PESPWire

The Quarterly e-bulletin of EPA's Pesticide Environmental Stewardship Program Winter 2015

Scientists Identify Pheromone for Bed Bug Traps

The arms of Regine Gries, a biologist at Simon Fraser University (SFU), have provided blood meals for more than a thousand bed bugs each week for five years while she and her husband, biology professor Gerhard Gries, searched for a way to control the pesky insects. Working with SFU chemist Robert Britton and a team of students, they may have finally found a solution — a set of chemical attractants, or pheromones, that lure the bed bugs into traps. Their research has been published in the journal *Angewandte Chemie*.

"The biggest challenge in dealing with bed bugs is to detect the infestation at an early stage," said Gerhard. "This trap will help landlords, tenants, and pest-control professionals determine whether premises have a bed bug problem, so that they can treat it quickly. It will also be useful for monitoring the treatment's effectiveness."

Regine Gries feeding the bed bugs. Photo: Greg Ehlers, SFU

They began their research eight years ago when Gerhard began searching for pheromones that could lure and trap bed bugs. Regine worked with him, running all of the lab and field experiments and, just as importantly, enduring 180,000 bed bug bites in order to feed the large bed bug colony required for their research. She became the unintentional "host" because she is immune to the bites, suffering only a slight rash.

They initially found a pheromone blend that attracted bed bugs in lab experiments, but it didn't work in apartments infested with bed bugs. "We realized that a highly unusual component must be missing — one that we couldn't find using our regular gas chromatographic and mass spectrometric tools," Gerhard said.

continued on page 3

In This Issue:

Featured Member: Environmental Health Services, Inc.

In 1985, Gold PESP member, Environmental Health Services, Inc. (EHS) was founded with the commitment to not only provide effective pest management solutions, but to also be stewards of the environment. EHS pioneered IPM concepts such as preventive exclusion and utilization of low impact products which have now become industry standards. EHS believes there is strong value in providing a solution rather than a band aid approach (treating the symptoms) to any pest problem.

A member of EHS's exclusion-only vehicle fleet

EHS is so committed to prevention, that they have vehicles devoted to nothing but exclusion. They do not carry any pesticides, only the materials needed to prevent pests from entering structures.

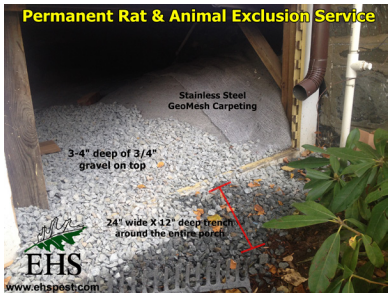
We sat down with George Williams, technical manager and staff entomologist at EHS, to discuss the application of IPM and pest control in sensitive environments.

EHS

www.ehspest.com

What inspired your company to focus on exclusion prevention and low-impact products?

Exclusion and low-impact products have been our core philosophy since our company's inception in 1985. John Stellberger, our company owner, is a visionary in this area and back in 1985 this thinking was at least a decade ahead of its time. Over the last quarter of a century we have improved our structural pest exclusion techniques and have now implemented technology into it (i.e. digital camera-video inspection scopes). Thanks to amazing research and development from product manufacturers, the pest control products available today give us so many 25b and low-impact options.



What makes pest control in restaurants and food services unique, and how do you use IPM to address these challenges?

Pest management in restaurants is much different than in a federally regulated food service (manufacturer, distribution, etc.) facility. Restaurant pest control is about as difficult as anything in the industry. Sanitation, cultural practices, and structural issues are, in some cases, daunting.

The success of a pest program in this environment relies solely on a mutually beneficial partnership with the client. The client must buy-in completely when it comes to cooperation and expertise from the pest management professional. IPM tactics can work in any setting as long as there is a committed partnership.

What pest control practices have you found to be the most useful in sensitive environments?

The most important practice with pests in a sensitive environment is following the root-cause-analysis process. Interview the client to understand the history, concerns, obstacles, past corrective actions, etc. After this you perform a true holistic three dimensional structural inspection to determine why the pest is there.

