

GROWERTALKS

Cover Story

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Should We Nix Neonic?

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On June 15, 2013, thousands of dead bumblebees blanketed the ground of a Target parking lot in Wilsonville, Oregon. Bumblebees and other insects, including honey bees, started falling out of the blooming European linden trees surrounding the lot. The cause? Employees from a local landscaping company sprayed the trees with a pesticide containing the active ingredient dinotefuran (a neonicotinoid), with the goal of ridding the area of aphids. What they did was cause the death of more than 50,000 bumblebees and cause a national outcry. The Oregon Department of Agriculture found that the applicators were negligent when applying a pesticide while the trees were “clearly in bloom” and each was fined \$550. As a direct result of the incident, the state of Oregon put restrictions on neonicotinoid pesticides, specifically dinotefuran and imidacloprid,

for application on linden trees.

Bringing it closer to home, environmental group Friends of the Earth published its own findings of neonics, specifically pinpointing garden plants as a source for pesticides that are, in their view, one of the key causes of bee decline. The “pilot study,” as they called it, consisted of them purchasing a variety of garden plants at box stores in three locations (San Francisco Bay, Washington, D.C. area and Minneapolis area). The study doesn’t say how many plants they purchased, but it does say that from 26 of those plants, the researchers created 13 composite samples comprised of stems, leaves and flowers. The report states that they found neonicotinoids in seven of 13 samples. However, they admit that they didn’t test for or find neonics in pollen or nectar, which is what the bees eat and how they would be exposed to it. Regardless, national media picked up on the story, focusing on the fact that gardeners should be aware—or even avoid buying plants altogether.

And this issue is not just in North America. This past December, the European Union instituted a two-year ban on three of the most used neonicotinoids. The environmental activist group Greenpeace has started a consumer petition in the Netherlands to ban neonics for good.

The agricultural community has been dealing with the issue of pesticides for years—whether or not to use

them; debating their safety for humans, animals and insects; and dealing with pressure from environmental groups, chemical companies and legislators.

It's a heated issue, to be sure. Some want to ban all pesticides outright; others feel this is way too reactive. So, is there a way to meet in the middle, with science instead of sentiment leading the way, and still protect the pollinators?

A bee background

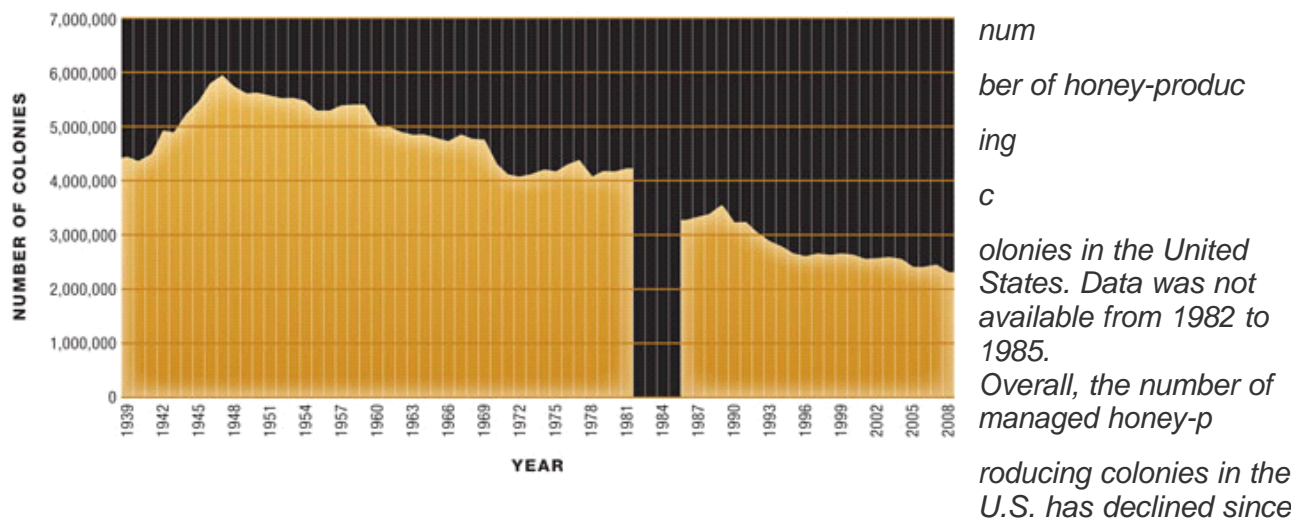
Kim Flottum has been a beekeeper for more than 36 years and editor of Bee Culture magazine for 28 years. After earning a horticulture degree from the University of Wisconsin-Madison, Kim worked in various nurseries and greenhouses. He also worked for USDA, conducting pollinator and soybean research. That's when he started beekeeping; he's been actively involved with it ever since. Kim has seen the population rise and fall over the years, and he has witnessed how much the beekeeping industry has changed.

