Krakow, Poland, the Danish Natural Environment Research Institute, and the numerous programs and partners represented in the IPPC.

Paul is active in IPM education and extension in Oregon and the western United States and has also provided IPM instruction and workshops in the United Kingom, Norway, Germany, the Netherlands, Turkey, Kenya, Malaysia, and Peru. He has spoken at numerous international conferences on IPM and ecotoxicology. He has been a consultant to the U.S. Environmental Protection Agency on Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Scientific Advisory Panels and has been in collaboration with the National Risk Management Research Laboratory, the USDA-Animal and Plant Health Inspection Service's Biotechnology Regulatory Services, and the FAO Plant Production and Protection Division. He has served on a number of international, national, and state committees and working groups. Paul is stationed at OSU.

Carla Thomas, Associate Director

Carla Thomas is Associate Director of the Western IPM Center. Her expertise is in plant pathology/epidemiology, and her area of specialization is weather-based crop risk models and biosurveillance. She also has extensive experience in emergency response planning and exercises.

Carla has an M. Sci. from Michigan State University. During the 32 years of her career, she has worked in extension, research, and USDA program management roles for the University of California, Davis. She also spent 8 years in the private sector developing and implementing weather-based IPM decision support systems for governments, grower groups, private consultants, and farm production companies. While in the private sector, she worked throughout the United States as well as in Australia and eight other countries in Europe and Latin America. Recently, at UC Davis, she served as a co-founder and Associate Director of the Western Region for the National Plant Diagnostic Network (NPDN). She also served as the NPDN Exercise Coordinator and the Chair of the Epidemiology Committee. She was one of the recipients of the 2006 USDA Group Honor Award for Excellence and the 2010 USDA-National Institute of Food and Agriculture Partnership Award for Innovative Program Models. She has published more than 20 scientific papers and book chapters. Carla is stationed at the WIPMC's headquarters at UC Davis.

State Brief

ARIZONA

Responding to Resistance

By Al Fournier, William McCloskey, and Lydia Brown, Arizona Pest Management Center, University of Arizona

In Arizona, we have tried to organize our people and IPM programs to flexibly respond to the changing pest management needs of stakeholders. This includes the organization of faculty into multidisciplinary IPM Teams that work with Assistants in Extension to maximize responsiveness to emerging pest management issues. This has been a nimble and effective approach, as seen in the recent detection of, and response to, the suspected evolution of a glyphosate-resistant weed population.

In mid July 2012, a Monsanto representative reported poor control of Palmer amaranth (*Amaranthis palmeri*) with glyphosate in Roundup Ready® Flex cotton on a grower's field in central Arizona. After three applications at the maximum label rate, the majority of plants in the field were unaffected. On July 24, Dr. McCloskey and coauthors from our Field Crops IPM Team released a Field Crops IPM Short (***http://ag.arizona.edu/crops/cotton/files/ResistantPalmerShort.pdf***) to alert growers to the possibility of a resistance issue and to remind them of best management practices to minimize their risks. This was followed by Extension field days and workshops held at the same grower's field and other sites to educate growers about the nature of the challenge and management options for glyphosate-resistant Palmer amaranth populations.

Greenhouse studies were conducted by Dr. McCloskey with support from Field Crops IPM Assistant in Extension Lydia Brown to confirm and determine the level of glyphosate resistance. Seeds collected from the suspected glyphosate-resistant population and in other locations with suspected low-level resistant and known susceptible populations were grown out and tested for glyphosate susceptibility. Preliminary results from these studies and from independent research by Monsanto suggest the possibility of glyphosate resistance in the population collected from the grower's field mentioned above, but not from other sites. This suspected case of resistance will be reported to the International Survey of Herbicide Resistant Weeds (HRAC; ***www.weedscience.org***).

In 2013, Dr. McCloskey and co-workers will be addressing glyphosate-resistant Palmer amaranth management options through Extension programs and publications and conducting relevant research in collaboration with Monsanto and other concerned agrochemical companies. Our ability to respond quickly to this emerging issue has been strengthened by the flexibility and structure of the Arizona Pest Management Center and our Field Crops IPM Team.

Steering and Advisory Committees Guide the Western IPM Center

In September, the Western IPM Center's steering and advisory committees met with the new Center leadership in Portland. Both committees extensively discussed their concerns about potential upcoming changes in federal funding of pest management. The changes would be in line with USDA-NIFA's goal of combining all related pest management efforts into a single coordinated national response.

