



2005 Annual Report

MSU Integrated Pest Management Program

The IPM Report, Vol. 12, No. 1 - Spring 2006

Welcome to our annual report

We take this opportunity to give appropriate acknowledgement to our partners who are essential in all our projects. Likewise, we hope we have provided value in cooperative projects led by our partners. Inside this report, we offer an overview of our IPM Program funding, reports on several IPM projects and their impact, and also a full listing of our grant and sponsored project activities during 2005.

Looking to the future, I want to share with you two efforts that are in planning and initial roll-out phase: our weather-based IPM initiative and our IPM web resources initiative.

Weather-based IPM initiative

An organizing committee of 10

MSU personnel from various units within our college representing a wide range of production systems met last summer to investigate strategies to achieve a high quality, sustainable weather-based IPM system for Michigan. We hosted a conference on October 17 to gain input from current and potential users of a weather-based information system. Seventy-five participants representing MSU, state and federal governments, private consultants, information technology commercial sectors, and commodity groups attended.



IPM Coordinator Mike Brewer (left) and David Epstein join the monthly conference call linking IPM staff with ICM educators.

Conference discussions indicated:

- A dependable, sustainable weather-based system to support pest, plant, and natural resource management decision-making is necessary for

Continued on page 3.

MSU IPM Program: generating partnerships to bring better pest management to Michigan

Who we serve

We work with **growers, consultants and their commodity groups** to solve pest management problems in **fruit, landscape, nursery, field crops, vegetable and forestry-related plant production systems**.

Agency partners

To serve stakeholders, we collaborate with **state and federal agencies** such as the Michigan departments of Agriculture and Environmental Quality; the USDA Cooperative State Research, Education, and Extension Service; and the Natural Resources Conservation Service.

MSU Partners

We work with **MSU field staff and campus faculty** within the departments of Plant Pathology, Entomology, Crop & Soil Sciences, Horticulture, Forestry, MSU Diagnostic Services, MSU Extension and the Agricultural Experiment Station. Our home department is Entomology.

How we collaborate

We support specialists and educators in **research, demonstration, and educational projects** and help deliver their findings to IPM practitioners. This work is often coordinated through MSU's Area of Expertise teams.

The IPM Program is associated with ICM educators funded through Project GREEN. We are also allied with other related programs: the North Central Region IR-4 Program, North Central IPM Center, and the MSU Pesticide Safety Education Program. Funding sources are explained on page 2. Major contributors are Project GREEN; the Michigan IPM Alliance; and the USDA Cooperative State Research, Education and Extension Service.

Profile of the MSU IPM Program staff and our ICM staff partners

As IPM coordinator, **Michael J. Brewer** supervises the IPM Program staff and oversees its outreach and applied research activities. He works with staff and stakeholders to create programs that increase the development and implementation of IPM in Michigan.

Joy Landis is the assistant IPM coordinator and communications manager. She is responsible for publications and other communication resources and collaborates with Michael Brewer in administrative aspects of organization, reporting and public relations.

David Epstein, tree fruit IPM integrator, coordinates activities related to IPM fruit extension and demonstration, and takes part in applied research projects. He facilitates collaboration between the university, growers and the tree fruit industry.

Rebecca Lamb is a communications specialist for the IPM Program. She partners with Joy Landis to provide editing, layout and design of web resources and print materials for the program.

Dale Mutch, cover crops/IPM specialist, is located at the W.K. Kellogg Biological Station where his specialty is use of cover crops and other sustainable crop management techniques to improve pest management and cropping system health. He collaborates across the state with Extension educators to coordinate field crop IPM demonstrations and educational opportunities.

Nikki Rothwell, district fruit IPM educator, is based at the Northwest Michigan Horticultural Research Station. She works with the MSU fruit team on developing innovative, system-type approaches for minimizing the risk

from fruit pests. Her efforts include statewide extension opportunities for Michigan's fruit growers.

Integrated Crop Management educators funded through Project GREEN

During 2005, the IPM Program met through regular conference calls with the Integrated Crop Management (ICM) educators to share ideas and collaborate on projects. The ICM educators provide regular field reports for the *Crop Advisory Team Alert* newsletters published by the IPM Program.

Jim Breinling is county Extension director for Mason County and also serves as the West Central vegetable ICM educator based in the Newaygo County Extension office.

Amy Irish-Brown, district fruit and vegetable ICM educator, is located at the Clarksville Horticultural Experiment Station.

Mira Danilovich, district horticulture/marketing fruit ICM educator, is based at the Oceana County MSU Extension office and serves fruit growers in Oceana, Mason and Manistee Counties.

Dean Krauskopf, ICM educator in Southeast Michigan, is responsible for working with the greenhouse industry in 13 counties centered around Metropolitan Detroit and the sod industry across the state.

Jill O'Donnell, statewide Christmas tree ICM educator, works out of the Wexford County MSU Extension office.

