Features:

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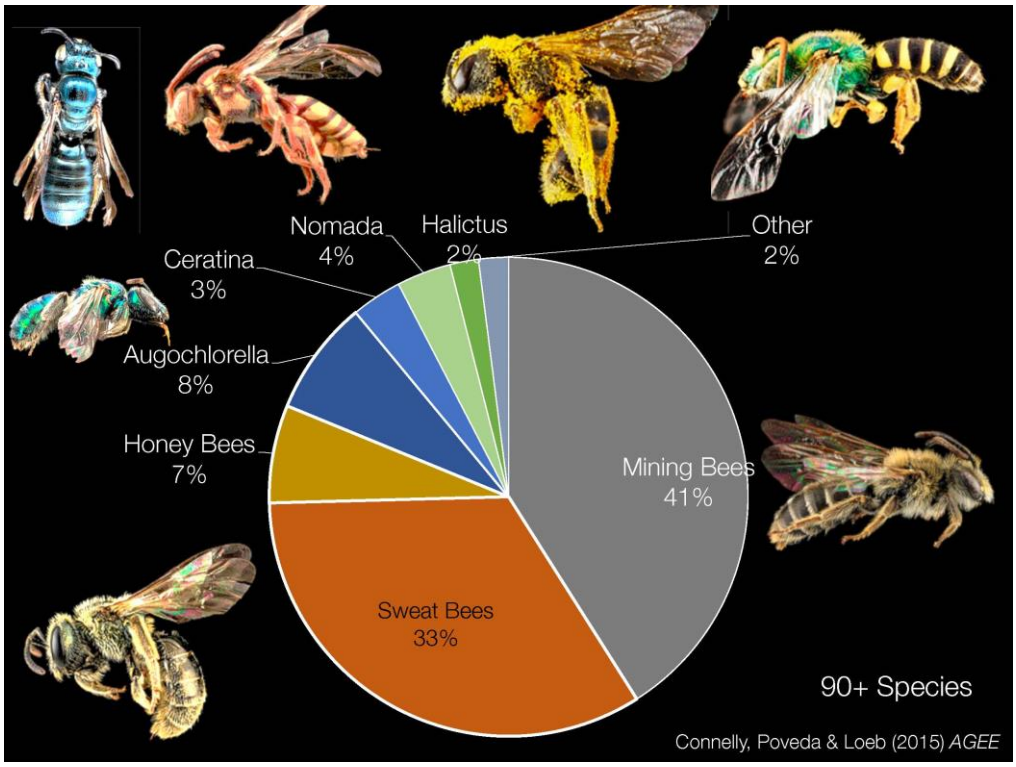
Pollinator Edition

In this special edition of the New York Berry News we will be touching on a universal topic- Pollinators. Research has shown that pollinator populations have greatly diminished. Keeping ourselves informed is the first step in addressing this issue.

What can you do to help encourage the presence of pollinators? What type of pollinators are in our area? What are others in the industry doing to reduce negative impacts on pollinators? What other resources are available? In this issue we plan to answer these questions.



There are a number of pollinating bees, more than you might expect. Shown here are bees present that just influence strawberry pollination!

How Farmers Can Help Pollinators

This article was originally posted on the USDA's Natural Resources Conservation Service website which can be viewed here: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/pollinate/farmers/

Native bees are valuable crop pollinators. The over 3,500 species of native bees (often called pollen bees) help increase crop yields and may serve as important insurance when cultivated European honey bees are hard to come by.

There are simple, inexpensive ways you can increase the number of native bees living on your land. Any work you do on behalf of pollinators will support other beneficial insects and wildlife. Improvements to pollinator habitat may be eligible for financial support from government programs.

Principles of Farming for Crop Pollinators

Know the habitat on your farm. Using an illustration as a guide, look for areas on and around your land that can support native bees. Most native bees are solitary or live in small colonies. Bumble, digger, and sweat bees make up the bulk of pollen bees in most parts of the country.

Protect flowering plants and nest sites. Once you know where bees are living and foraging, do what you can to protect these resources from disturbance and pesticides.

Enhance habitat with flowering plants and additional nest sites. Most bees love sun and prefer to nest in dry places. Nests are created underground, in twigs and debris, and in dead trees or branches. You can add flowers, leave some ground untilled, and provide bee blocks (tunnels drilled into wood) to increase the number of native bees on your farm.

Critical Requirements of Native Bees

Food. Bees eat only pollen and nectar. In the process of gathering these resources, they move pollen from one flower to another, and thus pollinate your crops. Bees rely on an abundance and variety of flowers and need blooming plants throughout the growing season. Native plant species are particularly valuable.

Shelter. Native bees don't build the wax or paper structures we associate with honey bees or wasps, but they do need places to nest, which vary depending on the species.

- Wood-nesting bees are solitary, often making individual nests in beetle tunnels in standing dead trees.
- Ground-nesting bees include solitary species that construct nest tunnels under the ground.
- Cavity-nesting social species—bumble bees—make use of small spaces, such as abandoned rodent burrows, wherever they can find them.

Protection from pesticides. Most insecticides are deadly to bees, and unnecessary herbicide use can remove many of the flowers that they need for food.

Getting Started

Here are two things that you can do to begin improving habitat for native bees on your land:

- Minimize tillage. Many of our best crop pollinators live underground for most of the year, sometimes at the base of the very plants they pollinate. To protect them, turn over soil only where you need to.

