

Additional Accomplishments and Impacts for the Reported for 2009-2010

State-Level Accomplishments and Impacts

Alaska

1. Educational programs disseminate research-based knowledge to 14,000 (fourteen thousand) Alaskans annually, including: professional pest-control operators, home gardeners & commercial agriculture clients, home & property owners, community groups & organizations, youth & volunteer groups university departments, & the general public.
2. The IPM Program distributes thousands of CES/UAF Publications, annually.
3. Actively engaging the community with training that is multiplied (train-the-trainer) for community volunteers including: Master Gardeners, Community Tree Stewards, Youth Groups, and the Anchorage School District. IPM staff contribute and participate in classes, conferences and trainings with outreach at public events throughout the state.
4. IPM staff serve Alaskans and promote Natural Sciences Education, with IPM staff serving on State of Alaska Community Forest Council and by distributing UAF & admissions publications.

Arizona

1. We conducted a statewide stakeholder needs assessment for IPM in agronomic crops as part of our 2009-10 Extension IPM grant. **Impact:** *This needs assessment informed our 2010-13 EIPM proposal with respect to the agronomic crops area of emphasis, helping us to focus our limited resources according to identified stakeholder priorities.*
2. AZ is leading development of two regional Pest Management Strategic Plans, one for Cotton production in AZ and Southeast CA and one for Turf in low and high desert Southwest including AZ, CA and NV. Stakeholders have met and both documents are in the final write-up stage. **Impact:** *Once completed, these documents will identify research, education and regulatory priorities for these crops.*
3. In May 2010, University of Arizona in cooperation with the Arizona Crop Protection Association (AZCPA) completed a revised and greatly expanded Pest Control Advisor (PCA) manual. These education materials support PCAs taking the state licensing exam administered by the Arizona Department of Agriculture (ADA) and will be available through the AzCPA. The book presents an Integrated Crop Management / Integrated Pest Management perspective and comes bundled with the UC ANR publication "IPM in Practice." **Impact:** *This revision replaced a training manual that is nearly 20 years out of date and will bring our industry professionals to a new standard, enhancing IPM knowledge and implementation. The ADA has revised and updated the PCA licensing exam to be consistent with the new manual.*
4. In January 2010, the Vegetable IPM Team launched bi-weekly IPM advisories for growers and pest control advisors. The updates feature information on insect, weed and disease management in vegetables, scouting techniques, and more. They are posted on our Arizona Crop Information Site at <http://ag.arizona.edu/crops/vegetables/advisories/advisories.html> and are also sent to subscribers as smart phone updates.
5. We continue to develop data, tools and resources to support evaluation of IPM adoption and impact. This includes significant investment in development of a 20-year historical database of Arizona Pesticide Use Reporting (PUR) data in partnership with the Arizona Department of Agriculture. This effort has received a funding boost through 2 recent successful Arizona

Department of Agriculture Specialty Crop Block Grants that will partially support a database specialist position for the next 3 years. **Impact:** *These data are used to respond to federal information requests as reported on the Arid Southwest IPM Network website (http://ag.arizona.edu/apmc/Arid_SW_IPM.html).*

