INTEGRATED PEST MANAGEMENT

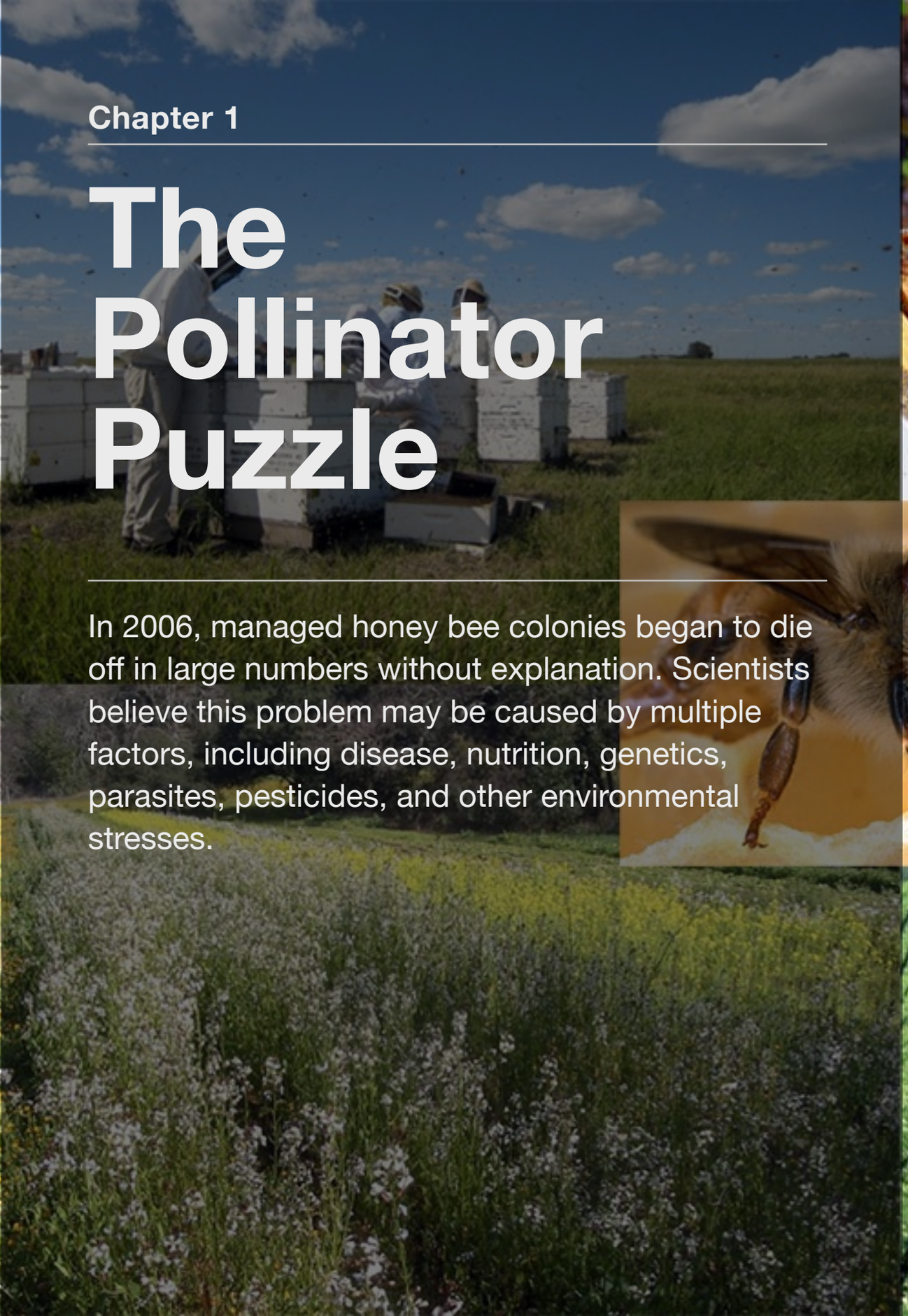
insights

April 2015

Chapter 1

The Pollinator Puzzle

In 2006, managed honey bee colonies began to die off in large numbers without explanation. Scientists believe this problem may be caused by multiple factors, including disease, nutrition, genetics, parasites, pesticides, and other environmental stresses.



