



2006 Annual Report

Western Integrated Pest Management Center

WIPMIC

Director's Comments

This is the second annual report of the Western Integrated Pest Management (IPM) Center. During the past year the Center has undergone an external review of the Regional IPM Centers, funded numerous projects, work groups, and information networks, and participated in international, national, and local meetings, workshops, and symposia.

The Western IPM Center is one of four centers in the United States. Each center is unique in the issues it addresses, but all follow the overarching guidance of the National IPM Roadmap, which identifies agricultural, urban, and natural systems goals. The Road Map is available at <http://www.ipmcenters/IPMRoadMap.pdf>. The goal of the National IPM Program is to improve the economic benefits of adopting IPM practices and to reduce potential risks to human health and the environment caused by pests or by the use of pest management practices.

Funding provided to the Western IPM Center comes primarily from the United States Department of Agriculture, Cooperative State Research, Education, and Extension Service (USDA-CSREES). This funding is used to support Center activities through several programs.

Information Networks. Information networks at the state or multistate level provide needed information about pest management needs and tactics at the local level. These networks respond to information requests from USDA and USEPA. Coordination of these requests often occurs via regional comment coordinators.

Pest Management Strategic Plans (PMSPs). Regional staff develop pest management strategic plans. These documents are used by industry and by state and federal authorities as they try to understand pest management uses and needs in agricultural settings.

Work Groups. Focused work groups are funded to address particular issues, such as pesticide resistance management, urban IPM, weather modeling and pest forecasting, and other topics. These work groups have been enormously successful in leveraging other funds to address issues identified as important in the West. Several large grants have been obtained by work group members as a result of the small support provided by the Western IPM Center.

Grants. As research and education needs are identified through the work groups and other stakeholders, the Western IPM Center is able to provide some funding via an annual grant program and through small startup grants. The small startup grants can be quickly funded to address newly emerging issues, such as diseases or other pest outbreaks.

Advisory and Steering Committees

Two standing committees guide the Center. The Advisory Committee provides vision and guidance. Its members represent a wide range of stakeholders that link the Center to stakeholder needs and priorities for pest management programs in the West. These advisors, integral to Center outreach, promote awareness of the Center's resources to their constituencies and beyond. The Steering Committee gathers input from stakeholders (including the Advisory Committee), determines broad policy goals and priorities, recommends Center budgets, and provides direction for timely and effective Western IPM Center management.

In the pages of this annual report, we highlight some of the activities and people that have made the Western IPM Center a success.

Highlights of WIPMC Grants Programs

Spatially Explicit Approaches for Measuring and Implementing Higher Level, Multi-Crop, Multi-Pest IPM

Principal Investigators: Peter C. Ellsworth and Al Fournier, University of Arizona, Maricopa; Yves Carrière, University of Arizona, Tucson; John C. Palumbo, University of Arizona, Yuma



(Photo by Jack Kelly Clark)

Problem: The investigators have developed IPM guidelines for cross-commodity management of whiteflies. These guidelines provide for sharing of important reduced-risk chemistries among major crops like cotton, vegetables, and melons to delay the development of resistance in pest populations. But adoption of these guidelines over large areas, often with multiple crops, will be required to ensure area-wide reduction in whitefly populations and to provide effective resistance management for major reduced-risk technologies.

Objectives: (1) Using newly developed spatially explicit analysis methods, quantitatively evaluate group adoption of the guidelines by Arizona growers; (2) through dialog with stakeholders, gain insight into the adoption of specific reduced-risk chemistries and other IPM behaviors in Arizona cropping systems; and (3) develop a better, more responsive approach to IPM guidelines generation, evaluation, and education.

Interim Results: Objective 1 required access to reliable insecticide use data linked to specific geographic locations for multiple agricultural crops, so the first phase of the project focused primarily on the development of these data. Partnerships established among University of Arizona Cooperative Extension, the Arizona Department of Agriculture, and USDA's Arizona office of the National Agricultural Statistics Service were instrumental in developing the data. Investigators gained access to five years of pesticide use reporting (PUR) data, including geographic references that, when combined with available geographic information system (GIS) maps, can link pesticide applications to specific areas. Investigators are developing

a database for testing spatially derived hypotheses about IPM practice adoption.

