

Pennsylvania Integrated Pest Management Program 2015 Summary

The Pennsylvania IPM Program (PA IPM) is a collaboration between the Penn State University (PSU) and the Pennsylvania Department of Agriculture (PDA). At PSU, the IPM Team is lead by 3 faculty who coordinate multiple IPM projects in **tree and small fruit** (Rajotte), **field crops** (Tooker) and **vegetables** (Gugino). These faculty in turn collaborate with many other faculty and staff at PSU and across the region to address emerging critical problems in weed, invertebrate and pathogen management in crops. At Biglerville Fruit Research & Extension Center in Adams County, field staff (Biddinger) carries out cutting edge research on **invasive species** affecting the fruit industry and the preservation of **pollinator species** and **pesticide effects** on same. Three PSU IPM program staff (Garling, Niedermeier, Lerman) is responsible for outreach, education and policy implementation in the built environment including **community IPM, schools** and **housing**. At PDA, three staff (Thomas, Pickel, Schildt) works directly with stakeholders in **specialty crops** (Christmas trees, biological control in greenhouse production systems) and **compliance with IPM in schools** legislation. Below is a summary of programming in each area of and partners involved. Most projects involve leveraging of IPM funding to secure additional resources in order to build more diverse and wider partner networks plus more holistic, focused and/or extended efforts in areas of critical need (e.g. pollinator research, invasive pest species, new bio-based pesticides for pyrethroid-resistant bed bug management and pests and asthma issues in urban areas, targeted outreach to underserved audiences).

Agronomic Crop IPM Extension Program

1. In 2015 for the fourth year in a row, we have led a **soybean sentinel plot program**, in which about 15 Penn State extension educators scouted 20 or so typical soybean fields for **insects and pathogens**. The goal of this project, which we hope to have in place again in 2016, is to provide PA soybean growers weekly notices on the insects and pathogens that are active in their fields with the expectations that this information can help to direct or even prompt their own scouting efforts. A clear benefit of this effort is that over four years and about 20 fields per year, we have only had one soybean field that had a pest population that exceeded an economic threshold and thus needed a insecticide application; the remaining 79 fields did not require insecticides applications, emphasizing that most PA soybean fields do not developing damaging pest populations.

2. We have two ongoing statewide monitoring efforts to gauge the risk to **corn** production posed by two migratory **lepidopteran species**, black cutworm and western bean cutworm. One of these species is the black cutworm which is a perennial risk to early season corn seedlings. Most growers deal with this pest species by treating their fields at planting with preventative insecticide applications, which are often ineffective and environmentally risky. Western bean cutworm is a more recent invader and has become economically damaging in most Great Lakes States. In Pennsylvania, we have not had reports of economic damage, but continue to monitor the pest population to help gauge the risk to corn growers. With our monitoring efforts, county extension educators tracked both cutworm populations as they arrived in the state using pheromone traps, and when a substantial flight of moths was found, we fed the data into the Pennsylvania PIPE (Pest

Information Platform for Extension and Education) or PestWatch, helping to alert growers to their population size and the risk they posed.

3. We continue to develop an IPM program for **slugs** in Pennsylvania. Our previous research has demonstrated that neonicotinoid seed treatments in **corn and soybeans** exacerbate slug populations by poisoning or killing natural enemies. We are currently testing on seven commercial farms an alternative control for slugs based on no-till, cover crops and conserving natural enemy populations.

Vegetable Crop IPM

1. As part of on-going efforts to manage **late blight on tomato and potato**, Penn State extension educators collected samples from confirmed outbreaks of late blight and sent them to Cornell University for genotyping. Information regarding outbreaks and pathogen genotype was then disseminated to growers via newsletter articles, IPM hotline updates and the USAblight.org website (with genotypic information being available within 24hr of Cornell receiving the sample). Knowledge about the occurrence and county level location of outbreaks and the genotype enable growers to make in-season management decisions with regarding to the selection and timing of fungicides. The team list for this project is at (<http://usablight.org/personnel>). Those contributing to the extension, monitoring portion of the project are all from land grant universities including UMD, Cornell, UW-Madison, Penn State, Univ. Maine, NCSU, UF, UK and Oregon State University.