Section 1

The Pollinator Puzzle

The Northeastern IPM Center has invested $1.5 million in projects related to improving our understanding of honey bee and pollinator health since 2003. The majority of this funding comes from the USDA National Institute for Food and Agriculture (NIFA). These studies add to the knowledge base that could help us protect honey bees, wild bees, and other insects and their $15 billion worth of pollination services. Pollinators help bring food to our table such as almonds, apples, oranges, sweet cherries, and blueberries. Those top five crops alone carry an annual value of nearly $8 billion in the United States.

Mystery deepens

At the recent Pollinator Health and Safety Conference held in South Portland, Maine, with representatives from the Northeastern IPM Center and its Pollinator Working Group attending, John Skinner of the University of Tennessee warned that scientists are seeing new symptoms distinct from classic colony collapse disorder that could indicate a new pathogen or problem.

Since the 1980s, bee colonies have been extensively damaged by a pest called the varroa mite. Varroa mites and small hive beetles could carry viruses and other pathogens into honey bee hives. Researchers are also concerned about tracheal mite, nosema, and other diseases. Interaction between fungicides and pesticides can make those pathogens more potent.

Skinner described the time he went to a beekeeper's property to inspect his hives and to determine what was happening with bee die-off. They reached the last beehive. "The grower had used three different kinds of chemicals and a roach motel was in there, too. I said, 'You're a good beekeeper, but here's what killed your bees. Off-label use of chemicals.'"

Multiple solutions

Nancy Ostiguy of Pennsylvania State University has been conducting research on bees for 16 years, and in 2003 received $142,255 from the Northeastern IPM Center to study lethal and sub-lethal effects of pesticides used to control varroa mite in honey bee colonies. At the Pollinator Health conference, she pointed out that pesticides have impacts beyond the target organism.

Dennis vanEngelsdorp, an entomologist at the University of Maryland, received a 2015 Partnership Grant from the Northeastern IPM Center. He plans to compare organic and conventional beekeeping practices, as well as study a technique called brood nest size restriction to control varroa mite.

Skinner, Ostiguy, and vanEnglesdorp (and many others) believe multiple factors are causing honey bee decline. The current approach to the problem, therefore, involves multiple avenues of research, hopefully leading to many new tools in the IPM toolbox.

Chapter 2

Pollinator Losses in the Northeastern U.S.

One in every three bites of food is attributable to insect pollination. With insect pollinators so vital to food production, national and global reports of their decline are concerning.

Section 1

Pollinator Losses in the Northeastern U.S.

In the US, commercially managed honey bees are essential in pollinator-dependent agricultural systems. These colonies are often trucked across the continent to pollinate large plantings of fruit and nut crops such as almonds, apples, blueberries, cucurbits, and a variety of seed crops.

There is a difference between colony losses and colony population declines. Beekeepers who suffer losses can quickly replace “dead out” colonies by splitting live colonies and adding a queen to the split. This practice is expensive both in terms of labor and lost productivity. Anticipating higher losses, many commercial beekeepers have increased the number of colonies they take into the fall. The story is different in the Northeast, where the top five honey-producing states saw the number of managed colonies decrease from 94,000 in 2008 to 89,000 in 2013, a 5.3 percent reduction.

The stutus of non-apis pollinators is more difficult to pin down. An analysis of Northeastern U.S. bee specimens collected over a span of 140 years revealed the persistence of native species as a group with only ‘modest’ richness declines. Out of 187 native species examined for relative abundance only three *Bombus* species were identified as having rapid declines. However, large community shifts were noted, as 56 percent of species experienced considerable changes in relative abundance; over time the numbers of exotic bees steadily rose by 27 percent while the numbers of native bees dropped by 29 percent.

The U.S. Geological Survey began funding a systematic count of native bee species in 2010. Their goal is to better understand native bee populations, which have not been studied as extensively as managed honey bees.

Chapter 3

IPM and Pollinators: Coordinated Action

Government sponsors are coordinating the actions of researchers, educators, beekeepers, and growers in the field in ways that could help reverse pollinator decline.

Section 1

IPM and Pollinators: Coordinated Action

For the winter of 2013-14, 23 percent of American managed honey bee colonies died, a figure notably lower than the eight-year average loss of almost 30 percent. Beekeepers used to lose only 10 percent of colonies.

