University of Illinois
EIPM FY2012 state report

PD- Dr. Suzanne Bissonnette, Plant Clinic & IL- IPM Coordinator,

Illinois EIPM-CS 2012 NCERA 222 report: The University of Illinois EIPM program continues to make progress in implementation of EIPM proposed programing and outreach during the 2010-2013 funding cycle. Audience members targeted are: Illinois citizens, agriculturalists, master gardeners, green industry personnel, producers, Extension personnel, grade school personnel and students. The IPM program in Illinois is broader than our EIPM program and our PI's, co-PI's and key personnel continue to provide outreach in other IPM programming not specifically funded by EIPM. Extension Specialists and Educators in Illinois now have a history, born of economic necessity, of providing successful 'self-supported' IPM programing to clientele. For example, to highlight a few, the highly successful "Corn and Soybean Classics" a conference for Agriculturalists is offered in 7 venues each year throughout the state supported by Specialists, Educators and invited speakers. Attendance in 2007-2012 was 1051, 1088, 1020, 1134, and 1049 respectively. The Field Crop Scouting Manual in its 6th edition https://pubsplus.illinois.edu/X880e.html brings 10% of its sales back to our program amounting to about $10,000/year for publication support. The AgMasters conference, a multi-disciplinary intensive 2 day workshop, is offered annually. Enrollment is capped at 160 and it offers one general session and 12 specialized sessions. In 2012, 30% of respondents indicated that they expected $10-$15 profit per acre from: "a practice you put in place in 2013 that you learned from the 2012 AGMasters Conference". *These and other IPM programs continue in Illinois. Expansion of our Extension IPM program has been realized due to the fiscal support EIPM-CS has afforded us. Below are summaries of our Areas of Emphasis for 2012.*

Urban IPM: In the area of Urban IPM much progress was made in the implementation of educational modules for advanced training for Master Gardeners. The website for this online training is live and Consumers and Master Gardeners can learn about newly emerging or persistent plant diseases and insect problems in the home landscape with the ***new*** **University of Illinois Extension Online IPM modules**, http://mg.cropsci.illinois.edu/index.php . These modules are designed for Extension Master Gardeners but can be used by home gardeners and green industry professionals. Eight online IPM Modules are available to EMGs and others through University of Illinois. These modules cover: Brown Marmorated Stink Bug, Thousand Canker Disease, Spruce Problems, Downy Mildew on Impatiens and more, Bacterial Leaf Scorch, Sudden Oak Death, Emerald Ash Borer, and Bur Oak Blight. These modules were created to inform about newly emerging pest and disease problems in home landscapes. The modules are open to Master Gardeners throughout the US as well as others who would like to learn about pests and pathogens in the landscape. Participants must create an account to login to the modules. Each module has detailed information and pictures about a particular pest or pathogen. At the conclusion of the lesson participants complete a short quiz. Additionally, there is an evaluation after each module. Participants who successfully complete the module and quiz get a printable certificate can be used to verify completion of the modules. In Illinois, each module is worth 0.5 hours of continuing education credit. Participants may return to the modules at any time to review the material but only claim the CEUs one time per module. As of 4-4-13 601 participants had completed the modules. Evaluations show that overall for the 8 modules respondents reported a ***75% increase in knowledge of the pest*** after taking the course. As an example, evaluation results for the brown marmorated stink bug module, 123 respondents reported an 86% increase in knowledge after taking the module. They reported 85% confidence that they could identify the pest in the landscape and 80% confidence that they could teach about the pest. They gave a 95% rating to the module.

Support for Diagnostic Facilities: The Plant Clinic Staff at the University of Illinois ***diagnosed 4,552 plant samples*** in the 2012 growing season. The total was comprised of 1325 client submitted samples, 1061 phytosanitary inspection samples, 2166 contracted SCN egg extraction samples for private industry. Additionally, information was provided all year via 2,100 telephone inquiries, approximately 2,150 email requests, and 620 walk-in consultations. This is a total of 4870 client contacts in the 2012 Plant Clinic season. There continues to be an increase, each year, in the number of plant and soil samples that were processed at the U of I Plant Clinic. Processed samples increased from the year 2011 by 17%, are up 152% from 2010 and 110% from 2009. The 2012 sample total (4552) compared to the totals of the previous three years, (3879 samples in 2011, 1804 samples in 2010, and 2159 samples in 2009).

The clinic initiated a new informational bulletin series: Plant Clinic REPORT. The first bi-fold full color 6 page report "Spruce Problems (Pest and Cultural Issues)" was completed in 2012. It is available in print and online at http://web.extension.illinois.edu/fmpt/downloads/45140.pdf . An educational publication series of "Look-alike Tree Species for Exotic/Invasive pests" is in development for Walnut. A Plant Clinic Facebook page was developed by Diagnostic Specialist Stephanie Porter in 2011 to increase our visibility and provide a means of provided research based Horticultural and Agronomic information to followers https://www.facebook.com/UofIPlantClinic . In 2012, the Facebook page built to a base of 643 likes (followers), which has increased from 359 likes (followers) in 2011. Porter also developed a blog http://universityofillinoisplantclinic.blogspot.com/ to address hot topic and timely issues as they arise at the Plant Clinic. There were 34 blog posts and 11,470 pageviews in 2011 and 23 blog posts and 29,366 pageviews in 2012.

The Plant Clinic staff contributed articles to Extension Newsletters including 35 articles for Home, Yard, and Garden Newsletter http://hyg.ipm.illinois.edu/ and 5 articles for The Bulletin http://bulletin.ipm.illinois.edu/index.php.

Development and Implementation of ***In-depth Focused First Detector Programming*** was a key component of the Support for Diagnostics Area. The first detector workshops this past winter focused on invasive tree pests. The goal was to provide in depth training sessions on emerging and current ***invasive*** insects, pathogens, and plants. Training in 2013 focused on emerald ash borer, thousand cankers disease, and three invasive plants--giant hogweed, Japanese stiltgrass, oriental bittersweet, mile a minute weed, princess tree, and Japanese chaff flower (depending on the location of the event). In addition to presentations by state experts covering identification, biology, hosts, sampling, management, look-a-likes, and regulation on each pest, participants also completed hands-on activities to put their new knowledge to work. A 100 page full color handbook was developed and provided to each participant in the workshops; in kind monies supported the printing of the manual. Targeted Audience: tree care professionals, master gardeners, master naturalists, forestry and natural resource professionals, and conservationists.

Statewide, 324 individuals completed first detector training in 2012. At each workshop, participants were asked to complete an evaluation form which consisted of a few questions to help us plan for future workshops as well as asking what their profession/interest was to help classify our audience. Participants were also asked to rate their degree of understanding of the presented material before and after training using a 1 to 5 scale (1= very little, 5 = a lot). About 70% of participants returned evaluation summaries.

Wide Area Monitoring: The Areawide Pest Monitoring program supported a formal network of cooperators who monitored for critical insects and plant pathogens through trapping, field monitoring and sample collecting. The network was coordinated in conjunction with the Illinois Cooperative Agriculture Pest Survey (CAPS) program and involved personnel at the University of Illinois Plant Clinic, and regional and local Extension Educators and Specialists. Agronomy Day Presentation: "Stinkbugs on the Move: Increasing Management Challenges on the Horizon" Crop Management Conference Presentations: "Invasive Species Coming to a Site Near You" reaching 1500 clientele. In wheat virus survey, of 241 samples, 0.8% were positive for High plains virus, a new report for Illinois. **Impact:** One very important aspect of the pest monitoring this last year was the inclusion of trapping and surveying for the brown marmorated stink bug, a new invasive insect in Illinois. With the development of the Pest Monitoring Network website, cooperators were able to submit "real time" data, providing timely updates to Illinois agricultural producers on the status of these economic pests.

School IPM: Illinois School IPM program continued supporting the Westville grade school pilot program and extended to University of Illinois Champaign-Urbana campus. The Westville School District was recognized by the Environmental Protection Agency with a school IPM award in May 2010. In addition, the team will begin the process of certification by the Environmental Protection Agency and the IPM Institute. Factors that brought about this and other possible future awards include monthly inspections of monitoring stations at all three schools in the district. In response to Extension staff reductions, School IPM has refocused and initiated a bedbug mitigation, food services and building monitoring cooperative program with Facilities and Service on the UIUC campus. This project has also included cooperation with the Spurlock Museum aiming at wood and natural fiber pests. The project and the Museum are utilizing the Hetta units both to mitigate serious pests to wood and fiber objects in the collections and as an educational IPM project.

Iowa State University
EIPM FY2012 state report

The Integrated Pest Management (IPM) program at Iowa State University (ISU) is an inter-disciplinary, multi-departmental, collaborative effort within Extension and the College of Agriculture and Life Sciences (CALS) to meet the land grant university mission of providing educational opportunities and information grounded in research-based science to targeted audiences. The ISU IPM program is instrumental in providing both on-going and situation-specific, research-based information through educational programs and publications. These efforts outline the basic principles of IPM and are designed to encourage growers to adopt IPM practices, which will increase agricultural profitability while minimizing environmental effects associated with pest management practices.

ISU Extension Farm: In 2012, the ISU IPM program inherited the ISU Extension Farm (currently named Field Extension Education Laboratory – FEEL). The Extension Farm organizes demonstration plots for Extension and industry-led events targeting farmers, agribusiness personnel and students. During the 2012 season, we held 29 events with over 1,000 individuals attending. Common topics were corn rootworm, soybean and corn diseases such as Goss's wilt and southern rust, and corn and soybean growth and development in drought conditions.