Ongoing dialog with growers and pest control advisors (PCAs) at Cooperative Extension meetings provided insights into barriers to IPM adoption (objective 2). To complete this objective, investigators will conduct further quantitative spatial analysis of the PUR data and follow-up interviews with PCAs and growers in the next stage of the project. Ultimately, the insight gained about potential adopters' IPM decisions will allow investigators to develop an improved approach to IPM guidelines generation, evaluation, and education (objective 3).

Development of an IPM Program for Arthropod Pests of Cool-Season Grass Hay Crops

P.I.s: Larry Godfrey, University of California, Davis; Doug Walsh, Washington State University



Problem: Hay from cool-season grasses, especially timothy (*Phleum pretense*) and orchardgrass (*Dactylis glomerata*), is an important crop in several western states. As the crop acreage, market demands, and importance to local agricultural economies all increase, the needs for and scrutiny of sound IPM practices have also increased in the crop.

Objectives: To investigate sampling protocols, decision thresholds, the influence of cultural practices on pest populations, and the incidence of biological control on sites in California, Washington, and Nevada, and to develop the data needed to design a baseline IPM program for major arthropod pests of cool-season grass crops.

Interim Results: Studies targeting two species of thrips and four to five species of mites were initiated in the fall of 2005 in California, Nevada, and Washington. Investigators quantified populations of these pests and the key natural enemies every 10 to 14 days in untreated timothy fields and evaluated the effects of these pests on timothy yield and on hay quality.



In Washington, mite populations have not reached numbers high enough to cause economic damage. At two locations in Nevada significant thrips populations developed but did not significantly impact hay yields; however, hay quality and visual appearance, which are of utmost importance in this market, were reduced by high thrips levels. Similar results were found in California. Investigators are evaluating methods to sample thrips populations and exploring control measures for thrips and mite pests. In a Washington timothy field, they conducted a dormant oil efficacy trial for spider mites, including winter oil, summer oil, four different insecticides/miticides, burning, and mowing. Spider mites were greatly reduced in post-treatment grass and soil samples in all treated plots, while mites increased in the untreated plots in the soil samples. Burning and mowing were just as effective in reducing spider mites as oils and pesticides. In California and Nevada, the efficacy of registered and experimental insecticides, including some organic options, was compared for thrips. Data are still being tabulated from preserved samples.

Integrated Control of Spotted Knapweed: Utilizing Spotted Knapweed-Resistant Native Plants to Facilitate Revegetation

P.I.s: Mark Paschke, Jorge Vivanco, and Laura Perry, Colorado State University; Ragan Callaway, University of Montana

Problem: Invasive plants are recognized as having severe ecological and economic impacts. Affordable long-term management methods are lacking for many of the most destructive exotic invasive plants, including spotted knapweed. Research on weed invasions has primarily focused on aboveground processes. However, it is now known that plant roots are unparalleled factories of diverse chemicals, and that the secretion of a phytotoxin by the roots of knapweed is a possible mechanism for its success in replacing native species. Understanding this below-ground chemical warfare can suggest completely new approaches to managing and restoring invaded landscapes.

Objectives: (1) To determine if plants that excrete high concentrations of organic acids into the rhizosphere (the soil region around a plant's roots) can be used to detoxify spotted knapweed soils and allow for the subsequent establishment of native vegetation. The native vegetation to be examined will include an arsenal of knapweed phytotoxin-resistant and knapweed phytotoxin-sensitive species that investigators have screened and characterized under previous funding; (2) to identify which of the knapweed phytotoxin-resistant plants identified under previous funding also produce high concentrations of knapweed phytotoxin-fighting organic acids.