For more information about MSU Extension staff and activities, visit the MSUE web portal at: www.msue.msu.edu



Overview of IPM Program funding

Fund source	IPM/ICM role	2005
Federal (Extension IPM)	Core budget	\$169,000
Project GREEN (salaries and operating)	Core budget	\$184,000
Grants:		
Federal grant	Team leader*	\$ 221,000
Federal grant	Team member*	\$ 955,000
Proj GREEN grant	Team leader	\$102,500
Proj GREEN grant	Team member	\$111,100
State agency grant	Team leader	\$ 7,000
Other (industry, NGOs)	Team leader	\$ 114,000
Other (industry, NGOs)	Team member	\$ 119,000
Sub-total	Team leader	\$ 444,500
Sub-total	Team member	\$1,185,100

*Team leader indicates project initiated by IPM staff. Team member indicates a project initiated by another unit with IPM staff involvement.

The above table does not reflect ICM educator funding and activities.

Measuring IPM's contribution to conservation will provide better access to Farm Bill funds

Farming is a process that involves ecological disturbance. Awareness of this basic premise is important for growers transitioning from conventional pesticide use to the newer chemistries, technologies and management practices in use today. Understanding how management practices impact functional diversity (the optimization of the abiotic and biotic factors that yield a sustainable production system) will lead to more effective management of the ecosystem, where pests are kept in check while minimizing the occurrence of pest outbreaks.

Through a partnership with The American Farmland Trust, MSU researchers and extension personnel are working with Michigan cherry, peach, and apple growers to provide the measurement tools needed to further growers' understanding of functional orchard ecology and how it can be best managed for long-term



Anita Zurbrugg of the American Farmland Trust learns about mite diversity from Mark Whalon, MSU Entomology (left), and Francis Otto, Cherry Bay Orchards, Leelanau, MI.

benefit. A second goal is to assess the ecological impacts of IPM practices on the farm ecosystem, including the surrounding landscape. By designing the assessment tools to be compatible with the Natural Resources Conserva-

tion Service (NRCS) protocols, Michigan fruit growers will be stronger applicants for NRCS EQIP funds available for adopting sustainable practices that conserve environmental resources.

We are utilizing soil and foliar nutrient analysis, fruit tree carbon storage and water use efficiency, soil and duff diagnostics, and insect and mite diversity to ascertain overall orchard health as affected by management practices. These measures are monitored in an array of fruit farms – from intensively managed to abandoned sites – to explain the association between production management practices and orchard ecological stability.

Up until now, IPM evaluation has been focused largely on evaluating pesticide application records. These functional ecology indices will provide a much more in-depth measure of what constitutes sustainable farming practices. – *David Epstein.* ♦

Coordinator's report *continued from page 1*

Michigan's agricultural and green industries to remain competitive in global markets and economies.

- Funding support for the current system is fragmented and inadequate to meet the needs.
- A regional system should be widely accessible and well linked to MSU's educational and research structure. It should be supported centrally and positioned to grow beyond this core through private sector partnerships and extramural grants.
- The system should have three core elements and functions: environmental monitoring; model application; and integrated delivery, use and education.

The committee recently submitted a conference report and

budget plan to Project GREEN for their consideration. An abbreviated version will soon be sent to those who attended the October conference. Many thanks to those who attended the conference, commented on reports and provided relevancy statements. Also, thanks to those on the organizing committee with me: Jeff Andresen, Ron Calhoun, Ron Goldy, Ed Grafius, Willy Kirk, Bruce MacKellar, Natalie Rector, Nikki Rothwell, Annemiek Schilder and Bill Shane.

IPM web resources initiative

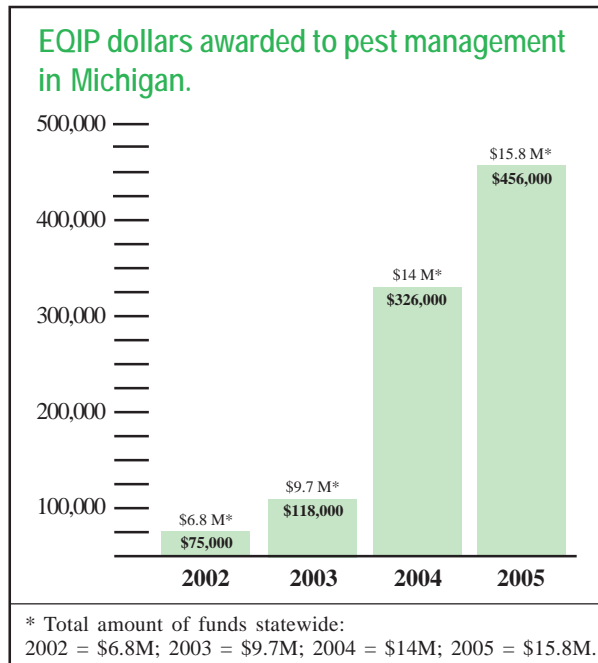
For 10 years, the MSU IPM Program has developed and maintained a web site that primarily featured projects and programs with key IPM staff involvement.