6. We are engaged in a Pest Management Alternatives Program (PMAP) grant to evaluate resistance management concerns for whitefly chemical controls across multiple crops. As part of this project, and with stakeholder input, we are revising cross-commodity IPM guidelines for whitefly control. **Impact:** *The anticipated impact of this project is promotion of statewide adoption of cross-commodity pesticide use practices that will help sustain important chemical tools for whitefly management.*
7. The Pesticide Safety Education Program (PSEP) is now managed through the Arizona Pest Management Center (APMC) and our statewide multidisciplinary IPM Coordinating Committee. Peter Ellsworth has been appointed IPM Coordinator, replacing Paul Baker. For the past two years, our limited PSEP funds have been managed through a mini-grants program administered through the APMC. **Impact:** *Through these mini-grants we have stimulated training opportunities in remote areas of Arizona for diverse audiences, supporting both initial pesticide applicator certifications and delivery of CEUs in cooperative programs with the Arizona Department of Agriculture. A summary of PSEP projects and their impacts is available on the Arizona Pest Management Center website at http://cals.arizona.edu/apmc/docs/2009_PSEP_SummaryV3.pdf.*
8. We have added a PSEP page to the Arizona Pest Management Center website. This new section of the website hosts information on our minigrants program and links to training resources at <http://cals.arizona.edu/apmc/psep.html>. **Impact:** *This website promotes the transparency of our programs and provides clientele access to training tools and information.*
9. Dr. Dawn Gouge is working with the City of Phoenix and several other partner organizations to create an education / IPM certification for structural pest management professionals. The comprehensive program will include on-the-job training and job placement for graduates.
10. We in the fourth year of a Risk Avoidance and Mitigation Program (RAMP) grant with University of Arizona as lead institution. Arizona hosted a meeting of nearly all RAMP project PIs in June 2009. Researchers presented updates on nearly 30 individual projects that make up the RAMP. **Impacts:** *Meeting presentations and PI updates on projects and impacts are available on the Arizona Pest Management Center website at http://cals.arizona.edu/apmc/partner_meeting.html. Additional impacts are documented in our 2009 Annual Report, available at <http://cals.arizona.edu/apmc/RAMP.html#reports>.*
11. As part of the RAMP, Peter Ellsworth and Al Fournier have been working with an independent contractor, Red Hill Studios, to develop an interactive computer game to teach growers about spatial movement of Lygus bugs among crops and the impact of community planning (crop placement) on potential for economic damage from Lygus. The game is in the development stage with plans for pilot test of the game in Arizona this fall. We plan to follow-up with grower interviews in the cotton season following to document the impact of the game on future planting practices. **Impacts:** *Anticipated impacts are to educate growers on Lygus movement and crop source-sink relationships, to create grower awareness of the need for communication and cooperation with neighbors to reduce economic risk from Lygus. This approach will serve as a potential platform for teaching growers and pest managers about spatial consequences of pest management practices and pest and beneficial arthropod ecology.*

1. Urban IPM

- Advanced IPM training for master gardeners with 265 MGs from 38 counties given hands-on training. UC IPM program developed web page with materials that can be used to repeat training by MGs in different communities. The address is www.ipm.ucdavis.edu/FAQ/mgadvanced.html
- Retail garden center employees are an important source of consumer pest control information but most of them are not well trained about pesticides or less toxic solutions. UC IPM program develop online training for retail employees. Our courses are free and have been viewed by over 1000 users.
- Argentine Ant is a major ant invading homes in CA. Insecticides are used to control Argentine Ant but several of these insecticides pose water quality problems. UC IPM program develop online videos demonstrating how to manage ants without using problem chemicals.
- UC IPM program published new Landscape Pest ID cards.
- UC IPM Kiosk continues to be a major success. It is stand alone touch screen computer placed in retail stores, libraries, county fairs or garden clinics. There are 16 units placed in nearly 300 locations and used by over 45,000 people in 2.5 years

2. Agriculture

- New IPM citrus and rice manuals are nearly completed and final copies will be sent to printer before the end of the year. In addition, revision of IPM in Practice book is in the final stages and will be completed in the spring of 2011. Several new Year-Round IPM (YRP) and Pest Tips were published and are available on UC IPM Website.
- Comprehensive almond IPM workshops were conducted in partnership with California Almond Board, department of pesticide regulation and community alliance with family farmers (CAFF).
- Concentrated grape IPM outreach program was conducted that include development of grape pest identification cards in English and Spanish, update grapes YRP and PMG, field meetings in major wine growing areas on vine mealybug management techniques, and training meetings for field workers to teach them how to find and identify pests.
- UC IPM program help walnut growers to develop effective methods to control moth. We work with walnut growers to optimize using puffers-develop application technology for pheromone mating disruption in walnuts orchards.
- Due to shortages in honey bees for almond pollination, UC IPM program is working with researchers in USDA to develop blue orchard bees as promising pollinators to supplement honey bees.
- UC IPM program continue its efforts to respond rapidly to new pests that disrupt IPM programs such as, European grapevine moth, spotted wing drosophila, vine mealybug, glassy-winged sharpshooter/Pierce's disease, and Asian citrus psyllid. Several outreach programs were developed to address these pests.