ISU FARM: ISU works to provide quality, unbiased research data to assist in the decision-making process of on-farm operations. In 2011, Iowa State began the ISU Farmer-Assisted Research and Management (FARM). In 2012, there were over 150 trials completed, many related to IPM. This program will continue to expand in the next few years as the program matures. We also

are planning on merging our program with the Iowa Soybean Association in the next year, furthering our impact of this program.

ScoutPro: We continue to partner with ScoutPro, a company developing scouting apps for farmers, in the development of a series of apps based on ISU field guides and diseases publications. Features include a mapping tool and dichotomous key for identifying pests in the field. Pesticide management recommendations will also be available to farmers. The mapping software will allow farmers and agricultural practitioners to keep records of their scouting activities to plan for future years. The apps increase access to information and potentially expand the audience of the original publications as well as provide tools not available in print versions. In their pilot year, over 12,000 reports were submitted through ScoutPro's apps.

Educational Events and Learning Materials: During July of 2012, we had the 2nd Crop Scouting Competition, an event where secondary students from across Iowa competed and showcased their scouting abilities in corn and soybean at the ISU Extension Farm. Ten teams from across Iowa attended the competition on July 31, 2012. Approximately 35 students and 11 team leaders were present. This included a 100 percent return on team leaders from 2011, and was over 300 percent growth in number of teams from the first year. Another event, CSI: Crops, was held where 4-H students learned about diseases, insects, weeds, and disorders of crops at the Field Extension Education Laboratory at ISU. Entomologists, plant pathologists, weed scientists, agronomists, and others teach during the multi-day event.

Development was initiated on Urban IPM learning materials intended for high school students and 4-H clubs and the 14-part set of IPM learning materials distributed to secondary agriculture educators in previously was updated and made available online. IPM Program members delivered presentations on research design, plant pathology, insects, disease assessment training, soybean, cucurbit, woodland, corn, tree, tomato, and turf diseases, introduction to diagnosis, disease updates, etc. to a variety of audiences including coop interns, 4-H, college/high school students, growers, scout school participants, Master Gardeners, Integrated Crop Management attendees, Iowa Public Radio listeners, phytosanitary inspectors, field day attendees, etc.

IPM Program members taught Pl P 391: Practical plant health; and were invited to lecture in a variety of other undergraduate courses such as Vegetable Production and Management, Greenhouse Operation and Management, and Integrated Management of Tropical Crops.

Participate in ipmPIPE activities: In 2012, we participated in the soybean rust USDA ipmPIPE project and updated pest information for Iowa on the legume ipmPIPE public website. In addition, we continued to use a North Central (NC) ipmPIPE web page (www.ncipmpipe.org), which provides a platform for our western bean cutworm and black cutworm scouting activities, as well as mapping for other pests such as the brown marmorated stink bug and soybean cyst nematode. Also, the website was used in another state for recording information for several crop pests.

Plant and Insect Diagnostic Clinic: The Plant and Insect Diagnostic Clinic provides diagnosis of plant problems (plant diseases, insect damage, and assessment of herbicide damage) and the identification of insects and weeds from the field, garden, and home. During the calendar year 2012 a total of 1,635 physical insect and plant samples were diagnosed or identified at the PIDC, and the PIDC answered a total of 1,871 email inquiries. In addition, the PIDC supported Plant Pathology PI's in obtaining and processing samples intended for research.

Phytosanitary inspections: Each year, corn and soybean seed fields are inspected by scouts for the presence of diseases of phytosanitary concern. In 2012, the ISU PIDC served as a collection point for the corn and soybean plant samples submitted by field scouts. This service provided by the PIDC is an agreement between Iowa Department of Agriculture and Land Stewardship and Iowa Crop Improvement Association to identify potential regulatory diseases. In addition, the PIDC trains field scouts and provides support to scouts when necessary.

Developed compendium-like publications, trifold cards, and updated field guides: We have led the development of a series of ISU Extension publications on corn and soybean insects and diseases. Over 1 million copies of these publications have been printed from 2008-2012. Nearly 50 percent of the publications were printing requests made by external entities such as agribusiness, commodity groups, and even another academic institution. 2012 additions, revisions, or reprints are included in the publications sections of this report.

Contributed to ISU newsletters in 2012: The *Integrated Crop Management (ICM) News* Web site is ISU Extension's source of crop production news. *Horticulture and Home Pest News (HHPN)* is a newsletter for communities, homeowners, and the urban public. IPM staff published many articles in both the *ICM News* (www.extension.iastate.edu/CropNews) and *Horticulture and Home Pest News* (www.ipm.iastate.edu/ipm/hortnews) in 2012, including articles on plant diseases, insect scouting, etc.

Other publications, including learning materials, refereed journal publications, non-peer reviewed articles, etc. were published, submitted, or released that IPM staff were involved in include Integrated Pest Management, Filling in the Cracks; Effect of Headline on Soybean Aphid Resistant and Susceptible Varieties; Effect of Fungicides and Plant Populations on Soybean Disease and Yield; ISU FARM Research Report; Epiphytic Survival of *Erwinia tracheiphila* on Muskmelon (*Cucumis melo* L.) in *Plant Disease*; First Report of Soybean Vein Necrosis Disease Caused by *Soybean vein necrosis-associated virus* in Wisconsin and Iowa in *Plant Disease*; Temporal patterns in appearance of sooty blotch and flyspeck fungi on apples in *Microbial Ecology*; Comparison of environmental conditions during epidemic and non-epidemic years of soybean sudden death syndrome in Iowa in *Plant Health Progress*; Biology, yield loss, and control of Sclerotinia stem rot of soybean in *Journal of Integrated Pest Management*;

Kansas State University
EIPM FY2012 state report

Hessian Fly

It has been determined adult Hessian flies are active starting in early March and continuing through November which is much longer than previously reported and have caused a change from the "Hessian Fly Free Date" to a "Best Pest Management Planting Date" as it appears there is no date where wheat can actually be planted and still germinate that Hessian flies are not still potentially active. This information is being reflected in the updated Extension publications and being presented to farmers, crop consultants, and Extension agents across the state.

Stored Product Protection

The Stored Product Protection Book was published in 2012. This book contains information of storage systems, prevention methods, monitoring-based methods and decision making associated with stored products. A copy of the book was distributed at the meeting for participants to view.

Healthy Yards and Communities

The Kansas Healthy Yards and Communities program has been successful using videos featuring various topics including proper disposal of pesticides and pruning shade trees. The videos can be viewed by visiting www.kansasgreenyards.org and on the KSREVideos YouTube channel (www.youtube.com/user/KSREVideos) where the collection of 249 videos (on 2 playlists) has 913,188 views total. This program website was visited by 18,683 unique visitors in 2012, resulting in 51,454 page views. The "Pocket Guide to Common Pest Problems and Beneficials" book completed in late 2012, has already sold more than 550 copies. E-mail addresses were collected at the 2012 Advanced Master Gardener training conference from those who attended the session on insect identification and, received a copy of this book, to determine if they used the publication and if it enhanced their IPM decisions.

RetailWorks

The first RetailWorks conference was held February 17, 2012 with topics on choosing perennials and shrubs for Kansas, pesticides and how they kill insect and mite pests, and other topics. Information about the event and schedule was disseminated to commercial nurseries and retail garden centers. The RetailWorks program had an attendance of 27 participants with 19 returning an evaluation. On average, all statements were "Agree" or "Strongly Agree" for each of the following statements (score: 1 = strongly disagree, 3 = neutral, 5 = strongly agree). The QUALITY of this training met my expectations: 4.3, the information presented in this training was USEFUL: 4.5, I gained a lot of KNOWLEDGE as a result of this training: 4.2, there was a good VARIETY of speakers/topics: 4.6, the presenters were able to COMMUNICATE the content of the training effectively: 4.4, as a result of this training, my business is likely to be MORE SUCCESSFUL: 4.2 I will make CHANGES to my current business practices as a result of this training: 4.0, this training is a GOOD VALUE (time and money): 4.3. Comments included: "Best training in years. Thanks!" and "Good-- very informative & makes you think."

NurseryWorks

A total of 94 individuals representing 13 states attended the first NurseryWorks conference. These participants represented wholesale nursery growers, retail nursery operations, landscaping companies, extension, and the nursery/landscape association. Impact statements from participants include: "We will be reassessing our pre-emergent scheduling, and becoming vigilant about timing," "We have already tested and adopted some of the weed control concepts Dr. Gilliam presented," "I will update my extension lessons with information and demonstration methods learned." NurseryWorks also received an award for innovative programming.