The Northeastern IPM Center recently convened a panel asking how IPM can help stakeholders protect pollinators. Scientists and growers are applying IPM's strategy of evidence-based, systematic thinking to the pollinator puzzle. The session streamed live in the fall of 2014; a recording is available on the web (see "Resources.")

Multiple causes at work

Some conclusions of the panel: Many factors could be causing harm to bees. Monoculture crop efficiency is good for increased yield, but reduces weeds and the diversity of forage plants that could enrich the diets of bees. It will be important to plant more diverse landscapes, reduce dependence on prophylactic seed treatment, and increase the use of IPM. For example, growers can spray in the evening and avoid treatment of fields when plants are in bloom. Consumers may need to get used to cosmetically imperfect produce.

More than neonicotinoids

Pyrethroids and fungicides are part of the picture, not only neonicotinoids. Neonicotinoids may be safer for water, since they are not water soluble, but they do get into plants and into nectar. Some neonicotinoids could be safer for agricultural workers, since they are applied to the ground rather than sprayed in the air where they can drift. Researchers are asking how long neonicotinoids persist in the environment.

IPM supporters need to take a broad role in shaping the solution. One option would be to combine multiple IPM techniques under one label, like a dolphin-safe tuna label for IPM.

Ahead of the curve

The Northeastern IPM Center, through the National Institute of Food and Agriculture's Regional IPM Grants, sponsored pollinator research and outreach as early as 2003, well in advance of widely distributed news reports about bee die-off in 2006. Between 2003 and 2008, the Center sponsored $350,000 in projects on pollinators. Between 2008 and 2014, it distributed $1.2 million for 23 projects.

Cathy Neal and Amy Papineau of the University of New Hampshire Cooperative Extension are coordinating a newly formed multi-state Northern New England Pollinator Habitat Working Group that will identify emerging issues in conservation, maintenance, and enhancement of pollinator habitat across northern New England. The project is funded by the Northeastern IPM Center's Partnership Grant program.

Partners in action

Regional partners are also taking action to increase our knowledge and outreach about pollinators. For example, the Southern IPM Center recently established a pollinator protection working group. The Western IPM Center funded a project in New Mexico that tested more than 100 species of mostly native plants for their ability to attract pollinators and other beneficial insects. The North Central IPM Center is an active supporter of pollinator health initiatives, and is the lead in collaborating with USDA and EPA on the current pollinator health activities. The Center funded one project that found that beekeepers should be wary of feeding bees high fructose corn syrup or sucrose, as these sugar substitutes are not nutritionally equivalent to honey. Honey contains compounds which could help bees metabolize and detoxify proteins that could be suspect in pollinator decline.

According to the Northeastern IPM Center's panel, multiple factors appear to be causing pollinator decline. But one IPM strategy—applying science—is helping us piece together the pollinator puzzle.

Chapter 4

Pollinators in Resources Database

The Northeastern IPM Center's Resources Database lets you search the category "pollinator."

Section 1

Pollinators in Resources Database

Recent entries include weed management practice selection among Midwest U.S. organic growers; sublethal effects that could cause homing failure in forager honey bees, even though sublethal effects remain incidental in current pesticide testing schemes; and information about bee-friendly farming and how you can certify your farm, vineyard, garden, or beekeeping operation.

Earlier entries explore how pesticides could alter the susceptibility of bees to the gut pathogen Nosema ceranae; and how growers could incorporate pollinator conservation into a whole farm plan and then document improvements in pollinator habitat resulting from specific action and management practices.

The enterprising individual will find many opportunities. See the “Resources” section for a link.

Chapter 5

New England Bees Have New Ally

A group of professionals are protecting existing bee habitat on farms, open land, and in natural areas.

Section 1

New England Bees Have New Ally

Extension specialist Cathy Neal and field specialist Amy Papineau are coordinating the Northern New England Pollinator Habitat Working Group, funded by the Northeastern IPM Center.

Neal and her colleagues recently constructed a “bee hotel” at the Woodman Farm on the University of New Hampshire campus in Durham. The hotel, constructed from bricks, cinder blocks, reclaimed wood, sticks, stems, and rocks, will serve as a home for native solitary bees.

Neal said, “I have seen a huge increase in bumblebees and other pollinators, as well as birds, since planting the wildflowers.”