Interim Results: Based upon the results of earlier greenhouse studies identifying knapweed phytotoxin-tolerant and knapweed phytotoxin-sensitive native plants, investigators have initiated two field experiments in knapweed infested areas of Montana to study the effects of different seed mixes on resistance to knapweed reinvasion. These field studies should result in recommended seed mixtures for reclaiming knapweed infested rangelands in the western United States.



Reduced Fungicide Use for Hop Downy Mildew Management

P.I.s: Cynthia Ocamb and Leonard Coop, Oregon State University; David Gent, USDA-Agricultural Research Service (ARS)

Problem: Hop (*Humulus lupulus*) is an economically important crop in the western United States, producing nearly the entire U.S. supply and greater than 30% of the world supply of hops. Hop downy mildew, caused by *Pseudoperonospora humuli*, is one of the oldest and most devastating diseases of hop and remains a serious threat to sustainable and profitable hop production. Current management relies heavily upon chemical inputs, with some growers using as many as 10 applications per season to suppress disease. The need to develop multi-tactic strategies that reduce unnecessary pesticide use is underscored by increasing production costs and concerns over food safety and environmental quality.



Objective: The overall objective of this project is to improve hop grower profitability and sustainability with reduced-risk pest management tactics that will protect hop plants against downy mildew and conserve environmental quality.

Interim Results: Investigators employed a downy mildew forecast model, developed in England, that predicts infection events in response to rainfall, hours of high relative humidity, and temperature. They found that fungicide applications applied according to this downy mildew risk index provided disease suppression similar to that of the standard grower (preventative) spray program, but with three fewer applications during 2005 and four fewer applications than the grower standard in 2006. Concentration of downy mildew spores in the air was measured with an air sampler, and weather variables were monitored. Preliminary analysis of the 2005 data suggests that of the weather variables investigated, duration of morning leaf wetness was the most accurate predictor of major infection events.

Potato IPM Scouting Manual (A Pocket Guide in English and Spanish)

P.I.s: Ronda Hirnyck and Wayne Jones, University of Idaho

Problem: There are currently no potato IPM manuals in English or Spanish that are specifically directed at field scouting.

Objectives: To develop, design, and publish a potato IPM scouting manual in English and Spanish that will fill unmet pest management needs in Pacific Northwest potato production. To provide training on the use of the manual to Cooperative Extension personnel, growers, and State Lead Agency representatives who will subsequently train farm laborers.

Interim Results: Using existing potato IPM publications and interviews with university specialists, investigators produced a preliminary outline for the Potato IPM Scouting Manual that includes a "wish list"

of pests (including insects, diseases, weeds, and nematodes) and details about when during the crop cycle each pest occurs, when scouting activities should occur, what part of the field and plant need to be scouted, and when damage is present. Investigators then compiled a preliminary inventory of photos that are needed in order to correctly identify each pest and its damage.

The group developed a sample manual and conducted a pilot workshop at the 2005 University of Idaho Potato Conference in Pocatello, Idaho. Information outlined in the sample manual included: a detailed scouting plan, a photograph identifying each pest and the damage it causes, graphics depicting where to scout for each specific pest, its economic threshold, and a place to record data. Attendees were asked to scout for the diseases outlined in the sample manual. Data recorded by the participants were collected and used to evaluate the utility and ease of use of the manual. Attendees also provided comments on how to improve the manual. Subsequent pilot workshops were conducted in Blackfoot, Grace, and American Falls, Idaho in June of 2005 utilizing the revised sample manuals.



(Photo by Reed Findlay)

Walnut Pest Management Alliance: A Research and Implementation Project

P.I.s: Carolyn Pickel and Joe Grant, University of California Cooperative Extension

Problem: Codling moth, since it is a key pest in walnuts, is the primary target for broad-spectrum insecticide use in walnut production. Water quality issues, more restrictions on certain pesticides used to control codling moth, and codling moth's increasing resistance to the most commonly used pesticides have all increased the pressure for alternative management strategies.

Objectives: The primary objective of the walnut Pest Management Alliance (PMA) is to reduce the use of pesticides in walnuts by continuing to refine the techniques for codling moth control using area-wide pheromone mating disruption (PMD).