Lincoln University
EIPM FY2012 state report

Dr. Jaime C. Piñero

I. One highlight of activities targeting vegetable and small fruit farmers in Missouri:

A series of four 2-day IPM workshops targeting beginner farmers was offered during July-August of 2012 in various locations throughout Missouri. Each workshop included several classroom sessions as well as a visit to a local farm. Hands-on activities included demonstrations of pest problems in the field and of insect pest monitoring tools, and a display of live beneficial and pest insects. Comprehensive educational resources were provided in a flash drive to each workshop participant. Since most small and mid-scale farms in Missouri are highly diversified, an ecological approach to IPM was emphasized. All aspects of IPM were covered from growing healthy transplants to cover cropping and pre- and post-harvest sanitation. This workshop format was very well received by farmers. Short-term outcomes: After conducting a statistical analysis on the '*before*' and '*after*' scores, a significant increase in knowledge was documented for every single IPM topic (N= 24). When farmers were asked whether they learned about the economic and environmental benefits associated with IPM implementation, 92 and 8 percent responded that they strongly agreed or agreed, respectively, with this statement. Importantly, 92 and 8 percent of trainees indicated that they were planning on adopting at least one IPM tactic in their operation. Mid-term outcomes: Remarkably, one from the Kansas City area actually got a grant proposal funded from the NCR SARE 'Farmer and Rancher grant program' with a central element of the proposal being on IPM tactics learned from this workshop. This successful grant acquisition and the farmer's actual plans to apply IPM information from the workshop into his farm operation in 2013 can be considered a change

in behavior. A farmer's website reporting on the progress of his project can be accessed here: http://www.rockycreekvalley.com/education/studies.html

II. One highlight of activities targeting Extension educators in Missouri:
To better be able to assist farmers in Missouri, the LU IPM program implemented 2-day In-Service Education (Train the Trainer) IPM workshops for Vegetables (in 2011) and for Small Fruits (in 2012) targeting Extension educators. Objective: The goal of these workshops was to provide training to agricultural professionals and educators in the Missouri's Cooperative Extension Service on **sustainable** IPM for vegetables and small fruits so that they could help farmers more effectively. Short-term outcomes: As a result of the 2011 workshop, all educators increased their level of knowledge of the economic and environmental benefits of implementing IPM practices. Mid-term outcomes: For the 2011 Vegetable IPM workshop, a **9-month post-workshop** survey (conducted in June 2012) showed the following outcomes: (1) **779** clients were assisted by 22 Extension educators in a 9-month period using information covered in the workshop, (2) **40** Newsletter articles, newspaper columns/radio shows were published using IPM information given at the workshop, (3) **125** farms were visited and IPM was discussed with farmers, (4) **244** one-on-one interactions, and (5) **68.2%** (15/22) of the extension educators interacted with minority/limited-resource farmers. Mid-term outcomes of the 2012 workshop will be gathered soon through an online 9-month, post-workshop survey. An ISE IPM workshop titled "Sustainable Management of Soil-Borne Diseases and Weeds" will be offered on June 4-5, 2013, at two LU farms in Jefferson City, Missouri.

III. Success Story: Mr. Jose Fonseca is a Hispanic vegetable farmer from St. Peters, MO. Jose met Dr. Piñero, LU State IPM Specialist, in the summer of 2010. Jose is a conventional farmer that expressed high interest in using IPM as a way to reduce pesticide use for various reasons: (1) he grows produce in an urban environment that has a hospital and a daycare in close proximity, (2) his costumers have been asking him what types of pesticides he sprays, and how often, and (3) he is a conscientious farmer that cares about the environment but had not been able to improve his farming operation due to lack of knowledge. As a result of numerous one-on-one interactions with Dr. Piñero and other LU IPM staff over a nearly 3-year period, and after attending various IPM workshops and growers conferences, Jose was able to reduce pesticide use in zucchini production by 95 percent in 2011 compared to previous years, and by 99 percent in 2012 compared to previous years by using the trap cropping approach. These data do not include time and input (fuel) savings and environmental benefits. This change in behavior is a mid-term outcome. By continuing to use trap cropping as an effective way of reducing pesticide use, Jose is becoming more effective at managing insect pests while using less inputs. He indicated that he will continue to implement the trap cropping approach in 2013 and beyond, leading to a more permanent change in behavior and improved economic, environment, and human health benefits, an expected long-term outcome.

IV. Selected 2012 outputs:

- ***Fact sheets:***

"Tomato pinworn: An emergent pest in Missouri" (Publication date: 08.30.2012).
"Stink bugs: The Good, the Bad, and the Ugly" (Publication date: 10.11.2012).

- ***Extension articles, including in trade media, and conference proceedings:***

Piñero, J.C. 2012. Research and Extension highlights of the new Integrated Pest Management Program at Lincoln University. Proceedings of the 6th National Small Farm Conference, Tennessee State University, Memphis, TN.
Piñero, J.C. 2012. Reducing Heat Stress and Insect Pressure in Crops using Kaolin Clay (Surround WP). The Broadcaster (Bi-Monthly Periodical of the Midwest Organic and Sustainable Education Service – MOSES) Vol: 20, Number 2, pages 6-7.

- ***Webinars:****Bacterial Canker of Tomatoes:* This webinar was offered on July 30, 2012, in response to recent outbreaks that have been documented in various Midwest states including Missouri (2011, 2012) and Ohio (2012). This webinar featured presentations by plant pathologists Dan Egel (Purdue University) and Sally Miller (Ohio State University). In this webinar, the following topics were covered: (1) how to diagnose bacterial canker in the greenhouse and in the field, (2) disease development and spread routes, (3) disease prevention practices, and (4) disease management options. *Webinar trainees: 21.* URL to access to the webinar: https://learn.extension.org/events/584.

- ***Extension Presentations / posters (workshops & local/regional/national/international conferences): > 15.***

Selected Examples: **2013** Four presentations at the Great Plains Growers Conference, held in St. Joseph, MO (Jan. 10-12). Topics: (1) An Introduction to Integrated Pest Management, (2) Determining Economic Thresholds for Pesticide Applications, (3) Organic Research and Extension at Lincoln University: Farmer input, and (4) Update- Brown Marmorated Stink Bug/Spotted Wing Drosophila/ Japanese Beetle. Also co-authored a presentation (Organic Management of Japanese Beetles by J. Wilson and J. Piñero) and a poster (Getting benefits out of a bad bug: On-farm composting of Japanese beetles, by H.Y. Johnson, J. Wilson, P. Byers, and J. Piñero). Total combined audience: > 250.

2012 Growing Growers IPM workshop in Kansas City MO (August 20), presentation: Organic Insect Pest Management. Audience: 34
2012 6th National Small Farm Conference, Memphis, TN (September 20). Presentation: Research and Extension highlights of the new Integrated Pest Management Program at Lincoln University". Audience: 18.
2012 Presentation to Master Gardeners, Jefferson City, MO (April 24), presentation: Using Trap Crops to Minimize Insect Pest Damage to Vegetable Crops. Audience: 75.
2012 7th International IPM Symposium, Memphis, TN (March 27-29). Poster titled "The New IPM Program at Lincoln University of Missouri, an 1890 Land-Grant University" by Jaime C. Piñero.
2012 7th International IPM Symposium, Memphis, TN (March 27-29). Research poster titled "Synergistic interactions within and across insect sensory modalities: Applications for IPM" by Jaime C. Piñero, Silvia Dorn, Roger I. Vargas, Giovanni Galizia, and Ronald F.L. Mau.
2012 Workshop for Hispanic Farmers, Sedalia MO (April 24, 2012). Audience: 8 Hispanic farmers.
2012 Minority and Limited-Resource Farmers Conference, Jefferson City, MO (March 2-3), presentation: Integrated Pest Management. Audience: 35 farmers.
2012 Annual Conference of the Missouri Organic Association (St. Louis, MO, Feb. 2-4, 2012), presentation: Determining Economic Levels for Pesticide Applications. Audience: 17 organic farmers.

University of Minnesota
EIPM FY2012 state report

IPM research and extension programming crosses disciplines and is conducted by approximately 80 faculty and staff and is facilitated by the UMN EFANS IPM Program. Significant collaboration and coordination occurs in this organization; the UMN EFANS IPM Program has developed an extensive communication network and strong working relationships with its stakeholder groups.

Events: In order to meet the needs of our clientele, UMN EFANS IPM Program participates in Extension events targeted both at producers and at agricultural professionals (through the UMN Institute for Agricultural Professionals). Some of the most successful and best established of which included the annual Agricultural Professional Updates, the Crop Pest Management Short Course, Winter Crop Days, the Commercial and Private Pesticide Applicator Training Programs, and multiple Field Days and plot tours. The UMN IPM Program personnel also collaborate with county and regional Extension Educators in the development and delivery of local and regional Extension programming related to pest management.

Through the growing season of 2012, many Minnesota producers and agricultural professionals were battling resistance issues in corn, soybeans and potatoes. Increasing tolerance to insecticides, herbicides and fungicides were being encountered in all three cropping systems. Consequently, throughout the season and well into the fall and early winter, Extension programming was designed and delivered to provide insight into the development and management of pesticide resistance. This represented individual efforts by UMN IPM personnel across the state to ensure that Minnesota producers and agricultural professionals understand why the existing problems are developing and what can be done to manage the situation.

Grower Participatory Research/Demonstration: There is a long history of grower participation in Minnesota's Extension delivery. In 2012, the UMN IPM Program was assisted by growers in establishing on-farm research and demonstration trials at over 30 locations. These included soybean, small grain, corn, and alfalfa plots used to assess and demonstrate a wide variety of pest management tactics varying from insect management to insecticide resistance. The increasing problem of glyphosate resistance in Minnesota has resulted in significant research and demonstration on recognizing and managing resistant weeds.