The committees also discussed and made recommendations about the Center's signature programs, priorities for Center-funded grants, the Center's communication vehicles and how these might be enhanced, Comment Coordinator protocols, ways to expand funding for the Center, and the breadth and rotation of membership on both committees.

Steering and Advisory Committee Members

Steering Committee

Dr. Steve Balling
Director, Agricultural and Analytical Services
Del Monte Foods

Ms. Sherry Glick
National Pesticides and Schools Coordinator
U.S. EPA

Dr. H. Michael Harrington
Executive Director, Western Association of Agricultural Experiment Station Directors
Colorado State University

Dr. Jennifer Miller
Sustainable Agriculture Associate
Northwest Center for Alternatives to Pesticides

Dr. V. Philip Rasmussen
Professor and Director of the Western Sustainable Agriculture Research and Education program (WSARE)
Utah State University

Advisory Committee

The advisory committee includes all members of the steering committee, plus:

Dr. Lori Berger
Executive Director
California Specialty Crops Council

Mr. Steve Ela
Partner and Operations Manager
Ela Family Farms

Dr. Dawn Gouge
Associate Professor and Associate Specialist—Urban Entomology
University of Arizona

Dr. Tom Holtzer
Department Head and Professor, Dept. of Bioagricultural Sciences & Pest Management
Colorado State University

Ms. Peg Perrault
Environmental Specialist
EPA Region 8

Dr. Jennifer Ryder Fox
Dean, College of Agriculture
California State University, Chico

Ms. Rebecca (Becky) Sisco
Regional Field Coordinator
Western Region IR-4

Dr. Doug Walsh
Professor and Entomologist, Department of Entomology
Washington State University
Irrigated Agriculture Research and Extension Center

Ex Officio Members

Dr. Herb Bolton
National Program Leader, Division of Plant Systems-Protection
USDA National Institute of Food and Agriculture

Dr. David Epstein
Entomologist
USDA, Office of Pest Management Policy

Rick Melnicoe

Highlights of Western IPM Center Grants Programs

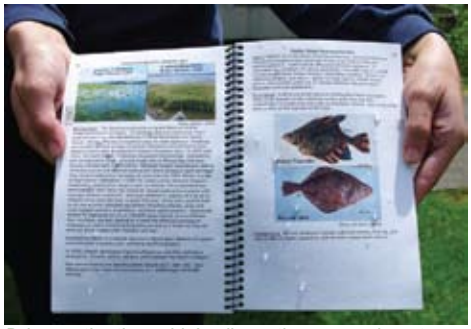
The following highlights of WIPMC grants programs show the breadth of projects funded and the impacts made to improve the economic benefits of adopting IPM practices and to reduce potential risks to human health and the environment caused by the pests themselves or by the use of pest management practices.

Illustrated Field Guide to the Pests of Bivalve Aquaculture in Washington and Oregon

Principal Investigators: Steven Booth and Kristin Rasmussen, Pacific Shellfish Institute, Washington

Summary: The *Pest Management Strategic Plan for Bivalves in Oregon and Washington*, published in July, 2010, featured descriptions of pests of bivalves and their impact. Several of the identified pests are invasive species, some of which have arrived in Washington or Oregon just within the last few years. They are not well known and sometimes difficult to distinguish from native species. Members of the PMSP's planning workshop, held in March, 2010, were unanimous in recognizing that the development of a field guide was of very high priority. Objectives of this project included 1) developing a pictorial guide to the pests of bivalve aquaculture in Oregon and Washington, 2) publishing the guide in both printed and electronic formats, 3) distributing the guide to commercial bivalve producers, educational groups studying estuarine ecology or other relevant curricula, regulatory agencies or councils dealing with invasive species issues, and beachcombers, and 4) measuring the guide's primary impact to bivalve aquaculture by surveying growers' abilities to identify pests prior to and after the guide's dissemination.

Results: 230 copies of the "Dichotomous Key and Illustrated Guide to the Pests of Bivalve Aquaculture in Washington and Oregon" were produced in hard copy on all-weather paper and bound in plastic covers so



Steven Booth

Drips on the the guide's all-weather paper do not smear ink.

they could be used on shellfish grounds and beaches. A PDF version was produced for dissemination on Web sites.

The dichotomous key section allows the user to identify individual pests according to their major taxonomic group or habitat. Both Latin and common names are provided. A separate page is provide for each pest that includes color photos and further summarizes status, description, and management options. The systematic or taxonomic placement of each pest is presented in a species list that includes both Latin and common names and codes that again indicate its status as a primary or secondary pest and its primary category.