Impacts: Special Issues

Application technology for pheromone-based mating disruption continues to evolve, and the walnut PMA is flexible enough to incorporate emerging technology.

Interim Results: In the last several years, the walnut PMA has successfully demonstrated codling moth management using PMD in a sprayable formulation applied at very low rates with a conventional orchard sprayer. In 2005, the PMA tested two different tactics for the application of PMD. The sprayable formulation was applied with a custom-made, ultra-low-volume applicator in order to reduce application costs. Also in 2005, two long-term, area-wide trials (total acreage greater than 700) were started using aerosol pheromone puffers. The aerosol puffer units are hung high in the tree canopy at a rate of one unit per two acres and are designed to emit pheromone all season. The two puffer trials continued in 2006 with the goal of reducing the use of insecticide supplements. Large-scale testing of pheromone laminate flakes was begun in 2006 at three locations. The flakes are applied with a helicopter using a custom-made bucket dispenser. The flakes stick in the tops of the trees and emit pheromone for 60–75 days.

The walnut PMA maintains a strong alliance among walnut industry representatives, University of California researchers and farm advisors, Community Alliance with Family Farmers Biologically Integrated Orchard Systems (BIOS) partners, California Department of Pesticide Regulation representatives, grower cooperators, and pest control advisors (PCAs). At the beginning of each year these groups meet to share trial results and to ensure the project is addressing current pest management issues, both locally and state wide. Insight from these partners helps the project to remain current in its focus. Input from end users, such as PCAs and growers, is especially important, as the PMA hopes to move toward wider adoption of reduced risk pest management systems.



See the Western IPM Center Web site, <http://www.wripmc.org/>, for further details about objectives, progress, and outcomes of WIPMC funded projects.

Special Issues Projects Yield Results

The Western IPM Center has an ongoing call for proposals to address special IPM issues in the West. Special issues funding may be requested to convene groups of people to address emerging issues such as new pests, water concerns, development of proposals for larger grants based on documented stakeholder needs, or development of Pest Alerts. The Western IPM Center has funded several projects under this program this year. The impacts of some of these small grants (up to \$5,000 each) are summarized below:

- Dialogue promoted between researchers and pest managers to identify future research needs for effective policy and pest management decision making.
- Teachers educated about the impacts of pesticides on watersheds and the reduction of pesticide use in and around schools. Educators received resources to implement IPM-based activities and lessons with their students and gained knowledge, tools, and incentives to incorporate activities into their curricula that improve water quality and reduce pollution.



- Long-term, sustainable pest management program developed in the Pacific Northwest for potato tuber moth (a new emerging pest). This program will be delivered to growers, extension agents, and crop consultants for immediate use.
- Leading researchers from different disciplines brought together to present information on the latest and best science related to tamarisk biology, ecology, impacts, control, and restoration.



(Photo by Rick Melnicoe)

Addressing Western IPM Issues

Newly Funded Critical Issues Projects

The Western IPM Center funded four critical issues projects, totaling \$93,475 in the fall of 2005.

The projects:

- Predator Control of Rodent Pests
Principal Investigator: Jacki Hastings, Polk Soil and Water Conservation District
- Research and Extension on Integrated Biological and Cultural Management of Canada Thistle
PIs: Fabian Menalled and Perry Miller, Montana State University; Sue Blodgett, South Dakota State University
- Development of a Yellow Starthistle Management Guide for the Western United States
PI: Joseph DiTomaso, University of California, Davis
- A New IPM Delivery Method to Increase Adoption Rates
PIs: Ronda Hirnyck, Edward Bechinski, and Steven Reddy, University of Idaho



Further information is online at <http://www.wripmc.org/>.