Evaluation: We annually conduct an IPM Adoption Survey at Pesticide Applicator Training sessions across the state. It includes questions designed to ascertain the efficacy of the individual extension program and the impact of our IPM Extension efforts overall. The IPM Adoption survey is administered using Turning Point technologies (many of which were donated from the NCIPM Center). In 2012, 830 producers participated, answering questions designed to assess pest management in Minnesota (although not all 830 answered questions on the same cropping systems as the state wide survey crosses production areas). Of particular interest were the responses dealing with the onset of resistance in corn (presumably to *Bt* traits) (fig. 1) and to glyphosate (fig. 2). These data do underscore the growing concern of growers about pesticide resistance. In Minnesota, these concerns were accelerated when laboratory trials confirmed chlorpyrifos resistance in some Two Spotted Spider Mite populations in soybeans.

Consequently, the UMN EFANS IPM Program incorporated resistance management information in plot tours and fields days in the summer of 2012. This will also be a focus for events in 2013.

External Funding: The UMN IPM Program actively competes for external funding to augment existing federal support. In 2012 the primary personnel of the IPM program alone generated in excess of $250K in non-Federal competitive funding directly aiding the IPM Extension program. Most of this was stakeholder supported commodity support, demonstrating the strong stakeholder support received by our program.

Michigan State University
EIPM FY2012 state report

Larry Olsen, Interim IPM Coordinator, Associate Chair Entomology
Joy Landis, Assistant IPM Coordinator and Communications Manager

Using Enviro-weather boosts economic impact of Michigan's tree fruit industry by an estimated $1.8 million annually

MSU's IPM and Climatology programs established Enviro-weather in 2006 in response to the need for a dependable and sustainable weather-based system to support IPM and other management decision-making. Today, Enviro-weather includes 78 stations across Michigan and Wisconsin's Door Peninsula. Weather data is communicated quickly and inexpensively using cellular IP technology. Enviro-weather's web-based tools and applications serve a wide variety of commodities representative of the state.

In a joint 2011 study with the Michigan field office of the National Agricultural Statistical Service, we quantified that using Enviro-weather increases the application of IPM strategies by tree fruit growers, our largest user base. Using Enviro-weather was estimated to reduce the amount of pesticide applied to apples and sweet and tart cherries by 306,238 pounds of active ingredient per year. Furthermore, tree fruit growers reported that use of Enviro-weather led to increased yield and quality of the crop. *The total economic impact associated with using Enviro-weather-based information was estimated to be more than $1.8 million based on less pesticide use and higher yields.*

The IPM Program and Enviro-weather are launching a new promotional effort this fall to increase use of the website's resources in other commodity groups.

Second year for MSU IPM Academy – enhanced with SARE

For the second year, a group of MSUE educators, led by Erin Lizotte and Joy Landis, collaborated to develop a two-day Academy that cut across commodity groups and provided educational resources to serve beginner and advanced IPM users. View program details at http://bit.ly/11bTHvt. The special topic at this year's Academy was climate change and impacts on IPM. This year, we started a two-year process to reach more of the consultants, NRCS technicians and others who advise with farmers in an effort to multiply our connections to farmers. We applied for and received a Sustainable Ag Research and Extension (SARE) Professional Development grant for this purpose.

Our audience was 39% farmer/renter/owner, 18% farm employee, 21% ag business or government and 21% university employee. While we are still analyzing our evaluation data, here are some of the results:

- 93% of attendees increased their awareness of MSU IPM resources.
- 92% reported an improved understanding of sustainable ag practices.
- 67% agreed (31% "maybe) the timing of the Academy motivates them to implement something new this growing season.

Percent of attendees who plan to utilize, expand or improve use of the following IPM practices based on the IPM Academy:

- 92% (n=44) Access MSU IPM resources online
- 81% (n=39) Scouting for insects and diseases
- 63% (n=30) Scouting for beneficial insects
- 75% (n=36) Referencing weather modeling to make management decisions (e.g., Enviro-weather)
- 44% (n=21) Only treating for pests when the economic threshold is reached, as applicable
- 46% (n=22) Supporting beneficial insect habitat to promote pest control via natural enemies
- 44% (n=21) Selection of pest resistant varieties or cultivars
- 38% (n=18) Sanitation practices (removal of inoculum, sterilizing implements, etc.)
- 48% (n=23) Utilize the least biologically impactful pesticide when management is needed
- 44% (n=21) Protecting native pollinators (mowing before spraying, spraying at night)

Academy participants will be resurveyed in November.

Pest ID web/app collaboration with the Great Lakes Fruit IPM Working Group

Through MSU's IPM Tree Fruit Integrator, Julianna Wilson, we are collaborating with the Great Lakes Fruit Working Group (Michigan, New York, Ontario, Wisconsin, Ohio, Illinois, Indiana and Pennsylvania) to bring a key print pest identification resource into web and app formats. The larger project updates and redesigns MSU's cherry and apple websites. Working Group member Art Agnello, a professor at Cornell University, and his co-authors have given permission to add the contents of his book, the "Tree Fruit Field Guide to Insect, Mite, and Disease Pests and Natural Enemies of Eastern North America," to the MSU-based tree fruit websites and the to-be-developed app. The book is a comprehensive identification guide that is only available as a spiral-bound book through Cornell University's Plant and Life Sciences Publishing, but its content is relevant to all

tree fruit growers in Eastern North America. The finished product will be fully searchable content that is both mobile and desktop user-friendly. The Quebec government will cover costs to replicate the new Internet version of the guide in French.

Smart Gardening Initiative

The MSU IPM Program is joining with our Consumer Horticulture team and Master Gardeners to deliver key messages for garden and lawn care. Our goals are to:

1. Develop simple and clear messages that are easily understood as "Smart Gardening."

Smart Lawns - Raise the mower height to the highest setting and return grass clippings and chopped trees leaves to the lawn.

Smart Plants - Trees and shrubs planted for landscaping should be native to Michigan or well-adapted to Michigan. Problem-prone plants should be avoided.

Smart Soils - Soil from lawns, shrub beds, flower beds and gardens should be tested using a standard MSU Extension soil test kit. Application of fertilizers, mulches, and pH modifiers should follow recommendations from soil test results.

2. Develop a recognizable brand for delivering this information to homeowners and lawn and landscape maintenance professionals.

3. Train Master Gardener volunteers to deliver the Smart Gardening message to their community audiences.

4. Partner with industry to deliver Smart Gardening messages, distribute tip sheets and provide options for sustainable lawn and landscape maintenance.

5. Deliver Smart Gardening message through media, gardening conferences, tips sheets, and a new focus on "Smart Gardening" at the MSUE website www.migarden.msu.edu.

6. Use Master Gardener volunteers to determine adoption rate and transformation in actions of homeowners exposed to "Smart Lawns", "Smart Plants", and "Smart Soils" educational materials.

The centerpiece of this effort was booths at the state's two largest home/garden shows. Prior to the show we trained the Master Gardener volunteers on our "Smart" messages as well as how to engage people when they wander up to the booth. They recorded interacting with over 2,500 people from over 30 of Michigan's 83 counties. Some attendees shared email addresses and we will contact them this fall to learn if they adopted our "Smart" practices.

More broadly, the response has been great. We've distributed all 3,500 copies of each of our nine tip sheets. Our counties want more copies to have available locally. An industry panel read one of our funding proposals and they are asking to be involved. The Master Gardener volunteers are excited about the messages and the materials we have for delivering them.

The Smart Gardening program was conceived late summer 2012. Data for evaluation will be available in a few months. Plans are underway to expand this program through a partnership with the Ohio State University's Master Gardener program and consumer horticulture team.

IPM news and alerts a focal point at growing MSU Extension website

Being a successful IPM practitioner today requires having access to regional data and advice during each unique growing season. The IPM communications team organizes over 60 MSU campus specialists and field extension staff to produce IPM and related articles and reports.

This information is posted in the plant agriculture portion of MSUE's website (http://msue.anr.msu.edu/topic/info/agriculture). Educational and advisory information is posted year-round, peaking during the growing season when an average of 95 articles is posted each month. The accompanying table shows the number of people signed up to receive a weekly email digest of these articles. These counts do not reflect the many people who go directly to the web pages through search engines (54% of all). The entire MSU Extension website now receives more than a half million viewers each year, making over 1.8 million page views. Our IPM information continues to be a significant draw for this traffic.

Web resources – new IPM Program website

Additional website updates:

- **New IPM Program website** (ipm.msu.edu). We redesigned our site and our Pesticide Safety & Education Program has joined our site.
- **Sweet Chestnut Orchard production website** (http://chestnuts.msu.edu/). Edible sweet chestnut orchards have sprung up across Michigan over the last 20 years. As of 2007, Michigan had the largest number of chestnut growers and the most acreage of any state in the United States. All of our MSU chestnut growing advice, including an extensive pest management section, is included.
- **Small scale hop production in the Great Lakes Region** (http://hops.msu.edu/). This website won a 2012 award from the National Association of County Agricultural Agents. Recent hop shortages, growing appeal with specialty beers, and the desire for organic and locally sourced agricultural products have resulted in increasing interest in local hop

production by farmers, brewers and backyard enthusiasts. This website also includes an eXtension "Ask the Expert" widget and is suitable for sharing with growers throughout the region.