The next step is detailed monitoring and/or trapping to determine pest thresholds in various areas. Intense structural exclusion is a vital component of pest elimination and this must be done in all conducive areas of the structure. Depending on the pest issue trapping, vacuuming, and low impact prescription treatments will eliminate or keep pests below accepted levels.

Tell us about a success story applying IPM to a challenging pest management situation.

In 2009, we were called in to a particularly challenging situation. A landmark restaurant in Boston's inner harbor was infested with rats, and several PMPs had failed to prevent rats from entering the restaurant. There was pressure on this restaurant from health agencies, and no one had been able to solve the problem.

Areas of the seawall in Boston's harbor have suffered over 200 years of erosion, and there are many underground tunnels not listed on maps – which means there are numerous potential entry points for rats throughout the harbor. The rats were literally running along the sea wall under the facility and they were going everywhere.

Boston Harbor

The prior contractors used copper mesh and expanding foam which didn't work. The rats easily gnawed through it. The only way was to use stainless steel mesh screening and essentially encapsulate the underside of the restaurant right up to the gutter line.

Our service specialists battled cold temperatures and had to be exact about timing to work around the tide changes. A miscalculation would lead to our technicians and equipment getting flooded! We succeeded in completely encapsulating the entire restaurant, creating a 100% impenetrable exterior area to the historic eatery, and completely excluding rats and mice from entering the structure.

EHS's Key Pest Prevention Tips

Fall is one of the best times to focus on pest-proofing a building in anticipation of winter. However, it's not too late to pest-proof during the winter months. Mice need an opening the size of a dime (1/4"), rats the size of a quarter (1/2"), and insects even less space to gain entrance.

It is highly important to seal pests out at all times of the year so having an inspection by a pest management professional is a great investment in pest protection, as they know exactly what to look for. Pests, like all other organisms, need food, water, and shelter to survive. If these are in abundance they will thrive. Any action taken to reduce these three contributing factors will pay big dividends.

Pests are truly endophilic (ecologically associated with humans and their domestic environment). Their survival is totally dependent on humans and we give them everything they need, often on a silver platter!

Bed Bug Traps

Continued from page 1

That's when they teamed up with Britton to study the infinitesimal amounts of chemicals Regine had isolated from shed bed-bug skins. After two years, they finally discovered that histamine, a molecule with unusual properties that eluded identification through traditional methods, signals "safe shelter" to bed bugs. Importantly, once in contact with the histamine, the bed bugs stay put whether or not they have recently fed on a human host.

However, neither histamine alone nor in combination with the previously identified pheromone components effectively attracted and trapped bed bugs in infested apartments. So Regine began analyzing airborne volatile compounds from bed bug feces as an alternate source of the missing components.

Five months and 35 experiments later, she found three new volatiles that had never been reported. These three components, together with two components from their earlier research and the histamine, became the highly effective lure they were seeking.

Work has begun to develop an effective and affordable bait and trap for detecting and monitoring bed bug infestations. They expect it to be commercially available next year.

Read more at:
Bed Bug Aggregation Pheromone Finally Identified

Reprinted with Permission from Entomology Today

EPA's Top 10 Tips to Prevent or Control Bed Bugs

Make sure you really have bed bugs, not fleas, ticks or other insects. You can compare your insect to the pictures on our Identifying bed bugs web page or show it to your local extension agent.

Don't panic! It can be difficult to eliminate bed bugs, but it's not impossible. Don't throw out all of your things because most of them can be treated and saved.

Think through your treatment options, don't immediately reach for the spray can. IPM techniques may reduce the number of bed bugs and limit your contact with pesticides. If pesticides are needed, always follow label directions or hire a professional. There is help available to learn about treatment options.

Reduce the number of hiding places, clean up the clutter. A cluttered home provides more places for bed bugs to hide and makes locating and treating them harder. If bed bugs are in your mattress, using special bed bug covers (encasements) on your mattress and box springs makes it harder for bed bugs to get to you while you sleep. Leave the encasements on for a year.