3. Natural Resources

- Promoted IPM in California through establishment of partnerships with NRCS and DPR. NRCS implemented IPM standard and incentives in NRCS programs such as EQIP.
- The new wildlife IPM program completing a survey on areas of needed research for wildlife pests in California. Other activities included IPM program for controlling California voles in artichokes, developing monitoring and management methods for Norway and roof rats, and evaluating several attractants for potentially increasing capture success of pocket gophers.

4. UC IPM Website

- Continue to update and add new products to our website. The website received more than 50,000 hits a day. This large number of hits clearly showed the relevancy of UC IPM program.

New Mexico

1. ALFALFA (Contacts: Jane Pierce, Scott Bundy, NMSU)

Alfalfa hay is the principal agronomic crop in New Mexico, with increasing interest in organic production: approximately 20,000 acres of alfalfa are now grown organically. However, alfalfa weevil (*Hypera postica*) is an important factor limiting the further expansion of this sector. **Impacts: Biological control of alfalfa weevil:** Releasing, evaluating and establishing several parasitoids of alfalfa weevil (*Microctonus colesi* and *Oomyzus incertus*). **Alfalfa as a source of beneficial for other crops (mainly cotton and pecans):** Determining the effects of direction and distance from alfalfa and time of cutting on the movement of beneficial insects from hay fields to pecans and cotton. Initial results indicate that movement is predominantly in a westerly direction (i.e., with the prevailing wind) and that beneficials may disperse approx. 80-100 ft from alfalfa. This may be strategically important in the Pecos valley, where land is increasingly being taken out of alfalfa production in order to plant pecans. **Blister beetles in alfalfa:** Cantharidin in blister beetles can be lethal to livestock (particularly horses), and there is considerable concern amongst livestock owners regarding the risk of blister beetle contamination of hay. Determination of regional prevalence and distribution of different species of blister beetles in NM alfalfa and their relative cantharidin content will improve management of this risk to livestock.

2. PECANS & PISTACHIOS (Contacts: Jane Pierce, Richard Heerema, NMSU)

IPM efforts in these two crops include determining the influence of nearby alfalfa on biological control in the nut orchards (see above), and intensive surveying for new pests and diseases (particularly in pistachios, where the impact of pests is largely unknown, and in which two new fungal pathogens were found in 2008). A new study is examining the causes behind increased damage by pecan nut casebearer in small versus larger trees. At present, it appears that this may be due to faster egg development (and hence reduced opportunities for predation) in the hotter canopy of the younger trees.

3. CHILE (Contacts: Steve Thomas, Jill Schroeder, Soum Sanogo, NMSU) Current IPM effort is directed at understanding multi-trophic-level interactions between weeds, nematodes and fungal pathogens that affect chile peppers. **Impacts: Crop rotation:** To manage yellow/purple nutsedge and southern root-knot nematodes, NMSU is assessing the efficacy of rotations involving warm-season annual crops (NemX cotton & pearl millet) that can compete with nutsedges (or have suitable herbicide options), and a competitive, cool-season biofumigant crop ('Boss' oilseed radish); these experimental treatments are being compared with rotations involving a nematode-resistant non-dormant perennial alfalfa that has been used successfully in the past. **Weed-nematode-pathogen interactions:** NMSU is determining the interactions between *Verticillium dahlia*, southern root-knot nematode and three principal annual weeds of chile [spurred anoda (*Anoda cristata*), Wright's ground-cherry (*Physalis acutifolia*) & tall morning glory (*Ipomoea purpurea*)], and on the subsequent growth of chile in affected fields.

