

**NCERA222: Integrated Pest Management  
Annual Report  
Compiled by Patrick Beauzay, North Dakota State University**

**Project Number:** NCERA222  
**Project Title:** Integrated Pest Management  
**Period Covered:** 2015  
**Date of This Report:** 4/22/2016  
**Annual Meeting Dates:** 3/22/2016 to 3/23/2016

**Participants**

**NCERA State Representatives:** Suzanne Bissonnette, Univ. of Illinois; John Obermeyer, Purdue Univ.; Daren Mueller, Iowa State Univ.; Frannie Miller, Kansas State Univ.; Joy Landis, Michigan State Univ.; Eric Burkness, Univ. of Minnesota; Lee Miller, Univ. of Missouri; Jamie Piñero, Lincoln Univ.; Bob Wright, Univ. of Nebraska; Patrick Beauzay, North Dakota State Univ.; Jim Jasinski, The Ohio State Univ.; Paul Johnson, South Dakota State Univ.; Bryan Jensen, Univ. of Wisconsin

**NC IPM Center:** Sue Ratcliffe, Univ. of Illinois; Lynnae Jess, Michigan State Univ.; Laurie Vial, Univ. of Illinois

**USDA-NIFA:** Marty Draper

**Administrative Advisor:** Wendy Wintersteen, Iowa State Univ.

**Brief Summary of Minutes**

NCERA222 Meeting March 22-23, 2016 Ohio State University, Columbus, OH

Attendance: Darren Mueller, Wendy Wintersteen, John Obermeyer, Lynnae Jess, Bryan Jensen, Bob Wright, Eric Burkness, Lee Miller, Suzanne Bissonnette, Joy Landis, Jim Jasinski, Patrick Beauzay, Frannie Miller, Paul Johnson, Jaime Piñero, Sue Ratcliffe, Marty Draper, Jeff Jacobsen

Welcome – Jim Jasinski (Chair): Introduction

NCERA 222 Renewal Status: Jim Jasinski

Final document submitted. Potential edits from Wendy Wintersteen, some draft improvements. Objectives reduced from 5 to 4.

Jeff Jacobsen – Part of NCERA review committee: special viewpoint. Red pen by nature. Experiment station directors review (MRC multistate review committee). Level of detail not as great as NC-research multistate as opposed to this rapid response type committee but need to be a bit more succinct.

Jim – Go with changes. Tightened up narrative. Objectives – two individual objectives combined into one. Evaluate programs piece of first objective focused on program evaluator position, which has been vacated by Jean Haley.

National IPM Committee Update & Discussion  
Patrick Beauzay

Notes posted. 1. Formation of an executive committee with Charles Allen, new chair. State of IPM report to ESCOP and ECOP. Use APLU to highlight IPM and its successes. Regional representation: Chair, Past Chair, Chair Elect.

IPM opportunities in Presidential Pollinator Strategy. Government compensated two beekeepers in lawful use of clothianidin dust of corn seed treatment in MN.

Herbicide Resistant Weed Discussion: Europe ranks #2 in herbicide resistant weed reports even without GMO use.

Northeastern IR4 Regional Office moving from Cornell to Rutgers. Overhead charges may be a reason.

Hot topics: Tickborne diseases, climate change and pests, invasive pests, nonchemical solutions to manage weeds, mosquitoes (Ezika virus) etc.

EIP program discussion: Problems with reviewers, summarized in letter by Ash from Georgia submitted to NIFA. Bob Wright: Response letter from NIFA?

National IPM coordinator position? Position description or tasks? No resolution on topic. No clear expectation on how the position would work.

OPMP - Primary role between USDA and EPA; administratively in ARS. Current structure: Harold Coble: retired. Sherill Kunickis – New Director: Friend on Monarch issue. Full list can be found at <http://www.ars.usda.gov/News/docs.htm?docid=12431>.

Office of Science & Technology Policy – Also sign off on new projects. Directly under President/

NC IPM Center Update  
Susan Ratcliffe

New publication: North Central RIPM program – Final information pulling from CRISS (Reports). PIs will get copy of publication.

Personnel transitions: Larry Olsen retiring- service since 2000. Lynnae Jess and Sue provide leadership, Laurie Vial Comm Specialist, Mike Grefienkamp – IT specialist.

FY16 Funded New Working Groups

IC Scope: Steve Kells, UMN:

Great Lakes Fruit

Great Lakes Vegetable

Northern Plains IPM Guide

Organic and IPM: Strengthening the Alliance – Tom Green, IPM Institute of North America.

Public Tick – Symposium in DC area.

Pulse Crops

Sunflower Pathology

Great Lakes Hops: Erin Lizotte, MSU

Great Lakes Urban Agriculture, Jacqueline Kowalski – need for members working in community gardens, etc.

Improving the IPM capacity of CCAs  
North Central Nursery IPM  
IPM in schools  
Continuing  
Invasive Plants in Trade  
Midwest Weather

\$300,000 Working Group Program

Signature

Tribal IPM

Indoor Air Quality/School IPM

Resistance Management

How do states work with growers in organizing responses vs. confusing EPA labels.

Urban Ag IPM

Connection: New format, going out several times a week. Timely delivery of information. Push articles, and will sometimes pull. Laurie Vial, communications specialist. A lot of employment opportunities and funding feeds. Attempting to expand content and readership.

Have provided investment in evaluation, survey development, logic models and grant preparation. Seeking stakeholder input regarding future evaluation needs.

Needs? Evaluation training needs and delivery methods

Evaluation topics, projects and support – specific (i.e. logic models, survey development)

Additional grant programs: mini-grant, critical issues, graduate and post doc only funding opps.

Administrative Report

Wendy Wintersteen

FY16: Eliminated charging for indirect costs. This will be in the RFA verbiage every year, and perhaps put in the Farm Bill so this won't be necessary. Board of Agricultural Assembly concluded the fewer lines (i.e. Smith-Lever, Hatch, AFRI) that are advocated for the more successful we will be and bring focus to the message. Particular earmarks are drying up and the environment has changed. Consolidation of lines has = lost money.

Going thought of agency is that capacity funding does not = innovation. Ag research funding is different than NIH & NSF for a good reason.

2017 President Proposed Budget has \$3 million increase for Crop Protection. How does that money get into Extension IPM programming? Who answers questions on Zika virus? Pollinator protection? Resistance management?

Potential competitors in Danforth Institute and Noble Foundation, and more money lobbied for competitive funding programs such as AFRI.

IR4 has power of stakeholders. Need for state stakeholder voice to advocate extension IPM.

The role and function of NCRA

Jeff Jacobsen

Four regional associations with four executive directors, with fifth “region” that overlaps with 1890 institutions.

With Ag experiment stations, along with Kris Hamilton at U. of Wisconsin. Multistate projects and review renewals and mid-term reports. Various hierarchies of review.

NRSP – One of these is IR4.

