INTEGRATED PEST MANAGEMENT

Insights

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Integrated Pest Management

Northeastern IPM Center

Insights

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Inside

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Center-Funded Project Promotes IPM among New England Beekeepers

Multi-institutional effort addresses varroa mite threat to honey bees

A Northeastern IPM Center-funded project has given New England beekeepers better tools and resources for combating a parasite causing significant bee losses.

Any large-scale threat to honey bees is ultimately a threat to humans because of the critical role bees and other pollinators play in maintaining the food supply. While many factors contribute to declines in honey bee populations, the parasitic varroa mite (*Varroa destructor*) is the greatest pest threat to bees and a management headache for beekeepers.

Funded Project Aims to Improve Varroa Mite IPM

The Northeastern IPM Center awarded a 2018 Partnership Grant to a team led by Kim Skyrm, chief apiary inspector and apiary program coordinator at the Massachusetts Department of Agricultural Resources, and Jennifer Lund, apiarist at the Maine Department of Agriculture, Conservation, and Forestry.

Skyrm and Lund had identified a lack of information, education, and training on how to successfully implement varroa mite IPM, especially for new beekeepers, and sought to develop a program tailored specifically to New England. Their resulting work has laid a solid foundation for improved management.

"We were seeing varroa as the biggest driver of colony losses in our states year after year," said Lund. "It is a tricky pest to manage. For most honey bee pests and diseases, a problem generally stays within a beekeeper's apiary. With varroa mites, as a hive is collapsing, the mites spread to other apiaries, causing a cascade of hive collapses over a large area and often between beekeepers. We saw a regional IPM approach as the best option to control this devastating pest."

Jennifer Lund (left), apiarist, Maine Department of Agriculture, Conservation, and Forestry, and Kim Skyrm (right), apiary program coordinator/apiarist, Massachusetts Department of Agricultural Resources.

> "With varroa mites, as a hive is collapsing, the mites spread to other apiaries, causing a cascade of hive collapses over a large area and often between beekeepers."
> *– Jennifer Lund, apiarist, Maine Department of Agriculture, Conservation, and Forestry*

Better Pest Management through Inspection, Outreach, and Tracking

The project proposal included three specific objectives:

- **Create a collaborative network** of state-level apiary inspectors and beekeepers that will address regional varroa mite concerns by making this pest a priority for outreach efforts among New England beekeepers.
- **Establish a set of protocols and workshops** with demonstrations on varroa mites that provide the most regionally appropriate IPM-focused education, utilizing both traditional and newly developed monitoring and treatment methods.
- **Collaborate with existing online interactive location-based varroa mite monitoring website** MiteCheck (www.mitecheck.com), managed

See "Beekeepers" on Page 2

Call for Submissions and Photos

Do you have IPM-related news or an IPM story to tell? We value the perspectives of growers, implementers, policymakers, and others on the front lines of pest management, and we welcome guest submissions for future newsletter editions.

Whether you'd like to write something new for us or submit something you've already had published elsewhere—given reprint permission from that publication—we want to hear from you!

Do you have high-quality photos of pests, pest damage, pest-management methods, or people demonstrating IPM practices? Your images could help us tell the story—and promote awareness—of current and emerging pest- and pest-management issues.

If we use your photos, they could appear in any of our channels or collateral, including newsletters, brochures, websites, and social media, and you'll be credited as the photographer.

Please visit neipmc.org/go/ncfs for more information.

Katydid on camera lens. Photo by Judy Gallagher, flic.kr/p/ookiiq, CC BY 2.0.

Beekeepers

Continued from Cover Page

by the Bee Informed Partnership (BIP), to allow sharing of real-time data collected by beekeepers implementing the varroa mite IPM program.

Why the focus on New England? The project leaders found that losses reported by Massachusetts and Maine beekeepers during the 2017–2018 season greatly exceeded national averages. They also point out that New England's climate entails unique management challenges, thanks to a short beekeeping season and harsh winters.

"When looking for resources to provide beekeepers about varroa mite management, we found that a lot of the information available to beekeepers is from regions that have completely different climatic conditions from those in the Northeast," said Skyrm. "The extended break in the brood cycle of both the mites and the bees, caused by our long winters, changes how colonies and mites develop during the season in a way that you would not see in areas with milder winters. This difference impacts the management strategies used to control the mites."