4. PEST MANAGEMENT IN ORGANIC FRUIT AND VEGETABLES (Contact: Tess Grasswitz, NMSU)

Approximately 200,000 acres are managed by organic farmers and ranchers in New Mexico, with many conventional farmers now transitioning to organic production. Many of these new or transitioning growers have little experience with organic approaches to pest management, and techniques for specific pests that were developed elsewhere do not always perform well under New Mexico growing conditions. **Impacts:** Development of locally-applicable information on pest management issues, particularly in relation to insect and weed problems in fruits and vegetables, is increasing small farm vegetable production in NM. Furthermore, in recent years, there has been a considerable increase in the

use of hoop houses for season extension amongst New Mexico's organic growers (460 units erected in the past 5 years during extension workshops, with an estimated 2300-2700 installed statewide over the same time period). This in turn has created a demand for training on "biointensive" pest management strategies (such as augmentative biological control programs) for protected crops. The organic pest management program includes research on the integrated control of peach tree borer (*Synanthedon exitiosa*), peach twig borer (*Anarsia lineatella*) and cherry sawfly (*Caliroa cerasi*), and on non-chemical control of squash bug (*Anasa tristis*) and cucumber beetles (*Diabrotica* spp.). Extension efforts include oral presentations at the annual New Mexico Organic Farming Conference, a table-top display of beneficial insects that was exhibited at 8 different venues in the past year and a series of seven organic IPM farm walks which, in collaboration with the New Mexico Organic Commodity Commission, were conducted across the state in 2009. These events attracted more than 130 people, with 36% travelling over 100 miles to participate (including some from out of state). *Impacts:* After the events, 80% of attendees reported an increase in their knowledge of organic pest management and 89% reported an increase in their understanding of organic pest management.

5. SCHOOL IPM (Contact: Tess Grasswitz, NMSU)

This is a new area within New Mexico's IPM program. Initial efforts have been focused on increasing awareness of IPM amongst the state's school maintenance and facilities managers. An initial focus group meeting in Albuquerque has been followed up by a presentation to the Maintenance Advisory Group of the NM Public Schools Facilities Authority and a school IPM 'Taster Day' that attracted participants from across the state. However, with New Mexico's schools facing budget cuts, school closures and staffing reductions, engaging this sector in pest management programs continues to present something of a challenge.

6. IPM FOR HOME GARDENERS AND THE LANDSCAPE INDUSTRY (Contacts: Tess Grasswitz, Carol Sutherland, NMSU)

NMSU has an active program related to consumer/urban IPM that includes over 700 Master Gardeners in 15 New Mexico counties. The curriculum for the latter includes classes on both general entomology and IPM. In addition, a new program was started in 2009 in which a network of Albuquerque Master Gardeners was recruited and trained to monitor codling moth, with the ultimate aim of using their data to issue 'pest alerts' to the general public in the greater Albuquerque metropolitan area. This is important not just for improving codling moth control for home gardeners, but also to reduce the overall pest pressure experienced by small-scale commercial orchards located on the urban fringe. Pest management and general entomology training is provided for commercial, public and private pesticide applicators (sections 3A and 3B: ornamentals and turf) at a series of five workshops held throughout the state each year. The table-top display of beneficial insects is also regularly exhibited at events for home gardeners and the landscape industry.

7. WEEDS (Contacts: Dave Thompson, Jamshid Ashigh, NMSU)

New Mexico's weed IPM program has two major foci: biological control of invasive weeds and herbicide resistance in weeds of agronomic crops. The biological control program is focused primarily on improving the efficacy of existing biocontrol agents rather than the importation of new species. For example, the addition of nitrogen fertilizer to saltcedar 'nursery' trees has been found to increase the fitness and efficacy of saltcedar leaf beetles (*Diorhabda* spp.). The genetic basis of interactions between different species of saltcedar leaf beetles and their host plants is also under investigation.