EDs have regional as well as national responsibilities. Interface with NIFA in a variety of ways. Get involved in background, (i.e. working with Wendy Wintersteen on specific projects) some with regional and national importance. ESCOP support different standing national committees: Science & Technology. Also serve on committee on agriculture legislation. “The Family” = Extension, Land Grants, Experiment Stations, International, and some complicated extras.

Key areas: Open access publications and data, antibiotic resistance, diversity in research leadership, redesign of NIMMS input system.

NIMSS – Enhanced functionality for capturing IPM related HATCH projects.

Update on EIP, REEporting, FY 2016 funding, etc.

Marty Draper

Two regions with full-time EDs of Extension (North/South) and one for 1890s.

Largest single line at NIFA is AFRI, just two years ago it was Smith-Lever (capacity line).

Does NIFA support capacity? Under current leadership, Marty thinks they do.

Where can get additional money? In notes, a lot of emphasis on pollinators.

Capacity-Noncompetitive Program: FADI including NPDN – Need to write every year why it shouldn't be competitive type programs.

Capacity – Competitive Program: 1890 Capacity Building Program.

PD Meetings: New expectations in CPPM. Not enough money for individual programs, how extract more impacts through collaboration. Most PD meetings are one way... more dialogue in a roundtable may be more effective.

CPPM – enhanced coordination, collaboration and regional IPM networks. Complimentary and coordinated approaches in logic models. 1890 collaborations should be pursued where possible, but no penalty either way.

Next AFRI programs for release:

- Food Security – Soon
- Foundational – Out by mid April
- o AFRI-CARE: Critical Agricultural Research & Extension – Mary Purcell
- \$150k cap in 2014, \$200k in 2015
- Highly applied and problem solving
- Must have stakeholder support and involvement

- Must produce outcomes in the term of the grant.
- Start working on knowledge on the front end.

#### CPPM

- ARDP – Expected soon
- RCP – continuations already out
- EIP – continuations out soon (maybe this week)
- o Expected deadline of June 1.

Share outcomes with NIFA. “I did something neat.”

EIP: continue awards, indirect costs shall not be charged against any EIP grant. No recompetition in 2016. RFAs will be sent by April 1. Please submit early. Reporting can be submitted up to 90 days before your end date. Hold on to no-cost extension approvals until end.

CRIS is dead. Everything in REEport are available in the REEIS portal.

#### FY2017 President Budget

Methyl bromide transitions out. Could be housed in ARDP.

AFRI- doubling of funds requested. Congress loves AFRI and competition.

Several smaller lines are zeroed. Don't want to be there.

Conversation on how to document impact (particularly economic) across states. FNEP – nutrition does a good job of this, but may more difficult with the diversity of initiatives within IPM. Only done for individual projects not for state programs.

Themes & Emergin' Issues: Feeding 9B people, Pollinator Decline projects: “How can we bring changes in habitat, bee management, awareness?”, Zika virus – Let the *Aedes aegypti* map determine the need.

Kitty Cardwell – retired from NIFA, moving to Oklahoma State University, Director of NIMFFAB replacing Jackie Fletcher

Ray Knighton and Greg Crosby leaving. Marty Draper retiring sometime in July. Get continuation grant in before he leaves.

NPL Plant Pathology – 1 or 2 positions available. Expect posting in March-April.

#### Group Discussion / State Reports

##### Darren Mueller - Iowa

- Finished first iBook, and now university can't figure out how to load up to iTunes: gone to Communication group. Developing into a webbook, and built infrastructure behind it to monitor usage patterns, and learn from how they are learning.
- Crowd sourcing web page – Reddit: Bug Guide. PG version of Reddit.
- Twitter campaign to get people to populate maps where pests are. iPipe birthed out of soybean rust. Integration of NPDN.

##### John Obermeyer - Indiana

- Continued work on apps. Bookstore makes available through iTunes. Upper administration gets excited about apps.
- Effectiveness of Neonic Seed Treatments on Soybeans publication. Widespread interest from growers and lively discussion from seed producers.

#### Bryan Jensen - Wisconsin

- New app – Soybean Replant Guide: Take pictures with smartphone, the software will count seedlings and give answer whether need to replant or not. Don't charge for apps – done with student help.
- Education – Dicamba and 2,4D soybeans coming out in near future. Corn rootworm resistance management.

#### Bob Wright – Nebraska

- Crop and Pest Diagnostic Clinics: Impact statements
- RIPM funded project – Corn rootworm management in the transgenic area webinar published on PMN. 6800 Open Access views through August 2015.
- RNAi impact on corn rootworm management webinar
- Education grant through Monsanto on corn rootworm resistant technology & management
- State Climate Office established on campus. One stop shop for degree day models for insect development.

#### Eric Burkness subbing for Bill Hutcheson – Minnesota

- Institute for Ag professionals – 5 million farmland acres impacted.
- Two instances of corn rootworm resistance. 10-44 fold increase in pyrethroid resistance in soybean aphid.
- SWD: manipulating microclimate can be used to manage insect in high tunnels (raspberry production). Increase in temperatures and decrease in humidity shuts down reproduction.
- Let's beat the bedbug program. 685,000 website sessions – 11% increase from last year.

#### Lee Miller/Jaime Piñero - Missouri

- IPM website rebuild
- IPM 1031: Weed Control in Forages, Brushlands, and Noncroplands – Kevin Bradley
- Tick publication move to iBook
- Lawn care curriculum development
- "Train the Trainer" website by Lincoln University on organic pest management
- Documenting mid-term impacts from farmers. Morning workshop on farmer's land that are adopters. 60+ workshop attendees, invited 10 farmers to implement two things learned from previous years. Online surveys utilized to track progress.

#### Suzanne Bissonette – Illinois

- No state appropriations since last fiscal year. Budget based on teaching units, and extension contacts not counted. Non-replacement of Extension specialists. Shutdown of programs (i.e. Corn & Soybean Classics) and closed down 5 research stations in the state.
- Diagnostics in Specialty Crop & Area-wide Monitoring – Testing for glyphosate and PPO resistance in waterhemp. 240 fields in Illinois and surrounding states. Took in more samples than when free.
- Invasive Species Workshops. Tar spot in corn: 13 counties in Illinois.

Joy Landis – Michigan

- Erin Lizotte: 17 Webinars for Hop Production
- Publications: Bees in the Great Lakes Region (pocket guide), Protecting Bees in the Landscape
- BMSB: Wrote an article that got heavy traffic, and homeowners were helping with mapping effort.
- Lawn Grub Control – Insecticide Use on Home Lawns guide.

Jim Jasinski – Ohio

- Work in Urban Ag arena: Food deserts in Columbus/Dayton. Cities anxious to offload vacant lots for urban ag. Problems are more sociological – getting people to care for plant and convincing them to adhere to good principles of plant management.
- UAVs to image diseases on specialty crops: downy mildew and striped cucumber beetle in cucurbits.