- Allow crops to bolt. If possible, allow leafy crops like lettuce to flower if they don't need to be tilled right away. This gives bees additional food sources.

If you want to do more to increase the number of native bees pollinating your crops, you can plant hedgerows or windbreaks with a variety of flowering plants and shrubs, reduce or eliminate your use of pesticides, or work with your neighbors to protect natural areas around your farm.

Exercising Care with Insecticides

If you use insecticides, choose ingredients targeted to specific species (for example, Btk for pests such as leaf rollers) and the least harmful formulations (i.e., granules or solutions). Spray on calm, dry evenings, soon after dark when bees are not active. Keep in mind that even when crops are not in bloom, some of your best pollinators are visiting nearby flowers, where they may be killed by drifting chemicals.

More Information

USDA Forest Service Pollinator Page
National Sustainable Agriculture Information Service
North American Pollinator Protection site
USDA National Agroforestry Center pollinator articles
U.S. Environmental Protection Agency Pollinator Protection site
U.S. Fish and Wildlife Service Pollinators site
U.S. Forest Service Pollinators site
The Xerces Society for Invertebrate Conservation
NRCS Wildlife Habitat Management Institute Native Pollinators brochure (PDF, 4.7 MB)
Using 2014 Farm Bill Programs for Pollinator Conservation (PDF, 870 KB)

Pollinating Berry Crops

For some berry crops it has been shown that removal of all insect pollination leads to a 40% drop in fruit production. In addition the quality of non-insect pollinated fruit is significantly lower. To obtain a large, well-formed berry most of the individual pistils in the flower should be pollinated. Inadequate pollination results in smaller or imperfect fruit since not all seeds and drupelets are formed. To obtain good pollination each flower needs to be visited 5 or more times preferably over 4 or more days.

For optimal pollination, bees must be collecting and distributing the pollen.

When bees visit flowers they are after either nectar or pollen. They will always collect a bit of both, however they tend to focus on either pollen or nectar. Pollen foragers are around 10 X more effective at pollination. In general, for blueberries this is not a problem as the hives are in a growth phase and require large amounts of pollen. For raspberries this can be a problem as hives are usually stronger and focus more on the heavy nectar flow provided. In the later parts of the blooming season, hives may start filling all available space resulting in a significant slowdown in brood production. This will lead to a reduction in pollen foraging first and then nectar foraging. Therefore it is very important that beekeepers are managing the hive and ensuring that it is functioning optimally. This generally means that the beekeeper should be examining the hives every 2-3 weeks.

The effectiveness of bees in pollinating plants

There are several different species of bees that are used commercially for pollination: honeybees, bumblebees, orchard mason bees and leaf cutter bees. All of these bees have their uses for specific crops. In general, bumblebees are the most effective pollinators. They gather more pollen because they are hairier and larger and have developed the ability to buzz or shake in the flower and thereby gather more pollen. Studies have shown that queen bumblebees transfer up to 4 X as much pollen as honeybees; worker bumblebees transfer approximately twice as much pollen. However, more pollen is not always better; what is needed is enough pollen to result in fertilization of all the pistils. Extra pollen will not have an effect. The amount of pollen required for each flower varies depending on the plant species. A flower that has not been adequately pollinated continues to produce nectar so as to continue to attract pollinators it is usually only when full pollination has occurred that nectar flow stops. Bumblebees are large and strong and in some crops they tear holes in the sides of the flowers which allow access to the nectaries without depositing pollen on the pistils. This has been noted in blueberries and causes further decreases in pollination because other pollinators such as honeybees learn to use these holes made by the bumblebees.

Can native insect and bee pollinators be relied on?

Whether native pollinators will be adequate to pollinate a crop will depend on a number of factors:

- The size of the crop
- The kind of crop
- The surrounding forage
- The neighboring crops

Pollinating Berry Crops Con't

Today's farming practices are intensive and provide few places for native pollinators to live. Any crop that is surrounded by heavily farmed land will be deficient in native pollinators especially if the surrounding crops provide more attractive forage. Native bees are considered to be particularly undependable pollinators for some plants, such as blueberries, because of the high number of flowers involved and intensive cultivation. To rely on native pollinators one should ensure that the acreage is small and surrounded by grasslands or low lying shrubs.

The major disadvantage with native pollinators is that their numbers in any year cannot be assured. Many factors such as weather, pesticide spraying and human activity can have a significant effect on the numbers from year to year. It may not be until after the bloom is finished that a grower finds out that pollinators were too low in abundance.

Honeybees are effective pollinators and provide the best value

While other bees may transfer more pollen, honeybees are the best choice of pollinator in all but a few specialty crops. Honeybee colonies have populations that are thousands of times greater than any other bee species. As a result there are far more bees to go out and pollinate. Honeybees were one of the first animals to be domesticated. Because of this they are easier to manage and move than any other bee species since management techniques have developed over thousands of years.

Hives should be effectively placed for maximal pollination

Contrary to the information given in many publications it is not necessary to spread beehives throughout the field as scientific studies have shown that pollination effectiveness does not decrease substantially until beehives are more than 2.5 km from the blueberry plants. Pollination will be most efficient if the hives are located in groups near the center of the field. They should be easily accessible to facilitate management of the hives. Growers should accept that the bees will fly considerable distances while foraging and this will result in nearby fields also being pollinated. As bees will regularly fly 2 km while foraging, inadequate pollination is an indicator of insufficient numbers of pollinators, not poor distribution.