It's hard to compare today's numbers with those when colonies were at their highest during World War II, simply because there was a greater need for honey and beeswax then, said Kim.

"Honey bees, honey and beeswax were in incredible demand because we didn't have access to sugar, the military was using beeswax for water proofing, and everybody had a Victory garden and for Victory gardens you needed bees, so everybody had a beehive," explained Kim. "Then the war was over and nobody needed them anymore, so the number dropped."

During the early 1970s, the environmental movement was invigorated by hippie communes where people lived off the land. The beekeeping industry exploded. But at the time, there were only three manufacturers of beekeeping equipment. When supply couldn't meet demand, the number of colonies dropped. (See Table 1.)

Table 1. The



the late 1940s when the total number of colonies peaked at almost 6 million. Source: National Agricultural Statistics Service (2009)

Today, there are about 1,200 professional beekeepers in the U.S., but the number of part-time and hobbyist keepers has increased two-fold within the last 10 years, said Kim. This time, it was the local food movement that sparked the increase in beekeepers because local food also includes local honey. About the same time (2006), a phenomenon called Colony Collapse Disorder (CCD) became the reason why we were seeing less and less honey bees. And it's called a "phenomenon" because there's still no true explanation for why honey bees aren't returning back to their hives.

To be clear, CCD is a subset of overall bee decline. It is one of the reasons that honey bee populations have been decreasing during the last 20 years, but it is not the primary reason. Most studies have found that there are a number of factors that have contributed to the decline in bee populations. (Writer's note: For more background, you can Google the studies conducted by the United Kingdom's Department for Environment, Food and Rural Affairs; the Australian Pesticides and Veterinary Medicines Authority; the University of Guelph in Canada; and the Xerces Society.)

One of the major factors contributing to bee decline is loss of habitat. What were once fields of food crops and wildflowers are now concrete and pavement in many parts of the country. And the farmland we do have is filled with a smaller diversity of crops.

"What used to be good bee forage is now corn and soybeans and you just can't keep bees with just corn and soybeans," said Kim. "Since the '80s, agriculture has changed. The monoculture farms have gotten bigger, and they were able to get bigger primarily because of farming practices and better tools."

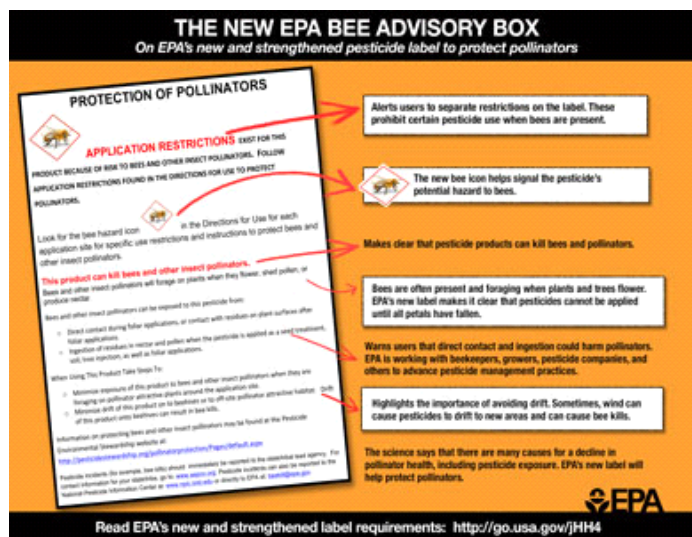
Another reason for the recent bee decline is when the Varroa mite (*Varroa destructor*) showed up in the late '80s/early '90s. Kim calls it a "blood-sucking demon."