Patrick Beauzay – North Dakota

- Soybean has increased dramatically. 88% rated understanding of soybean aphid and two spotted spider mite identification as low, so reaching new audience. SCN recent problem in North Dakota (detected in 12 counties). Sampling costs covered for farmers.
- IPM Pest Survey: Six field scouts distributed around the state. Soybean, sunflower, wheat, barley, corn. North Dakota Crop & Pest Report – electronic in season weekly newsletter.
- Sunflower iPipe for key insect and disease pests.
- Need for Livestock IPM personnel identified from stakeholders at winter meetings. Potential for regional collaboration.

Zsofia Szendrei, Michigan State University (2014 ARDP) - Developing innovative tactics for suppressing pest insects in asparagus

Asparagus miner, Common asparagus beetle – specialized feeder. Japanese beetle.

1. Chemigation for Asparagus miner management: No systemic insecticides registered in asparagus. Spray thiamethoxam on soil and washing into root zone with 1" of post application irrigation.
2. Natural enemy attraction for asparagus miner control: 12 species of parasitoids that attack asparagus miner. Flowers planted around field where asparagus miner damage is most abundant. Sweet Alyssum (winner – attracted good amount of parasitoid wasps), buckwheat, fava bean (passed away), partridge pea (didn't establish well). Trying perennial plants instead of an annual like sweet alyssum.
3. Japanese beetle: Trapping not successful in reducing populations. May need attract and kill after contact. Deltamethrin treated pouch with lure inside. Reduce 3 threefold amount of beetles caught in trap with pouch/lures despite field orientation.

Jim Nechols, Kansas State University (2014 ARDP) - Cotton crop risk in changing environments:

interaction of drought stress and early season arthropod pests

Hypothesis: multiple stresses will have additive or perhaps even synergistic effect on cotton loss.

Technology time slip...

Greenhouse

2 water \* 4 arthropod: [+ Water, - Water] & [Mite only, thrips only, mites+thrip, none]

Field

2 Water \* 3 arthropod: No mites only treatment.

Prediction of net increase in herbivory under drought stress due to spider mite increase.

Unanticipated obstacles: record rainfall, adapting mite colony to cotton. Prelim: What water content for greenhouse? What thrips-mite ratio for 4-5 week experiment?

#### State Reports (continued)

Paul Johnson – South Dakota

- Exciting that have bottomed out on staffing numbers. 5000 commercial applicators keep recertified every two years. Incorporate pest management in the PSEP program.
- Pest Guides have been kept up to date. All three areas done in same format.

Frannie Miller – Kansas

- myFields program: new site features to allow users to customize with regional pest management information and subscribe to localized pest alerts based on filed location.
- Chemical Selection Tool for Herbicide Selection

-- 3.23.16 – Notes recorded by Jaime

Jaime was nominated for incoming vice-chair for 2018 – motion approved. Jaime suggested hosting meeting in MO in 2018. Fargo, ND, proposed for 2017 meeting (March 21-22)

Discussion on trip to Mexico in 2017 - Monarch butterfly: Small coordinating committee formed. It includes Jim Jasinski, Wendy Wintersteen, Jaime Pinero. Contact Wendy Wintersteen if interested in helping out. Trip to Mexico can be included in the third year of current IPM grant. Jeff Jacobsen discussed requirements for NIFA support for international travel. Potential dates: December 2016 - January, 2017. Need to take care of it upfront. Include objective and outcomes of the meeting. Avoid dates when weed scientists meet for best chance to make trip.

Sue suggested bringing a high farmer organization to Mexico. Perhaps Farm Bureau president from ND (Van der Wall [?]) can be invited. Group discussed that perhaps bringing just NCERA 222; and at some other time can bring a smaller, different trip for Farm Bureau (2-step trip).

JEFF JACOBSEN: Discussed re-formatting of State reports. He indicated that perhaps reports include too many details. Often, reports based on what was done on previous year. Need to look at objectives for current project. Inclusion of bullets with objectives was suggested. Handouts: sharing materials, he observed good collegiality in the group.

WENDY: Mentioned that we have included one impact statement in previous reports.

JACOBSEN: Not necessarily each state needs to have one impact statement (high quality) for the entire period of the 5-year. Not necessarily 12 impact reports per year. He reminded us that every state has requirements regarding reporting.

Every 5 years the overall project is looked at by Committee. It is also examined at the national level to report main impacts (CO State Univ.). Are the annual NCERA meeting reports meeting the expectations can be included in a national NIFA report. Again, suggested a couple of impact statements from the entire region per year, to be expanded at the national level.



WENDY: NCERA committee is a coordination / communications committee. She discussed the reason of the various categories. We are not supposed to share research projects. Some impacts include working groups, which is a large portion of the multi-state committee.

FRANNY: Discussed how to make it easier for person putting together report?

WENDY: Perhaps go back to approach asking everyone the things that are needed for report, for example 3 sentences / comments on each area. Number of words is a limitation. We will write one impact statement - reference to form SAES 424.

JEFF JACOBSEN: discussed reporting form SAES-422. R&E committees - 2 functions: coordination and information exchange. He went over reporting form SAES-422. Include objective and bullets underneath. Always include short-term outcomes, outputs, impacts, publications.

SUE: Exemplified long-term collaboration (Extension entomologists led to Journal of IPM).

WENDY: suggested providing the group with a past report for everyone to see how it was prepared.

We need to provide Patrick with 2016 report. Patrick suggested to post one past report as model in Wiggio, with comments from Wendy. Use new system (streamlined version). Send revised state reports to Pat by April 1st.

JIM: questions to Marty? Important date for Extension IPM grant: June 1. Next RFA November 2016 (?)

For final report: Need to present consolidated impacts years 1-3. Try to include the broader picture (best reflection of the entire project). No need to re-include publications in final report.

JIM: Evaluator left NCR IPM Center.

SUE: financially, not envisioned to hire another full-time evaluator specialist. Sue requested input from committee members as to the need to consider hiring a part-time person. How best to conduct training? videos? But hands-on training is also needed. Sue mentioned that NIFA hired 2 evaluator specialists.

FRANNIE: Often templates are needed - very useful to use across projects.

WENDY: Discussed EFNEP program. It is used to report national indicators. Perhaps focus on one area - three indicators.

MARTY: Impacts of national program (perhaps 15 years ago). Link will be provided to Sue.

Discussion centered on paying using contracts for specific trainings. BOB: Perhaps developing training modules contracting with NE IPM Center, South IPM Center?

Allusion to NC Stat templates – wonderful tools but nobody is using them. Marty will be sending info on evaluations to everyone.

Need to take next step: trainers have been trained and need to implement better evaluations using common indicator.

LYNAEE: IPM symposium 2018. Survey of 2012 symposium. Numbers declining. Not enough grower symposia, but more geared to University people. Please provide suggestions. Need to merge with other groups?

Meeting adjourned 11:10 am

### **Accomplishments**

**University of Illinois:** The University of Illinois Plant Clinic provides unbiased diagnoses of routine, unusual and exotic plant problems. Diagnoses were provided for Phytosanitary Certification, nematode analysis, herbicide resistance testing, and traditional samples.