Colonies should be placed in a sunny location, near water and protected from the wind. Wind seriously reduces foraging activity.

Not all beehives are the same.

While in general most farmers arrange for pollination of their blueberry crops, many often put some hives near the blueberries but do not consider the quality of the hives. Not all bees are the same, just as not all fertilizer is the same. Care should be taken to ensure that the bees are doing what they are supposed to be doing.

The beehives should be sufficiently strong. This means 5+ frames of brood and 8+ frames covered with bees at the start of bloom. Do not use substandard hives for pollination as hives with less than 4 frames of brood will be too small to do any significant pollinating and are not worth any fee that you pay. The stronger a hive is the more effective at pollination it will be. A hive of 20 000 bees is more than 3 times more effective than two hives of 10 000 bees. Therefore, paying $15 more for a hive that is twice as strong is a very cost-effective method of improving yield. If you have any doubts about the strength of your hives you should contact your beekeeper.

Almond growers in California have learned the value of pollination and around 1.4 million colonies are used in almond pollination every year (about half the total number of hives in the United States). Last year, a shortage of hives caused by large numbers of hives killed by Varroa mites caused a significant increase in the pollination price. Prices rose from $75 US to $110-125 US and some reports mention that growers scrambling for bees as the season started paid $150 US per hive. The almond pollination industry hires independent or former beekeepers to check the strength of the hives and ensure that the hive meets the requirements.

Advantages of Honeybees

- Honeybees are easily managed in artificial hives
- Honeybees can be easily moved into and out of fields in bloom and quickly adapt to new surroundings
- Honeybees have excellent spatial and memory capabilities and can communicate the location of rich floral sources quickly to other members of the hive allowing bees to quickly mobilize to pollinate flowers that are available for short periods such as large acreages of uniform berry crops.
- Honeybees are more adaptable and are capable of manipulating and pollinating complex flowers that cannot be pollinated by other generalist species.
- Honeybees will forage further than other bees

Disadvantages of Honeybees

- Honeybees are defensive and can sting if provoked
- Honeybees tend not to fly below temperatures of 50 F.
- Honeybees will switch quickly to flowers that are yielding better than the crop being pollinated (especially true for cranberries)

How to tell if you are getting adequate pollination

Blueberry flowers lose their corolla soon after pollination, giving the field a greenish appearance once new flowers stop appearing. Other signs of adequate pollination include the ease of separating the corolla from the plant when flowers are brushed by a hand. The appearance of the fruit is also a good indicator as poorly pollinated fruit tend to be misshapen. Measuring yields at harvest is not always indicative of pollination success since other factors such as diseases, pests, and weather have significant effects on yield.

Pollinating Berry Crops Con't

A method for quantitatively measuring pollination success requires marking a loose cluster with a thread or ribbon at or just before bloom starts. At this stage, flowers above the mark can be counted before they open. The blooms can then be assessed every 7-10 days to determine fruit set and bees can be added as necessary. A week after bloom has ended, fruit set should be assessed (the percent of set fruit relative to the initial number of flowers). Later, by the middle of June (2-3 weeks after bloom), after flowers drop, the percent of remaining berries held on the plant that should mature can be estimated by counting the fruit and determining the proportion of fruit relative to the initial number of flowers. At least 30 representative bloom clusters, throughout a field, should be used in these estimates. Any frost damage, and insect or disease damage should be taken into account in determining whether these estimates reflect pollination or whether they might also include other factors.

Honeybees are the most cost-effective way of increasing yield.

The economic benefits of good honeybee hives can be considerable. In general, growers have seen a correlation between yield and the stocking rate of beehives up to 5 hives per acre. This agrees with scientific data from the Lower Mainland which indicates that for optimal berry size, flowers on the cultivar Bluecrop require 125 pollen grains to be deposited on each flower. This corresponds to approximately 3-4 visits to each flower from bumblebees and 8-9 visits from honeybees.

Scheduling Delivery of Colonies

Try to schedule the delivery of honey bee colonies to coincide with 10-25% bloom. Early contact with the beekeeper is helpful for both parties. Keep in contact and inform the beekeeper when bloom will start.

Checklist of things to watch for in beehives

1. Ensure that you have the correct kind of bees for your crop. Honeybees for large acreages of berry crops, bumblebees for greenhouse crops.
2. Contact your beekeeper early in the season to ensure that there will be enough bees to meet your requirements. Then keep in contact with your beekeeper as the blooming season gets closer.
3. Ensure that the bees are delivered by 10-25% bloom.
4. Ensure that the colonies are strong enough.
5. Ensure that the beekeeper manages the hives effectively. In general this means the hives are checked when they are first placed in the field and then every 2-3 weeks after placement.
6. Colonies should be placed in a sunny location and protected from the wind.

View the original post on http://www.workerbeehoney.ca/honey-and-bee-stuff/56-pollination/77-pollinating-berry-crops with complete references and associated information.