Many New Mexico growers have expressed concern over herbicide resistance and the fact that the efficacy of some commonly used herbicides appears to be declining. At present, resistance has been

confirmed in kochia (*Kochia scoparia*) and there are reports of possible glyphosate resistance in Palmer amaranth (*Amaranthus palmeri*). **Impacts:** The herbicide resistance program is helping growers prevent, detect and integrate management of herbicide resistant weeds.

8. INVASIVE SPECIES/DIAGNOSTICS (Contacts: Natalie Goldberg, Carol Sutherland, NMSU)

This is one of the strengths of the IPM program at NMSU. We have a well established and extremely productive plant pathology clinic which provides plant diagnostic services for all crops/plants including urban landscapes and forests. The clinic also participates in National, Regional and State disease surveys (e.g. the legume IPM-PIPE project) and serves as a support lab for the National Plant Diagnostic Network. **Impacts:** The NMSU Plant Pathology Clinic processed approximately 2,000 plant samples last year for diseases and environmental stresses, and typically identifies 3-5 pathogens new to NM each year. Furthermore, every year, Dr. Carol Sutherland typically identifies approx. 1000 arthropod samples submitted by agricultural producers, gardeners, landscape managers, state and federal agencies, and the general public. Among the insects, Africanized bees and apple maggot are relatively new pests of current concern in NM.

Idaho

The organization structure and project emphasis areas of the FY09 Idaho Extension IPM Program were similar to prior years. Our program was led by the Extension IPM Coordinator (Bechinski) in collaboration with the Idaho Pest Management Center Director (Hirnyck). We have worked as a team since 2000 on pest management in Idaho and together account for 36-years of extension experience in IPM at the University of Idaho. Our approach was driven by stakeholder needs identified by Advisory Committees, statewide IPM adoption surveys, and Pest Management Strategic Plans. As in past years, statewide outreach in IPM was conducted by "Topic Teams," working groups of 5 to 15 County Extension Educators and State Extension Specialists who are charged with the planning, implementation and evaluation of subject-matter or issue-based research and extension programs.

1. Faculty work groups with annual IPM programming goals during FY09 included the Potato Team, the Cereal Team, the Sugarbeet Team and the Commercial and Consumer Horticulture Team. Extension IPM Coordinator Bechinski participated as member of those workgroups and helped teams (1) identify annual IPM programming objectives, (2) develop consensus action plans that respond to stakeholder needs while supporting the goals of the National IPM Roadmap, and (3) design Logic Model program assessment metrics for program accountability. Together the faculty teams delivered IPM outreach to more than 8,000 Idahoans at workshops, field days and similar venues.
2. E-IPM funding during FY09 focused in part on measuring intermediate Logic Model outcomes (i.e., changes in IPM adoption) by conducting a statewide survey of barley and wheat producers; that work remains in progress. IPM programming in urban landscapes included pest 70 contact hours of pest management workshops delivered by Bechinski to local and regional Master Gardeners, who in turn provided outreach in IPM to literally tens of thousands of Idahoans. Logic Model short-term outcomes – gains in IPM knowledge among Master Gardeners – were measured via standard pre:post audience tests.
3. We began during FY2009 a new extension publication series that addresses top-ranking concerns among homeowners about yard and garden pest. Seven titles in that *Homeowners Guide* series have been published since May 2009. Format is printed for-sale documents and

free on-line pdf manuals. Numbers of printed bulletins purchased and pdf manuals downloaded will serve as indirect proxies for short-term Logic Model outcomes (gains in IPM knowledge).

Utah

1. “Action-based” outcomes and impacts include: an increase in contacts with targeted stakeholders, an increase in use of IPM resources by stakeholders, a greater availability of Utah-adapted IPM tools, an increase in adoption of IPM practices by stakeholders, an increase in IPM collaborations, a decrease in use of broad-spectrum pesticides and an increase in use of low-toxicity and non-chemical products, and a reduction in human safety and health hazards and harm to agricultural and urban environments due to decreases in use of toxic pesticides.