> "[Our long winters in the Northeast] impact the management strategies used to control varroa mites."
>
> *– Kim Skyrm, chief apiary inspector and apiary program coordinator, Massachusetts Department of Agricultural Resources*

Helping Beekeepers on Multiple Fronts

Over the course of the project, the team pursued several measures aimed at gathering data from beekeepers and providing them with the tools and resources to better manage varroa mites.

As part of a multifaceted strategy, the project leaders

- **surveyed** beekeepers prior to the start of the project to determine their needs, as well as their knowledge and adoption of varroa mite IPM protocols;
- developed **brochures** about varroa mites and control options;

Cornell Offers Master Beekeeping Certificate

Cornell University is offering a Master Beekeeper Program certificate through eCornell, the university's online-learning subsidiary.

This is an advanced program targeted at beekeepers with at least three years of experience. The program's total duration is 15 months and it comprises four online classes along with three final exams, the latter to take place in person—extenuating circumstances, like COVID-19, permitting—at Cornell's Dyce Lab for Honey Bee Studies.

Topics include honey bee evolution, biology, and behavior, in addition to management of pests and diseases. Faculty authors include noted beekeeping experts from Cornell and the Ontario Finger Lakes Beekeepers Association.

Visit the Pollinator Network @ Cornell website at pollinator.cals.cornell.edu/master-beekeeper-program/ to learn more, watch a brief overview video, or register for the program.

Photo by Clara Morice, flic.kr/p/CvdUDp, CC BY-SA 2.0.

- offered **educational opportunities**—including group presentations, webinars, and workshops—about varroa mites, IPM, and chemical-treatment safety training;
- assembled **varroa mite monitoring kits** and distributed them to beekeepers in each state, with expanded kits provided to workshop attendees;
- encouraged beekeepers to enter **mite-count data** from their apiaries into MiteCheck.

Varroa mite on a honey bee. Photo by Stephen Ausmus, USDA Agricultural Research Service, Bugwood.org.

Accomplishments and Looking Forward

The team has made great strides in addressing the challenges of varroa mite management by developing clear, effective monitoring methods and delivering education to beekeepers. In the process, they have laid the groundwork for future research and extension efforts.

In spring of 2019, Lund and Skyrm presented a webinar on varroa mite management through the Northeastern IPM Center's *IPM Toolbox* series. That webinar proved so popular that the presenters were invited back to deliver an entire four-part webinar series in spring 2020, offering a far more detailed, deeper dive into varroa mite biology, sampling, and management.

The project, through all its deliverables, has generated significant interest from beekeepers not only in New England, but also throughout the Northeast and beyond. This has resulted in measurable increases in awareness of varroa mites and IPM among the beekeeping public. The numbers illustrate the scope of the effort:

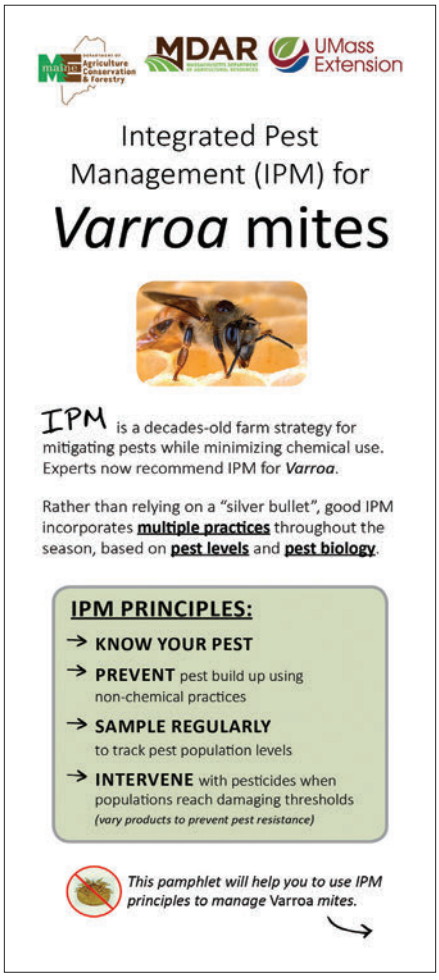
- **5,000 brochures** and **3,240 monitoring kits** were distributed to beekeepers.
- **123 presentations** reached **6,028 beekeepers**.
- The **2019 *IPM Toolbox* webinar** hosted **320 live attendees** while the **2020 webinar series** collectively hosted **806**. As of this writing, the recordings of the **2019 webinar** and **2020 series** have been viewed **776** and **488** times, respectively.
- **47 beekeepers** attended a series of **day-long workshops**.
- **MiteCheck** has received some **400 new entries** from Massachusetts and Maine.