How To: Providing Habitat for Pollinators

Written by Amara Dunn
Biocontrol Specialist, NYS IPM Program

You have probably already heard about all the benefits of providing habitat for pollinators, but if you are thinking about trying this on your farm, the logistics might seem a little daunting. When and how should you plant pollinator habitat? How much maintenance of these habitats is required? And how much will it cost? You can think of pollinator habitat establishment as including three general tasks: *choosing species, managing weeds, and establishing plants*.

Task 1: Choosing species

Your goals are to ensure that (1) something is blooming throughout the entire season (from early spring to late fall), and (2) diverse habitat structure is available (including grasses, plants of varied shapes and sizes, and some debris from previous years' growth). Often native wildflowers are recommended, but you don't need to stick with only native plants. *Just be sure you avoid invasive species*. When selecting species, consult regionally-appropriate plant lists, or search for a plant list by zip code. Don't forget that woody ornamentals can also provide habitat for pollinators. If you want to narrow your search by specific plant characteristics, try a searchable database. You can also let someone else do the species selection for you, and purchase pre-mixed native wildflower seeds that match your geographic region and setting.

Task 2: Managing weeds

While planting native wildflowers gives you the advantage of species that are adapted to your climate (often including at least some tolerance to deer browsing), the nature of weeds is that they are excellent at out-competing other plants. So you need to make a plan for managing weeds around your pollinator plants. In fact, spending a whole growing season working on weed control (whether you use cover crops, repeated tillage, herbicides, or some combination) is highly recommended. This is especially true if you want to direct seed a larger area. After pollinator habitat seeds are planted, strategic mowing (during the first year, to a height of about 8 inches, every time the foliage gets to be 12-18 inches tall) will prevent weeds from flowering, while not harming your perennial wildflowers. You can read more about weed management here. While less mowing is required in the second and subsequent years after planting, pollinator habitat is definitely not zero maintenance!

Task 3: Establishing plants

Direct seeding and transplanting pollinator habitat are your main options. Obviously, there will be major differences in plant costs (seeds versus plugs) and labor costs (direct seeding versus transplanting). These methods also differ in how long it will take for the plants to establish. If you plant seeds, expect growth (and flowers) to be minimal for at least the first two growing seasons. Growth from plugs will be faster.

Providing Habitat Continued

Seeds can be broadcast (by hand or mechanically) or drilled. If you are broadcasting, an excellent seed bed will be critical. A no-till drill can also be used, but you need to make sure that you use one that is appropriate for a mix of different species (and all the accompanying variety in seed shape and size). Many different tools can be useful when establishing habitat for pollinators from seed. Choose the combination that fits your farm. Some local Soil and Water Conservation Districts also have equipment available to rent.

Timing is another important aspect of establishing pollinator habitat, and spring may not be it. In fact, in the Northeast U.S., it's probably not the best time (see p. 7). Some wildflower seeds must experience cold temperatures in order to germinate. In fact, "frost-seeding" (broadcasting seed towards the end of winter, but while the ground is still frozen and covered with snow) may be a perfect option. This is especially true if you've spent the previous growing season managing weeds and you go into the winter with a well-prepared seed bed. If you are transplanting, sufficient moisture will be critical, and there is often more moisture in the fall (at least in the Northeast U.S.).

Clearly, there are a lot of decisions to be made! What's best for your farm? NYS IPM's Betsy Lamb, Brian Eshenaur, and Amara Dunn are helping you answer this question. This year, they are establishing small (5- by 23-foot) plots of pollinator habitat around a new Christmas tree planting at a research farm in Geneva, NY (at Cornell AgriTech at the New York State Agricultural Experiment Station). Each plot will either be direct seeded or planted with plugs of 16 different native wildflowers. Plants or seeds will go in the ground either in June or in the Fall, and six different weed control strategies will be implemented during the 2018 growing season, and beyond. Over the next several years, data will be collected on the time and money required for each habitat establishment strategy. Good habitat for pollinators is also good habitat for beneficial insects that eat pests, so beneficial insects (and pests) will be counted in both the habitat planting and the Christmas trees. Stay tuned for future opportunities to read about the results, visit these demonstration plots, and see what might work best for you!

One method for pollinator habitat establishment: Perennial pollinator habitat plants directly transplanted into untilled soil. Weeds were killed with herbicides.

Weed control is an important part of establishing habitat for pollinators. In this research plot, perennial transplants have been mulched with shrub willow chips to suppress weeds.

Upcoming Events!

Make your yard a "Pollinators' Paradise": June 16, 2018
Cornell Cooperative Extension Oneida County Master Gardener Volunteers invite you to the 22nd Annual Herb & Flower Festival, **Saturday, June 16, 2018** from **9:00 am to 2:30 pm**. The event is held at the Oneida County Farm & Home Center located at 121 Second Street, Oriskany, NY 13424.
https://www.morningagclips.com/make-your-yard-a-pollinators-paradise/

Pollinator week- June 18-24 2018
National Pollinator Week is a time to celebrate pollinators and spread the word about what you can do to protect them. For more information visit http://pollinator.org/pollinator-week

New York Soil Health announces first Soil Health Summit- July 18, 2018
Registration is now open for Soil Health Summit 2018, the first statewide soil health conference in New York. The event will be held **Wednesday, July 18, 2018**, at the Empire State Plaza Convention Center in Albany, NY. Visit https://blogs.cornell.edu/soilhealthinitiative/summit/#.WyPBamfIbaA for more info.