We are working with departments and Area of Expertise teams to make access to MSU's pest management expertise easier to find. With support from these groups, we are launching the IPM Resources web site during the next few months (see www.ipm.msu.edu). Those who subscribe to *CAT Alert* newsletters will notice the new design incorporated this spring. Please spend a little time navigating the site. It provides you increased access to IPM resources from MSU departments and AoE teams. We are excited that this new web structure will accommodate easy linkage to the weather-based IPM initiative as it develops. – *Michael J. Brewer.* ♦

IPM adoption increases as more growers participate in USDA conservation program

Farming practices that conserve natural resources and protect the environment are important to farmers and their neighbors alike. But implementing those practices can be expensive because the initial costs can rarely be recovered by farm sales only. To better support growers' efforts, the 2002 Farm Bill increased the funding available to assist growers with the expense of initiating conservation practices. One of the programs funded is the Environmental Quality Incentives Program (EQIP), a voluntary program administered by the USDA Natural Resources Conservation Service (NRCS). It provides payments to eligible growers for a wide range of practices on their farms, like pest and nutrient management.

From 2003 to 2005, Michael Brewer, MSU IPM Program, worked with private consultants, commodity groups, the Center for



were approved in our pilot counties. About \$3.0 million has been contracted with 15 percent of funds supporting IPM implementation (statewide about \$450,000 will support IPM implementation; for reference statewide funds allocated were \$15.8 million).

Growers are implementing a number of IPM techniques using the financial incentives from EQIP such as adding electronic canopy sensing technology to sprayers and using shielded sprayers to reduce drift potential, converting from chemical

Agricultural Partnerships and NRCS District Conservationists to help Michigan growers participate in EQIP.

Mike Brewer, Joy Landis, Rebecca Lamb, Dave Epstein, and Nikki Rothwell of the MSU IPM Program staff, MSUE educators, and MSU faculty developed "how to" guides summarizing the steps in applying to EQIP, and developed IPM tactic lists for grower use in developing plans to adopt IPM strategies.

Project surveys indicated that grower awareness of these financial incentives to support use of IPM increased from 25 to 75 percent of respondents during the course of our project. Awareness about EQIP increased from 44 to 62 percent of survey participants. In addition, the number of growers who indicated that they knew how to participate in EQIP increased from 18 to 45 percent.

In 2005, 73 EQIP applications

weed control to flamer/steamer weed control, and converting or eliminating pesticides with high to moderate potential for water contamination to pesticides with low risk potential. "The increased grower use of EQIP to adopt these techniques was really aided by MSU, NRCS, private consultants, and commodity groups working together with the growers," says Mike Brewer.

Dick Walsworth, a Michigan farmer, used the EQIP program to improve how his farm is run. He received EQIP funds for scouting, improving storage areas and other structures.

Walsworth uses a disease forecasting system based on weather data to determine when to spray fungicides. "Instead of spraying every 14 days religiously like we used to, we can now wait 18 to 20 days between sprays and save money." He explains, "If we can save one spray a year, that's about \$5,000." ♦

Partners

MSU Area of Expertise teams (fruit, vegetable, ornamentals), Cherry Marketing Institute, Asparagus Advisory Board, Gerber Co., Michigan Nursery and Landscape Assn, Michigan Apple Committee, Michigan Horticultural Society, and Center for Agricultural Partnerships.

Pilot counties: Oceana, Grand Traverse, Leelanau, Antrim, Ottawa.

Funding: Project GREEN, Joyce Foundation, EPA Strategic Ag Initiative

For more information, visit www.ipm.msu.edu/farmbill/eqip.htm

New pollinator may boost production in Michigan orchards

In recent years, honeybee populations have suffered costly declines causing MSU researchers to investigate alternatives for fruit producers who depend on these pollinators. One promising species is the horn-face bee (*Osmia cornifrons*), an efficient pollinator with strong association to fruit trees. These bees move readily within orchards and have shown increased pollination success rates, even under adverse weather conditions like those that frequently occur in Michigan during the spring pollination season.

The horn-face bee is native to Japan where it pollinates over 80 percent of the apples. Horn-face bees are solitary and because they are not part of a social colony like honeybees, all females are capable of reproducing and must forage for their own offspring. This intensive foraging behavior makes them desirable as orchard pollinators. The adults are active April through June, the peak pollinating months.

In 2005, Nikki Rothwell, fruit IPM educator, received funds from growers to test horn-face bees in Balaton® cherry orchards. This Hungarian variety of cherry produces disappointing yields compared with the traditional Montmorency variety, when the weather is cool during tree bloom.