Collaborations

National IPM Evaluation Group

The National IPM Evaluation Group (NIPMEG) is a clear indication that collaboration is under way. Western IPM Center staff participate actively in this collaborative effort that includes representatives from EPA's Strategic Agricultural Initiative Project, the USDA/CSREES regional IPM centers, and the CSREES National Program Leaders. The work group first met at an October 2004 workshop to explore mutual EPA/USDA goals for measuring success and to create a long-term strategy for cooperation on IPM performance measurement and outcome reporting. Issues discussed included impact assessment of IPM and data sharing. NIPMEG met November 14–15, 2006 in Dallas, Texas to work together on three areas:

- to review sixteen draft logic models that were developed by the National IPM Evaluation subcommittee and to identify target outcomes and indicators by applying the logic model framework to the goals of the National Roadmap for IPM
- to evaluate the database developed by the Reporting subcommittee for reporting progress of funded projects toward those target outcomes
- to share experiences of successful collaboration with the Natural Resources Conservation Service on IPM training and implementation

NIPMEG's fourth meeting is scheduled for fall of 2007.

A Pest Management Strategic Plan for IPM in Schools in the United States

Henderson, Nevada was the setting for a national IPM in schools Pest Management Strategic Plan (PMSP) work group meeting on October 24–25. Sherry Glick, USEPA, arranged the meeting near her Las Vegas office.



(Photo by Rick Melnicoe)

During the two-day workshop, 31 participants drafted a strategic plan to meet the group's agreed upon goal of implementing high-level IPM in K–12 schools nationwide by 2015. High-level IPM implementation would include, among other

things, IPM education for everyone involved in schools, from students to administrators, and extensive use of non-chemical controls such as architectural design. Participants from public school districts, university extension, regulatory agencies, nongovernmental organizations, and industry came from all over the United States to participate in the workshop. Discussions revolved around such questions as:

- What are the pest problems?
- Where are they within a school?
- What are the management options?

- Who needs to address them?
- Who needs to be educated to achieve the goal of high-level implementation by 2015?

Tom Green, of the IPM Institute of North America in Madison, WI, is the lead principal investigator for this project. Tom anticipates completion of the strategic plan in 2007. Funding for the strategic plan workshop and publication came from all four regional IPM centers and directly from USDA-CSREES.

Pest management strategic plans were originally developed for cropping systems. They are now being expanded to address nonagricultural settings. This allows policymakers to receive input on pest management issues from the broadest array of stakeholders. The regional IPM centers recognize that supporting strategic plans, such as the IPM in Schools PMSP, brings together a wider range of experts in pest management. Our collaborations with other agencies (EPA, HUD, local governments, school districts, etc.) enhance opportunities to expand IPM.

Information Networks Solve Problems

Activities of the Western IPM Center's information networks have resulted in everything from added worker protection to retained pesticide uses for minor crops. Each information network is comprised of many people working on a variety of issues. The main functions of information networks are to:

- serve as resources for information about the importance of pesticides and other pest management tactics in local production systems and urban and natural systems covered by the network
- collaborate and/or coordinate with a diverse group of stakeholders, including extension IPM coordinators
- identify critical issues
- aid in identifying appropriate individuals to whom IPM tactics use surveys, crop profiles, and Pest Management Strategic Plans (PMSPs) should be addressed



(Photo by Rick Melnicoe)

The network participants are closely involved in many activities directly related to the mission and goals of the Western IPM Center. They serve as members of work groups; organize or assist on PMSP teams; and participate in peripheral programs such as the Interregional Research Project No. 4 (IR-4), water quality, Natural Resources Conservation Service, sustainable agriculture, and many others.

This involvement provides avenues for the Western IPM Center to understand and address stakeholder needs. Followup activities from PMSPs have resulted in several research projects, IPM manuals, pesticide registrations, and improved IPM in many crops.

New Staff

Diane Clarke Joins Western IPM Center as Writer

In August, Diane Clarke joined the Western IPM Center staff as an editor and writer for a variety of center publications, including the quarterly newsletter, annual report, Pest Management Strategic Plans, Crop Profiles, and Pest Alerts. Diane will also work on developing new informational materials and tools to support and further the Center's all-important communication component.