4th Annual IPM Conference-August 7th, 2018
"Break the Cycle: Integrated Management of Ticks and Mosquitoes" Westchester County Center in White Plains, NY. More information to come.
https://nysipm.cornell.edu/resources/nys-ipm-conferences/breaking-cycle-ipm-ticks-and-mosquitoes/

NASGA 2018 Summer Tour- August 14-15, 2018
This year's tour will focus on northern California looking at strawberry production around Watsonville and Monterey. In addition to visiting strawberry farms we will head into central California to see some of the low elevation nurseries and discover other agricultural ventures that make California the number one horticultural production area in North America. https://nasga.org/n-american-strawberry-growers-summer-tour.htm#

NASGA Conference February 3-6, 2019
2019 NASGA Annual Meeting & 9th North American Strawberry Symposium (NASS) in Orlando, Florida, USA. More information coming soon. Visit https://nasga.org/n-american-strawberry-growers-conference.htm to keep up with current details.

National Pollinator Week is a time to celebrate pollinators and spread the word about what you can do to protect them.

Eleven years ago the U.S. Senate's unanimous approval and designation of a week in June as "National Pollinator Week" marked a necessary step toward addressing the urgent issue of declining pollinator populations.

Pollinator Week has now grown into an international celebration of the valuable ecosystem services provided by bees, birds, butterflies, bats and beetles.

The Pollinator Partnership is proud to announce that June 18-24, 2018 has been designated National Pollinator Week.

The Pollinator Partnership website provides a number of resources to help support this event. A Pollinator Week Toolkit is available through http://pollinator.org/assets/generalFiles/Pollinator-Week-2018-Toolkit.pdf.

The website also has a map of Pollinator Week activities according to area, ways to take action, and various resources to learn more about pollinators.

Please visit http://pollinator.org/ and http://pollinator.org/pollinator-week for more details.

Addressing a berry grower's dilemma: Balancing pollination and pest control

Written by Aaron Iverson
Postdoctoral Associate, Department of Entomology, Cornell University

Berry growers are often faced with a critical challenge—how to control their pest issues while not harming the pollinators that are essential for their crops. These pollinators may include managed bees, such as honey bees or bumble bees, but most often New York berry growers rely on a diversity of wild bees, many of which are small, fast, and perhaps never seen.

This summer, a research team from Cornell is addressing this question—studying the tradeoffs between pest control and pollinator health—on 18 participating farms that grow strawberries in the Finger Lakes Region. Although the impact of insecticides on bee health is well known, recent research conducted at Cornell and elsewhere shows that some fungicides can be highly toxic, as well. These findings complicate the ability of growers to control pests through chemical means while not harming pollinators, as fungicides are commonly applied during strawberry bloom, when bees are active.

On each farm, we are assessing pesticide exposure, the amount of pest/pathogen damage, the abundance of both pests and bees, and the impacts of pollination and damage on fruit yield and quality. We will calculate pesticide exposure through grower spray records and through pesticide residues detected on bees and strawberry flowers. For pest/pathogen damage, we are inspecting strawberry plants for the characteristic misshapen fruits (AKA 'cat-faced berries', 'button berries', or 'nubbins') often caused by the tarnished plant bug (*Lygus lineolaris*), which is often the most consistently noxious pest found on strawberry in the region. We are also assessing the abundance of the tarnished plant bug in the field, as well as any damage caused by other pests or pathogens, such as gray mold (*Botrytis cinerea*).

We are studying the bee community through visual surveys of bees visiting strawberry flowers, as well as selected capture with hand nets. Ultimately, we will analyze how fruit yield and quality correspond to the pollinator and pest community, with the goal of understanding how growers can best control their pests while also protecting the valuable service of pollination. In some circumstances, especially where pests are not as extreme, the negative impacts of pesticide use on the pollinator community may outweigh the benefits of decreased pests.

We would like to thank the many growers who are participating in this study, and we look forward to sharing the results in a future newsletter.

This research is being conducted by Aaron Iverson and Heather Grab (both postdoctoral researchers in the Department of Entomology) in collaboration with several faculty in Entomology and other departments. Under their supervisors Dr. Katja Poveda and Dr. Scott McArt, this team is working to address the issues related to overall pollinator health.

10 Pollinator Facts You May Not Know

- The United States is home to 4,000 species of native bees.
- Three-fourths of the world's flowering plants and about 35 percent of the world's food crops depend on animal pollinators to reproduce.
- Some scientists estimate that one out of every three bites of food we eat exists because of animal pollinators like bees, butterflies and moths, birds and bats, and beetles and other insects.
- Habitat loss, disease, parasites, and environmental contaminants have all contributed to the decline of many species of pollinators.
- The most common avian pollinator is a hummingbird.
- Honey bees communicate by dancing.
- Some flowers hold static charges until visited. Bumblebees, sensing static electricity, know which flowers to visit.
- Ninety percent of your vitamin C comes from insect-pollinated plants.
- The southeastern blueberry bee visits about 50,000 blueberry flowers in a lifetime, leading to 6,000 ripe blueberries.
- Pollinators' ecological service is valued at $200 billion each year in America.