Neal recommends that home gardeners leave some debris of plants like willow and raspberry for the bees, which will allow them to nest in hollow stems at the end of the season.

Chapter 6

Perspectives on the Pollinator Issue

The Northeastern IPM Center provides the following synopsis of two prevailing views on neonicotinoids and pollinators.

Section 1

Perspectives on the Pollinator Issue

Our goal is to bring this scientific discussion to your attention, not necessarily to promote either view.

Activist View: Growing numbers of scientists warn against neonicotinoid use.

Hundreds of reputable studies have been done linking neonicotinoids to bee infirmity and death. See the July 2014 Worldwide Integrated Assessment of Systemic Pesticides on Biodiversity and Ecosystems, a review of 800 peer-reviewed reports, concluding that neonicotinoids pose a threat to global biodiversity.

No one would suggest that neonics are the sole cause of mass bee die-offs. Neonicotinoid pesticides may interact with other insecticides and fungicides, as well as with parasites and viruses, in diminishing bee immune defenses.

Practices recommended by major pesticide manufacturers, like mowing plants in bloom before spraying, along with putting flowering margins around fields to provide pesticide-free bee habitats—cannot mitigate the crisis being caused by chemical agents.

Scientific data is strong enough to outweigh industry-funded studies. The stakes are high for ecosystems and for food production.

Industry View: Growers are concerned about the health of bees, too.

Neonicotinoids provide systemic protection of crops. They are precise and easy to use, and are relatively safe for people, animals, and beneficial insects.

If neonicotinoids were not available, growers would face higher operating costs and more time required associated with frequent application of older chemistries. This would create additional safety concerns for workers, their families and themselves. It would result in decreased yields and reduced product quality. It would mean less effective pest control and a return of pests growers thought were gone or controlled.

Alternative insecticides would kill the beneficial insects growers count on; and some pests would have no effective controls or predators.

A complex array of factors is associated with pollinator health issues, and neonicotinoids are only one of numerous possible contributing factors.

Chapter 7

Resources

Resources from the April 2015 issue of *IPM Insights*

Resources

Integrated Pest Management and Pollinators

What is the appropriate role for IPM on the issue of pollinators? Watch the web broadcast recording at:
http://neipmc.org/go/HsFg

Pollinators: Living Drones *(The Atlantic)*

As Jeff Pettis, a USDA official, said in a 2013 report on the health of honeybees, “We are one poor weather event or high winter bee loss away from a pollination disaster.”
http://neipmc.org/go/ENEY

Ecological Landscape Alliance

Advice on protecting native bees and encouraging bee habitat.

http://neipmc.org/go/FbFP

eXtension Bee Health portal

Research-based information emerging from America's land-grant universities on honey bee health, beekeeping, native bees, and more.

http://neipmc.org/go/jpQf

Pollinators in Resources Database

The Northeastern IPM Center Resources Database lets you search the category "pollinator."

http://neipmc.org/go/TRJF

Chapter 8

Credits

Photo Credits

Cover: Honey bee, *Apis mellifera* / Jack Dykinga, USDA Agricultural Research Service, Bugwood.org

Pollinator Puzzle: Mapping the issue; management practices, pesticides, varroa mites, and forage diversity are factors in bee health. J. Pettis, USDA

Pollinator Losses: A bumblebee on *Liatris pychnostachya*, Prairie blazingstar / C. Neal, UNH Cooperative Extension

IPM and Pollinators: C. Neal, UNH Cooperative Extension

Pollinators in Resources Database: A monarch and a bee on goldenrod / C. Neal, UNH Cooperative Extension

New England Bees: Two bees share a flower of *Ratibida pinnata*, yellow coneflower. C. Neal, UNH Cooperative Extension

Perspectives: Bumblebee in mid-flight near *Cassia hebecarpa*, Wild senna / C. Neal, UNH Cooperative Extension

Resources: A large hummingbird moth on *Monarda fistula*, Bergamot / C. Neal, UNH Cooperative Extension

Northeastern IPM Center

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Article Credit

"Pollinator Losses in the Northeastern U.S." by Andrew Garavito, Lisa Kuder, and Nathalie Steinhauer of the Dennis vanEngelsdorp lab, Department of Entomology, University of Maryland

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