**Purdue University:** Crop Management Workshops (CMWs) were held at different locations in the state during the winter meeting season, and had a total attendance of 1,016 people, of which 40% indicated responsibility for 10,000 acres or more. The CMWs focused on IPM and agronomic practices, including pest identification and biology, proper pesticide application timing, eliminating needless applications, most efficacious products and rates, pest resistance management tactics and anticipated pest problems for the coming season.

**Iowa State University:** We completed a 3-year study looking at the effect of fungicides on hail-damaged corn and soybean. Farmers are presented the option to treat their hail-damaged crops with fungicides to “protect what is left” or to “prevent pathogens from infecting through wounds.” Results indicated that, in general, hail injury alone is not a sufficient reason for foliar application of fungicides to corn and soybean in the absence of disease risk. An economic analysis was also performed to determine costs and benefits associated with foliar-fungicide application. These studies gave farmers and agronomists research-based information on if and when they should spray fungicides after a hail event. Research was highlighted in videos produced by ISU College of Agriculture and Life Sciences, extension articles, articles in ag magazines, and through social media. Research was also published in Plant Health Progress, which is a journal focused towards agribusiness.

**Kansas State University:** In 2016, the myFields program was presented at soybean, corn, and sorghum Crop School Series across Kansas (a total of 11 schools and approximately 600 attendees). Attendees were briefed on the myFields features, upcoming site tools, and provided the opportunity for attendees to give feedback to site organizers. Also in 2016, two Extension Agent training events provided us the opportunity to promote site features among Agents, and gain their insight on site development that will help them engage local networks of clients.

**Michigan State University:** The IPM Program collaborated with MSU Extension educators and specialists to develop an online series of 17 on-demand webinars with supporting materials covering a variety of aspects of IPM. See [http://www.ipm.msu.edu/agriculture/integrated\\_pest\\_management\\_academy](http://www.ipm.msu.edu/agriculture/integrated_pest_management_academy) The webinars covered a range of topics including those designed to help new farmers and those diversifying into new crops: Introduction to IPM, IPM Resources at MSU, Plant Pathology 101, Entomology 101, Chestnut IPM and Hop IPM.

**University of Minnesota:** Excellent progress has been made in urban IPM programming, including the “Let’s Beat the Bed Bug” program and structural IPM. Two working groups, one focusing on pest

exclusion in multi-family housing (SCOPE-MFH) and another focusing on pest exclusion in industrial and commercial food handling structures (IC-SCOPE), were created under a core initiative group called SCOPE (Scientific Coalition On Pest Exclusion). These working groups combine efforts of the NC and NE Regional IPM Centers, and are funded through grants from both regional centers. At the annual MN Structural IPM meeting, 1,100 attendees participated in a 2-day meeting.

**University of Missouri:** We have overhauled and launched our website with a completely new design and functionality. Various media outlets used by MU and LU faculty / IPM programs to communicate to clientele, (i.e. a scrolling Twitter feed) are integrated directly on the front page. The Missouri Produce Growers Bulletin, which had formerly been only in print, is now housed and updated on the website. The most important upgrade concerns our broad pest monitoring network, which involves 17 trappers monitoring for ten agronomically important insect pests across the state. Detailed insect profiles and scouting information are now displayed on the site, along with an easy to use map interface to determine the current trap counts in the grower's area. In 2016, we will add brown marmorated stink bug to this trapping system.

**University of Nebraska:** Educational programs to increase understanding of rootworm biology and behavior, and current management options are needed to maintain grower profitability and sustainability of Bt corn and other management options. A series of 5 webinars was published in December 2014 on the Plant Management Network, Focus on Corn website at: <https://www.plantmanagementnetwork.org/edcenter/seminars/CRWSeminar/> Two additional webinars were published in 2015. Funding from USDA-NIFA administered through the North Central IPM Center allowed these webinars to be open access. A multistate team of entomology researchers with experience on corn rootworms from across the midwestern United States provided current information on this topic. The major focus of these programs was on the western corn rootworm, *Diabrotica virgifera virgifera*.

**North Dakota State University:** "Getting it Right in Soybean Production" meetings were held at four locations in new soybean production areas within the state. Attendees gained knowledge about soybean agronomy, production, pest identification and IPM. These meetings reached 186 producers representing approximately 300,000 acres.

**The Ohio State University:** Conducted a two day high tunnel workshop which trained 30 new and beginner growers on current and emerging pest management topics, held three hands-on soybean production workshops for 59 farmers on topics such as soybean cyst nematode, insect identification, seed treatment, and yield limiting factors, and finally conducted a webinar and workshop for 65 small fruit growers on spotted wing *Drosophila* monitoring and management.

**South Dakota State University:** The seventh annual SDSU IPM Field School for Agronomy Professionals was held at the South East Research Farm located south east of Beresford, SD on July 30 & 31, 2015. The school was co-hosted with the South Dakota Agri-Business Association and SDSU Extension Plant Science. Attendance for the event included 54 professional agronomists. Six topic areas featuring corn, and soybeans were covered over the two days by SDSU Extension Plant Science Specialists, Extension Field Specialists and NRCS personnel.

**University of Wisconsin:** In reaction to the Wisconsin Certified Crop Advisors (CCA) Board request to conduct training for people wishing to take the Wisconsin CCA exam, the Wisconsin IPM Program

coordinated the development of more than 50 YouTube videos. Individuals who used the the videos to prepare for the exam were evaluated.

### **Impacts**

**University of Illinois:** The staff of the University of Illinois Plant Clinic diagnosed 3,522 samples in 2015 with 5,431 total diagnoses. The majority of the diagnoses were for agronomic samples (1,767 diagnoses of field crops and 1,713 diagnoses of field crop soil). There were 680 diagnoses were completed for herbicide resistance in waterhemp. Deciduous and evergreen ornamentals comprised 672 and 240 diagnoses respectively, with vegetables, fruits, perennials, and turf accounting for another 293 diagnoses combined, Table 1. Additionally, information was provided via approximately 1,900 telephone inquiries, 2,500 email and App requests, and 650 walk-in consultations. This is a total of 8,572 diagnostic service contacts at the Plant Clinic in 2015.

**Purdue University:** 92% of CMW participants indicated that they intended to apply pest identification and management knowledge gained from the workshops to next season's crops. 87% of participants indicated that they would share what they learned with co-workers and/or customers. 73% of participants indicated that they have implemented crop production and IPM strategies discussed at past CMWs into their operations.

**Iowa State University:** The Plant and Insect Diagnostic Clinic held several trainings throughout the year to improve the diagnostic skills of key clientele (i.e., Iowa Fruit and Vegetable Growers, Master Gardeners, Master Woodland Managers). Each of these trainings led to an improvement in the knowledge of disease identification. For example, in a Master Woodland Manager's training in September, 100% of attendees (22) confused symptoms of common tree diseases and disorders, but by the end of the training each of them properly differentiated some of these diseases. Being able to properly identify these tree diseases and disorders (e.g., oak wilt, anthracnose, oak decline, etc.) is an important first step in implementing effective management.