Horn-face bees are relatively easy to manage, reproduce without difficulty and do not sting. Gene

Garthe, a Northport grower who helped test some of the bees, noted that they were friendly. "You could stick your head right in the bucket, and they wouldn't sting you!"

"Our preliminary observations suggest that horn-face bees fly at slightly cooler temperatures and under different wind speeds than honeybees," Rothwell reports.

The study showed that horn-face bees forage for a longer amount of time per flower than honeybees and visit fewer flowers per tree than honeybees. When they stocked Balaton orchards with horn-face bees, they found three orchards had significantly higher fruit set with horn-face bees, while the remaining five orchards did not. Yield data suggest horn-face bees have the ability to pollinate as well as or better than honeybees.

Rothwell reported that most of the results are preliminary but promising, so further research is warranted and needs to be expanded to other cropping systems. Determining the optimal timing to deploy horn-face bees in cherry orchards is the key to managing the bees and improving yields. Much of the 2005 data suggests that horn-face bees were placed into the orchard



Bees are released from buckets.

"You could stick your head right in the bucket, and they wouldn't sting you!"

too late to be most effective. With better timing of releases into the orchard in spring, horn-face bees have increased pollinator potential in Michigan orchard systems.

Although most of the official research was conducted at the Northwest Michigan Horticultural Research Station and on eight growers' farms, over 35 growers in northwest Michigan obtained buckets of bees for their own "experiments." Jerry Brandt, a grower from Suttons Bay, found that his horn-face bees were

"getting around pretty good," even though the outside temperature read 57°F. Tom Broadhagen, an apple grower from Benzie County, claimed that he had to thin his apples twice because his horn-face bees

worked so well. Mike Paradis, who grows tart cherries in Antrim County, had his best-ever yield in a Montmorency block where he placed horn-face bee buckets.

The future looks exciting for horn-face bees in northwest Michigan. ♦



Partners

Funding provided by Balaton Marketing Committee and Balaton Growers

Researchers: Primary investigator - Nikki Rothwell, Jim Nugent, Rufus Isaacs, Zachary Huang, Amy Iezzoni.

For more information, contact Nikki Rothwell, email rothwel3@msu.edu

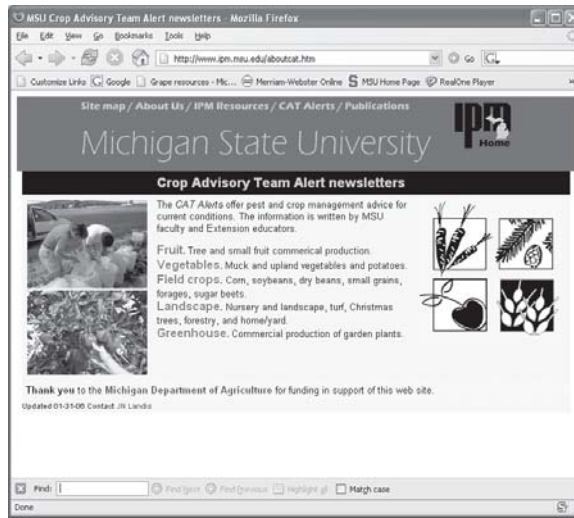
CAT Alert newsletters offer growers season-specific information for profitable IPM decisions

The MSU IPM Program provides a ready infrastructure for MSU Extension to relay observations and recommendations to growers and other pest managers in Michigan. Through the *Crop Advisory Team (CAT) Alert* newsletters, readers can learn about new research findings as well as the basics of managing pests. Regional reports help them determine what may be headed their way. The information is written by over 50 Extension faculty, specialists and educators. IPM communications manager Joy Landis and specialist Rebecca Lamb edit, design and oversee distribution of the resulting publications and web site.

Readers choose from five editions – field crop, fruit, vegetables, landscape and greenhouse – to access information tailored to their specific production needs.

“I think they’re helpful,” says Jim Sattelberg, a Michigan field crop producer. “The Alerts provide a good source of information, and you can never get enough good information.”

Sattelberg says the Alerts helped him face his first encounter with soybean aphids. “The first time we had soybean aphids, the Alert told us when to spray and the specific thresholds for the



The CAT Alert newsletters are available at:
<http://www.ipm.msu.edu/aboutcat.htm>

aphids. It was a lot of help.”

Sattelberg transitioned half of his 2,400 acres into organic production in 2002 and now uses the Alert’s regional reports to stay ahead of insects and diseases.

“The Alert makes you pay attention to what you wouldn’t normally look for,” Sattelberg says. “If the Alert reports insects

Last fall the *Greenhouse Alert* team prepared a special issue on cutting energy costs and the affects of lowering greenhouse temperatures on crops and pests.

or disease in the southwest region, and we know the wind is blowing them this way, we’ll start scouting our fields.”

The newsletters are available as a print publication, but growing numbers of readers are accessing it on the Internet. Over 2,200 people are signed up to get email notification when new issues are posted. This number has nearly doubled over the past three years.