Based on the success and level of interest so far, additional workshops have been planned, and the team believes other areas outside New England would benefit similarly from regionally focused varroa mite IPM projects.

About the Partnership Grants Program

The New England varroa mite IPM project exemplifies the Northeastern IPM Center's commitment to allocating resources and giving a platform to research and extension efforts that use IPM to address critical pest issues in the Northeast.

Read more about the Partnership Grants Program at neipmc.org/go/bfgs.



Right: This brochure introduces the varroa mite, provides steps to doing an alcohol mite wash, and lists IPM options for controlling varroa mites. Available at neipmc.org/go/wCyD.

Our Indispensable Pollinating Bees

By Jackie Swift, writing for Cornell Research (research.cornell.edu)

Bees are big news these days. The internet is full of stories about colony collapse, where hives of domesticated honey bees die off en masse. If the honey bee disappears, the current wisdom goes, crops won't get pollinated. Is this really true? There are 20,000 bee species in the world—4,000 of them in the United States and an estimated 420 in New York. Amongst all the bees out there, who is really doing the pollinating?

"My perspective as a wild bee specialist is that there are so many wild bees, maybe we should be trying to understand their role in agricultural crop pollination," says Bryan N. Danforth, professor in the Cornell University Department of Entomology.

New York State's Bee Diversity

The Danforth lab recently finished a 10-year study on bee diversity in New York State apple orchards. Contrary to the belief that honey bees are essential to pollinating crops, they discovered wild bees vastly outperform honey bees on a per-bee basis. Danforth's collaborator Mia Park—who earned a PhD in entomology from Cornell in 2014—found that wild bees deposit four times more pollen grains per visit than honey bees do.

"Honey bees are terrible pollinators," Danforth says. By videotaping the bees, the researchers discovered that most honey bees visiting a blossom suck up nectar at the base of the anthers, the pods that hold the pollen in a flower's stamen, rather than actively collecting pollen as wild bees do. As a result, honey bees don't pick up much pollen, and they don't come in contact with the stigma, the female part of the flower, to pollinate it.

"We did a lot of outreach to apple growers as a result of this project," Danforth says. "Our message was, 'You probably don't need to rent honey bees unless you have a very large orchard. You can probably rely on the native bees for much of your apple pollination needs. Conserve your natural habitat around the orchard where the wild bees live because it's going to benefit your bottom line.'"

Photo by Dave Burbank.

Social Bees versus Solitary Bees

We may think of honey bees as the quintessential bee, but Danforth is quick to point out that they aren't typical. For one thing, honey bees are floral generalists. "Honey bees will go to almost any host plant for pollen and nectar," Danforth says. "Many other bees are very highly specialized. They visit a single host plant species for their pollen and nectar. If their preferred host plant disappears, these pollen-specialist bees will likely go extinct as well."


Photo by Dave Burbank.

> "Conserve your natural habitat around the orchard where the wild bees live because it's going to benefit your bottom line."
> *– Bryan Danforth, professor, Cornell University Department of Entomology*

Of all the bee species in the world, only about 10 percent are social like the honey bee, living in colonies with many workers and offspring. Most (75 percent) are solitary, where a single female gathers pollen and nectar for her offspring, occupies the nest, and lays her eggs—often as few as a dozen. Another 15 percent of bees are brood parasitic. They lay their eggs in the nest of another bee species, and their larvae then kill the host larvae and consume the provisions meant for them.

"Biologically, bees are fascinating and diverse," Danforth says. "They arose from wasps, which are carnivores. But sometime in the Cretaceous Period, about 125 million years ago, the ancestors of bees switched from a carnivorous diet to an herbivorous one. That was a key innovation. It probably drove the rapid diversification of bees in the mid-Cretaceous."

Bee Phylogenetics

A big part of the Danforth lab's research focuses on the phylogeny of bees—their evolutionary history—using large data sets with thousands of genes to try to understand the evolutionary relationships among bees and between bees and other organisms. In particular, the researchers are interested in how bee phylogeny relates to that of their closest wasp relatives. "We can use phylogenetics to understand lots of things about bee biology, like the evolution of social behavior, host plant use, and parasitism," Danforth says.

"We can go back in time and reconstruct what an early bee might have looked like within any particular lineage of bees."

The researchers construct phylogenetic trees, then use them for further study, such as tracking how host plant associations of certain specialist bees changed over time. "We map onto a phylogeny of bees the host plant each bee species is visiting," Danforth explains. "Then we ask, 'What was the ancestral host plant that the ancestor of those bees was visiting?' We can also reconstruct ancestral states. In a sense, we can go back in time and reconstruct what an early bee might have looked like within any particular lineage of bees."