**Kansas State University:** Specific to site development, we have successfully integrated pest management activities for successful IPM in several ways. First, disease/weed/environmental issue profiles (*Diagnostic Guides*) for multiple cropping systems were added to the site that will be linked to regional management information. Second, we have incorporated a *Chemical Selection Tool* for herbicide selection using yearly KSU performance ratings, which was developed based on stakeholder feedback from 2014. Lastly, through related collaborations, we have developed site features that allow user groups to report disease and pest presence (KSU-Barley Yellow Dwarf Virus Consortium, and Texas Agri-Life Wheat Streak Mosaic Virus Consortium), map presence of pests in real-time via Bugwood.org, and alert other users about pest-risk in their area (TX, OK, and KS-Sugarcane Aphid Consortium).

**Michigan State University:** Our on-demand IPM webinars provide growers with an inexpensive, readily accessible means of learning. During the past year, agricultural producers have viewed the webinars over 1,967 times and reported significant increases in knowledge of IPM that will impact their total acreage of 1.5 million. Webinar viewers are surveyed at the end of each webinar. For example, growers who viewed Plant Pathology 101 (n=72, representing 31,572 acres) reported they better understood the economic impacts of plant pathogens (84.9%), the cause of plant disease (89.0%), the historical significance of plant pathogens (65.8%) and methods of disease suppression (83.6%).

**University of Minnesota:** From July 1, 2014, through June 30, 2015, [www.bedbugs.umn.edu](http://www.bedbugs.umn.edu) logged 684,889 sessions, representing a 10.8% increase over the previous period; 12,735 of these sessions were from MN, which is a 41.3% increase over the previous period and indicates that a broad audience outside of MN is using the bed bug resources. For participants of the Structural IPM meeting, 71% indicated that they were either satisfied or very satisfied with the information they received. This program also reached 532 individuals and community leaders representing disadvantaged communities.

**University of Missouri:** One 2-day ISE “train-the-trainer” workshop on Organic Pest Management was implemented on May 25-26, 2015. As a result of this workshop, Extension educators in Missouri increased their level of knowledge on organic IPM and also improved their abilities to assist farmers. Results from a 10-month post-workshop survey (answers continue to be received) thus far indicate that: (1) 90% of respondents assisted farmers using organic IPM knowledge acquired at the workshop, (2) 100% of respondents incorporated new ideas and information into regular programming, and 100% of respondents made use of information on organic management of SWD. We anticipate that about 1,000 farmers have been reached by the 45 participants of this workshop. Overall, the implementation of this type of Extension IPM activities has proven successful, and the outcomes highlight the efforts that the LU / MU IPM program is taking to train Extension educators in necessary IPM skills within and outside Missouri.

**University of Nebraska:** The corn rootworm webinar series received an Educational Project Award from the Mid-America Board Certified Entomologists in June 2015. The team receiving the award included Robert Wright, Univ. of Nebraska-Lincoln; Joe Spencer, Univ. of Illinois; Ken Ostlie, Univ. of Minnesota; Aaron Gassmann, Iowa State Univ.; Lance Meinke, Univ. of Nebraska-Lincoln; Erin Hodgson, Iowa State Univ.; and Adrianna Szczepanec, South Dakota State Univ. Over 330 computers accessed the live program online. Over 6,850 open access views were recorded on the Plant Management Network through August 2015.

**North Dakota State University:** At the “Getting it Right in Soybean Production” meetings, 103 soybean producers representing about 208,000 acres participated in evaluations on pest identification and IPM topics. Prior to the meetings, 82% of participants rated their understanding of soybean aphid and spider mite identification and management as low. After the meetings, 90% rated their understanding as moderate to high. 99% of participants indicated they can properly identify and scout for soybean aphids and spider mites, 95% indicated they understand the economic threshold for soybean aphid, 98% indicated they understand the spider mite injury scale and spray threshold, and 97% indicated they know how to identify common beneficial insects in soybean. Participants estimated an average savings of \$7.20 per acre, or about \$1.5 million if they applied IPM knowledge gained at these meetings in their operations.

**The Ohio State University:** In October, 2015 bed bug training was held for ~75 members of the Central Ohio Bed Bug Task Force who are mainly healthcare workers, social workers, maintenance workers, and landlords. A total of 63 evaluation responses were obtained, with most respondents (85%) indicated they were very likely to share the information learned with others. Given the heightened awareness of bed bugs, only 53% of respondents said they “always” inspected their hotel room for these pests prior to the workshop but post workshop (93%) stated they would check the room.

**South Dakota State University:** At the SDSU IPM Field School for Agronomy Professionals, a pre and post-test was given asking questions on material covered in the sessions. The pre and post-test showed an average increase of 37 % correct answers after completing the two days of sessions.

**University of Wisconsin:** All survey respondents who used the YouTube videos to prepare for the CCA exam indicated that the videos prepared them 'moderately' or 'very much'. Respondents also reported their knowledge increased 'moderately' to 'very much' in the following areas: pest identification (90% of respondents), pest life cycles (85%), preventing pest resistance (80%), and using IPM approaches to pest management (75%).

## **Publications**

### **University of Illinois:**

First Report of Tar Spot on Corn caused by *Phyllachora maydis* in the United States. G. Ruhl, M. K. Romberg, S. Bissonnette, D. Plewa, T. Creswell, and K. A. Wise. *Accepted to Plant Disease*.

First Report of Leaf Spot caused by *Alternaria alternata* on Leopard Plant (*Farfugium japonicum*) in Illinois. R. M. Metallo, D. E. Plewa, H. C. Pfaffe, S. J. Mullahy, and S. M. Bissonnette. *In progress*

A First Detection Success Story: Corn Tar Spot Identified for the First Time in the United States by Collaborative Efforts of NPDN and USDA-APHIS Fungal Identification Lab. G. Ruhl, M. Romberg, T. Creswell, S. Bissonnette, D. Plewa, K. Wise. *Poster accepted to the National Plant Diagnostic Network National Meeting, 2016*

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/800-Apple\\_Scab-2015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/800-Apple_Scab-2015.pdf)

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/801\\_Fireblight\\_of\\_Apple-2015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/801_Fireblight_of_Apple-2015.pdf)

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/802-Rust\\_Diseases-2015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/802-Rust_Diseases-2015.pdf)

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/803\\_Apple\\_Powdery\\_Mildew-2015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/803_Apple_Powdery_Mildew-2015.pdf)

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/804-Apple\\_Sooty\\_Blotch-Flyspeck-2015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/804-Apple_Sooty_Blotch-Flyspeck-2015.pdf)

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/805\\_Bitter\\_of\\_Apple-20015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/805_Bitter_of_Apple-20015.pdf)

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/806\\_Black\\_Rot\\_of\\_Apple-20015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/806_Black_Rot_of_Apple-20015.pdf)

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/807\\_White\\_Rot\\_of\\_Apple-20015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/807_White_Rot_of_Apple-20015.pdf)