University of Nebraska
EIPM FY2012 state report

Crop Production Clinics (http://cpc.unl.edu/) were presented at 9 locations in January 2013. About 1500 people attended this one-day workshop. This is the primary venue for recertification training for Commercial Applicator licenses in Ag-Plant. IPM and crop production, irrigation, soil fertility, and ag business topics are presented.
Weed Resistance Management Field Days and Workshops (UNL Weed Science faculty; co-sponsored with Nebraska Soybean Board)
2012 Field Days were held at Big Springs and David City Nebraska in July. University and industry specialists discussed herbicide resistance and the need for integrated weed management programs to delay the evolutionand/or spread of herbicide-resistant weeds.
2013 Workshops were held in March at 4 locations. These "hands-on" workshops will demonstrate how to use the Herbicide Site of Action Numbering System in the 2013 Guide for Weed Management Guide for Nebraska and cover these topics:

- herbicide tolerant crops,
- how weed resistance develops,
- overview of weed resistance in the Midwest and Nebraska, and
- examples and practical solutions for major weed resistance cases in Nebraska.

CropWatch (http://cropwatch.unl.edu) (Twitter, @UNL_CropWatch)
Web apps (http://ianrhome.unl.edu/web/ianr/mobileapps)
Western Bean Cutworm Speed Scout uses binomial (presence/absence) scouting of western bean cutworm eggs in corn to determine whether western bean cutworm populations have reached the economic threshold for treatment. (Wayne Ohnesorg et al. 2012)
2013 Urban Pest Management Conference (organized by Shripat Kamble)
http://entomology.unl.edu/urbanent/2013upmprogram.pdf

Dr. Steve Young, UNL Agronomy-Horticulture, West Central Research & Extension Center

1) Presented high school science program on invasive plants and their impacts on ecosystems to 450 high school students from Holdrege, Kearney, and Lexington at the UNL Youth Science Field Days
2) Hosted 3 invasive plant science (IPS) Workshops at WCREC for the Honor's Biology classes from Lexington and North Platte High School in the spring and fall; high school students from Lexington are required by their teacher to develop a field day with the material they learned in my program to elementary students in the spring.
3) Developed a new online 3-credit course through UNL (AGRO/NRES 107) entitled, "Invasive Plant Science: Impacts on Ecosystems" that will be targeting AP high school and undergraduate students; the course is ACE 9 (World issues) certified and will be offered beginning in the Spring 2013 semester and run for at least 5 consecutive years; the first offering filled up to maximum capacity (25 students) in less than 2 weeks.
4) Developed a new webinar series on invasive plants for NAIPSC members and anyone else interested in the ecology and management of invasive plants; contacted and arranged for 9 speakers in the fall and another 8 speakers for spring 2013; NAIPSC website (http://ipscourse.unl.edu) has been viewed over 4,500 times in 2012, which is double 2011.
5) Conducted second year of micro-dose studies to quantify the precise amounts of herbicide to kill individual plants - received NCIPM grant ($10K); 1 publication is pending and expect to submit another in 2013; results used for grant applications
6) Organized symposium for the ASA annual meetings on real-time weed identification and control; invited 8 speakers, which included 3 from Spain, UK, and The Netherlands; symposium was the first to be streamed live by ASA at one of their annual meetings; over 75 people watched online or live at the conference
7) Lead PI on proposal for one of the two UNL Big Ideas Seminar Series to be held on campus in 2012-13; collaborated with computer scientist and biological systems engineer at UNL to bring in 1 international speaker from the UK and 2 more speakers from the University of Maryland and Iowa State University; the seminar series took place in early 2013

North Dakota State University
EIPM FY2012 state report

Janet Knodel, Extension Entomologist & Associate Professor, NDSU
Marcia McMullen, Emeritus Professor, NDSU
Patrick Beauzay, State IPM Coordinator, NDSU

Staff: Patrick Beauzay was named the new State IPM Coordinator and Dr. Janet Knodel the new NCERA-222 representative towards the end of 2012 due to Dr. McMullen's retirement. State Extension Specialists that work on IPM issues include: one Extension Entomologist, two Extension Weed Scientists (one a joint appointment between ND and MN), four Extension Plant Pathologists (one a joint appointment with ND and MN), and one Plant Pest Diagnostician.

Primary Coordination Program Emphasis Area: IPM Implementation for Agronomic Crops

For the **IPM survey of agronomic crops**, a NDSU Extension Impact Statement entitled "NDSU Extension's IPM Survey Program Combats Crop Insects and Diseases" was developed in 2012 for the state legislators of North Dakota and IPM stakeholders.

Each year, insects and diseases attack North Dakota's crops, potentially causing large losses in yield and quality. Crop producers need up-to-date data on pest occurrence, distribution and severity, so that they can make informed and timely management decisions. Correct and timely management decisions can make the difference between profit and loss for a crop that year.

In 2012, a group of NDSU trained field scouts help producers stay informed about pest problems by surveying fields of major crops for insect and disease occurrence and severity. The survey has been titled the Integrated Pest Management (IPM) Survey, with the intent that once pests are found, they may need to be managed using an IPM approach.

Field scouts are trained each year in late May and are provided with scouting protocols and equipment for accurate field scouting. In 2012, field scouts surveyed five major crops (wheat, barley, soybean, sunflower and dry bean) across the state. Activities were coordinated by a team of state and area NDSU Extension specialists: R. Ashley, G. Endres, C. Hill, J. Knodel, S. Markell and M. McMullen. The survey effort also was assisted by S. Knoke, L. Lubenow and J. Fisher.

Impacts

Short term impacts relate to immediate information about pest problems. In 2012: **Producers learned that:**

- Wheat streak mosaic was present in many winter wheat fields and proper management steps were taken to reduce the risk to spring wheat.
- Wheat stripe rust developed early and reports of its occurrence allowed producers to make timely fungicide use decisions, resulting in improved yield.
- Fusarium head blight was not widespread or severe in the state.
- Soybean aphids were not at economic threshold levels, indicating insecticides were not needed for soybean aphid management.
- Sunflower and dry bean rust development was late in the season, generally past the optimum growth stage for fungicide use.
- Early detection of banded sunflower moth and sunflower moth in insect traps alerted producers to potential insect pest problems in flowering sunflowers.

IPM information from the IPM Survey delivery was timely, either immediate or on a weekly basis via:

- NDSU Extension Service Crop and Pest Report
- County Ag Alerts & Ag News releases
- AgDakota listserve
- IPM maps posted weekly at www.ag.ndsu.nodak.edu/aginfo/ndipm/

Long-term benefits of the IPM Survey are:

- Insect and disease occurrence or absence helps validate pest forecasting models
- Support export of agricultural commodities as free of regulatory pests
- Shifts in disease presence and severity may indicate a pathogen race change, necessitating new management strategies
- Detection of pest resistance to pesticides
- Educational and research program needs identified
- Improve economic profitability of farms
- Reduced environmental impacts from pesticides

NDSU's IPM trainings at extension meetings, commodity meetings or collaborative bi-state meetings have been very successful in the past years based on evaluations. Attendance at these meetings has been high with 75-200 people per meeting, even for meetings out in the counties. The collaborative bi-state trainings between extension specialist of North Dakota and Minnesota has provided extensive IPM training on crops grown in both states, and extends the outreach over a larger area and more people. These bi-state IPM trainings have developed closer relationships between commodity groups, extension specialists, and producers and delivered area-wide consensus IPM solutions for managing crop pests. A total of eight extension meetings were held in 2012 throughout the state.

Impacts of NCERA-222 on related activities:

- **Distribution of Updated NCERA Fungicide Efficacy Table for Wheat:** Distributed to ~ 1200 wheat growers at winter meetings, including "Best of the Best" workshops. Informed producers of most efficacious products for helping manage important wheat diseases.
- **Provided Commentary for Fusarium Head Blight Forecasting Site and Fusarium Head Blight Alerts:** Fusarium head blight forecasting site for ND indicated low Fusarium head blight risk across much of the state throughout 2012 season, except for a small pocket of risk near Langdon, ND and another in the northwest counties growing durum wheat.
- **Continued Promotion of the use of SCABSMART:** The ScabSmart website (www.scabsmart.org) provides easily accessed information on FHB management to wheat and barley producers. This site, initially developed at NDSU and funded by the US Wheat and Barley Scab Initiative, is a collaborative effort of small grain pathologists associated with NCERA 184. Information provided to this site is updated every year by wheat and barley pathologists and small grain breeders across the county. Information on new varieties with FHB tolerance was posted in 2012.

Primary Coordination Program Emphasis Area: IPM Implementation for Communities

For past work in the **IPM Implementation of Communities (urban)**, the NDSU Extension Service's Master Gardeners Program has continued to include IPM education and trained more than 900 volunteers each year. A monthly urban IPM newsletter entitled "Dakota Gardener" has been developed by Dr. Tom Kalb in Burleigh County to address key urban pest issues.

Support for the Plant Diagnostic Laboratory – Secondary Emphasis Area

For past work with **IPM Support for the Plant Diagnostic Facility**, the NDSU Plant Diagnostic Lab processed 3,854 samples in 2012. IPM information is provided with each pest diagnosis to encourage adoption of IPM practices for pest management of urban, crop and other situations. One example of a recent IPM extension publication that was developed for the diagnostic lab use is entitled Houseplants: Proper Care and Management of Pest Problems. The NDSU Plant Diagnostic Lab is an active member of the Great Plains Diagnostic Network (GPDN) to ensure multistate cooperation on the rapid detection and proper diagnosis of high-risk plant pests.