There are many pollinator-specific websites and resources available to the public:

USDA's Natural Resources Conservation Service website for insects and pollinators:
https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimals/pollinate

Xerces Society for Invertebrate Conservation: https://xerces.org/

Northeast Pollinator Plant List
https://www.wildflower.org/collections/collection.php?collection=xerces_northeast

List of New York commercial beekeepers http://pollinator.com/Pollination_Beekeepers/ny_pollinators.htm

Selecting Plants for Pollinators: http://www.pollinator.org/PDFs/Laurentian.rx9.pdf

NYS IPM Program Pollinator Page (Updates Coming Soon!)
https://nysipm.cornell.edu/environment/pollinators/

Pollination of Strawberry

Written by Dr. Heather Grab
Department of Entomology, Cornell University

Strawberry is traditionally thought to be a crop that does not require insect pollination in order to set fully formed fruit. However, recent studies in the New York region as well as in Europe, Canada, and elsewhere have consistently found that insect pollination can reduce malformations and improve berry size by 40% or more. The benefits of insect pollination extend well beyond fruit size alone. Insect pollination has been found to improve sugar-acid ratios, extend shelf life, and even reduce the prevalence of grey mold (*Botrytis cinerea*). Some strawberry varieties are more dependent on pollination than others, but a larger survey of varieties is needed before we can say definitively which varieties are the most and least pollinator dependent.

In New York State, strawberries are visited by a diverse community of insects comprised mostly of bees. While flies and beetles and butterflies visit strawberry flowers, their contribution to pollination is thought to be minimal compared to bees. Female bees actively collect large quantities of pollen from strawberry flowers which they use to provision their offspring. In the process, their bodies become covered in pollen grains which they spread from flower to flower in the strawberry field.

To date, we have recorded more than 90 species of bees providing pollination services in NY strawberry fields. Pollination services are provided mainly by wild bees as honey bees make up only around 10% of the flower visitors. The most common species are the Mining Bees and the Sweat Bees. Mining Bee nests are located in the ground and some species including the most common strawberry visitor, *Andrena nasonii*, place their nests right among the strawberry plants in the field. Mining Bees are active for only a few weeks in the spring and are solitary, with only a single female building a nest and caring for her offspring. In contrast, Sweat Bees display a range of social behavior from individual nest building to large colonies with a queen and many workers. Sweat Bees come in an array of sizes and metallic colors and are active for the entire season, providing pollination to many other crops after strawberry has finished blooming.

With so many visitors, you might be wondering who is best? Surprisingly, the answer is that the all bee species are about equal. But different species display a range of behaviors so that the best pollination is achieved when many species are working together. For example, large species like Bumble Bees and large Mining Bees approach the flowers from the top providing good pollination to the part of the flower that will develop into the tip of the strawberry fruit. Smaller species, like the Sweat Bees and Small Carpenter Bees approach the flowers from the side and work around the flower pollinating the area that will develop into the base of the fruit. Supporting a diversity of bees can help to ensure a well-pollinated crop.

To learn more about crop pollination in New York check out https://www.landscape-agroecology.com



All photos provided by Dr. Heather Grab.

Researchers create microparticles that could help save honeybees

Honeybee colonies could be saved from collapse in the future thanks to a microscopic particle that attracts pesticides, as created by Washington State University researchers.

Consider this: A grain of salt weighs 58,500 nanograms. It takes only 15 nanograms of pesticide to kill a bee.

Researchers at Washington State University have developed a new material that attracts pesticide residue in bees. Over time, pollen tinged with itsy bitsy amounts of pesticides accumulates in a bee's body, reducing the lifespan of each bee in a colony.

Toxic residue magnet

"The material acts as a magnetic microsponge that absorbs ingested toxic residues," said Waled Suliman, a postdoctoral research associate in WSU's Department of Biological Systems Engineering.

The product, a powder, can be incorporated into a sugar solution that's fed to bee colonies. Each microparticle is the size and shape of a grain of pollen, making them easily digestible for bees. And they're specially designed and formulated to be safe for beekeepers to handle.

Undergraduate innovation nets $20,000

Recently, a group named BeeToxx – comprised of undergraduate students mentored by Suliman, WSU's Derick Jiwan, and others – won second place in the Alaska Airlines Environmental Innovation Challenge, taking home a $10,000 prize and beating out 22 other teams. The students had the opportunity to work on a real world problem that goes beyond what they learn in classes, Suliman said.

This winter, the team involved was one of four to win the Honey Bee Health Coalition's Bee Nutrition Challenge and also received a $10,000 prize. Their proposal was chosen from among 20 submitted, with only four prize-winners.

"We're really proud to get noticed for the work we've done so far," Suliman said. "And this will help us keep testing and refining the product."

Just passin' through

When consumed by the bees, the particles attract and absorb pesticide toxins. Then, they pass through the bees like any other food. Each particle only spends a few hours in their digestive system, which is enough to significantly reduce pesticide residues.

In fact, each particle of Suliman's technology can remove about 300 nanograms of pesticide residue – much more than bees can survive.

Last summer, to test this new product, Suliman and assistant professor of entomology and manager of the WSU bee program Brandon Hopkins fed around 6,000 bees the microparticles in a sugar solution. Then they tested feces from those bees and found it contained the microparticles. In addition, the bees colonies remained healthy, showing that the microparticles don't harm bees.

Measuring toxin attraction

This summer, they will test just how well the particles attract toxins in the bees' bodies by collecting the microparticles after they've been through the bees and measuring them.