2. “Knowledge-based” outcomes and impacts include: a user-directed IPM Program due to input of stakeholder needs and priorities, an increased awareness of IPM and its advantages, and greater availability of economic analyses of IPM practices in Utah plant systems that will stimulate greater use of IPM practices due to profit incentives.

- Reduced pesticide use. The IPM advisory program has had a significant impact on pesticide use in Utah, and we expect this trend to continue. Applied research that focuses on implementing mating disruption and other reduced-risk alternatives will inherently reduce pesticide use. Utah-validated treatment thresholds allow growers to confidently implement supplemental treatments only when necessary.
- Increased adoption of IPM. For many IPM advisory subscribers, IPM as a management tool is new, but their adoption rate is high—96% of recipients are now familiar with IPM and use some aspect of IPM on their farms. Through IPM training, individuals who have learned monitoring, identification, and correct pest suppression skills will show increased confidence in adopting IPM principles.
- Reduced human exposure to pesticides. As growers’ knowledge increases in the correct use and choice of pesticides and as growers become more aware of reduced-risk products and alternative control strategies, direct harm should decrease.
- Healthier plants. In meeting the National IPM Roadmap goals, producing healthy plants while avoiding environmental degradation is a key priority. Most IPM advisory recipients responded in the 2008 pest advisory survey that their plants are healthier as a result of the advisory recommendations (51% said their plants are slightly healthier, and 26% say their plants are significantly healthier). As grower knowledge of effective monitoring techniques, effective mating disruption products, and accurate pest biology increases, growers will adopt timely and efficient suppression techniques, moderating pest populations over time, and reducing plant injury.
- Increased awareness by growers of risks in pesticide usage (drift, groundwater contamination, health issues, etc.).
- Reduced costs and greater profitability. IPM advisory recipients reported decreased costs (27%) and some had significantly decreased costs (12%). These savings were a result of reduced sprays, better spray timing, and knowledge of appropriate products.
- Promotion of regional interactivity among Extension staff and growers.
- Utah onion growers have switched their primary onion thrips pest management strategy from sole reliance on repetitious insecticide applications to crop management (especially nitrogen and irrigation management), biological control, and rotations of reduced-risk insecticides. These changes impact approx. 2,000 acres of dry bulb onion production in Utah for an annual savings of approx. \$180,000 and improved consistency in bulb quality and size.

- Use of validated trap thresholds have enhanced detection of codling moth in mating disrupted orchards, decreased errors in application of supplemental insecticide controls (both over- and under-treatment), and increased use of mating disruption by Utah's apple producers.
- On-farm demonstration of efficacy of reduced-toxicity insecticides as alternatives to organophosphate insecticides for cherry fruit fly control has increased the use of low toxicity insecticides and helped cherry growers move away from reliance on OPs as they are phased out of registration by EPA. Alternative insecticides that have shown consistent efficacy in Utah tart cherry demonstrations include GF-120, Entrust, Success, and Provado.
- Preliminary results on the efficacy of stations baited with GF-120 for cherry fruit fly control show promise. Research funding has been secured to expand the study in 2010 to measure fruit fly population reduction and fruit protection.
- We demonstrated that four commonly used mating disruption (MD) dispensers were still releasing sufficient pheromone after 140 days of field aging; however, there were clear differences among the dispenser types. Based on these results, we advise growers to carefully monitor codling moth activity in all MD-treated orchards. These results will help growers select the most effective MD dispenser for use in their orchards in Utah.
- Outcomes and impacts of caneborer research have been promoted through presentations to the berry industry and through publications (outreach). New information on raspberry horntail biology and behavior is helping berry growers better time control tactics. Current studies are assessing their overwintering behavior and survival in canes, and will support predictions of adult emergence in the spring based on degree-days (temperature-based phenology). This information will be invaluable to berry growers because there are no effective traps to monitor adult emergence and determine optimal timing to prevent egg-laying and cane infestation. We found variation in susceptibility of summer- and fall-bearing varieties to the raspberry horntail (RHT). These results will allow Utah berry growers to select more tolerant raspberry varieties for planting that will reduce their pest management costs and loss crop loss.