“The Alert gives me a broad range of articles that I can access easily and that are pertinent to what I’m doing,” says David Rennhack, who grows fruit and vegetables in Michigan. “The e-mail gives a breakdown of what’s in the current issue and a quick scan will let me know if I want to download it or not. It’s practical and timely.” ♦



Partners

Michigan Department of Agriculture
 MSU Extension, Michigan Agricultural Experiment Station, Project GREEN
 MSU Departments – Crop & Soil Sciences, Entomology, Forestry, Geography, Horticulture, Plant Pathology
 MSU Diagnostic Services, MSU Area of Expertise teams: field crops, fruit, ornamentals, vegetables, Christmas trees

For more information: www.ipm.msu.edu/aboutcat.htm. Quotes on this page provided by Project GREEN information staff.

Apple growers succeed with areawide approach to managing codling moth

Nobody likes a wormy apple, so Michigan's apple growers work diligently to prevent codling moth larvae from infesting their fruit. Traditionally, growers used organophosphorous (OP) insecticides to control this perennial pest; however several challenges are making OPs a less attractive option. In response, growers are working with MSU researchers and extension personnel in the apple growing region north of Grand Rapids to learn how to best use pheromone mating disruption along with newer, reduced-risk insecticides.

Codling moth males rely on chemical signals (pheromones) produced by female moths to find partners for mating. By spreading synthetically produced pheromone through out the orchard, a grower can confuse this communication and disrupt the mating cycle.

"We've learned that pheromone mating disruption works best when deployed over large, contiguous plantings, rather than in small plots surrounded by other orchards," notes MSU IPM Program's David Epstein.

A whole-farm areawide approach promotes collaboration by neighboring growers with

contiguous apple acreage and has proven to be one of the best means of tackling a perennial pest. The benefit from these areawide programs occurs gradually, needing two or more years to shrink codling moth populations and sustain them at very low levels through continual use of mating disruption. The strategy also includes judicious use of primarily reduced-risk insecticides.

The Michigan Codling Moth Areawide Project started in 2004 with eight growers on 800 acres and expanded to 20 growers on about 2,100 acres in 2005. In blocks deploying pheromone disruption for two years, captures of male codling moth in pheromone-baited traps were reduced 85 percent from 2004 to 2005. Codling moth injury to fruit was 87 percent lower in these orchards at harvest compared to non-disrupted orchards outside of the project.

The adoption of areawide mating disruption in Michigan has directly influenced the types of insecticides used and the number of sprays targeting codling moth. Orchards in the second year of areawide disruption reduced insecticide sprays targeting codling moth 24 percent from the first year to the second.



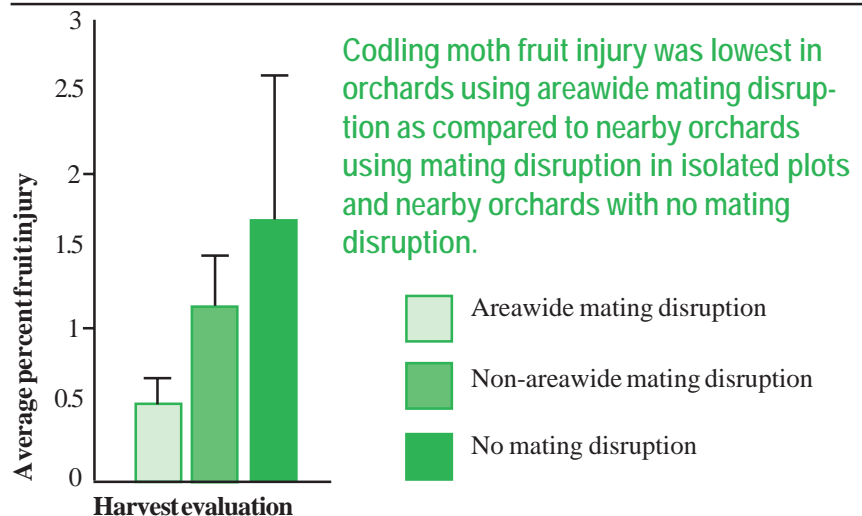
Adjacent farms not using disruption did not reduce the number of insecticides applied. Furthermore, the amount of OP's was significantly reduced in the areawide mating disruption orchards. The average amount of active ingredient in OP insecticides applied during the initial year was 3.8 lbs. per acre for areawide compared to 5.8 for those without mating disruption. Both types of orchard further reduced the amount of OP's used by the end of the second year with the areawide orchards using an average of 1.9 and those without disruption using 4.1 lbs. ai per acre. After two seasons, farms implementing areawide management reduced OP usage 50 percent.

In 2006, the project will expand to additional farms in the Fruit Ridge region, to Old Mission Peninsula north of Traverse City and possibly a location in southwest Michigan. ♦

Partners

Funding provided by: Gerber Products Company, Pacific Biocontrol Corporation, the USDA, the EPA, American Farmland Trust, the Michigan Apple Research Committee, and Michigan State University.