"We're really lucky that bees have fairly simple digestive systems," Suliman said. "Our material is specifically designed to work only on pesticide residues and only at a certain pH level and temperature. So the micro-particles won't absorb amino acids or anything else a honey bee eats."

Since they're still collecting data, the material isn't yet available to beekeepers. But Suliman is hoping to have the product on the market in the next two years.

"We have proof of concept," he said. "Ultimately, our goal is to lessen the economic impact of bee decline not only for beekeepers but also for farmers and food prices."

– By Scott Weybright, Washington State University. Originally appeared in American Fruit Grower, April 2018

New York State economy boosted by berry industry

Berries are an important part of the New York State agricultural economy, and the state economy as a whole.

Currently, berries – primarily strawberries, raspberries, blueberries, and blackberries – are grown in all but a few counties of New York State. More than 400 farms sell berries, whether wholesale to grocery stores and chefs or retail directly to customers through farmers' markets, farm stores, and pick-your-own (U-pick) operations. About 23 percent of the state's land area is used by farms to grow a range of fruits and vegetables, and the state is a leading agricultural producer in many categories.

In 2016 and 2017, berries accounted for $6.5 million in sales, with strawberries leading the way with nearly $6 million in total sales. Blueberries followed at about $300,000, with raspberries and blackberries accounting for about almost $120,000.

The berry-growing season in New York State is short. The season starts with strawberries, with the first fruits available in late May or early June and lasting until mid-July. Summer raspberries follow in July, with blackberries overlapping starting in the second week of the month and lasting through early August. Blueberries have one of the longest growing seasons of all New York State fruits, with the earliest berries appearing in mid-July and, at some farms, growing all the way until early October. Fall raspberries generally start to appear in early August, and are available through October.

Founded in 1988, the New York State Berry Growers Association (NYSBGA) is a nonprofit educational association for berry growers, from large wholesale family farms to independent farm stands and small pick-your-own operations, across New York State. The NYSBGA promotes the growing and marketing of berries through the exchange of valuable information, including scientific research and farming techniques. We also represent growers in issues of labor, research, and technology, both academically and legislatively, and award research grants to study and address issues important to New York State berry growers.

Original article posted on the Fruit Growers website, May 30, 2018:
https://fruitgrowersnews.com/news/new-york-state-economy-boosted-by-berry-industry/

Bumblebee Queens Under Pressure

Spring is a busy time for bumblebee queens.

After emerging from hibernation, their to-do list includes making nests, laying eggs, and keeping their larvae warm and fed. It's physiologically demanding, and the stakes are high: the success of the colony depends on a queen's solitary work during this time.

In a study published today in *Proceedings of the Royal Society B*, researchers at the University of California, Riverside found that environmental threats are piling onto the stress faced by nest-building bumblebee queens.

Led by Hollis Woodard, an assistant professor of entomology, the team found that exposure to a widely used insecticide and a poor diet negatively impacted bumblebee queens' health and work, which could have dramatic consequences on an already dwindling pollinator group.

Bumblebees are workhorses of the insect pollinator world, playing a key role in both natural and agricultural ecosystems. Crops as diverse as tomato, blueberry, and red clover all depend heavily on their pollination services. Bumblebees, which are both fast and fuzzy, are highly efficient at transporting pollen from one flower to another.

Unlike honeybees, which are perennial, bumblebee colonies arise each year from the work of a single queen to establish a nest of up to 400 workers.

"Queens are probably already a bottleneck for bumblebee population dynamics," said Woodard, whose group studies how bees are adapting to climate and environmental changes. "If a queen dies because of exposure to manmade stressors, then a nest full of hundreds of important pollinators simply won't exist."

Previous studies have implicated insecticides, including the widely used neonicotinoids, with a decline in pollinators. While neonicotinoids are usually applied to seeds, they contaminate soil–where bumblebee queens hibernate–and make their way into plant tissues, including pollen and nectar.

Another stressor bumblebees face is declining floral diversity, driven by agricultural land use and other global changes.

"Bumblebees are floral generalists that collect pollen from a wide variety of plant species, and there is evidence from previous studies that a mixed diet supports bumblebee colony development better than a diet comprising pollen from a single flower," Woodard said.

Queens Continued

Woodard's team tested the effects of temporary or sustained exposure to the neonicotinoid imidacloprid and a single-source pollen diet on queens' mortality, activity, and ability to establish healthy nests.

They showed bumblebee queens were far less active and six times more likely to die during sustained exposure (37 days) to the pesticide, which could be somewhat mitigated by a shorter exposure of 17 days. The surviving exposed bees also produced only a third of the eggs and a fourth of the larvae of untreated queens.

While the effects of a single-source pollen diet were overshadowed by the effects of pesticide exposure, a monofloral pollen diet alone was sufficient to negatively affect bumblebee brood production.

"Ours is the first study to explore the impact of multiple stressors on bumblebee queens during an understudied but important phase of their lives. It joins a small but growing body of research suggesting there are unique effects on queens that can have dramatic consequences for future generations," Woodard said.

Woodard said the data support the idea that use of neonicotinoid insecticides in the U.S. should be reconsidered. The member states of the European Union recently agreed to ban neonicotinoids from all fields by the end of 2018 due to the serious danger they pose to bees.

"Our research suggests there are hidden costs to insecticide use that may only be observed if you consider the totality of an organism's life history. This is intricately linked to human well-being because bee heath is extremely important for food production, biodiversity, and the environment," she said.