Regularly wash and heat-dry your bed sheets, blankets, bedspreads and any clothing that touches the floor. This reduces the number of bed bugs. Bed bugs and their eggs can hide in laundry containers/hampers. Remember to clean them when you do the laundry.

Do-it-yourself freezing may not be a reliable method for bed bug control. Home freezers may not be cold enough to kill bed bugs (0oF or -18oC); always use a thermometer to accurately check the temperature. Putting things outside in freezing temperatures could kill bed bugs, but there are many factors that can affect the success of this method.

Kill bed bugs with heat, but be very careful. Special equipment and very high temperatures are necessary for successful heat treatment. Black plastic bags in the sun might work to kill bed bugs in luggage or small items, if the contents become hot enough. Bed bugs die when their body temperatures reaches 45°C (113°F). To kill bed bugs with heat, the room or container must be even hotter to ensure sustained heat reaches the bugs no matter where they are hiding

Don't pass your bed bugs on to others. Bed bugs are good hitchhikers. If you throw out a mattress or furniture that has bed bugs in it, you should slash, or in some way destroy it, so that no one else takes it and gets bed bugs.

Reduce the number of bed bugs to reduce bites. Thorough vacuuming can get rid of some of your bed bugs. Carefully vacuum rugs, floors, upholstered furniture, bed frames, under beds, around bed legs, and all cracks and crevices around the room. Change the bag after each use so the bed bugs can't escape. Place the used bag in a tightly sealed plastic bag and in an outside garbage bin.

Turn to the professionals, if needed. Hiring an experienced, responsible pest control professional can increase your chance of success in getting rid of bed bugs. If you hire an expert, be sure it's a company with a good reputation and request that it use an IPM approach. Contact your state pesticide agency for guidance about hiring professional pest control companies. Also, EPA's Citizen's Guide to Pest Control and Pesticide Safety provides information about IPM approaches, how to choose a pest control company, safe handling of pesticides, and emergency information.

For more information on bed bugs, please visit www2.epa.gov/bedbugs

Innovations in Pest Control: Rodent Biomonitoring Bait

As interest in alternatives to conventional pesticides grows, technologies both new and old are emerging to address the demand. Biomonitoring baits are one such technology; with a history dating back to 1995, but only recently reintroduced to the market. There are two types of biomonitoring baits; a product that incorporates a biofluorescent marker, and a product that incorporates a dark pink dye. Biomonitoring effectively addresses the "monitoring for pest pressures" step in a successful Integrated Pest Management (IPM) program. IPM is a smart, sensible, and sustainable approach to pest control that focuses on the underlying issues that make an area attractive to pests.

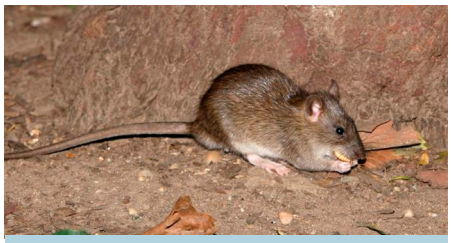


Photo: Tom Myers All-Rite Pest Control

Bio-monitoring baits, also known as monitoring tracking baits (MTBs), are palatable bait blocks readily consumed by rodents with additives to allow for tracking. The biomarker blocks contain more than 16 human food-grade ingredients, making them highly attractive to rodents in both taste and texture. After they are digested, the biomarker additives are excreted in the rodent scat. Under a specially designed LED UV light, even the faintest of feces with the biofluorescent marker glows brilliantly, yet does not highlight surrounding items without the biomarker. In contrast, the pinkish scat from the other bait product is easily detected in the light.

Initially introduced in 1995, the non-toxic MTBs were created for the structural pest management industry, but not enough interest was shown for them to become widespread.

More than 15 years later, these products were reintroduced shortly after LED technology for UV black-lights was developed. The advanced LED technology made black lights more powerful and compact enough to easily fit in a pocket, aiding pest management professionals in rodent monitoring.