2. A statewide monitoring program continues in place for **cucurbit downy mildew**. This pathogen does not overwinter in northern climates and thus is typically transported long distances in wind trajectories. The primary management tool for this disease is the application of in-season fungicides since host resistance is not available. Therefore, timing their application when the crop is most at-risk reduces unnecessary fungicide applications. Information regarding outbreaks and disease forecasts can be found at cdmipmpipe.org and is further disseminated to growers statewide via newsletter articles, IPM hotline updates, etc. As downy mildew is confirmed by Penn State extension educators across PA, this information is fed into the forecasting system for the benefit of growers both locally and across the east coast. In addition, a sentinel plot containing multiple cucurbit species was established and monitored at least weekly for downy mildew development and water samples collected after every rain event to determine which event resulted in pathogen infection to further evaluate the forecasting models. Multistate involvement in reporting and forecasting models include 26 states and Canada, listed at (<http://cdm.ipmpipe.org/node/23>).

3. Produce auctions serve as major distribution points for **wholesale produce growers** across Pennsylvania. Often these growers, many of whom represent underrepresented audiences (i.e. plain sect religious groups), are our first line of defense in identifying and reporting disease, insect and invasive species. In partnership with PDA, educational kiosks were established a eight produce auctions over the past two years to provide growers with current information regarding pest outbreaks and management recommendations, identification of new invasive species, changes in food safety regulation resulting from

FMSA as well as emerging issues such as avian influenza. Posted information is updated every 7 to 14 days and a wide array of brochures and factsheets are available.

Tree and Small Fruit Pests and Pollinator Preservation

Management of “traditional” pests of fruits is increasingly compounded by the arrival and expansion of new pest species such as **Spotted Wing Drosophila** (SWD) and **Brown Marmorated Stink Bug** (BMSB). Adapting IPM protocols to effectively manage pests while preserving **honeybees** and other **pollinators** is challenging. Multi-state, multi-departmental, multi-funded teams are working on the diverse aspects of the issue with critical leadership provided by Dr. David Biddinger and others. Projects ongoing include:

1. Biology, ecology and management of BMSB in orchards, small fruits, grapes, vegetables and ornamentals (PA and MD)
2. Developing sustainable pollination strategies for US specialty crops (13 state collaborators)
3. Determining the role of and limiting factors facing native pollinators for the mid-Atlantic tree fruit industry (PA and NY)

These three projects have generated a plethora of publications and outreach workshops for growers across the region. In addition, a table that lists toxicities of materials to bees was created for growers to use, which also provides useful guidelines to follow to protect *all* pollinators. Growers are advised to follow these guidelines, and avoid the materials that are toxic to bees during bloom *or* when blooming weeds that bees visit are present in the field. The table can be found here: <http://extension.psu.edu/plants/tree-fruit/commercial-tree-fruit-production/honeybees>

4. Widespread concern about pollinators is leading to innovative partnering on the subject. In 2015, a new initiative “**Protecting Philadelphia’s Pollinators**” began in Philadelphia County with the goal of creating and implementing a cross-jurisdiction policy to assure pollinator habitat and health. Partners include PA IPM staff and faculty, PSU extension educators, US EPA R3, PA State Beekeepers Association, PDA, PA Department of Environmental Protection, local politicians, community groups and city agencies.