This article was originally published in Morning Ag Clips by the University of California – Riverside via EurekAlert!
https://www.morningagclips.com/bumblebee-queens-under-pressure/

Pollinator Syndrome Table

Plants and pollinators have co-evolved physical characteristics that make them more likely to interact successfully. The plants benefit from attracting a particular type of pollinator to its flower, ensuring that its pollen will be carried to another flower of the same species and hopefully resulting in successful reproduction.

Animals, wind, and water can all be vectors for pollen. The flower type, shape, color, odor, nectar, and structure vary by the type of pollinator that visits them. Such characteristics are considered pollination syndromes and can be used to predict the type of pollinator that will aid the flower in successful reproduction.

Use the pollinator syndrome table to help you identify the potential pollinators you may associate with different flower types. Visit https://www.fs.fed.us/wildflowers/pollinators/What_is_Pollination/syndromes.shtml for more information.

Trait	Bats	Bees	Beetles	Birds
Color	Dull white, green or purple	Bright white, yellow, blue, or UV	Dull white or green	Scarlet, orange, red, or white
Nectar Guides	Absent	Present	Absent	Absent
Odor	Strong musty; emitted at night	Fresh, mild, pleasant	None to strongly fruity or fetid	None
Nectar	Abundant; somewhat hidden	Usually present	Sometime present; not hidden	Ample; deeply hidden
Pollen	Ample	Limited; often sticky and scented	Ample	Modest
Flower Shape	Regular; bowl shaped-closed during day	Shallow; have landing platform; tubular	Large bowl-like, Magnolia	Large funnel like; cups, strong perch support

Trait	Butterflies	Flies	Moths	Wind
Color	Bright, including red and purple	Pale and dull to dark brown or purple; flecked with translucent patches	Pale and dull red, purple, pink or white	Dull green, brown, or colorless; petals absent or reduced
Nectar Guides	Present	Absent	Absent	Absent
Odor	Faint but fresh	Putrid	Strong sweet; emitted at night	None
Nectar	Ample; deeply hidden	Usually absent	Ample; deeply hidden	None
Pollen	Limited	Modest in amount	Limited	Abundant; small, smooth, and not sticky
Flower Shape	Narrow tube with spur; wide landing pad	Shallow; funnel like or complex and trap-like	Regular; tubular without a lip	Regular; small and stigmas exerted

Impacts of Cultivation on Pollination of *Vaccinium*

It is known that fruit size and abundance is related to proper pollination. In order to encourage this process, the movement of pollen throughout a planting is required. There are various cultural practices that may be used to positively influence pollination within a normal farm operation.

1) Plant mixed cultivars within a planting

Planting large blocks of the same cultivar to ensure uniformity in treatment and harvesting can lead to smaller fruit in highbush blueberries. By thoroughly mixing cultivars throughout a field you are increasing the likelihood of high yield and large berry size. This is because certain cultivars produce larger berries when fertilized with pollen of a different genotype. While alternating cultivars within a row is not always practical, arranging the cultivars in a way that is functional for farm operations could theoretically give better results. The choice of cultivar can also influence the likelihood of pollination. Many pollinators favor varieties with short, wide corollas as well as varieties that are adequate pollen producers.

2) Being conscious of spraying events

An evident cultural practice that can effect bee foraging is the use of pesticides in and around the planting. Not using insecticides during bloom, using the least-toxic materials, and applying sprays at the appropriate times can help decrease negative effects on pollinators. Pesticides stay active for longer periods of time when the weather is cool, so caution is warranted when applications occur prior to bloom. Some herbicides and fungicides are toxic to bees as well, and some repel bees from plantings where chemicals are sprayed. Certain fungicides affect pollen germination and pollen tube growth as well.

3) Manage the surrounding habitat

Managing the areas surrounding the *Vaccinium* fields to support wild bee populations can be an effective way to increase pollination. Nesting sites, a consistent food source, and clean water are requirements for bees. Using care when applying pesticides, especially after heavy rains, will ensure a clean supply of water. Maintaining a nearby fallow field or bee forage preserve will help supply food during the growing season.

Modifications of cultural practices can be a low cost way to improve pollination effectiveness in *Vaccinium*. The choice of cultivars and their distribution in the planting, pesticide applications, groundcover, nutrient and water management, and the management of surrounding habitat are all ways that a grower can improve pollinator effectiveness.

This is a summarized version of the full article, Impacts of Cultivation Practices on Pollination of *Vaccinium* written by Marvin Pritts, which can be viewed here: https://www.actahort.org/books/446/446_12.htm

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New York Berry News (**NYBN**) is a seasonal commercial berry production newsletter provided by Cornell berry team members. It is designed to help promote and strengthen commercial berry crop production in New York State. NYBN is available free of charge in pdf format at: https://blogs.cornell.edu/berries/new-york-berry-news/

Visit the NYBN web site to view back issues or to subscribe to monthly e-mail notices with table of contents and a link to the most current issue.

More on individual team members and their areas of expertise may be found at: https://nysipm.cornell.edu/agriculture/fruits/cce-programs.

Visit https://blogs.cornell.edu/berries/ for more berry related resources

UPCOMING EVENTS posted on page 10

Questions or comments about the New York Berry News?

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