MTBs can assist in controlling rodent infestations, especially in sensitive locations where IPM is required or preferred. The monitoring baits are perfect for use in schools, childcare centers, zoos, medical facilities or other sensitive areas where pesticides are not desired or allowed, yet proactive rodent IPM control is necessary. MTBs also offer the advantage of avoiding secondary exposure to rodenticides. In areas where other mammals or birds of prey frequent and rely on consuming rodents for prey, these sensible tracking baits will have no impact on non-target animals.

The monitoring baits help pest management professionals determine the paths rodents travel from their nests to their food sources and back. By tracking the brightly colored or 'glowing' droppings, a pest professional can also determine the species and size of a rodent infestation, as well as their range, entry locations, harborages and approximate nest locations.

Dr. Bobby Corrigan, rodent specialist for the New York City Department of Health and Human Hygiene, has used both types of bait in New York City bait stations, both with and without conventional rodenticides. As the MTBs are extremely palatable, the rodents scent the stations with their scat and urine. This scenting is like posting a neon sign, inviting and directing other rodents to join in the feast. According to Dr. Corrigan," MTB scats provide the road maps for where to install traps and bait stations for maximum on-the-job efficiency".

MTBs can be deployed in outdoor bait stations to determine if rodents are living in or entering a building, and if entering the building, direct pest professionals to the openings that need to be sealed.

When used in indoor stations, the baits can show the paths rodents are traveling, as well as their indoor nest(s). Dr. Corrigan was able to use the MTBs to determine how Norway rats were using under-pavement tunnels as pathways below the sidewalks of Manhattan for entry access into buildings.

According to Dr. Corrigan, one of the best utilities of MTBs is in large buildings, such as apartment complexes. Strategically placed, they can detect on which floors the rodents are harboring, their entry points, and the pathways they're using, even if they're in the ceilings, floor voids or walls. They are a smart addition to any IPM program.

In addition to rodents, the fluorescent biomarker has also been used to detect cockroach movement, their locations of entry, and even their harborages. Are they entering from the basement, sewers, neighboring structures, pipe or wall voids? The cockroach frass (excrement), although much smaller than rodent scat, is still detectable with the UV black lights, and glows just as brilliantly, uncovering all of the cockroach travel and harborage secrets. A scattering of the cockroach frass indicates the holes that need to be sealed and the specific locations that need treatment.

MTBs should always be placed in bait stations and should be inspected and changed at least monthly. Because they are non-toxic, they may be disposed of as any other food products.

For Dr. Corrigan's practical implementation of biomarkers in NYC go to: www.pctonline.com/biomonitoring-rodents-Corrigan.aspx

For more information on controlling rodents and use of rodenticides, go to: www2.epa.gov/rodenticides

YardScaping: An IPM Success Story

One of the big questions whenever a grant is awarded is whether the project will become sustainable after initial funding runs out. Although the hope is that every project will go on to be self-sustaining, that is unfortunately not always the reality. However, many projects do see continued success, and one such shining example is Maine's YardScaping Partnership.

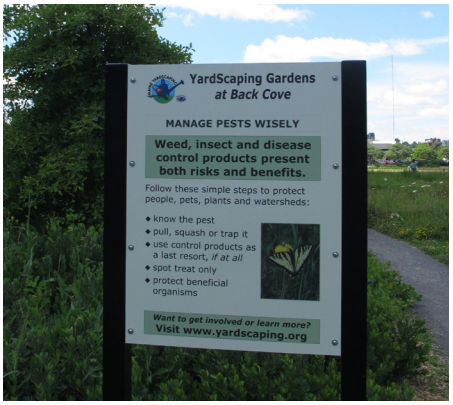
In 2004, the EPA's Office of Pesticide Programs provided $35,000 towards the Maine Board of Pesticides Control (BPC) $160,000 project entitled, *YardScaping: Minimizing Reliance on Pesticides by Example Using Demonstration, Outreach, and IPM Training*. The project, led by BPC's Gary Fish, had the goal of addressing the rapidly increasing use of yard care pesticides, rising more than seven-fold between 1995 and 2007, with run-off confirmed in Maine's Casco Bay seven times between 2001 and 2009.