IPM Education for the Pesticide Applicators – Secondary Emphasis Area

For **IPM Education for Pesticide Applicators**, the NDSU's Pesticide Applicator Training Program continues to provide IPM training for commercial and private pesticide applicators for approximately 5,542 commercial and 11,518 private applicators in 2012. IPM outreach is provided via face-to-face meetings at the county, state and stakeholder levels, IPM publications, videos on pest and pesticide updates and the pesticide applicator's web page and newsletter. For a past example of IPM education via video production, Dr. Jeff Stachler, NDSU/UM Weed Specialist, put together a series of short YouTube Videos about managing herbicide resistant weeds. These videos are computer and smart phone friendly.

Ohio State University
EIPM FY2012 state report

Jim Jasinski
Ohio State University Extension IPM Coordinator

The Ohio IPM Program has a long history of serving its citizens by developing and implementing programs that address traditional agricultural audiences, such as growers of field and specialty crops. Due to local food movements, season extension, and transportable pests such as bed bugs, our program has begun to shift toward addressing those emerging community and urban issues. In the past several years, the Ohio IPM program has focused on these six areas: Agronomic crops, Specialty crops, Diagnostic centers, Housing IPM (bed bugs), NRCS Conservation Programs (EQIP), and Urban IPM (Master Gardeners). Detailed below are updates in each of these areas.

In early January 2013, Joe Kovach retired as the IPM Program coordinator after 13 years of service in that position. His replacement, Jim Jasinski, has been a member of the OSU IPM Program for 20 years, and was appointed as the new Coordinator in February, 2013.

Agronomic crops: This program area is led by Anne Dorrance, Andy Michel, Mark Loux, and Ron Hammond. Over the past year this group has continued soil sampling in southern Ohio which lags the rest of the state in yields, where they identified a prevalent new disease on soybean roots, charcoal rot. Also causing yield loss, seed treatment trials for soybean cyst nematode revealed no significant differences in yield in grower trials, and reproduction of SCN was found on PI88788 for the first time. A

statewide insect monitoring network was set up for Western bean cutworm, and pockets of glyphosate resistant weeds (giant ragweed, common ragweed, pigweed) have been detected throughout the state and verified through seed testing.
Specialty crops: This area is led by Joe Kovach and Jim Jasinski. Joe continued to transition from his high tunnel polyculture project to a high tunnel parking lot project that compared pests and yields from plants in pots and raised beds sitting on top of the pavement; in pots suspended on wire mesh fencing forming "vertical gardening"; in beds set in trenches cut right through the asphalt; and all three ways both inside and outside of high tunnels. Jim continued to work on several disease issues (powdery mildew, bacterial leaf spot) and a spray technology study related to pumpkins. These projects were showcased at a field day with 30 growers in attendance. Jim along with other OSU faculty has conducted an insecticide trial for lepidoptera pests on sweet corn which was presented at several grower meetings. Jim remains active with the Great Lakes Vegetable Working Group and is one of the lead authors on the now completed Good Bugs + smartphone app.
Diagnostic centers: This area is led by Nancy Taylor. Nancy is responsible for running the OSU Diagnostic Center housed at ODA. A total of 827 samples were processed through the C. Wayne Ellett Plant & Pest Diagnostic Clinic. This included 543 samples submitted for disease evaluation, 119 nematode samples, 121 insect identification samples, 17 plant or weed identification samples, and the remaining samples uncategorized. Clients who accessed the services of the C. Wayne Ellett Plant & Pest Diagnostic Clinic included: 97 from Agribusiness, 90 Arborists, 85 Growers/farmers, 156 Homeowners/home gardeners, 145 Lawn care/landscapers, 38 Crop consultants, 36 Greenhouse growers, 29 Golf course/athletic field managers, 26 Individuals, 25 Nurseries, 24 Researchers/specialists, 20 Pest control operators, 15 Park/school/church/other grounds keepers, 12 Tree farms, 12 Garden centers, 11 Foresters, 7 Regulatory agents, 1 Medical doctor, 1 Museum. Nancy lends her diagnostic services and expertise on field visits, on-site consultations, telephone consultations, field days, and meetings.
Housing IPM (bed bugs): This area is led by Susan Jones. Last year Susan conducted a statewide bed bug survey of how Ohioan's manage bed bugs; 36% of licensed pest control operators responded to the survey. Results from the bed bug survey indicated that bed bugs continue to be a major pest problem that is widespread across Ohio. Bed bug treatments predominated in apartments/condos, single family homes, and hotels/motels. Respondents estimated that only 10% of their customers had not misused products in an attempt to kill bed bugs. Bug bombs, rubbing alcohol, and a wide variety of insecticides were among the most misused products. The one bit of good news from the survey was that the majority of respondents thought that customers were recognizing bed bug infestations earlier than in the past. Susan has been updating the Central Ohio Bed Bug Task Force website to reflect new information and conducting updates to hundreds of people at several Pesticide Recertification meetings across the state.
NRCS Conservation Programs (EQIP): This area is also led by Jim Jasinski. Jim, Joe Kovach, and Celeste Welty held a workshop to train four crop consultants and 10 NRCS staff to be able to understand and work with specialty crop growers who are interested in signing up for 595 (pest management) or IPM Conservation Activity Plans through EQIP. Jim has written two newsletter articles and referred many specialty crop growers interested in adopting IPM practices to visit with their local NRCS staff about enrolling and qualifying for conservation programs like EQIP.
Urban IPM (Master Gardeners): This area is led by Pam Bennett. Pam is the State Leader for the Master Gardener Volunteer Program. In the past year, presentations about entomology, IPM, and Pesticides were given to nearly 500 Master Gardener volunteers in training as a part of the standard program curriculum. Pam also contributes to the eXtension Master Gardener Community of Practice and is the state lead on Ask an Expert on eXtension for home horticulture questions.
Impact statement: In fall 2011, a statewide survey of pest management professionals (PMPs) was conducted to gather data on the incidence and distribution of bed bugs and control efforts. With a response rate of 35.6% (225/632 responses received), survey results indicated that the number of bed bug calls and treatments dramatically increased each year from 2005 to 2010. In 2005, ca. 50% of companies neither received calls regarding bed bugs nor provided treatment for bed bugs, but by 2010 and 2011, only 3-5% of PMPs reported such. In 2011, bed bug treatments were reported for all 88 Ohio counties. The majority of bed bug treatments were performed in apartments and condos (subsidized and unsubsidized) as well as in single family homes. The survey also revealed that the majority of people (ca. 90%) were using products improperly in attempts to control bed bugs; the most commonly misused products for home bed bug control were over-the-counter (OTC) foggers/"bug bombs" (14%), dusts (14%), outdoor/garden pesticides (14%), OTC aerosols (13%), and alcohol (12%). The one piece of good news was that residents were detecting bed bug infestations sooner than in past years.

Purdue University
EIPM FY2012 state report

Agronomic Crops

We continued our train-the-trainer strategy in which we target most of our educational activities at agribusiness personnel. The following table summarizes some of those activities.

Title	2010	2011	2012	Description
Crop Management Workshops[1]	906	968	931	Commercial applicators in attend an all-day winter IPM meeting.
Indiana CCA Conference	731	728	808	CCAs and/or commercial applicators

				attend a 2-day winter meeting
Pest&Crop Newsletter[1]	90,000+	60,000+	81,000+	Views and downloads
Crop Diagnostic Training Center	687	632	1,027	Attendees of in-field, hands-on workshops receiving IPM and agronomic training
Corn & Soybean Field Guide	49,213	58,241	46,394	Copies of a pocket guide of IPM and agronomic information sold
Weed Control Guide for Ohio and Indiana	400 3500	502 4000	601 4000	Downloads/sales of a 200 page bi-state guide
Purdue Ag Center Field Days	9800	12,000	10,900	Attendees at 8 research centers' field days featuring IPM research
Private Applicator Recertification Programs	7,699 199	6,207 178	7,072 184	Number of attendees and approved sessions where growers received IPM education
Plant & Pest Diagnostic Lab	294	267	297	Number of field crop samples analyzed and provided management recommendations
Nematode Soil Samples	1361	1509	1355	Number of soil samples analyzed for pest nematodes with management recommendations.
Field Pest/Crop Videos[2]	10 5,907	18 6,873	19 28,045	Completed IPM/agronomic short-videos and YouTube views

1. [1]See #7, "Previous EIPM Award Outcomes" below
2. [2]YouTube web site: http://www.youtube.com/playlist?list=PL1DCC2F39021955FF

With the ongoing success of the 320-page Corn & Soybean Field Guide, and in listening to feedback from users, we developed a field guide app designed for Apple's iPad, available soon through the App Store. Aside from moving to the readily updatable and growing digital arena, the app version of the pocket guide will also include hundreds of high-quality pictures, data recording tools with interactive calculators, pest/crop videos, and a report generator (including field history and pictures) for real-time submission to Purdue's Plant & Pest Diagnostic Lab. Stakeholders have requested an app for the smartphone, which is under development

The popularity of the Corn & Soybean Field Guide has led to the production of the Midwest Cover Crops Field Guide (ID-433) and the Wheat Field Guide (ID-448). The Cover Crops Guide was just awarded the Gold Award for technical publications from the Associated for Communication Excellence.