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/808-Apple\\_Phytophthora-2015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/808-Apple_Phytophthora-2015.pdf)

[http://extension.cropsciences.illinois.edu/fruitveg/pdfs/809-Apple\\_Necrotic\\_Leaf\\_Blotch-2015.pdf](http://extension.cropsciences.illinois.edu/fruitveg/pdfs/809-Apple_Necrotic_Leaf_Blotch-2015.pdf)

### **Purdue University:**

Tilmon, K., R. Koch, W. Bailey, C. DiFonzo, **C. Krupke**, T. Hunt, K. Jarvi, B. Jensen, J. Knodel, B. McCornack, A. Michel, J. Peterson, B. Potter, A. Szczepanec, J. Tooker, E. Hodgson, S. Zukoff. 2015. The Effectiveness of Neonicotinoid Seed Treatments in Soybean. Publication E-268. Cooperative Extension Service, Purdue University: On-line: [www.edustore.purdue.edu](http://www.edustore.purdue.edu)

### **Iowa State University:**

Books and Refereed Publications:

Kandel, Y., Bradley, C.A., Wise, K.A., Chilvers, M., Tenuta, A., Davis, V.M., Esker, P.E., Smith, D.L., Licht, M.A., and Mueller, D.S. 2015. Effect of glyphosate application on sudden death syndrome of soybean under different field conditions. *Plant Disease*. 99:347-354.

Kandel Y.R., Haudenschild, J.S., Srouf A.Y., Fakhoury, A.M., Chilvers M.I., Wang J., Santos, P., Hartman G.L., Malvick, D.K., Floyd, C.M., Mueller, D.S. and Leandro, L.F.S. 2015. Multi-lab comparison of six quantitative PCR assays for detection and quantification of *Fusarium virguliforme* from soybean roots and soil. *Phytopathology*. 105:1601-1611.

- Kanobe, C., M.T. McCarville, M.E. O'Neal, G.L. Tylka, and G.C. MacIntosh. 2015. Soybean aphid infestation induces changes in fatty acid metabolism in soybean. *PLoS ONE* 10(12):e0145660. doi:10.1371/journal.pone.0145660.
- Kurle, J., Dorrance, A.E., Robertson, A.E., Bradley, C., Giesler, L. and Wise, K. Pathotype diversity of *Phytophthora sojae* in ten states in the United States. *Plant Disease* (in press).
- Matthiesen, R., Abeysekara, N., Maroof, S. and Robertson A.E. Combining isolates to screen for novel sources of resistance to *Phytophthora sojae* in soybean. *Plant Dis.* (in press)
- Matthiesen, R., Ahmad, A. and Robertson, A.E. 2016. Temperature affects virulence and fungicide sensitivity of four species of *Pythium* on corn and soybean. *Plant Dis.* (in press) Available online as *Plant Disease* "First Look": <http://dx.doi.org/10.1094/PDIS-04-15-0487-RE>
- Olson, T. R., Gebreil, A., Micijevic, A., Bradley, C.A., Wise, K.A., Mueller, D.S., Chilvers, M.I., and Mathew, F.M. 2015. Association of *Diaporthe longicolla* with black zone lines on mature soybean plants. *Plant Health Progress* doi:10.1094/PHP-RS-15-0020
- Stewart, S., Robertson, A.E. Wickramasinghe, D, Michel, A. and Dorrance A.E. 2016. Population structure among and within Iowa, Missouri, Ohio and South Dakota populations of *Phytophthora sojae*. *Plant Dis.* 100: 367-379
- Zhang, J, Singh, Ar., Mueller, D. and Singh, As. 2015. Genome-wide association and epistasis studies unravel the genetic architecture of sudden death syndrome resistance in soybean. *The Plant Journal.* 84: 1124–1136. doi:10.1111/tpj.13069

#### Extension Publications:

- Hahn, J., Jesse, L., Liesch, P., (2015) Social Wasps in the Upper Midwest. Extension Publication PD 40
- Jesse, L. Brockman, N., Lewis, D. (2015) Gardening for Butterflies and Pollinators. Extension Publication RG6-1
- Kandell, Y., Robertson, A., Zaworski, E., Chilvers, M., Dorrance, A.E and Bestor, N. 2015. *Phytophthora* Root Rot of Soybean. CPN 10-14. Iowa State University Extension and Outreach.
- Shour, M., Jesse, L., Lewis, D. (2015) Looking for Emerald Ash borer in Iowa. Extension Publication PM 3071
- Smith, D., Chilvers, M., Dorrance, A., Hughes, T., Mueller, D., Niblack, T., and Wise, K. 2015. Soybean Disease Management: Charcoal Rot. Crop Protection Network. CPN 1004
- Tenuta, A., Bradley, C., Chilvers, M., Giesler, L., Mathew, F., Mueller, D., Sisson, A., and Wise, K. 2015. Soybean Disease Management: Scouting for Common Soybean Seed Diseases. Crop Protection Network. CPN 1001.
- Tilmon, K., R. Koch, W. Bailey, C. DiFonzo, C. Krupke, T. Hunt, K. Jarvi, B. Jensen, J. Knodel, B. McCornack, A. Michel, J. Peterson, B. Potter, A. Szczepanec, J. Tooker, **E. Hodgson**, S. Zukoff. 2015. The Effectiveness of Neonicotinoid Seed Treatments in Soybean. Publication E-268. Cooperative Extension Service, Purdue University: On-line: [www.edustore.purdue.edu](http://www.edustore.purdue.edu)
- Tylka, G.L. and M. P. Mullaney. 2015. Soybean cyst nematode-resistant soybeans for Iowa. Iowa State University Extension Publication PM 1649, 28 pp.
- Tylka, G.L., G.D. Gebhart, C.C. Marett, and M.P. Mullaney. 2015. Evaluation of soybean varieties resistant to soybean cyst nematode in Iowa – 2015. Iowa State University Extension, publication IPM 52, 32 pp.
- Wise, K., Bradley, C., Chilvers, M., Giesler, L., Mathew, F., Mueller, D., Smith, D., and Tenuta, A. 2015. Soybean Disease Management: Stem Canker. Crop Protection Network. CPN 1006
- Wise, K., Bradley, C., Chilvers, M., Giesler, L., Johnson, B., Legleiter, T., Licht, M., Mueller, D., Noveroske, A., Sisson, A., Smith, D., Tenuta, A., and Young-Kelly, H. 2015. Soybean Disease Management: Scouting for Soybean Seedling Diseases and Disorders. Crop Protection Network. CPN 1009.