Specialty Crops

Christmas Trees

In 2015, as part of the PA Christmas Tree Scouting Report program, PA IPM Program staff (Pickel and Schildt) continued to scout for pests and beneficials and provided in-depth guidance to 12 Christmas tree farms. These growers continue to use the IPM practices including monitoring scale populations and other pests, beneficials and using reduced-risk chemicals. Several farms began using the chemical spirotetramat (new chemistry, soft on beneficials) in connection with controlling their *Cryptomeria* scale populations, and at least one farm eliminated one spray from their management program (down from 3-4 in a previous season). PA IPM staff also serves as a pest management advisor to numerous other Christmas

tree growers across Pennsylvania and the other Mid-Atlantic states by phone, via the internet or on-farm visits as needed. All temperature information gathered through the growing season by IPM Program personnel, as well as biorational and biocontrol options for Christmas tree pests are shared through the 2015 PA Christmas Tree Scouting Report. This report, along with handouts and fact sheets, has a direct distribution list of 349 farmers, industry professionals and educators, and is available online at the Penn State University Christmas Tree Website (<http://ento.psu.edu/extension/christmas-trees/scouting-reports>).

High Tunnel Vegetable IPM with Emphasis on Biocontrols

In collaboration with NRCS-Conservation Innovation Program, PA IPM staff at PDA assisted 5 Mennonite farmers with implementation of biocontrol-intensive IPM to control thrips, two-spotted spider mite and greenhouse whitefly. In-depth hands-on training of the farmers was accomplished via weekly scouting for insect, disease and mite activity, pest identification and discussion of the dynamics of different control strategies. Biological controls appropriate for each pest (i.e. *Amblyseius cucumeri*, *Phytoseiulus persimilis* and *Encarsia formosa*) were introduced into the high tunnels and a marked decrease in conventional pesticide applications were made possible while improving pest control.

Built Environment: Community IPM, Schools and Housing

In the built environment, pests such as mice, rats, cockroaches, fleas, bed bugs, head lice, mosquitoes, ticks and many others are ubiquitous, chronic and can present human health hazards. Repeated, multiple a.i. indoor pesticide use by individuals and pest management contractors is the norm. PA IPM efforts in this area are based on a community partnership model. For the past 12 years, PA IPM has maintained a presence in Philadelphia County and built programming within the Philadelphia School and Community IPM Partnership. Comprised of 300 individuals, organizations, community groups, businesses and agencies, the partnership provides guidance on programs needed, greatly expands the audience types learning about IPM via personal, professional and institutional trainings and members serve as collaborators in securing additional funding for IPM efforts. PA IPM staff brings IPM expertise to regional partners' efforts including the Delaware Valley Regional Planning Commission, Delaware Valley Association for the Education of Young Children, American Lung Association of the Mid-Atlantic Asthma Prevention Program, and the Healthy Communities Task Force.

Bed bug education, outreach, research and policy initiatives.

Bed bug infestations of low-income, multifamily housing across the region continue to be an intractable problem. Attempts to mitigate bed bug issues requires working with diverse stakeholders, who are often at odds with one another. Lack of city or housing authority policies on roles and responsibilities for prevention and elimination of bed bugs exacerbates these conflicts. Low-bid environments select for under-qualified pest control service providers. Widespread ignorance and stigma associated with bed bugs leads to large amounts of ineffective and potentially dangerous indoor pesticide use by everyone involved. Lack of safe and effective pesticide products, especially those providing residual effects, hampers the inclusion of pesticides into a well-designed IPM approach to bed bug

control efforts. Consequently, PA IPM and PSU research efforts on bed bugs in 2015 focused on the following:

1. Philadelphia Bed Bug Task Force – The need for stakeholder cooperation and local agency oversight to make progress on bed bug management is pressing. At the request of a city councilman whose constituency was experiencing unresolved bed bug issues, PA IPM staff convened a series of monthly meetings of diverse stakeholders with the purpose of collectively crafting and providing policy recommendations to the mayor by the end of 2015. In attendance were concerned citizens, pest control professionals, city agencies, landlords and their lawyers, housing authorities, tenants' rights groups and non-profit community health organizations. Bed Bug Policy Recommendations were completed and sent forward to the new mayor in January 2016. Once adopted and approved by the mayor, the policy will be made publicly available. New York City was a key collaborator.