The hard copies of the guide were given away to the first 125 commercial bivalve producer/members of the Pacific Shellfish Growers Association (PCSGA) who submitted requests through PCSGA or Pacific Shellfish Institute's (PSI) Web site. Hard copies were also distributed at PCSGA's annual conference and to interested members of Washington and Oregon state agencies, researchers, recreational divers, and beachcombers. Electronic copies of the guide can be viewed and downloaded from both the PCSGA and the PSI Web sites (see ***http://www.pcsga.net/farming-science/key-to-pests-of-bivalve-aquaculture/*** and ***http://www.pacshell.org/projects/bivalvePestGuide.html***). The ability of the guide to educate growers and others about bivalve pests is being measured through an on-line survey. Users of the guide are asked to click on the survey link and answer questions about the usefulness and completeness of the guide.

Impacts and Potential Impacts: The guide will impact bivalve aquaculture in Washington and Oregon by improving the ability of bivalve producers to identify and thereby manage pests. Pests can substantially suppress crop yields. Better pest management of bivalve pests will result in better yields and profits for producers, stimulating the economies of coastal communities. Better management will also improve water quality (through increased filtration) and enhance the estuarine environment by providing structure and habitat.

The guide will increase knowledge among non-producers, especially regulators, about the complex pest situation that faces commercial bivalve production in Oregon and Washington. Ultimately, the field guide will lead to better regulatory policy, especially regarding exotic organisms that may or may not advance to official invasive status.

The guide could potentially lead to reduced populations of invasive or non-native species that negatively impact not only bivalve aquaculture but also the ecology of intertidal communities in Washington and Oregon. Non-native oyster drills are widely distributed among Washington and Oregon estuaries. However, many people are likely not familiar with them or their eggs. Invasive tunicates pose an especially dangerous threat, and the guide is aligned with other efforts that spread awareness about that threat.

Improving IPM of Mosquitos by Addressing Scientific Uncertainty and Public Concerns

PI: Robert Peterson and David Weaver, Montana State University

Summary: IPM programs for mosquitoes are advanced in many areas. However, to address technical and public concerns, there was a need to empirically explore uncertainties about environmental concentrations and fate of mosquito adulticides delivered via ultra-low-volume (ULV) application. This project's objectives were to: 1) experimentally derive actual environmental concentrations of ULV insecticides and then use them to develop a statistical model relevant to ULV applications, 2) share the results and model with all relevant stakeholders, 3) develop a novel lower-cost method that mosquito management districts could use

Robert Peterson

Collection of insecticide deposition receptors on mannequin.

to quantify environmental concentrations of insecticides, and 4) evaluate the efficacy of insecticides sprayed in ULV applications with respect to structures and vegetation, which then could generate an IPM program to minimize the amount of insecticide sprayed while achieving maximum efficacy of those insecticides that are sprayed.

Results: Data from experiments during three field seasons in California, Montana, and Louisiana were used to construct a statistical model that predicts the movement and efficacy of ULV insecticides. The data and model showed which specific environmental and physicochemical variables influence the movement, risk, and efficacy of ULV applications. Wind speed, temperature, atmospheric stability, and droplet size significantly influenced the fate and efficacy of ULV applications. But the density of the formulation was the most important factor for determining the deposition of insecticides. This information was novel, since mosquito control districts and regulatory agencies assumed the droplet diameter was the most important factor for determining the movement of insecticides.

The statistical model created from the three locations and years was built into an Excel spreadsheet with a user manual and will be disseminated to all interested parties via the Web.

Impacts and Potential Impacts: Mosquito control districts and regulatory agencies will be able to determine the concentrations of ultra-low-volume insecticides in the environment. The knowledge from this study can be integrated into mosquito management plans, enabling managers to avoid applications during conditions that would result in high deposition of insecticides, thus reducing the risks to humans and the environment.

Adopting IPM on Oregon's School Landscapes

PIs: Aimee Code, Northwest Center for Alternatives to Pesticides; Tim Stock, Oregon State University

Summary: In 2009, Oregon passed a law requiring all Oregon schools to implement IPM policies by July 1, 2012. This project filled an important gap in IPM outreach, since the vast majority of school groundskeepers in Oregon had received no formal training in IPM, yet they would be required to fulfill the new state mandate. In addition, no funding was designated for the new law, yet it came at a time when school facilities and grounds staff were being cut due to budget shortfalls. These barriers made the new law daunting to many school districts.