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Wise, K., Bradley, C., Chilvers, M., Giesler, L., Johnson, B., Legleiter, T., Licht, M., Mueller, D., Noveroske, A., Sisson, A., Smith, D., Tenuta, A., and Young-Kelley, H. 2015. Soybean Disease Management: Soybean Seedling Diseases. Crop Protection Network. CPN 1008

#### **Kansas State University:**

Tilmon, K., R. Koch, W. Bailey, C. DiFonzo, C. Krupke, T. Hunt, K. Jarvi, B. Jensen, J. Knodel, **B. McCornack**, A. Michel, J. Peterson, B. Potter, A. Szczepaniec, J. Tooker, E. Hodgson, **S. Zukoff**. 2015. The Effectiveness of Neonicotinoid Seed Treatments in Soybean. Publication E-268. Cooperative Extension Service, Purdue University: On-line: [www.edustore.purdue.edu](http://www.edustore.purdue.edu)

#### **Michigan State University:**

Extension Bulletins and Factsheets:

Brown, D. and Lizotte, E. 2016. Pesticides Registered for Use on Hop in Michigan 2016. Michigan State University, East Lansing MI 48824.

Dedecker, J. 2015. Integrated Pest Management Scouting in Field Crops. Michigan State University Extension Bulletin E3294. Michigan State University, East Lansing MI 48824.

Lizotte, E. 2016. Michigan Chestnut Management Guide 2016. Michigan State University, East Lansing MI 48824.

Lizotte, E.M. 2015. Integrated Pest Management Scouting in Perennial Agricultural Crops. Michigan State University Extension Bulletin E3295. Michigan State University, East Lansing MI 48824.

Tilmon, K., R. Koch, W. Bailey, **C. DiFonzo**, C. Krupke, T. Hunt, K. Jarvi, B. Jensen, J. Knodel, B. McCornack, A. Michel, J. Peterson, B. Potter, A. Szczepaniec, J. Tooker, E. Hodgson, S. Zukoff. 2015. The Effectiveness of Neonicotinoid Seed Treatments in Soybean. Publication E-268. Cooperative Extension Service, Purdue University: On-line: [www.edustore.purdue.edu](http://www.edustore.purdue.edu)

Werling, B. 2015. Integrated Pest Management Scouting in Vegetable Crops. Michigan State University Extension Bulletin E3293. Michigan State University, East Lansing MI 48824.

Wollaeger, H. 2015. Integrated Pest Management Scouting in Greenhouse Crops. Michigan State University Extension Bulletin E3296. Michigan State University, East Lansing MI 48824.

Online, on-demand webinars:

Elsner, E. 2015. Entomology 101 Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.

Garcia, C. 2015. Insect Scouting in Fruit Crops Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.

Irish-Brown, A. 2015. Plant Science 101 Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.

Irish-Brown, A. 2015. Soil Science 101 Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.

Lizotte, E. 2015 Hop IPM Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.

Lizotte, E. 2015. Chestnut IPM Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.

Lizotte, E. 2015. Integrated Pest Management Resources Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.

Lizotte, E. 2015. Introduction to Integrated Pest Management Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.



- Lizotte, E. 2015. Pesticides 101 Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.
- Lizotte, E. 2015. Plant Pathology 101 Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.
- Rodriguez, L. 2015. Tactics for Vegetable Disease Management Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.
- Rodriguez, L. 2015. What's Wrong with My Vegetable Plants Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.
- Werling, B. 2015. Becoming an Insect Investigator Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.
- Wollaeger, H. 2015. Growing Bee-Friendly Plants in the Greenhouse Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.
- Wollaeger, H. 2015. MDARD Nursery Program Update Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.
- Wollaeger, H. 2015. Summer 2015 Nursery Update Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.
- Wollaeger, H. 2015. Top Diseases and Insects in Nursery Crops Webinar. [www.ipm.msu.edu](http://www.ipm.msu.edu). Michigan State University, East Lansing MI 48824.

Poster presentations:

- Wilson, J. K., J.N. Landis, M.A. Fournier, E.M. Lizotte. December 2015. New from MSU Extension for fruit growers: publications, online resources. Great Lakes Fruit/Vegetable/Farm Market Expo, Grand Rapids, MI (poster presentation).
- Wilson, J. K., J.N. Landis, M.A. Fournier, E.M. Lizotte. December 2015. New from MSU Extension for vegetable and other growers: publications, online resources. Great Lakes Fruit/Vegetable/Farm Market Expo, Grand Rapids, MI (poster presentation).

**University of Minnesota:**

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- Alves, T., I. MacRae and R.L. Koch. 2015. Soybean aphid (Hemiptera: Aphididae) affects soybean spectral reflectance. *J. Econ. Entomol.* 108(6): 2655–2664. <http://jee.oxfordjournals.org/content/108/6/2655>
- Burkness, E. C., T. M. Cira, S. E. Moser, and W. D. Hutchison. 2015. Bt maize seed mixtures for *Helicoverpa zea*: Larval movement, development and survival on non-transgenic maize. *J. Econ. Entomol.* 108(6):2761-2769. doi: 10.1093/jee/tov253.
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- Koch, R.L., Z. Sezen, P.M. Porter, D.W. Ragsdale, K.A.G. Wyckhuys and G.E. Heimpel. 2015. On-farm evaluation of a fall-seeded rye cover crop for suppression of soybean aphid (Hemiptera: Aphididae) on soybean. *Agric. and Forest Entomol.* 17(2): 239-246. <http://onlinelibrary.wiley.com/doi/10.1111/afe.12099/abstract>
- Pezzini, D. and R.L. Koch. 2015. Compatibility of flonicamid and a formulated mixture of pyrethrins and azadirachtin with predators for soybean aphid (Hemiptera: Aphididae) management. *Biocontrol Sci. and Tech.* 25(9): 1024-1035. <http://www.tandfonline.com/doi/abs/10.1080/09583157.2015.1027659>
- Rich, W.A. and R.L. Koch. 2016. Effects of Rag1 aphid-resistant soybean on mortality, development and preference of brown marmorated stink bug (Pentatomidae). *Entomol. Experimentalis et Applicata* 158(2): 109-117. <http://onlinelibrary.wiley.com/doi/10.1111/eea.12392/abstract>

Rogers, M. A., E. C. Burkness, and W. D. Hutchison. 2016. Evaluation of covered tunnels for management of *Drosophila suzukii* in fall-bearing red raspberries. Journal of Pest Science DOI 10.1007/s10340-016-0731-1.