Over 40% of the 931 Crop Management Workshop (CMW) participants indicated that they make or influence pest management decisions on at least 10,000 acres and 80% have implemented crop production/IPM strategies from ideas from past CMWs. 94% of the participants indicated that the CMW improved their IPM decision making ability and 94% indicated that the CMW was worth their time and expense to attend. 86% of the participants indicated that they would share the meeting's content with colleagues and/or customers.

The 2012 *Pest&Crop* on-line newsletter, 71,907 visits (HTML) and 10,010 (PDF) downloads, effectively reached a targeted audience of pest managers that make significant pesticide input decisions on Indiana's field crop acreage. Via on-line evaluation, readers indicated that the newsletter was useful (98%), timely (97%), helped them improve their pest management decision making ability (88%), saved/made them money (62%), and was considered their main source of pest information (72%). Over half of readers indicated they shared information with co-workers and customers.

Consumer/Urban Environments

IPM activities in urban landscapes and gardens are practiced by a diverse group of individuals ranging from homeowners and Master Gardeners to trained landscape and lawn care professionals and golf course superintendents. In Indiana, these groups are engaged through a variety of stakeholder organizations including Purdue Master Gardeners, professional stakeholder groups including the Indiana Arborists Association (IAA), Indiana Nursery and Landscape Association (INLA), Midwest Regional Turf Foundation (MRTF), and Indiana Flower Growers Association (IFGA). Each organization has an annual state-wide meeting whose agenda is set by a steering committee that works in consultation with representatives from Purdue Extension to implement and assess progress toward their strategic goals. Purdue Extension Specialists meet regularly with the leadership of these organizations to identify and prioritize educational programing needs and plan Extension projects and activities. At the local and in-state regional level, local grower organizations and county Extension educators work within the larger state-wide stakeholder organizations. Pest management is a major component of most of these programs.

Annual meetings of state-wide and local clientele groups reach over 10,000 participants annually. Full membership in statewide stakeholder organizations includes 2,500 Master Gardeners, 450 INLA, 500 IAA, 600 MRTF, and 100 IFGA. Extension Specialists work with the director of the P&PDL to diagnose 1,700 home horticulture cases each year. In 2008, at the request of the green industry, our Green Industry Working Group conducted an educational needs assessment with stakeholders,

Extension Educators and Specialists to improve state-wide delivery of information to clientele. This stimulated a functioning working group that resulted in new hires for Purdue Extension including Nursery Production and Turfgrass Extension Specialists.

Our first diagnostic mobile app in the Purdue Plant Doctor series was completed and released with over 1100 copies sold. The platform is available for the development of additional apps. Two Flower Doctor apps have recently been completed.

Specialty Crops

Nearly 800 specialty crop growers attend the Indiana Horticultural Congress in Indianapolis in January of each year. Participating organizations include IN Wine Growers Guild, IN Horticultural Society, IN Vegetable Growers Association, Hoosier Organic Marketing Education, and IN Raw Products Association. There are numerous local or regional Extension fruit and vegetable grower meetings around the state. Demand for Extension education has increased recently because of an increase in the number of new, smaller acreages devoted to the production of vegetables and fruit for sale in several food hubs that have been established or are under development. Many newer growers have limited knowledge of IPM. Demand remains high for Purdue Extension recommendations with 408, 142, and 300 publications sold to vegetable, tree fruit, and small fruit growers, respectively in Indiana. In addition, 468 vegetable growers subscribe to the "Vegetable Crops Hotline" newsletter (up 19%) and 492 fruit growers subscribe to the "Facts for Fancy Fruit" newsletter (up 18%).

We recently completed a half day Apple IPM Workshop at the Indiana Horticultural Congress. A variety of traditional Extension workshops including the Illiana Vegetable Growers' School, Southwest IN Melon Growers Workshop, Summer Horticultural Meeting and numerous local and regional meetings are held around the state each year. We have 9 fruit and vegetable related videos on our YouTube channel (http://www.youtube.com/playlist?list=PL8B4B288C9754C06) with over 3000 views in the past year. In 2012, Indiana lost much of its fruit crop due to two freeze events and we quickly posted videos to show growers how to determine if their fruit buds were still alive. This information had IPM implications because pesticide use is greatly diminished when the fruit crop is lost.

In 2011, The Illiana Vegetable Growers School had a record attendance (129), and over 83% and 70% of the respondents, respectively, indicated that they planned to make changes in their insect and disease management. When asked what portion of the program was most valuable, insect and disease management were the two most commonly mentioned topics. Based on the previous year's meeting, 59% stated that their vegetables had improved quality, 47% thought they had reduced their environmental impact, and 18% had reduced their costs of production.

South Dakota State University
EIPM FY2012 state report

Darrell Deneke, Ext. IPM Coordinator

The objective of the South Dakota IPM (SDIPM) Program encourages unbiased science-based, decision-making by the state's residents; identifying and reducing risks from pests, monitoring, using decision-management guidelines and promoting the use of a variety of pest management strategies. Improved knowledge of pest biology, impact of environmental factors, pest forecasts and communication that includes available technology, landowners and managers can prevent unacceptable levels of pest damage by economical means, while posing the least possible risk to people, property, resources, and the environment. Delivering IPM resources, educational/professional development and extension programs to SD residents, stakeholders, and the agricultural community is the focal point of the SDIPM Program. The SDIPM program has strong support from public and private agencies in SD including Natural Resources Conservation Service (NRCS), Conservation Districts, Bureau of Indian Affairs (BIA), South Dakota agencies (Agriculture (SDDA), Game, Fish and Parks (SDGFP), SD Weed and Pest Commission including county-based Weed and Pest Boards, USDA, APHIS, SD Agri-Business Association, USDA, ARS, NCARL, USDA Forest Service, US Fish and Wildlife Service, The Nature Conservancy, and producer commodity groups. Some of the major projects for the year included the following:

Professional agronomist advising the state's growers must have the best up-to-date information available to advise their grower clientele. The SDSU Extension IPM Program organizes two training events for agronomy professionals annually. A crop consultants' update is held for the South Dakota Independent Crop Consultants to discuss current agronomy concerns with SDSU Plant Science Specialists. Each year SDSU Extension IPM trains over 75 percent of the state membership of the South Dakota Independent Crop Consultants' Association. This represents approximately 700,000 acres. The group was updated on SDSU Plant Science research as well as new product information to assist them with advice for their grower clientele. The SDIPM program annually organizes the SDSU IPM Field School in July. This training event is co-hosted with the SD Agri-Business Association. Over 75 professional agronomists from 20 businesses representing over 1.3 million acres in South Dakota attend and complete the 2-day training. Training areas of agronomic and economic concerns include soybean cyst nematode management, identification and scouting training in foliar and root borne diseases in wheat and soybeans, timing for proper fungicide applications, new and emerging corn insects, thresholds and timing of treatment for soybean insects, herbicide timing and weed control programs, and pesticide resistance management, and fertility management and agronomic/climate interactions. The sessions were videotaped and pod casts were developed and are on the new SDSU Extension iGrow web page.

A pre and post-test was given, asking questions on material covered in the sessions and three questions on changes in behavior (1. How likely are you to scout the fields and use pesticides only after pest levels reach economic thresholds? 2. Have you considered using aphid-resistant varieties for pest management? 3. Would you now consider using aphid resistant soybean varieties for pest management?) The pre and post test showed an increase of 10% incorrect answers to the questions asked at the end of the sessions. Results in changes in behavior showed 8% not likely, 28% somewhat likely and 64% likely for the field scouting question to 7% not likely, 23% somewhat likely and 70% likely. The questions on using aphid resistant varieties showed a change from 50% no to 96% yes. Results from the evaluation/survey following the school showed 82% rated the sessions useful to very useful

The SDIPM program has been working with the SDSU Pesticide Education program and the Iowa State University School IPM Coordinator on a special project of introducing school IPM into South Dakota. Two school districts were selected to start the school IPM process, and they include the Flandreau Public School and Brookings Elementary Schools. Completion of pilot project was in December of 2010, a School IPM Demonstration Day was held in 2011 at the Flandreau Public School. Area school administrators, custodians, and kitchen staff coordinators were invited to the program to introduce them to the School IPM Concept. School surveys were conducted to determine where South Dakota schools were in terms of some type of an IPM program. Results show organized IPM plans and interest in the South Dakota schools remains low. Have presented IPM programs and pesticide safety programs for the state's school custodian group.

Provided an IPM training for NRCS personnel as requested. Have been assisting the state NRCS in putting together a plan for farmers to use IPM documentation in their EQIP program and developing a chart for growers to record an IPM strategy for **Prevention, Avoidance, Monitoring, and Suppression** (the **PAMS** approach) in their farm operation. Also have been assisting NRCS staff on education of pest management for organic growers.

Provided IPM training for other groups including Tribal Pest Control Officers from 3 states, area forestry groups, and South Dakota Weed and Pest supervisors and county Weed and Pest Board members.

Assisted with the third annual SDSU Organic Farming Conference held in Sioux Falls, SD in December of 2012. Over 100 growers and interested parties attended the conference covering topics on transitioning, pest control options including biological control of noxious weeds, production options and marketing.

An organic grower's advisory group was formed to set direction for organic agriculture programing and research at South Dakota State University.

The second annual Sustainable Agriculture and Organic Tour were held at the Southeast South Dakota Research Farm near Beresford, SD in August of 2012. The tour featured research plot work done on the newly established organic section of the farm. Had a special session using beneficial insect and biological control of weeds. Over 50 growers and interested participants attended the tour.