To determine how to help school districts adopt landscape IPM, the project team drew from the needs expressed by stakeholders, including those represented in the IPM in schools PMSP (*School IPM 2015: A Strategic Plan for IPM in Schools in the United States*) and identified by the WIPMC-funded Western Region School IPM Implementation and Assessment Work Group. Project team members also contacted stakeholders, conducting a pest management survey of all 197 school districts in Oregon to learn the specific needs for the state. A significant need for greater support for IPM techniques on school landscapes was clearly identified.

This project sought to make IPM accessible and understandable to 10 school districts. Specific objectives were to 1) launch a model learning and demonstration site for landscape IPM at one Oregon public school (including an initial inspection, three site visits, and an evaluation) and 2) conduct a training to introduce IPM basics and practical hands-on landscape management IPM techniques to the people involved in managing school landscapes, with the goal of reaching at least 25 participants.

Results: The project provided 10 school districts (serving 114,500 students) with new tools for managing landscape pest problems, assisted three schools (serving 3,000 students) to become demonstration sites for landscape IPM, and helped in an ongoing process to have the two school districts

Eugene City Parks Department

Blue fescue planted in a tree well to create a weed barrier.

with the demonstration sites implement IPM district wide. Jointly, those two school districts serve 44,400 students.

The project team held a landscape training for 26 people from 10 school districts, focusing their education and outreach on key school landscape problems that previously had been controlled with routine herbicide use. These problems included weed growth where mowers could not reach (e.g., next to hardscapes and fence lines and around trees), weed control in playgrounds, and weeds in landscaping beds. The project team also worked with the schools to improve the outdoor environment to reduce indoor pest problems. For example, each school moved the dumpster to minimize insect and vertabrate pests, and they began trimming bushes and trees to keep plants off external walls and to decrease harborage for pests.

Solutions adopted as a result of this outreach included 1) creation of priority zones to minimize herbicide use and exposure, 2) planting of blue fescue or selected wildflowers around tree wells and in other areas where mowers could not reach, 3) eliminating herbicide use on the playground, and 4) building a list of groundcovers that could be planted in landscape beds to out-compete weeds. A number of site-specific recommendations also occurred, including 1) creating a native plant garden, 2) using a flame weeder, 3) conducting outreach to parents who were using herbicides in their current grounds management (especially in sports fields), and 4) using the active parent committee, already working on the grounds, to help manage high priority areas without pesticides. A quiz, taken both prior to and at the end of the trainings, showed a high level of comprehesionon of the topics covered. The participants' follow-up comments also showed interest in IPM. For example, one participant said he would be developing management zones to better prioritize maintenance.

Impacts and Potential Impacts: This project helped school districts address the causes of their landscape pest problems rather than treating the symptoms. The process selected by the project team for the demonstration schools showed that all three schools implemented the recommendations in a timely fashion. A number of landscape IPM techniques were adopted by demonstration schools. For example, a high threshold of acceptance was created for playground weeds (kept low by foot traffic); vegetation is being planted around trees to outcompete weeds; and grounds staff are attempting to "weed whack" prior to seed production. Pesticide use has decreased, as has pest pressure. In addition, outdoor harborage for indoor pests has been reduced. Two Oregon school districts are now adopting IPM plans that include strong landscape management components. The demonstration sites are easily replicated, and there is the potential to expand landscape IPM to other school districts in Oregon and around the West. In addition, school districts could potentially seek IPM Star or other certification for their outstanding practices.

Developing an Education Program on a Semiochemical-based IPM Method for Weevil Pests on Guam

PI: Gadi Reddy, University of Guam

Summary: High-risk insecticide usage in ornamental nursery plants, betel nut, banana, and sweet potato has been very high in Micronesia, including on Guam. Growers and nursery firms had little or no knowledge of the risks associated with the insecticides they used. They were also unaware of the benefits of using pheromones and fungal pathogens in controlling pests Guam's agricultural professional are generally locally-trained, with minimal exposure to the finer nuances of semiochemicals.

The purpose of this project was, through training, to build agricultural professionals' understanding of the role of semiochemicals in pest control programs. The training covered the relationship between semiochemical-based trapping methods and overall crop production on Guam for

Gadi Reddy

Project director describing the semiochemical techniques to agricultural professionals on Guam..

four important weevil pests: the banana root weevil, *Cosmopolites sordidus*, the New Guinea sugarcane weevil, *Rhabdoscelus obscurus*, and two sweet potato weevils, *Cylas formicarius*, and the West Indian sweet potato weevil, *Euscepes postfasciatus*.