The Danforth lab recently finished a 10-year study on bee diversity in New York State apple orchards. Photo by Dave Burbank.

> "We can go back in time and reconstruct what an early bee might have looked like within any particular lineage of bees."
>
> *– Bryan Danforth, professor, Cornell University Department of Entomology*

At the Museum of the Earth

Danforth's phylogenic work is getting air time at a new exhibit on bees, which opened in October 2019 at the Museum of the Earth in Ithaca, New York, Cornell University's hometown. The exhibit was funded as part of a research grant by the National Science Foundation (NSF).

"The focus is to highlight unfamiliar aspects of bee biology," Danforth says. "We don't talk about honey bees or the bumble bees in your backyard. Instead, we emphasize the biology of some lesser-known but truly remarkable bees, such as bees that build nests in snail shells, bees that forage by the light of the moon, and highly specialized bees that collect floral oils—all the really interesting stuff most people don't think of when they think of bees."

Documenting New York State Bees, and Other Bee Projects

Danforth is also collaborating with the New York Natural Heritage Program on the Empire State Native Pollinator Survey. Funded by the State of New York, the project will document all 420 species of bees in the state to determine the status of their populations. A main focus of the project is to understand which species are threatened or in decline and identify the likely causes.

Recently Danforth has begun a new project, funded by the United States Department of Agriculture and the NSF, to look into another startling discovery made by Mia Park during the apple orchard project. Park found that fungicides have a bigger impact on the community of orchard pollinators than insecticides do, even though fungicides have low direct toxicity for adult bees. Danforth and his collaborators theorize that fungicides might be impacting the microbial communities in the pollen provisions collected by females for their offspring. "There's an enormous diversity of microbes in these pollen provisions," he says. "We're just starting to appreciate how important they are to larval development."

In all his research, Danforth is driven by his admiration for the under-appreciated solitary bees. "They're fascinating and many of them are beautiful," he says. "And I think we've completely underestimated how much they contribute to our crop production. We haven't quantified the value of these unmanaged bees. Let's stop giving all the credit for crop pollination to the honey bee, and let's try to find out how much pollination is provided—for free—by wild bees."

This article first appeared on the Cornell Research website, at research.cornell.edu/news-features/our-indispensable-pollinating-bees, and is reprinted with permission.

Due to shutdowns imposed in response to the COVID-19 pandemic, an online version of Bryan Danforth's Museum of the Earth exhibit has been made available at www.museumoftheearth.org/bees.

Since this article was first published, Danforth co-authored a book, titled, The Solitary Bees: Biology, Evolution, Conservation*. It contains a chapter on the role of wild bees as crop pollinators, which outlines the evidence that wild bees are economically important pollinators of many of our high-value crops.*

For more information, see press.princeton.edu/books/hardcover/9780691168982/the-solitary-bees.

Asian Giant Hornet Threat, in Context

Invasive hornet's threat to humans may be overhyped, but danger to pollinators is very real

The COVID-19 pandemic was already in full swing earlier this year when news first broke of the Asian giant hornet (AGH) being found in the U.S.

Perhaps it was because of "crisis fatigue" from the ongoing pandemic that the media and public seemed primed to assume the worst about any new perceived threat. Perhaps it had something to do with the colloquial nickname "murder hornet" often hyperbolically used in place of the invader's legitimate name.

Regardless of the cause, substantive news and facts about AGH may have become obscured by the hype that its arrival elicited.

Asian giant hornet specimen. Photo by USGS Bee Inventory and Monitoring Lab, flic.kr/p/2jNtkss.

Danger is Real but Specific

To be clear, AGH is a threat, but not in the way it is often perceived. Given the sheer size of the insect and the length of its stinger, it is able to penetrate protective outerwear that would stop many other stinging insects, and when it does sting, it administers a particularly large dose of venom. It can be deadly to humans, especially in the case of multiple stings.

However, AGH is not inclined to attack unless provoked, and no humans have been stung or killed by the hornet in the U.S. to date. So far, its range in the U.S. has been limited to a small swath of the west coast. Ongoing efforts aim to prevent it from expanding into new territory.

Pollinator Protection and the Trouble with Lookalikes

A more credible threat posed by AGH is to honey bees, making it a potential factor in pollinator decline and thus impacting the food supply. The hornets can wipe out an entire colony by feeding on the young.