This confirmation of fertilizer and pesticide run-off raised concern among state agencies and other environmental stewardship organizations. The partnership sought to change the mindset of homeowners from pursuing lawns with a carpet of green grass to pursuing healthy yards grown without the excessive use of pesticides, fertilizers and water.

The project proposed to establish a beautiful, highly visible, low input landscape demonstration site in Maine's largest city, Portland, which would serve as an attention-grabbing "advertisement" of how homeowners can minimize reliance on pesticides and still grow attractive gardens and turf. The YardScaping Gardens were designed to be a showcase for trees, shrubs, and perennials that can make Maine gardens more sustainable and help gardeners and landscapers reduce their reliance on fertilizers, pesticides, and irrigation water.

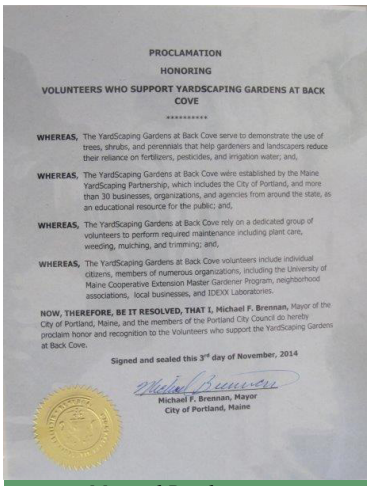
The gardens, as well as the messages displayed on signage throughout, were intended to demonstrate and explain how Integrated Pest Management (IPM) strategies, such as choosing low-maintenance plants adapted to Maine's climate, protecting beneficial insects, accepting some weeds, using spot treatments and minimizing reliance on pesticides can make for desirable landscapes.

The YardScaping Gardens at Back Cove had their grand opening in 2011, after ten years of planning, meetings, grant writing, fundraising, and planting. The two-and-a-half acres donated by the City of Portland along the shore of Back Cove showcase appropriate plantings in urban to rural settings in a beautiful, homeowner-doable way, and serve as a model for municipalities across the state.



This project was a success due to the more than 30 businesses, organizations and agencies from around the state. Most of the work on the gardens has been done by volunteers from those organizations and from many of the neighborhoods that surround the cove. Volunteers continue to donate their time to maintain the gardens, with special focus on removing weeds by hand and mulching.

The gardens have seen such success that they have been recognized several times, with the "Friend of Casco Bay" award from Friends of Casco Bay, the "Gold Leaf Award for Outstanding Landscape Beautification Activities" from the International Society of Arboriculture and most recently from the Mayor of Portland.


PROCLAMATION

HONORING

VOLUNTEERS WHO SUPPORT YARDSCAPING GARDENS AT BACK COVE

****

WHEREAS, The YardScaping Gardens at Back Cove serve to demonstrate the use of trees, shrubs, and perennials that help gardeners and landscapers reduce their reliance on fertilizers, pesticides, and irrigation water; and,

WHEREAS, The YardScaping Gardens at Back Cove were established by the Maine YardScaping Partnership, which includes the City of Portland, and more than 30 businesses, organizations, and agencies from around the state, as an educational resource for the public; and,

WHEREAS, The YardScaping Gardens at Back Cove rely on a dedicated group of volunteers to perform required maintenance including plant care, weeding, mulching, and trimming; and,

WHEREAS, The YardScaping Gardens at Back Cove volunteers include individual citizens, members of numerous organizations, including the University of Maine Cooperative Extension Master Gardener Program, neighborhood associations, local businesses, and IDEXX Laboratories.

NOW, THEREFORE, BE IT RESOLVED, THAT I, Michael F. Brennan, Mayor of the City of Portland, Maine, and the members of the Portland City Council do hereby proclaim honor and recognition to the Volunteers who support the YardScaping Gardens at Back Cove.

Signed and sealed this 3rd day of November, 2014

Michael F. Brennan, Mayor
City of Portland, Maine

Mayoral Proclomation

On November 1, 2014, the Mayor of Portland issued a proclamation honoring the hard-working volunteers who dedicated their time to build and maintain the gardens. The award-winning gardens continue to inspire the residents of Portland towards environmental stewardship through sustainable landscaping.