"It is the worst thing that has happened to honey bees ever in the history of the world," said Kim emphatically. "The damage that it does to a bee individually is bad, but what's worse is that as it feeds on a bee, it's also passing along viruses. So you've got direct damage and you've got peripheral damage done by the viruses. And what the viruses do primarily is, rather than kill them outright, it simply shortens their life. So if you shorten the life of every bee in a colony by 10% over the course of a summer, you've got fewer and fewer bees. And you've got bees that are being stressed."

Adding to the stress is a new fungus called Nosema (*Nosema ceranae*), which affects the bee's internal organs and digestive system, preventing it from eating. There are antibiotics available to treat it, but they're unpredictable and don't always work.

Since the onset of Varroa mite, beekeepers have been forced to fight fire with fire. Kim said that most beekeepers have an arsenal of miticides they use to keep Varroa mites off their bees. It works, but at a price.

"The stuff that we beekeepers use to fight Varroa mite is pretty tough stuff and they're hard on bees," Kim said. "The problem is that when I put one of these treatments in my hive, it kills a bug on a bug and most of them do a pretty good job of that. But at the same time, the excess that's in that hive is absorbed into the wax—not a lot, parts per billion. But parts per billion begin to add up, so you've got bees living in an environment that's toxic."



How do neonics play a part?

Picture it: You've been working 70 hours a week for the past month. Your boss has been on your case daily. You've got kids at home and two are sick, so your spouse is cranky. Your car breaks down. You haven't been getting enough sleep and you've been eating fast food. As you're leaving work one night (late, of course), somebody sneezes. By the time you get home, you've caught a cold, because your immune system has been stressed right to the breaking point.

This is the analogy Kim used to describe the role neonics play in the bee population decline. Neonics are not killing bees outright and are not the sole cause for bee health decline, but some studies have shown that they're yet another added stress for an already stressed-out bee.

"What keeps this fuel lit is there's been just enough studies to show that bees can deal with the treatment I'm giving them. My bees can deal with Varroa if I take care of it," said Kim. "There have been enough studies to say that the tipping point is when you add in one more stress, and the one more stress has been pointed to as being pesticides. The pesticides that they've looked at have been neonicotinoids, but they've also looked at fungicides and found the same thing. So it's not necessarily that chemical, it's a chemical that's the tipping point."

According to a report from The Xerces Society for Invertebrate Conservation, titled "Are Neonicotinoids Killing Bees?," there's no direct link between neonics and Colony Collapse Disorder (CCD). But, research suggests that neonics may make honey bees more susceptible to parasites and pathogens, including the Nosema parasite. Other studies have suggested that neonics can cause confusion in their little bee brains, preventing them from flying properly or even reaching their home hives.

Scott Black, executive director for the Xerces Society based in Oregon, said that the causes of bee decline aren't necessarily in a numbered list, with neonics being last. He believes it's "a soup of issues."

"We agree that all of these are important issues, but it seems that, to me, folks are trying to make it seem like we know less about these chemicals than we do and that these chemicals are down the list," said Scott. "I'm not saying that they're more important than Varroa mite, but I think a lot of people are trying to say they're less important and I don't think we have the data or the information to say that. I think they're working in tandem. These honey bees have so many issues—they've got diseases, they've got Varroa mite, they often don't have enough good quality food and they've got these poisons in their hive—it's a synergistic effect."

Also, neonics alone may not be a primary cause, but when combined with another pesticide or fungicide, it could become toxic, said Kim.

"Chemical A isn't dangerous, Chemical B isn't dangerous, but Chemical A and B together are toxic as heck,"

Kim said, explaining that major bee deaths in California were attributed to tank mixes, which the EPA doesn't test. "I think [the EPA is] going to start looking at what is going on in the real world. In the lab it's easy to test. I spray some on this bee, she doesn't die. But if I put 50 gals. of water in a tank and 10 gals. of these chemicals and spray a tree, what happens? Then you begin to see."

Certainly, we can all agree that pesticides have come a long way from the highly toxic chemicals, like aldicarb, that were dangerous to all mammals, from humans on down the chain. New classes of chemicals, notably neonics, are much safer for the people applying them. But now, a decade later, evidence is pointing to the harm they may be doing to the insects that use these plants as food sources. We may have yet to see the long-term effects of some of these chemicals, said Scott.