Results: The project was carried out in three phases. In phase one, project team members worked on course development.

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Highlights—*from page 7*

Over 12 months, semiochemical-based trapping methods were implemented for control of the four targeted weevil species. Photos of trapping systems and pest damage symptoms, as well as the trapping date, were collected and developed into an instruction manual. In phase two, the team provided instruction. For 4 months, 10 agricultural professionals, using material developed in phase one of the project, were instructed on trapping methods, with emphasis on the importance of lure and trap characteristics and diagnosis of pest problems. Various traps, lures, and trapping methods were used. Phase three consisted of a field day and evaluation. The newly-trained agricultural professionals hosted a field day for growers and the general public. Two months after the field day, the agricultural professionals met with the project team. They provided feedback on the effectiveness of the project and evaluated the long-term gains in their knowledge of semiochemical-based trapping methods.

Impacts and Potential Impacts: Pheromone trapping techniques were optimized for the important weevil pests targeted in this project. The project helped growers replace the traditional use of pesticides in the region with lower-risk pest control methods. The manual prepared under this project and distributed to agricultural professionals significantly improved their knowledge of the weevils and the demonstrated trapping techniques. The agricultural professionals have disseminated the information on trapping techniques to growers on Guam, and it is expected they will also disseminate it to growers in the Commonwealth of the Northern Mariana Islands. As the growers themselves adopt and follow the techniques, the result will be greater protection of human and environmental health.

*See the Western IPM Center Web site, **http://www.wripmc.org**, for further details about objectives, results, and impacts of WIPMC-funded projects.*

IPM and Water Quality Training Modules Completed

Beginning in late 2011 and continuing throughout 2012, the WIPMC coordinated a signature program to develop multi-disciplinary curricula on "Best Management Practices to Reduce Pesticide Impacts on Water Quality in the West," adapted to different audiences and needs (e.g., Pesticide Safety Education Program educators, Master Gardeners, professional landscapers, and growers). To serve these audiences, program participants created three 1-hour modules for 1) agriculture, 2) urban settings (parks, golf courses, etc.), and 3) urban settings (Master Gardeners/homeowners).

Peer review and final editing for all three training modules was completed in December, and the modules are now available to IPM educators. To link to the modules for viewing or downloading, visit ***http://www.wripmc.org.***

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Mark Your Calendar

2013

January

- Western Orchard Pest and Disease Management Conference, January 9–11, Portland, Oregon. ***http://www.tfrec.wsu.edu/pages/wopdmc***

February

- 10th Annual Diversified Agriculture Conference, February (date TBA), Ephraim, Utah ***http://diverseag.org***
- 53rd Annual Meeting of the Weed Science Society of America & 67th Annual Meeting of the Northeastern Weed Science Society, February 4–7, Baltimore, Maryland. ***http://www.wssa.net/meetings/wssaannual/info.htm***
- World Ag Expo, February 12–14, Tulare, California ***http://www.worldagexpo.com***

March

- Western Society of Weed Science Annual Meeting, March 11–14, Catamaran Resort Hotel, San Diego, California. ***http://www.wsweedscience.org/default.asp***
- 59th Annual Conference on Soilborne Plant Pathogens (formerly Soil Fungus Conference), March 26–28, Oregon State University, Corvallis, Oregon. ***http://soilfungus.ars.usda.gov***

April

- 97th Annual ESA Pacific Branch Meeting, April 7–10, Harrah's Lake Tahoe, Stateline, Nevada. ***http://www.entsoc.org/Pacific/2013-esa-pacific-branch-annual-meeting***

June

- 2013 APS Pacific Division Meeting, held jointly with APS Caribbean Division, June 17–19, Westward Look Resort/Wyndham Grand Resort and Spa, Tucson, Arizona. ***http://www.apsnet.org/members/divisions/pac/meetings/Pages/default.aspx***

July

- 52nd Annual Meeting of the Society of Nematologists, July 14–17, Cleveland, Ohio. ***http://www.nematologists.org***

August

- American Phytopathological Society (APS)-Mycological Society of America (MSA) Joint Meeting, August 10–14, Austin, Texas. ***http://www.apsnet.org/meetings/annual/pages/default.aspx***

November

- Entomological Society of America 61st Annual Meeting, November 17–20, Austin, Texas. ***http://www.entsoc.org/am/fm/index.htm***

2014

- 26th Vertebrate Pest Conference, March 3–6, 2014, Big Island, Hawaii. ***http://www.vpconference.org***

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