The success of the YardScaping Partnership is reflected in the overall changes in attitude shown by the landscaping, lawn care and golf course associations in Maine. The Maine Landscape and Nursery Association now offers a Sustainable Landscaping certification and the Maine Golf Course Superintendents Association has been encouraging its member courses to seek Audubon International certification. Phosphorus has been removed from lawn fertilizers and a definite shift has occurred in many lawn care companies, that they now offer a more tailored approach to pest management.

Maine's YardScaping Partnership hopes a smartphone guided tour of the YardScaping Gardens at Back Cove will inspire many gardeners to practice IPM and plant more sustainable landscapes.

For more information, please visit: www.yardscaping.org

YardScaping Tips for a Sustainable Lawn

Mow high. 3 inches or more for vigorous roots and to shade out weeds.

Let the clippings lie. Clippings are high-quality, low-cost fertilizer.

Welcome wildlife. Landscaping for wildlife is healthy gardening at its best. Reduce your lawn, plant in layers (trees, shrubs and groundcovers) and aim for a mix of species. Try plants that offer sheltering thickets or produce nectar and fruit. Add water like a pond or birdbath. Always have something in bloom especially early on to attract insects that will in turn attract birds. Add non-living materials like fallen logs, stonewalls and feeders.

Got weeds? Liberally apply perennial ryegrass seed all season long.

Got bugs? Overseed with insect-resistant fescue grasses or use beneficial nematodes, fungi, or bacteria. Identify whether the bugs are pests, harmless, or in fact beneficial to your garden.

Water wisely. If needed, water once or twice a week with a deep soaking (1–1½ inches).

More tips: www.maine.gov/dacf/php/pesticides/yardscaping/landscape/index.htm

EPA School IPM Webinars Potentially Impacting Millions of Students

The EPA Center of Expertise for School Integrated Pest Management (IPM) is dedicated to facilitating the implementation of IPM in schools throughout the nation. The Center has developed a series of webinars to educate the school community on various aspects of IPM, and has hosted the first five webinars of the ongoing series. Four of the webinars: *School Community Mosquito IPM*, *Tick Safe Schools*, *Keeping Rodents Out of Your School*, and *Bed Bugs in Schools* all addressed pest-specific topics that regularly occur in school environments. *The Basics of School IPM* reviewed the principals of IPM such as monitoring, sanitation, maintenance and exclusion to reduce pest pressures, as well as mechanical, biological, and traditional chemical methods of pest control appropriate for schools.

Attendance has quadrupled since the first webinar, and attendees have come to represent approximately 2 million students per seminar. A variety of resources from the webinars are available on the PestWise website including copies of the slides from the presentation, recorded versions, presenter contact information, and answers to questions asked during the webinars.

The Center partnered with a variety of experts in the field of pest management who have been key to making the webinars so successful.

Special thanks goes out to: Dr. Dini Miller, Virginia Tech University; Dr. Mike Merchant, TX A&M; Dr. Marc Lame, Indiana University; Dr. Thomas Mather, University of Rhode Island; Dr. Kathy Murray, Maine Dept. of Agriculture; Mr. Tim Stock, Oregon State University; Dr. Claudia Riegel, New Orleans Mosquito, Termite and Rodent Control Board; Dr. Bobby Corrigan, New York City Board of Health and Mental Hygiene; Mr. Mark Hardin, Howard Co. (Maryland) Public School System; Mr. Joe Conlon, American Mosquito Association.; Ms. Susan Jennings, EPA, Office of Pesticide Programs; and Ms. Christine Dunathan, Friends School (Greenbelt, MD).

Check our website (www.epa.gov/pestwise/events/sipm-webinars.html) for information on upcoming webinars including: *Dealing with Nuisance Birds around Schools* (2/24/2015); *Bed Bugs in School Environments* (3/19/2015); and *Managing Outdoor School Vertebrate Pests* (3/31/2015).

Video Series on Practical IPM Tips Now Available

The California Department of Pesticide Regulation, with support from EPA Region 9, has produced a series of entertaining, short videos contain practical IPM tips from experts and information needed to comply with the California Healthy Schools Act. For more information see http://apps.cdpr.ca.gov/schoolipm/managing_pests/video_series.cfm

Promoting these videos is one way EPA is helping to make IPM information available to schools.