2. Bed bug prevention and control - education/outreach

PA IPM staff collaborated with multiple partners within the state and region in developing outreach tools for bed bugs in English and Spanish. These include 1-2 hr powerpoint trainings, fact sheets, video and webinars. There is crossover between this topic and IPM programming in both schools and housing. Schools, childcares and housing agencies specifically request bed bug management training in addition to (and often in lieu of) general IPM training for other chronic pests. In 2015, the PA IPM urban team collectively educated/trained 755 community health workers* in 19 events, 449 housing professionals (16 events), 193 school and childcare staff (24 events). *(Community health workers include hospital or public health agency staff providing home visitation to low-income communities, school nurses, asthma educators, and/or social workers employed by community group/non-profit entities.) Key interstate collaborations on bed bug education have been with New Jersey and New York. A media frenzy resulting from the discovery of a bed bug on a Philadelphia public bus resulted in five media interview opportunities, including both WHYY, the public radio news station, and KYW, the major AM news outlet. WURD, an African-American-focused station, carried both a news interview, and a one hour interview with listener call-in.

3. Research on *Beauveria bassiana* for bed bug control

The PSU entomology team continues their work to secure Environmental Protection Agency (EPA) registration for their proprietary formulation of *B. bassiana* (Aprehend™) for bed bug control. Efficacy evaluations have demonstrated excellent levels of mortality in bed bugs after crossing a 2" spray barrier. Long-term residual effects have been demonstrated up to 3 months after a single spray application. Evaluations have also been conducted in collaboration with NC State University, which demonstrate efficacy of Aprehend™ against three strains of bed bugs with documented resistance to deltamethrin. Field testing will commence in uninhabited properties pending regulatory approval and full scale replicated field trials will commence immediately following regulatory approval. PA IPM staff and partners will assist in finding housing sites for field-testing and incorporation of the product into a robust IPM protocol.

IPM for schools and childcares.

PA IPM staff participates in ongoing national, regional and state initiatives and forums promoting IPM awareness and implementation in schools and childcare

centers. In Pennsylvania, although school IPM is mandated by legislation, the lack of any compliance enforcement limits the priority schools afford IPM. School IPM manuals, resources and trainings are available and we take advantages of partnerships and bed bug crises to gain access to schools and childcare facilities. The PA IPM Program staff co-chairs the Health and Wellness Task Force for the PA Green & Healthy Schools Partnership (PAGHSP). The Task Force is currently working to promote and guide IPM and Green Cleaning Protocols in Schools across the Commonwealth. PA IPM staff also participate in the IC3 Committee; the Inter-Agency Childcare Coordination Committee, of city, state, private, NGO, and non-profit stakeholders.

1. Working with asthma partners with k-12 schools. The **PA Department of Health** monitors asthma incidence statistics across the state's 501 school districts. PA DoH can prioritize school facilities where asthma levels are high and encourage them to participate in "environmental assessments" of the facilities with an emphasis on IPM to safely mitigate mice and roaches and review their overall compliance with state IPM requirements. In addition, the **School District of Philadelphia (SDP)** initiated an Asthma Management Program throughout the district that includes an emphasis on IPM. PA IPM participates in monthly meetings with the Environmental Services staff. An emphasis on rodent reduction to reduce asthma triggers has resulted in the installation of over 1700 doorsweeps, and a clutter reduction campaign. In 2015, we completed/participated in 5 environmental assessments of schools and/or childcares, held one webinar on school IPM, produced a short video about installation of door sweeps and provided consultations and direction to our partners in IPM programming. Our staff participate as members of multiple state a local working groups focused on asthma mitigation, green school initiatives, LEED certification and university IPM policy implementation and training. The PA IPM Program conducted a Pesticide Applicator Training program for SDP for 6 Career Technical Education ("VoTech") students.