In AGH's native Japan, the bees have evolved behaviors for defending against it, but the U.S. honey bee counterpart has no such defenses.

Further complicating matters is the presence of other wasp species that, to the untrained eye, resemble AGH to varying degrees, but do not pose similar threats.

Further Reading

Integrated pest management (IPM) experts have been working to gather and disseminate credible, scientifically accurate information about AGH, what people need to know, and what's being done about it.

For more information:

"Asian Giant Hornets – A Concern for New York?" (blogs.cornell.edu/nysipm/2020/05/05/asian-giant-hornets-a-concern-for-new-york/), a New York State IPM Program blog post first published in May but updated periodically since.

Asian giant hornet pest alert (www.ncipmc.org/projects/pest-alerts1/asian-giant-hornet/), hosted by the North Central IPM Center and co-developed with the Western IPM Center.

Above: Asian giant hornet on ice. Photo by Washington State Department of Agriculture, flic.kr/p/2jTrFdh, CC BY-NC 2.0.

Left: Close-up view of Asian giant hornet specimen. Photo by USGS Bee Inventory and Monitoring Lab, flic.kr/p/2jNvArQ.

Beneficial Pollinators and the Plants That Attract Them

By Megan Pistolese, SLELO PRISM

There is an intimate relationship between plants and insects that evolves over time. SLELO PRISM has developed an illustrated guide that provides an overview of some of the pollinators you may want to attract to your garden.

Not all pollinators are ostentatious in appearance, and although many people appreciate butterflies for their appealing coloration and are familiar with the role of bees, these insects are not the only ones that aid in pollination.

View or download the guide as a PDF at neipmc.org/go/NseD.

We also have a web page dedicated to our Pollinator Pathway Project at www.sleloinvasives.org/learn/pollinator-pathway-project/. Through this more regional initiative, we encourage local gardeners to pledge to choose native over non-native plants or those known to be invasive.

***SLELO PRISM** is the **St. Lawrence - Eastern Lake Ontario Partnership for Regional Invasive Species Management**. It is part of New York State's PRISM network, a collection of eight agencies that address invasive species concerns throughout the state by region.*

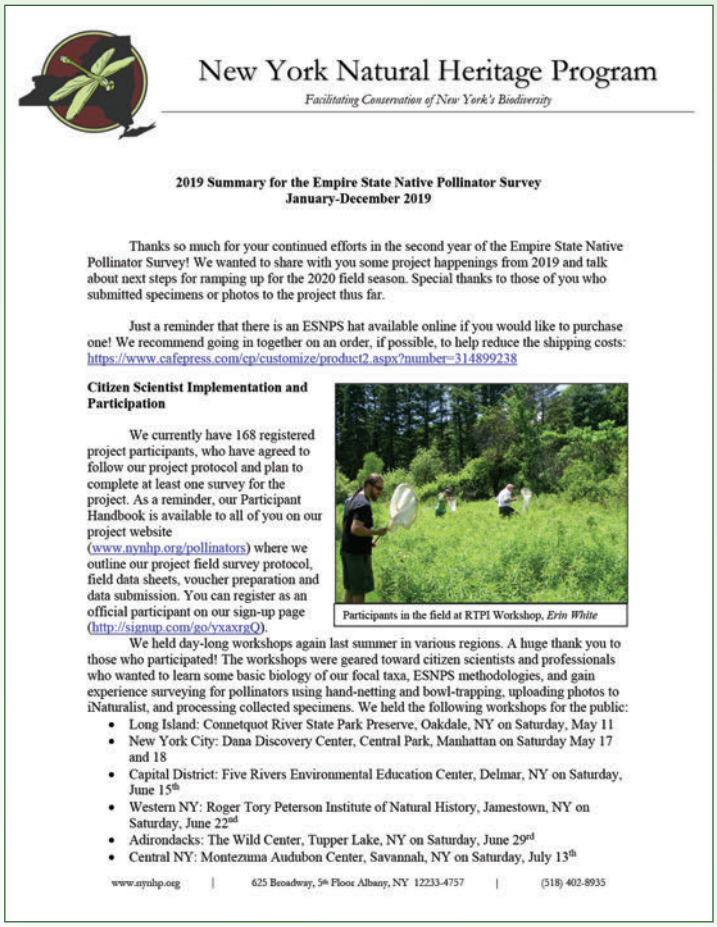
New York Commissions Study Supporting Pollinator Conservation, Management

In 2015, New York's state government assembled a pollinator task force to address declines in native pollinator populations by generating recommendations around management, education, research, and monitoring strategies.