"I think [the chemical companies] really thought that neonicotinoids were safer for pollinators and safer for animals," said Scott. "But the problem comes in that our laws in the United States don't mandate really thorough testing before these chemicals go on the market. There weren't enough studies to truly show whether these chemicals impacted pollinators before they were approved. So we have to figure it out once they're approved and people have already adopted them and started using them and finding them useful, whether it's in agricultural or nursery practice. To me, as a scientist, shouldn't we understand the chemicals we use before we approve them? It doesn't seem like the EPA and the laws that regulate the EPA work that way."

Could we live with an all-out ban?

If that landscaper in Oregon hadn't been negligent and didn't spray those linden trees, would we be having this discussion? Lin Schmale, SAF's Senior Director of Government Relations, said eventually the issue would have been brought up, but those bee deaths brought it to the forefront—especially among the general public.

"Just that one unfortunate thing that happened in Oregon became a focus point," she said. "There may be some growers and landscapers who are not bothering to read the label, but it's the law. Now the rest of us are paying for it."

Scott agreed. "I think especially in the horticulture industry, it is a defining moment that people sat up and started taking interest in this," he said.

With the help of conservation groups, the mainstream media continues to cover the issue in news reports and online articles. Some environmentalists—including Friends of the Earth—are even going so far as holding protests outside of big box retail stores such as Home Depot and Lowe's stores, telling people that the plants they're buying for their backyards are killing bees.

It is a situation that Gary Mangum, owner of Bell Nursery in Maryland and a Home Depot supplier, knows a lot about.

"I believe Home Depot or any big box retailer is going to be guided by the regulatory environment and not be reactive to every group out there," Gary explained. "I think Depot, as well as the other big boxes, they've got history to deal with, so they understand how these things evolve. At the same time, they're environmental

stewards. They care about the environment. They care about the consumer. They want to get input from people and there are constructive ways to deal with that.”

Because there seems to be so much press and reaction to the neonic issue, will you suddenly be facing a total ban of the pesticides you use and trust? Joe Bischoff, AmericanHort’s Regulatory & Legislative Affairs Director, says it’s unlikely there would be a complete ban here in the U.S. But, right before press time, the state of Minnesota passed a bill that says any plant with a “detectable amount” of neonics cannot be labeled as beneficial to pollinators. The legislature even went so far to classify neonicotinoids as “pollinator-lethal insecticides.” Although not a “ban,” it is one of the first bills passed with regards to pesticide limitations.

“You see a lot of states with legislation pending. In most states, it’s been shut down or significantly altered,” said Joe. “You’re even seeing it at the federal level. There certainly is pressure.”

Scott Black and the Xerces Society recently helped draft the Saving America’s Pollinators Act, which would essentially ban four of the six neonics until the EPA finishes its reassessment of these chemicals, which will be in 2018 at the earliest. They have 60 co-sponsors for the bill in the House, but Scott says they’ve got a long, uphill battle to get it passed.

“Even just pushing it is a good way to educate the public and, hopefully, to educate lawmakers about this important issue and get agencies—mainly the EPA—to take faster action,” he said.

Joe says the EPA is just trying to keep the lines of communication open with all sides and recognizes the importance of neonics to the ag and hort industries—but with the caveat that they must be used responsibly.

“People are sometimes worried about the idea of a residual chemical that lasts a little longer, but that also means fewer applications, so there are benefits there,” said Joe. “We have to try to back up and communicate the importance of reading the label and informing growers that they have to pay attention and follow the law.”

The hardest hurdle to overcome may not be legislative or regulatory, but public perception, because this is when the emotions run high over the link of neonics to bee decline.

“The public perception side is really the toughest,” said Joe. “That’s the hardest place to make sure this science message gets out there, to know where the science is, what’s going on, what do we really know about the interaction, and that’s where we’re lagging. That’s where we’re trying to get ahead of it.”

In the meantime, while EPA is going through the reassessment process, they’ve issued a new bee hazard advisory label that makes it more clear for farmers and growers if the chemical is harmful to pollinators and when it can be properly applied to avoid any problems (see Figure 1). But not everybody loves the new label.