For more information, contact David Epstein, 517-432-4766, epstei10@msu.edu, or Peter McGhee, 517-432-9514, mcghee@msu.edu



Organic and conventional farmers come together with MSUE to produce integrated weed management bulletin

A team of seven organic and six conventional farmers, four MSUE weed specialists, four MSU Extension educators and two MSU graduate students have published a new bulletin titled *Integrated Weed Management: One year's seeding . . .*, E-2931 in 2005.

The process for developing this publication started in 2003-2004. With grant support from the Environmental Protection Agency, the group met during four 8-hour working sessions. There were two objectives. The first was to discuss the integrated weed management systems that Michigan field crop producers already used and find out what other types of information would be useful to gather from scientific literature. The second objective was to weave this information into a guide that would follow the first two books in the Michigan field crop series, *Michigan Field Crop Ecology and Management*, and *Michigan Field Crop Pest Ecology and Management*.

An organic farmer said, "I wasn't sure why conventional farmers were part of this process at the first meeting but by the last meeting I realized they have similar weed problems as organic farmers and that we have a lot in common."

A conventional farmer said, "I thought organic farmers were nuts, but I have really gained a lot of respect for what they are doing after these meetings."

The second phase of this project was to train additional MSU Extension educators and allow them to comment and edit the bulletin. With grant support from Project GREEN, each



chapter of the bulletin was presented to 18 county educators during a couple of two-day meetings. Participation by the Extension educators helped make the bulletin more farmer friendly and practical. As a final component of Phase II, educators committed to hosting meetings around integrated weed management and the bulletin.

During the winter of 2005-2006, ten farmer meetings were conducted throughout Michigan. Over 600 farmers were introduced to the bulletin along with hands-on training exercises. MSUE educators estimated that over 50 percent of the farmers trained would incorporate the integrated weed management practices. One educator noted, "Using all management options in an integrated system should be the goal for us as educators and for farmers – it seems more sustainable."

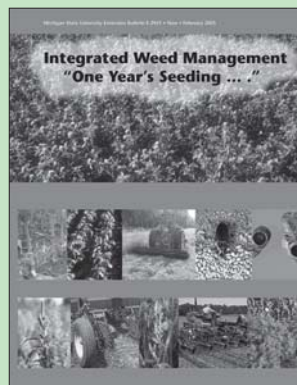
Over 1,100 copies of the bulletin have been sold in the first year. An NCR-Sustainable Agriculture Research and Education grant is providing over 60 of the farmers who attended the training with \$200 each to review and further upgrade the bulletin for its second printing. This input should strengthen adoption of the proposed bulletin practices in the future.

IPM field crops specialist Dale Mutch spearheaded the collabora-



Weed specialist Karen Renner records farmers comments while Dale Mutch facilitates the discussion.

tive bulletin project. Mutch notes that such collaborations often require more time, however, the resulting products and opportunities for people to connect are worth the additional effort. ♦



Partners

Michigan State University Extension, Michigan Agricultural Experiment Station, Organic and conventional farmers, EPA, Project GREEN, NCR-SARE, MSU Departments: Crop and Soil Science, W.K. Kellogg Biological Station

For more information, contact Dale Mutch, mutch@msu.edu

Order publications at:

<http://www.emdc.msue.msu.edu/intro.cfm>

Active grant and sponsored projects during 2005

IPM staff names are in bold.