Selected Extension Publications:

- Koch, R.L. and S. Wold-Burkness. 2015. Potato leafhopper in Minnesota soybean. University of Minnesota Extension.
- Koch, R.L. and S. Wold-Burkness. 2015. Thistle caterpillar in Minnesota soybean. University of Minnesota Extension.
- Koch, R.L. and S. Wold-Burkness. 2015. Wireworm in Minnesota soybean. University of Minnesota Extension.
- Koch, R.L. 2015. Stink bugs in Minnesota soybean. University of Minnesota Extension.
- Koch, R.L., W.A. Rich and S. Wold-Burkness. 2015. Bean leaf beetles in Minnesota soybean. University of Minnesota Extension.
- Marston, Z., I. MacRae and R.L. Koch. 2015. Shedding light on NDVI. University of Minnesota. <http://www.aeroag.umn.edu/learn/index.html>
- Shindelar, A. & S. Kells. 2015 (revised). Bed bug control in residences (web & pdf), University of Minnesota Extension (5 languages; video), on-line: <http://www.bedbugs.umn.edu/bed-bug-control-in-residences/>
- Tilmon, K., **R. Koch**, W. Bailey, C. DiFonzo, C. Krupke, T. Hunt, K. Jarvi, B. Jensen, J. Knodel, B. McCornack, A. Michel, J. Peterson, **B. Potter**, A. Szczepaniec, J. Tooker, E. Hodgson, S. Zukoff. 2015. The Effectiveness of Neonicotinoid Seed Treatments in Soybean. Publication E-268. Cooperative Extension Service, Purdue University: On-line: [www.edustore.purdue.edu](http://www.edustore.purdue.edu)

Current Newsletters & Web Resources:

- SW-MN IPM News (Bruce Potter): <http://swroc.cfans.umn.edu/ag-programs/pest-management>
- Extension Crops Team: For more information, see IPM Guides for all major crops, including, e.g., Corn IPM Resources: <http://www.extension.umn.edu/agriculture/corn/pest-management/>
- VegEdge: [www.vegedge.umn.edu](http://www.vegedge.umn.edu)

**University of Missouri:**

Peer-reviewed:

- Piñero, J.C. and Manandhar, R. 2016. Effects of increased crop diversity using trap crops, flowering plants, and living mulches on vegetable insect pests. TRENDS in Entomology (in press).
- Piñero, J.C., Quinn, J. Byers, P.L., Miller, P.D., Baker, T., and Trinklein, D. 2015. Knowledge and Use of Integrated Pest Management by Underserved Producers in Missouri and the Role of Extension. Journal of Extension [On-line], 53(3) Article 3RIB3. Available at: <http://www.joe.org/joe/2015june/rb3.php>.

Fact sheets:

- Bradley, K. 2015. IPM 1031: Weed & Brush Control for Forages, Pastures, and Noncropland. University of Missouri Extension, 164 pages. *Winner of 2015 ASA-CSSA-SSA Excellence in Extension Educational Materials Award.*
- Manandhar, R. and Piñero, J.C. 2015. The Harlequin Bug. Lincoln University Cooperative Extension IPM program Fact Sheet. GS#18-F-2015, 5/08/2015.

Manandhar, R. and Piñero, J.C. 2015. The Pest Caterpillars of Cole Crops in Missouri I: Identification and Life Cycle. Lincoln University Cooperative Extension IPM program Fact Sheet. FS#18-F-2015. 12/08/2015.

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Tilmon, K., R. Koch, **W. Bailey**, C. DiFonzo, C. Krupke, T. Hunt, K. Jarvi, B. Jensen, J. Knodel, B. McCornack, A. Michel, J. Peterson, B. Potter, A. Szczepaniec, J. Tooker, E. Hodgson, S. Zukoff. 2015. The Effectiveness of Neonicotinoid Seed Treatments in Soybean. Publication E-268. Cooperative Extension Service, Purdue University: On-line: [www.edustore.purdue.edu](http://www.edustore.purdue.edu)

Wilson, J.T. and Piñero, J.C. 2015. The Basics of Organic Insect Pest Management. Lincoln University Cooperative Extension IPM program Guide Sheet. GS#18-F-2015, 5/08/2015.

### **University of Nebraska:**

Fact sheets:

Tilmon, K., R. Koch, W. Bailey, C. DiFonzo, C. Krupke, **T. Hunt, K. Jarvi**, B. Jensen, J. Knodel, B. McCornack, A. Michel, **J. Peterson**, B. Potter, A. Szczepaniec, J. Tooker, E. Hodgson, S. Zukoff. 2015. The Effectiveness of Neonicotinoid Seed Treatments in Soybean. Publication E-268. Cooperative Extension Service, Purdue University: On-line: [www.edustore.purdue.edu](http://www.edustore.purdue.edu)

Webinar content: <https://www.plantmanagementnetwork.org/edcenter/seminars/CRWSeminar/>

Estimation of Efficacy Functions for Products Used to Manage Corn Rootworm Larval Injury: Dr. Nicholas Tinsley, University of Illinois at Urbana-Champaign

RNA Interference as a Pest Management Tool for Western Corn Rootworm: Dr. Ana María Vélez, University of Nebraska-Lincoln

Rootworm Biology and Behavior: Dr. Joseph L. Spencer, University of Illinois at Urbana-Champaign

Resistance Evolution and IRM for Rootworm: Dr. Aaron Gassmann, Iowa State University

Adult Corn Rootworm Suppression: Dr. Lance J. Meinke, University of Nebraska-Lincoln

Larval Corn Rootworm Management: Dr. Robert Wright, University of Nebraska-Lincoln

Decision Tree for Grower Management Options: Re-Learning Corn Rootworm Management in the Transgenic Era: Dr. Ken Ostlie, University of Minnesota

### **North Dakota State University:**

Peer-reviewed Publications:

Bradshaw, J., J. Knodel, J.P. Michaud and J. Prasifka. 2016 (in press). Insect Chapters *In* Bob Harveson, Sam Markell, Charlie Block and Tom Gulya (Eds.). Compendium of Sunflower Diseases and Pests, APS, xx pp.

Friskop, A.J., Gulya, T.J., Halley, S., Schatz, B., Schaefer, J.P., Jordahl, J.G., Meyer, S.M., Misk, K.W., Hendrickson, P., and Markell, S.G. 2015. Effect of fungicide and timing of application on management of sunflower rust. *Plant Disease* 99:1210-1215.

Friskop, A.J., Gulya, T.J., Harveson, R.M., Humann, R.M., Acevedo, M., and Markell, S.G. 2015. Phenotypic diversity of *Puccinia helianthi* (Sunflower Rust) in the United States from 2011 and 2012. *Plant Disease* 99:1604-1609

Liu, Z., El-Basyoni, I., Kariyawasam, G., Zhang, G., Fritz, A., Hansen, J., Marai, F., Friskop, A.J., Shao, S., Akhunov, E., and Baenziger, P. 2015. Evaluation and association mapping of resistance to tan spot and *Stagonospora nodorum* blotch in adapted winter wheat germplasm. *Plant Disease* 99:1333-1341.

- McGinnis, E., K. Kinzer, and J. LeBoldus. 2015. First report of impatiens downy mildew caused by *Plasmopara obducens* in North Dakota. *Plant Disease*. 99(7): 1039.
- Zollinger, R. K., Howatt, K., Bernardis, M. L., and Young, B. G. 2016. "Ammonium Sulfate and Dipotassium Phosphate as Water Conditioning Adjuvants," *Pesticide Formulation and Delivery Systems: 35th Volume*. *Journal of ASTM International*, ASTM STP1587, G. R. Goss, Ed., ASTM International, West Conshohocken, PA, pp. 42–51, doi:10.1520/STP158720140126.

Extension Publications:

- Adams, J. and R. Zollinger. 2015. How adjuvants affect glufosinate. *Western Society of Weed Science (WSWS)* (42).
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