A University of California, Davis employee for more than 11 years, Diane began in 1996 as an administrative assistant for the Pesticide Safety Education Program (PSEP), part of the University of California

Statewide Integrated Pest Management Program. In 1998, Diane became a writer for PSEP and served in that capacity until 2004. Since then, she has worked in the International Relations Program as an academic advisor and the Office of Research as an intellectual property assistant.

Diane received her bachelor's degree in English from California State University, Fresno, and her master's degree from Fuller Theological Seminary.



Diane Clarke

Work Groups

Western IPM Center Sponsors Seven Work Groups

Western IPM Center funding currently supports seven issue-based work groups involving:

- Crop insect losses and impact assessment in California and Arizona cotton and other crops
- Western region school IPM implementation and assessment
- OnePlan IPM Planner: collaboration with Natural Resources Conservation Service (NRCS) in developing IPM guidelines as part of NRCS conservation plans
- Development of a technical work group that discusses and refines standards and protocols for the collection, analysis, and Web delivery of weather data for IPM purposes
- A Pacific Northwest small fruits work group to identify and prioritize IPM research projects
- A Pacific Northwest coalition that collaborates on a multitude of issues
- Development of a Structural Pest IPM Program and 2007 IPM Curriculum and prioritizing of research projects to be conducted at the new Structural Pest Research and Demonstration Facility at Washington State University, Puyallup



The eleven-member Structural Pest IPM Work Group includes a diversity of stakeholders from California, Colorado, Hawaii, Idaho, and Washington.

Impacts

OnePlan IPM Planner Work Group

Adoption and implementation of IPM practices to minimize environmental risks from pesticides have long been goals of pest management programs, and they are integral to the National IPM Roadmap. To attain these goals, producers must shift from traditional pesticide use to a more holistic consideration of all available IPM strategies. The OnePlan IPM Planner work group has identified that by using the USDA Natural Resources Conservation Service's (NRCS) Conservation Planning process and incorporating IPM guidelines into farm planning, growers have a planning tool they can utilize to help them make that shift. In addition, the work group helped to develop a process and system to begin incorporating these IPM guidelines into the NRCS protocols. The impacts of this work group are:

- Potential for reducing pesticide use and risk on farms.
- Input for the development of a quicker planning tool that will get farm plans promoting IPM on the ground in a more timely manner.
- Adoption of two pest management practices (green manures and field scouting) by Idaho NRCS for use with the Environmental Quality Incentives Program (EQIP). This is a first for the Idaho NRCS.

Structural Pest IPM Work Group

An eleven-member work group was established with a diversity of stakeholders from five western states (CA, CO, HI, ID, and WA). This group identified the top structural pests for each state or geographical area (AZ, CA, HI, ID, NV, OR, WA) to include in the Structural Pest IPM curriculum to be used for demonstration workshops and training programs at the Structural Pest Research and Demonstration Facility at Washington State University, Puyallup.

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Three Lead the Center



Rick Melnicoe

Rick Melnicoe, active in pest management issues for more than 25 years, serves as the director of the Western IPM Center (WIPMC), headquartered at Meyer Hall, University of California, Davis.

Co-director is entomologist Tom Holtzer of Colorado State University, Fort Collins, and associate director is Linda Herbst of UC Davis.

The WIPMC 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.

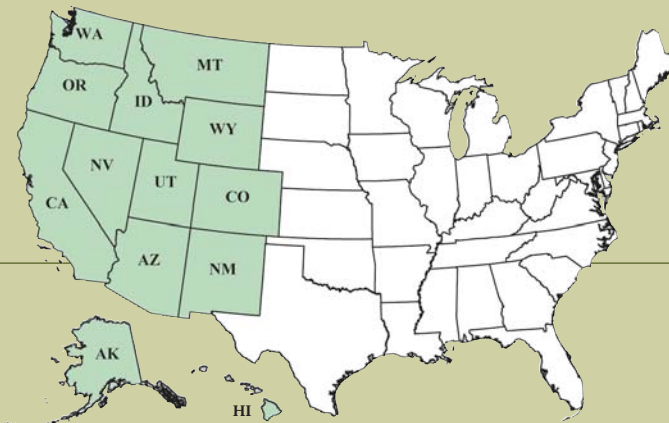
The contracted center staff includes regional comment coordinators, regional Pest Management Strategic Plan/crop profile coordinators, and an IPM regional grants manager, located throughout the region.