The SDIPM program is actively involved in the educational programming and promotion of the state's biological control of noxious weeds projects. These projects are a joint effort with the SD Dept. of Ag., County Weed and Pest Boards, Area Weed Management Districts and State and Federal Land Management Agencies. Leafy spurge flea beetle collections were held in June 2012 and provided training opportunities on collection and distribution of this bio-control agent for management of leafy spurge. Participated in a purple loosestrife root dig for rearing purple loosestrife bio-control insects and the establishment of a spotted knapweed rearing site. Both of these projects are part of the special South Dakota/ Nebraska Purple Loosestrife Management Project.

Assisted with the Commercial Pesticide Applicator Recertification and Training program providing topics on IPM. Conducted eight sessions across the state and trained over 1650 commercial applicators. The day long sessions provided recertification for applicators in pesticide safety, herbicide, insecticide, and fungicide updates and non-crop and right-of-way issues. Pest management updates were also discussed. The private pesticide applicator training program trained and recertified over 3000 private pesticide applicators. There were sections on IPM, pesticide safety and sprayer calibration.

A traveling display put together by the SDIPM program and SDSU WEED project was set up at the South Dakota State Fair, Dakota Fest Ag Show and the SD State Weed and Pest Convention. The display features a live weed plant display, noxious weed biological control display and SDSU Extension pest management information. Annually about 7500 people visit the display.

The SDIPM program participated in several SDSU Plant Science Research Farm Grower tours and county producer tours. IPM topics were included in the programs which centered around weed control in crops and pasture and range. Information on pesticide resistance, weed identification and management tips were offered.

Conducted 21 spring and summer weekly conference calls for Extension agronomy field specialists and extension state specialists on pest and crop updates and alerts. The conferences were conducted on the Elluminate online conferencing system. This was very important this year with the tranision of the new SDSU Extension format and drought concerns through out the growing period. A weekly newsletter was established to inform clientel of current agronomic concerns.

Weed management has been and continues to be an important part of the SDIPM program. Worked closely with the SDSU Extension Weed specialist and the SDSU WEED project and assisted in the discussion and planning of field plot treatments and

programs. Had extra responsibility with invasive, noxious, pasture and range, and pulse crop weed control studies and programs.

IPM targeted studies included working with the SD Game, Fish and Parks, NRCS, and the US Fish and Wildlife Service on noxious weed control programs that would allow for least amount of damage to exsisting or newly planted native forb species. Tactics included mowing, reduced herbicide rates, application timing comparisons, tillage, grazing and biological control. This continues to be an on-going project with these land management agencies. A guide is being developed that will include herbicide tolerance ratings on native forbs in grass plantings.

Another area in integrated weed management is dealing with herbicide resistence in the state and working with growers observing this developing problem. Glyphosate resistant weed bio-types are becoming increasing common in several regions of the state due in part to the lack of diversification of weed management programs. Herbicide resistance is a priority concern in current corn/soybean rotation cropping systems. SDIPM and the SDSU Ext. WEED project has been working with growers helping them determine if resistant weed biotypes are the reason for their weed control problems through green house and field evaluations. Changes in weed management plans are discussed with growers to help control continued weed control issues.

The Northern Plains IPM Guide, a web based pest management developed by the Great Plains IPM Working group was launched with the first section on soybean insect and disease pests at completion. This guide will compliment the High Plains IPM Guide which serves western SD and other western states. The Northern Plains IPM Guide serves eastern SD and Great Plains states. Dr. Buyung Hadi put the information together for this project and part of his salary and support came from the SD IPM program. Expansion of the guide to include corn and small grains is underway with weed control information being planned for the future of the guide development.

Two free down –loadable mobil apps were also developed from information found in the Northern Plains IPM Guide. One was on soybean insects and the other was on soybean diseases. These guides were compiled to provide growers an aid for the rapid identification of the more common pests of soybeans in South Dakota. A third mobil app is near completion and is a soybean aphid tracker app that will allow growers to record populations of soybean aphids and map populations through GPS technologies.

Two newly developed mobile apps were introduced as free down-loads for public and private land managers on noxious weed identification and control and identification tips for identifying native and introduced thistle species. Because of the great expense of managing and controlling invasive weeds in rangelands, pastures, and croplands, it is essential to be accurate in the identification of any species at hand. The recognition of native species not only helps maintain local biodiversity, but also prevents wasted effort, controls costs, and minimizes herbicide use and chemical pollution.

Have been actively invloved with deveopment of Best Management Practices for Wheat in SD, Best Management Practices for Soybeans in SD, and Best Management Practices for Corn. These management guides authored by SDSU Plant Science staff have been very well received by the agronomic clientle across the state. My chapters included sections on scouting, IPM principles and pest management. A newly developed series of pest management guides for corn, soybeans, and small grain specificly discusses pest management options and will be revived on an annual basis.

University of Wisconsin
EIPM FY2012 state report

The goal of the University of Wisconsin Integrated Pest Management Program is to increase agricultural profitability while minimizing environmental effects associated with pest management practices and growing safe food and feed.

One of the most important functions of the UW IPM Program is to engage stakeholders and determine their needs. This has been accomplished through several venues including: Chair and membership on the Technical Advisory Committee for UW Integrated Pest and Crop Management Programs; Leadership roles for the Certified Crop Advisors and WI Association of Professional Agricultural Consultant's organizations and input to and from all major commodity groups in the state of Wisconsin

Activities and Events

3 Field Scout Training Classes. These classes are designed to provide students with information necessary to monitor and diagnosis pest and nutrient deficiency problems in corn, soybean, alfalfa and wheat. Soil sampling and crop staging techniques are also provided. Soil fertility and nutrient management information is provided because of our desire to offer students a comprehensive course that trains students for summer crop scout internships and ultimately as crop consultants.

IPM Field Day; This field day is advanced level training for agricultural crop consultants and features University of Wisconsin-Madison researchers and extension personnel who discuss their current research and extension pest management programs.

Certified Crop Adviser Pre-Test Training Webinar Series; The UW IPM Program coordinates a series of 10 webinars designed to provide participants with core knowledge necessary to become a quality crop advisor and to aid with preparation for the state CCA exam.

Crop Diagnostic Training Center Field Days; The mission of the CDTC is to enhance the basic training outline above by establishing hands-on, in-field training workshops that are designed to provide advanced level instruction aimed at increasing adoption of new and existing IPM practices. Integrated crop and pest management strategies are demonstrated utilizing

concurrent sessions to maintain small group sizes (15 participants or less), thereby maximizing instructor and field plot access. Small group size, coupled with dedicated demonstration plots is central to the success of the program where participants are expected to roll up their sleeves and learn by doing rather than passively listen to presentations.

Custom Applicator Training Program. This 3 day training program is for new custom applicators and is a collaborative effort between UW-IPM, Wisconsin Agri-Business Association, Fox Valley Technical College. Instruction components include: hands-on equipment operations and road transport (utilizing 8 new spray rigs made available by the crop protection industry), pesticide application, spray nozzle and monitor instruction, spray product management, mixing and loading procedures, field operations, plant and pest identification skills, personal safety and record keeping requirements. The program's real strength has been in providing hands-on training to minimize the chances of crop and environmental mishaps that are more likely to occur with on-the-job training in this industry.

Events which UW IPM staff assisted with instruction include 2 Pesticide Applicator Training programs and over 40 guest lectures given by IPM staff for classrooms and county/regional/state field days. Applied research is also conducted by IPM staff when science based research data is not available and producers are looking for immediate recommendations. The IPM staff assisted with three on-farm foliar fungicide projects on corn and 5 foliar fungicide trials on alfalfa. Results are distributed to county extension agents and presented at various county and state meetings.

Products

Mobile device and internet use is changing how global and local agriculture operates and expands their businesses. Farmers in Wisconsin, like the rest of society, are increasing their use of smartphones and other related handheld devices for communication and information gathering. To adapt to this new mobile internet trend, the UW IPM Program has developed the IPM Toolkit app designed for smartphones and tablets. This app allows a user to read UW Extension news articles, view videos, download publications and access pictures which aid in adapting IPM practices to their agricultural operations.

The IPM Toolkit app is available to users for free on iPhones and iPads and has been downloaded approximately 2,000 times in the last 26 weeks. A version for Androids is near completion. Distribution is available worldwide and is distributed by Apple iTunes https://itunes.apple.com/us/app/ipm-toolkit/id504685615?mt=8 The Android version will be distributed by Google Marketplace for free when completed.

The IPM Program also revised two invasive species factsheets (Brown Marmorated Stink Bug and Spotted Wing Drosophila); developed 9 new YouTube videos; 2 articles were written for the "Fresh Magazine"; co-authored several articles for the Wisconsin Crop Manager Newsletter; Coordinated 3 on farm research plots for foliar fungicide use on corn; 5 plots for foliar use of fungicides on alfalfa, co-authorship of " On-Farm Foliar Fungicide Research Result for Corn".

IPM staff also edited and prepared the Wisconsin Crop Manager Newsletter for electronic distribution. The Wisconsin Crop Manager is an electronic newsletter that features weekly pest and crop management information throughout the growing season. 2012 statistics indicates there are over 1000 subscribers. During the 2012 calendar year, 198 articles have been written for 29 issues with an average of more than 3000 visitors per month. Additionally, 3 blogs had over 2000 visitors/blog. Articles are written by UW faculty and IPM staff.