Staying at the Top of Our IPM Game to Maximize Benefits to Clients

By Kathy Murray, Ph.D., IPM Entomologist, Maine Department of Agriculture, Conservation and Forestry, and Katherine Mumm, Project Coordinator, and Thomas Green, Ph.D., President, IPM Institute of North America

Reprinted with permission from Crops & Soils Magazine

Sit down with any farmer and they will tell you that farming is not a profession for the faint of heart. Modern day agriculture is filled with significant risk. Challenges present themselves in unpredictable weather, labor shortages, ever-changing market demands and prices, and the growing intensity of advancing technology. Add pest and pollination concerns to the mix and it's enough to threaten the sanity and livelihood of even the most experienced grower.

One coping strategy is to separate the concerns a farmer has control over and those he or she does not. While growers cannot change the weather, they can use weather data to influence their management decisions, including Integrated Pest Management (IPM). In this article, we refresh the basics and challenge consultants to consider opportunities to improve our IPM game and maximize our benefits to our customers.

A National Commitment to IPM

In 1996 the US Congress defined IPM as "a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks". Federal and state policies and programs have been established to identify measurable goals and improve IPM adoption to deliver economic, health and environmental benefits.

The National Roadmap for IPM identifies strategic directions for IPM research, implementation, and measurement for pests in all settings throughout the United States. The United States Department of Agriculture (USDA) established the Office of Pest Management Policy in 1997 to promote the development of new pest management methods and lead adoption of IPM.

The USDA National Institute of Food and Agriculture (NIFA) IPM Program provides leadership and funding to support the development of new IPM strategies. The Environmental Quality Incentives Program (EQIP) offered by the USDA Natural Resources Conservation Service provides financial and technical assistance to enhance IPM adoption by agricultural producers in order to address natural resource concerns and deliver environmental benefits. Of course the rubber meets the road on the farm. Programs and policies to support IPM adoption are a great start, but the benefits of IPM are truly evident when IPM practices are fully utilized on the farm.

The IPM Toolbox

IPM can be thought of as a toolbox of 'best management practices' for protecting crops from pressures imposed by insect pests, weeds, diseases and wildlife. IPM tools continue to evolve to meet new challenges posed by introduced invasive pests, pest resistance to pesticides and changing consumer demands. IPM offers flexible selections from a menu of research-based practices, pest thresholds and technologies, allowing growers and consultants to select those that best fit the need. There are four primary 'drawers' in the IPM toolbox:

Systematic monitoring and accurate identification of pests, damage and/or pest conducive conditions.

Although remote sensing tools, region-wide trapping networks, and weather monitoring or prediction systems are very useful for some pests; scouting is often the primary tactic.

Scouting for fnsects using beat cloth
Photo: NCSU Extension

This involves systematically moving through fields, looking for and documenting pest populations. Assessing the pest situation at pre-set intervals, using research-based protocols ensures your results are repeatable, and comparable from one farm to another, and from one date to another.

This field-level pest threat assessment enables the consultant and grower to precisely determine if pest control treatment is needed, when it's needed, where it's needed and establish what effective options are available, practical and affordable. It's a very different approach than walking or driving the edge of a field where it's convenient, and simply looking for any sign of pest activity. It's also more time and cost-intensive.

Do you know where systematic sampling pays off for your clients? Do you effectively sell the benefits of this service for a reasonable fee, and/or as an advantage of using your services vs. your competition?

Pest management decision-making based on real-time pest assessments.

Systematic scouting opens the door to the opportunity to use science-based economic thresholds and reliably determine if the cost a pest control action will be covered by improvements in yield or quality.

For instance, research shows the break-even point for controlling Colorado potato beetle, *Leptintarsa decemlineata*, regarded as the most important insect defoliator of potatoes, is at 200 small larvae per 50 potato plants.

Research-based thresholds can be fine-tuned by each consultant and grower to fit their specific conditions such as crop value, labor, materials and equipment available.