Tom Holtzer



Linda Herbst



Structural Pest IPM Work Group (continued)

The impacts of this work group are:

- A detailed education plan for the Structural Pest IPM Program was developed, and a two-day pilot Structural Pest IPM Workshop occurred at the Structural Pest Research and Demonstration Facility in October, 2006. There are four training programs planned for the facility during 2007 as a result of input from the participants of the pilot workshop.
 - The work group identified alternative control techniques as the top priority research need for structural pest IPM in the western United States. Alternatives to perimeter applications could reduce runoff and water contamination.
 - The curriculum developed by this work group stressed that IPM in the urban environment requires accurate identification of the pest, evaluation of the damage or health threat posed by such infestations, and a determination of conditions conducive to infestation.
- The WSU Structural Pest IPM Web site was developed and launched during this work group project period. The Web site (<http://structuralpest.wsu.edu>) provides information to clientele and stakeholders on education and resources for structural pest IPM.



Small Fruits Work Group for Oregon and Washington

The blueberry, raspberry, blackberry, and strawberry (referred to collectively as small fruit) industries in Oregon and Washington share many common pest management concerns and practices. The Small Fruits Work Group includes a balance of industry representatives, growers, and public researchers. It was formed to enhance the ability of these related crops and research institutions to make the most of their combined resources through the development of new communication tools, access to collaboration opportunities on projects, and better coordination of research priorities. The impacts of this work group are:

- Development of the insect/disease searchable database on the www.nwipm.com Web site. This is being used extensively and now has industry sponsorship to support its maintenance.
- *The Small Fruit Update* newsletter has provided a medium for disseminating the weekly input of work group members to growers, industry, and researchers.

- The work group was directly responsible for organizing and recruiting participants in development of a successful USDA Western Region Sustainable Agriculture Research and Education grant proposal entitled "Encouraging Sustainability in Small Fruits by Educating Producers on Scouting and Decision-making Parameters."
- Lines of communication between publicly funded small fruit researchers and extension agents and the industries they serve have been greatly enhanced.

Crop Insect Losses and Impact Assessment Work Group

Impact assessment is central to the evolution and evaluation of IPM programs. Quantifiable metrics on insecticide use patterns, costs, targets, and frequency; on crop losses due to all stressors that impact yield and quality; and other real world economic data (e.g., crop value) are the most objective tools for assessing change in IPM systems. Prior to formation of the work group, the investigators' efforts had been organized around cotton. This project has enabled formalization and extension of the process to melons and lettuce in Arizona as well as extension of coverage to the low deserts of California, and the project is beginning to serve as a model for establishing similar efforts in other crops, for other pest groups, and in other regions. The impacts of this work group are:



(Photo by Rick Melnicoe)

- In collaboration with scientists and stakeholders throughout the low desert areas of Arizona and southern California, work group investigators have provided a forum for discussion and development of crop insect loss and impact assessment in key economic crops of this region.
- The project serves as a clearinghouse for information and metrics on crop insect loss and impact assessment thus facilitating assessments of additional pest groups and in new areas of the West and beyond.
- These data and this work group serve to address any federal, regional, state, or local requests for information on the impact of insects or insecticides on key crops.
- This work group is directly measuring the intent of each insecticide input by asking stakeholders to identify the specific intent or intended target or targets of their management decisions and inputs.
- Members of this work group were successful in their application for a multi-state USDA Risk Avoidance and Mitigation Program (RAMP) grant in the amount of \$2,500,000 in 2006.

Western
IPM
Center

For more information on the
Western Integrated Pest Management Center, see
<http://www.wripmc.org/>

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