“It’s not good from a beekeeper’s perspective,” said Kim. “Citrus growers are supposed to give beekeepers 48 hours notice of when they’re going to spray, unless it’s less than 55 degrees, if it’s at night or if your pest problem exceeds a certain number. The label gives carte blanche to farmers to kill your bees. There’s too much wiggle room in it from a beekeeper’s perspective. It made it easier for the people who use the chemicals, but the beekeepers are forced to move their bees and the burden of cost is on them.”

Can both sides coexist?

The problem is that there is no one study that everyone can look to as concrete evidence about neonics one way or the other. There are many small research studies and anecdotal evidence that offer too much room for interpretation. Even the larger studies that have been conducted by the United Kingdom and Australian governments are looked upon with skepticism by many.

Dr. Raymond Cloyd, professor and extension specialist at Kansas State University and a long-time *GrowerTalks* contributor, is working toward being one of the first ones in the horticulture industry to conduct a study on neonics in ornamentals. As you read this, Dr. Cloyd is working to secure funding for this research project, which will track neonic residues in plants from time of application to when they're sold at retail. He and his team will also conduct tests on pre-treated seed and seed coatings. Dr. Cloyd has been following the pollinator/neonic issue for the past five years, so it's something he is very familiar with. He says that many people are trying to pin neonics as "the smoking gun," but it's too complex of an issue to narrow it down to one sole reason.

"Some people are jumping on this bandwagon without understanding what needs to be done," explained Dr. Cloyd. "We don't want to be redundant and do things that have already been done, because there is a tremendous amount of information on the impact on systemics—not just neonicotinoids, but even other materials—on bumblebees and honey bees and other pollinators. We want to look at it from a consumer standpoint, so we want to track how long these last, because that's the question I get asked: 'If I buy this from a Home Depot or a Lowe's, is it going to kill the bees?'"

As of today, it doesn't look like the EPA is interested in completely banning neonics. And although organizations like the Xerces Society would like to see us all living in a pesticide-free world someday, Scott Black knows that it's not a very realistic scenario.

"We're not a 'no pesticide' [organization], although personally I would love it if we didn't use these chemicals, because I do think they're harmful for the environment and I do think they can be harmful for humans, as well. But we definitely understand and take a nuanced approach by providing education on Integrated Pest Management."

Most greenhouse growers already have Integrated Pest Management programs in place, and more and more are growing some of their crops—especially vegetables—organically, including Bell Nursery. As many of you know, growing organically looks great on paper, but it comes with a whole new set of challenges. Gary said that they get a significant crop loss on their organic plants between seed and point of sale. Because of this, he has to use more water, fertilizer and greenhouse space. More inputs means higher cost to the consumer.

"It's a choice that people can make, but if we move in that direction culturally, it's going to cost a lot more money to feed people and a lot less [produce] will get to the marketplace," said Gary.

Scott agrees that consumers are also driving the need for using pesticides such as neonics, even if they don't realize it. And many times, it's these homeowners themselves who are using too much pesticides in their yards. A case study by the Xerces Society showed that homeowners can apply 12 to 16 times the amount

allowed in an ag setting.

“We have to educate the public so that they understand that they shouldn’t need a perfect plant, because I think it is on both sides—the nurseries have tried to make these perfect plants for people to buy, and people expect perfect plants without any insect damage,” said Scott.

For now, you don’t have to worry about having to dump your neonics—although no one is sure of their future.

“It’s going to evolve in terms of what people are growing,” said Kim. “The food demands of the world are going to change ... But long-term, the food-protection industry, the chemical companies, I predict they’re going to find something that’s less destructive for everything, not just honey bees, but all pollinators and the people who are eating the food. When we come up with a species-specific treatment to crops, we’ve solved the problem.”

In the meantime, we can do our part by using neonics responsibly, always following the label carefully, and educating staff and customers on pollinator health. As history shows, the chemistries have evolved to answer the demands of an ever-changing agricultural industry. But the length of time it takes to create a new class of pesticides can be decades. In the meantime, we should continue to have the discussion about the chemicals we’re using and challenge our chemical suppliers to strive toward creating ever-safer chemistries.

“You’ve got to have some sort of controls or you’d be run over,” said Kim. “Crop and human protection chemicals aren’t going to go away. What those chemicals are will change. In the meantime, can we hang on? I hope so. Beekeepers are pushing and chemical companies are pushing and farmers are pushing hardest of all and they’re all pushing against each other. But we can’t kill each other; we all need each other.” **GT**