2. Working within childcare continuing educational frameworks

Childcare practitioners are required by the state to be licensed and participate in continuing education. PA IPM has prioritized embedding IPM training into these pre-existing frameworks to ensure that such training is pervasive and sustained over time. PA IPM staff serves on the Health Services Advisory Committee (HSAC) for four local Early Head Start (EHS) programs: Children's Hospital of Philadelphia (CHOP), Health Federation of Philadelphia (HFP), the Public Health Management Corporation (PHMC), and the Norris Square Community Association (NSCA). Besides several in-person IPM and bed bug presentations to childcare providers in 2015, two embedded education efforts are ongoing, described below.

a) **Better Kid Care (BKC)** at Penn State provides state-of-the art on-demand credentialed training for childcare providers used across the US and beyond. PA IPM worked with BKC to create 5 related units on "eco-healthy childcare" focused improving indoor air quality through IPM and green cleaning. Each unit contains embedded video created specifically for that unit to demonstrate best practices. At the end of 2015, 5,580 people had completed the lessons, for a total of 11,360 hrs of training in multiple states. Evaluation questions,

“How much did you learn in this professional development lesson” and “How much of what you learned will you be able to use with the children or families in your care?” yielded an average of 3.4 each on a scale of 1 (nothing learned) to 4 (learned a great deal).

The lessons are listed below:

#401 Healthy Childcare Environments: Pest Prevention Using IPM – 2,002 completed lessons from 31 states (1763 from PA)

#410 Healthy Childcare Environments: Pest Treatment using IPM – 858 completed lessons from 33 states (674 from PA)

#423 Healthy Childcare Environments: Using Green Cleaners - 2,684 completed lessons from 33 states (2,411 from PA)

Just released in June 2015:

#509 Start your IPM Program: Adopt an IPM Policy (part 1) (for center directors) - 81 completed lessons from 13 states (60 from PA)

#528 Start your IPM Program (part 2) Implementation (for center directors) 55 completed lessons from 11 states (38 from PA)

The on-demand lessons are available on the Better Kid Care website at

extension.psu.edu/youth/betterkidcare/on-demand and the PA IPM’s IPM for Child Care and Early Learning Environments website at extension.psu.edu/pests/ipm/schools-childcare/childcare.

b) **Early Childhood Education Linkage System (ECELS)** is part of the PA Office of Childhood Development and Early Learning statewide infrastructure. In 2015, PA IPM worked closely with ECELS staff to produce an online intensive 3 hr self-learning module with facility assessment components. By end of 2015, 42 early care and education practitioners had completed the module, available at <http://www.ecels-healthychildcarepa.org/professional-development-training/self-learning-modules?start=20>

Staff also participated in health fairs and other outreach events at the request of health and childcare partners. Last year at least 2000 people were reached at 8 events.

IPM in Housing

Opportunities to deliver training to housing agencies and facilities managers has increased over the past five years due to non-profit organization and federal priorities, and propelled further by chronic bed bug problems. Recent emphases on “healthy homes” by the federal Office of Lead Poisoning Prevention and Healthy Housing (OLPPHH), US Department of Housing and Urban Development (HUD) in collaboration with USDA IPM Programs have augmented the historic efforts by the National Center for Healthy Housing (NCHH). PA IPM staff is trained and accredited to deliver all manner of healthy homes, IPM and bed bug management training. In 2015, full-day trainings to housing professionals reached over 1100 people in 8 states, including CT, NY, PA, MD, DE, DC, WV, and VA. One webinar was presented for the National Nursing Centers Consortium, on “Bed Bugs for Clinicians” with 130 people attending and about that many have since watched it. CME (Continuing Medical Education) units were available. A follow-up webinar on “Asthma, Pests and Pesticides” will be aired in February 2016. The “IPM for Multifamily Housing” training was recorded on video and was viewed of the NCHH website an additional 63 times in 2015.