As part of the resulting slate of recommendations, the state's Department of Environmental Conservation was directed to "begin a multi-year evaluation of New York's myriad native pollinator species," the goal being "to show the current state and distribution of native pollinators and serve as the foundation for developing and implementing future conservation practices."

The resulting pollinator survey project incorporated input from an array of scientists and administrators representing government, academia, and the non-profit sector, and collected data from throughout the state, most recently culminating in a 2019 project report with plans for continuing work through 2020.

To learn more about the survey—including the project background, study design, and contributing experts—or to download the 2019 report PDF, visit www.nynhp.org/pollinators.



New York Natural Heritage Program

Facilitating Conservation of New York's Biodiversity

2019 Summary for the Empire State Native Pollinator Survey
January-December 2019

Thanks so much for your continued efforts in the second year of the Empire State Native Pollinator Survey! We wanted to share with you some project happenings from 2019 and talk about next steps for ramping up for the 2020 field season. Special thanks to those of you who submitted specimens or photos to the project thus far.

Just a reminder that there is an ESNPS hat available online if you would like to purchase one! We recommend going in together on an order, if possible, to help reduce the shipping costs: https://www.cafepress.com/cp/customize/product2.aspx?number=314899238

Citizen Scientist Implementation and Participation

We currently have 168 registered project participants, who have agreed to follow our project protocol and plan to complete at least one survey for the project. As a reminder, our Participant Handbook is available to all of you on our project website (www.nynhp.org/pollinators) where we outline our project field survey protocol, field data sheets, voucher preparation and data submission. You can register as an official participant on our sign-up page (http://signup.com/go/yxaxrgQ).

Participants in the field at RTPI Workshop, *Erin White*

We held day-long workshops again last summer in various regions. A huge thank you to those who participated! The workshops were geared toward citizen scientists and professionals who wanted to learn some basic biology of our focal taxa, ESNPS methodologies, and gain experience surveying for pollinators using hand-netting and bowl-trapping, uploading photos to iNaturalist, and processing collected specimens. We held the following workshops for the public:

- Long Island: Connetquot River State Park Preserve, Oakdale, NY on Saturday, May 11
- New York City: Dana Discovery Center, Central Park, Manhattan on Saturday May 17 and 18
- Capital District: Five Rivers Environmental Education Center, Delmar, NY on Saturday, June 15th
- Western NY: Roger Tory Peterson Institute of Natural History, Jamestown, NY on Saturday, June 22nd
- Adirondacks: The Wild Center, Tupper Lake, NY on Saturday, June 29rd
- Central NY: Montezuma Audubon Center, Savannah, NY on Saturday, July 13th

www.nynhp.org | 625 Broadway, 5th Floor Albany, NY 12233-4757 | (518) 402-8935

Spotted Lanternfly, an Invasive Pest Threatening Grapes and Other Crops, Found in Ithaca, NY

A population of spotted lanternfly (SLF) has been found in Ithaca, NY, just off the Cornell University campus.

They were found on their favorite host plant, another invasive species, tree of heaven (*Ailanthus altissima*). However, SLF also feeds on many other trees and plants, which, unfortunately, includes grapevines. With New York State's important Finger Lakes grape-growing region and wine industries so close to Ithaca, state agencies and researchers are particularly concerned about this pest's impact in the region.

While SLF is native to Asia, it was first found in the U.S. in Pennsylvania, where it has caused significant economic damage. The New York State IPM Program and the Northeastern IPM Center, in conjunction with the state's Department of Agriculture and Markets and Department of Environmental Conservation, have been preparing for SLF's potential arrival in New York for the last few years.

Spotted lanternfly adult. Photo by Michael Houtz.

This partnership has yielded educational resources to help the public recognize the insect and prevent its spread, including a frequently updated map tracking confirmed locations and quarantine perimeters across the Mid-Atlantic and greater Northeast region.

Visit neipmc.org/go/DgHf for more information on this latest SLF find, including an assortment of additional resources and illustrated guides.

Credits

IPM Insights: Deborah G. Grantham, Director; Mike Webb, Editor; Kevin Judd, Designer. **Northeastern IPM Center:** Nancy Cusumano, Deborah G. Grantham, Jana Hexter, Kevin Judd, David Lane, Susannah Reese, Mike Webb.

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HIVE a wonderful winter season!
(A pair of beehives in winter. Photo by Steve Oehlenschlager.)

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