- New Agriculture Network web resource for organic farming.
Dale Mutch, Kellogg Biological Station/MSU IPM; **Joy Landis**, MSU IPM; Deborah Cavanaugh-Grant (U. of Illinois), Elizabeth Maynard (Purdue U.).
- Three IPM scouting guides for Christmas tree weeds, nursery weeds, and pests of herbaceous perennials.
Jan Byrne and Steven Gower, Diagnostic Services; Rob Richardson (NC State U.); Willie Kirk and Diane Brown-Rytlewski, Plant Pathology; Bernard Zandstra, Horticulture; David Smitley, Entomology; Raymond Cloyd (U. of Illinois); **Joy Landis**, **Rebecca Lamb** and **Michael Brewer**, MSU IPM.
- Regional management of soybean pests.
Doug Landis and Chris DiFonzo, Entomology, **Mike Brewer**, MSU IPM/Entomology; Scott Swinton, Agricultural Economics; Matt O'Neal (Iowa State U.), George Heimpel, David Ragsdale, Kent Olson (U. Minnesota), Claudio Gratton, Craig Grau, Tom German (U. Wisconsin).
- Grower adoption of IPM as a conservation tool.
Mike Brewer, **Joy Landis**, **Rebecca Lamb**, **David Epstein** and **Nikki Rothwell**, MSU IPM; Mark Whalon, Entomology; Amy Irish-Brown and Norm Myers, MSU Extension; Fruit, Vegetable and Ornamentals Area of Expertise teams.
- *Crop Advisory Team Alert* newsletters.
Joy Landis and **Rebecca Lamb**, MSU IPM; Fruit, Field Crop, Ornamentals and Vegetable Area of Expertise teams, and Michigan Department of Agriculture.
- Reduced-Risk Pest Management Systems for U.S. tart cherry.
Mark Whalon, Entomology; **David Epstein**, MSU IPM; George Bird, Entomology; Jim Flore, Horticulture; Larry Gut, Entomology; Amy Iezzoni, Horticulture; George Sundin, Plant Pathology; Diane Alston (Utah St. U.); Patricia McManus (UW, Madison); Suzanne Thornsbury, Agricultural Economics; **Nikki Rothwell**, MSU IPM/NW Mich Hort Res Station.
- Web site and newsletter for cherry Risk Avoidance and Mitigation Program project.
Mark Whalon, Entomology; **David Epstein** and **Joy Landis**, MSU IPM.
- IPM Resources web site.
Joy Landis, **Mike Brewer** and **Rebecca Lamb**, MSU IPM and Area of Expertise team collaborators.
- Weather initiative for integrated pest, plant and natural resources management.
Mike Brewer, **Nikki Rothwell** and **Joy Landis** MSU IPM; Jeff Andresen, Geography; Ron Calhoun, Crop and Soil Sciences; Willie Kirk and Annemieke Schilder, Plant Pathology; Ed Grafius, Entomology; Ron Goldy, Bruce MacKella and Bill Shane, MSU Extension.
- Upgrading fruit IPM weather tools.
Nikki Rothwell, MSU IPM/NW Mich Hort Res Station; Jim Nugent, W Mich Hort Res Station; Bill Shane, SW Mich Res and Extn Center.
- Organic approaches to pest and nutrient management in cucumbers and soybean.
Sieg Snapp, Crop & Soil Sci/Kellogg Biological Station; Mathieu Ngougio and John Biernbaum, Horticulture; **Mike Brewer**, **Dale Mutch** and **Joy Landis**, MSU IPM; Ed Grafius, Entomology; Vicki Morrone, CARRS.
- Aphid natural enemy interactions.
Doug Landis and Alejandro Costamagna, Entomology; **Mike Brewer**, MSU IPM/Entomology.
- Aphid natural enemies in soybean and neighboring habitats.
Mike Brewer, MSU IPM /Entomology; Takuji Noma, Matt Kaiser and Shaun Langley, Entomology.
- Invasive species initiative web site.
Doug Landis, Entomology; **Joy Landis**, MSU IPM; Tim Polack, CaTS; Carol Swinehart, Fisheries/Wildlife; Robin Millsap, Emerald Ash Borer project; Rufus Isaacs, Entomology.
- Giant hogweed (invasive weed) bulletin.
Steve Gower, MSU Diagnostic Services; Rob Richardson, (NC State U.); **Rebecca Lamb** and **Joy Landis**, MSU IPM, Mike Bryan (Michigan Dept. of Ag.).
- Evaluation of three models to privatize scouting in Michigan tree fruit.
David Epstein, MSU IPM; John Wise, Larry Gut and Larry Olsen, Entomology; Amy Irish-Brown, MSUE.