In addition to systematic scouting, site-specific weather data is widely used in combination with forecasting models to provide thresholds for action against crop diseases such as apple scab, Venturia inaequalis, and potato late blight, *Phytopthora infestans*. Insect trapping, either on the farm or through regional networks, similarly provide guidance on if and when to take action against migratory or seasonal pests such as corn earworm, *Helicoverpa zea*.

Do you take advantage of all of the thresholds available to you and your client to minimize costs and maximize returns?

Integrating combinations of pest prevention and management strategies into the farming system.

A cucumber grower might use crop rotation in combination with delayed transplanting, plus polyester row-covers to avoid striped cucumber beetle, *Acalymma vittatum* damage. A berry grower can plant early maturing varieties to escape later-arriving spotted wing drosophila, *Drosophila suzukii.* A lettuce grower might select disease resistant seed and a border crop of flowering plants to attract natural enemies of aphids.

Employing combinations of pest control and prevention strategies improves success and reduces the likelihood that a pest population will become genetically resistant to a control method. Fully incorporating these combinations of pest management strategies into the entire farming operation is what makes IPM effective and sustainable. This is the 'integrated' in Integrated Pest Management, and requires formal advance planning to implement profitably. Is this type of planning on your menu of services to clients?

Regular evaluation and assessment of pest management actions and outcomes.

For maximum benefit, consultants and growers should track and record key crop management data from pre-plant to harvest, and apply what has been learned to improve results and profits going forward. Records should include regular and accurate pest monitoring and damage assessment data, weather data, non-chemical pest control actions, and pesticide use including rates, dates, and conditions for each field. By combing through these records at season end, and comparing them from one year to the next, monitoring methods can be improved, thresholds can be refined, input costs cut and profits increased.

Good record-keeping and assessment are among the most valuable tools in a farming operation. Fortunately, mobile phone apps and other affordable technology make it easier than ever to track and analyze site-specific data.

Maximizing the Benefits

An IPM grower takes action to control pests only when and where observed pest activity warrants, saving time and money and reducing risks of unintended consequences. This 'control pests only if economically justified' approach protects pollinators, conserves the natural enemies that help keep pests in check, reduces the likelihood that pest populations will become genetically resistant to them, and improves economic sustainability. Improved application equipment and product formulations further reduce risks of leaching, run-off and drift, thereby protecting soil, water, air, plants, animals and people from risk of exposure to pesticides, and reducing farmer liability.

Staying at the top of your IPM game requires being aware of the tools that can return these benefits for your clients, and adding these tools and benefits to your marketing materials and sales pitch. Newly introduced invasive pests, resistant weeds and insects, and heightened concerns about pollinators and drift are among the many reasons to reassess your current offerings and beef up your IPM toolbox.

Upcoming Events

Association of American Pesticide Control Officials Annual Meeting
March 9-11, 2015
Alexandria, VA
aapco.org/meetings.html

8th International IPM Symposium
March 24-26, 2015
Salt Lake City, UT
ipmcenters.org/ipmsymposium

Hands-on IPM Workshops
- Pesticide Management and Water Quality, Jan. 21-22, 2015, Puyallup, WA
- Pruning for Plant Health and Plant Problem Diagnosis & IPM, Feb. 11-12, 2015, Seattle, WA

pep.wsu.edu/ipm/ipmworkshops.html

EPA School IPM Webinars
- Dealing with Nuisance Birds Around Schools - Feb. 24, 2015
- Bed Bugs in Schools – Ma. 19, 2015
- Managing Outdoor Vertebrate Pests at Schools - Ma. 31, 2015
- Avoiding Stinging Insects in School Environments - Ap. 21, 2015

epa.gov/pestwise/events/sipm-webinars.html

Agricultural Outlook Forum: Smart Agriculture in the 21st Century
Feb. 19-20, 2015
Arlington, VA
www.usda.gov/oce/forum

16th Wildlife Damage Management Conference
Ma. 1-4, 2015
Gatlinburg, TN
fwf.ag.utk.edu/wdmc2015