- Blueberry scouting guide added to www.blueberries.msu.edu web site.
Annemiek Schilder, Plant Pathology; and **Rebecca Lamb**, MSU IPM.
- Using cover crops to reduce Japanese beetle in blueberries.
Dale Mutch, Kellogg Biological Station/MSU IPM; Eric Hanson, Horticulture; and Rufus Isaacs, Entomology.
- Apple and stone fruit scouting guides translated to Spanish.
John Wise, Carlos Garcia-Salazar, Anamaria Gomez-Rodas, Trevor Nichols Res Complex/Entomology; **Joy Landis**, MSU IPM.
- Evaluating and incorporating the fungus, *Beauveria bassiana*, to control plum curculio in tart cherry and apple.
David Epstein, MSU IPM; and Mark Whalon, Entomology.
- Web site on enhancing biological control with native plants.
Anna Fiedler and Doug Landis, Entomology; **Joy Landis**, MSU IPM.
- Updates to grapes.msu.edu web site.
Rufus Isaacs, Entomology; Annemiek Schilder, Plant Pathology; **Joy Landis**, MSU IPM.
- Organic vegetable pest management.
Dale Mutch, Kellogg Biological Station/MSU IPM; and Ron Goldy, SW Mich Res Extn Center.
- Organic no-till soybeans using cover crops for weed control.
Dale Mutch, Kellogg Biological Station/MSU IPM; and Todd Martin, Kellogg Biological Station
- Manure-slurry seeded cover crops to reduce weeds in field crops.
Dale Mutch, Kellogg Biological Station/MSU IPM; Tim Harrigan, Biosystems & Ag Engineering; Sieg Snapp, Kellogg Biological Station/Crop & Soil Sciences.
- Codling moth areawide management.
David Epstein, MSU IPM; Larry Gut and Peter McGhee, Entomology; Amy Irish-Brown, MSUE; D. Thompson (Pacific Biocontrol Corp.); and T. DeKryger, Gerber Products Co.
- Biopesticide-based codling moth management.
David Epstein, MSU IPM; Larry Gut and Peter McGhee, Entomology; Amy Irish-Brown, MSUE; D. Thompson (Pacific Biocontrol Corp.); and T. DeKryger, Gerber Products Co.
- Improving Balaton® fruit set.
Amy Iezzoni, Horticulture; Jim Nugent, NW Mich Hort Res Station; **Nikki Rothwell**, MSU IPM/NW Mich Hort Res Station.
- Coordinating educational resources to be utilized in the Michigan Turfgrass Stewardship Initiative.
Thom Nikolai, Horticulture; **Mike Brewer**, MSU IPM; Scott Witter, CARRS; Eunice Foster, CANR; Doug Carter, Ron Calhoun and Debra Swartz, Crop & Soil Sci; Tom Smith, Michigan Turfgrass Foundation.
- Methyl bromide alternatives for nurseries.
Suzanne Thornsby, Agricultural Economics; Willie Kirk, Dennis Fulbright, and Diane Brown-Rytlewski, Plant Pathology; Bernie Zandstra, Horticulture; George Bird, Entomology; **Mike Brewer** MSU IPM.
- Strategies for reducing overwintering apple scab inoculum.
George Sundin, Plant Pathology; and **David Epstein** MSU IPM.
- Wax pheromone disruption formulations.
James Miller, Larry Gut, and Lukasz Stelinski, Entomology; **David Epstein**, MSU IPM.
- Functional Ecology: A catalyst for change in tree fruit IPM.
Mark Whalon, **David Epstein**, George Bird, and Larry Gut, Entomology; James Flore, Horticulture.
- Use of distance education and a web-based resource library to produce flexible IPM/ICM educational programs for the vegetable industry.
Beth Bishop, Entomology; James Breinling; MSU Extension; **Mike Brewer**, MSU IPM; Edward Grafius, Entomology; William Kirk, Plant Pathology; Mathieu Ngouajio, Horticulture; Hannah Stevens, MSU Extension; Darryl Warncke, Crop & Soil Sciences.
- IPM section of sustainable ag and food system web site.
Mike Hamm, CARRS; **Joy Landis**, MSU IPM.
- 2000-2004 Nursery and landscape research projects and educational programs CD.
Diane Brown-Rytlewski, Plant Pathology; **Rebecca Lamb**, MSU IPM.
- Mason County fruit growers test orchard floor management alternatives.
Ron Perry and Dario Stefanelli, Horticulture; Mira Danilovich, MSU Extension.

Selected IPM resources available from MSU Extension

Inventory number and title **Price U.S.**

Pocket-sized scouting guides

E-2928	A Pocket Guide to IPM Scouting in Highbush Blueberries	\$14
E-2889	A Pocket Guide for Grape IPM Scouting	\$14
E-2840	A Pocket Guide for IPM Scouting in Stone Fruits	\$12
E-2839	Pocket IPM Scouting Guide for Woody Landscape Plants	\$15
E-2720	A Pocket Guide for IPM Scouting in Michigan Apples	\$14

Crop Ecology series

E-2759	Fruit Crop Ecology and Management	\$16
E-2931	Integrated Weed Management: One year's seeding (field crops)	\$10
E-2646	Michigan Field Crop Ecology	\$12
E-2704	Michigan Field Crop Pest Ecology & Management	\$12

Miscellaneous

E-2649	What's Bugging You: Dealing with insects at home	\$7.95
DVD273A	Practical Guide to Scouting Apple Orchards (dvd format)	\$29.95
E-2892	Distinguishing Ash From Other Common Trees	\$0.50

Under development

Additional pocket-sized IPM scouting guides to be published in 2006:

Scouting diseases and insects of herbaceous perennials

Common weeds in Christmas tree plantations

And in 2007:

Common weeds in nurseries and landscapes.

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The IPM Report

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In this issue

- 1 Welcome from the coordinator
- 2 Profile of staff and funding
- 3 Measuring IPM's contribution to conservation will provide better access to Farm Bill funds
- 4 IPM adoption increases as more growers participate in USDA conservation program
- 5 New pollinator may boost production in Michigan orchards
- 6 *CAT Alert* newsletters offer growers season-specific information for profitable IPM
- 7 Apple growers succeed with areawide approach to managing codling moth
- 8 Organic and conventional farmers come together with MSUE to produce weed bulletin
- 9 Active grant and sponsored projects
- 11 IPM resources order form

<http://www.ipm.msu.edu>

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