

MARKET WATCH

LAWN/TREE CARE

Bee-friendly lawn care

How turf managers can help protect pollinators while using insecticides.

By JONATHAN LARSON AND DANIEL POTTER, PH.D.

Populations of cultivated honeybees, native bumblebees and other pollinators have declined alarmingly in recent years. Scientists are scrutinizing the possible causes of bee die-offs and what to do about them. Much of the debate centers on whether or not exposure to insecticides, especially neonicotinoids, contributes to the problem. Because lawn care providers use these insecticides to control grubs and other turfgrass pests, they should understand the issue and be able to reassure customers their services don't contribute to the problem.

WHY POLLINATING INSECTS ARE IMPORTANT

Many orchard and garden crops, including apples, cantaloupes, almonds, cherries, soybeans, blueberries and a host of others, will not produce fruits without first being pollinated by bees. European honeybees get much of the credit, but in the U.S. alone some 4,000 species of native bees, including bumblebees, orchard mason bees, squash bees and leafcutter bees, also provide important pollination services.

According to a 2012 scientific study published in the journal *Public Library of Science One (PLOS One)*, crops pollinated by bees and other insects contributed \$29 billion to U.S. farm income in 2010. If bees continue to die off, those pollination needs may not be met, resulting in shortages of fruits, vegetables and seeds. These shortages lead to higher costs to consumers. Insect pollination also is essential to the preservation of wild plants, most of which would not otherwise produce fruits and seeds.



University of Kentucky researchers studied how to reduce insecticide hazards to bees. Above: A bee hive at a safe foraging site. Right: A hive in a treatment tent.



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LAWN/TREE CARE How turf managers can protect bees

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MAINTENANCE One company saves with box trucks

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IRRIGATION Successfully selling efficient irrigation systems

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DESIGN/BUILD Pros debate hourly vs. flat-rate design fees

Bees in suburban areas commonly forage on flowering lawn weeds. Indeed, we've surveyed and collected dozens of species of native bees visiting dandelions and white clover in central Kentucky lawns. Many of the species we caught are also pollinators of garden crops, fruits and berries, and of ornamentals such as flowering crabapples and hollies. Bumblebees, for example, are especially good pollinators of tomatoes, eggplant and peppers in home gardens.

WHY ARE BEE NUMBERS DECLINING?

Experts agree there's no single reason why bee numbers are declining. Rather, bee populations face a number of stresses that include parasitic mites, disease-causing pathogens, land development, habitat fragmentation, changes in beekeeping practices and, in some cases, exposure to pesticides.

Parasites, diseases and changes in beekeeping practices. Honeybees are parasitized by varroa mites that suck their blood and by tracheal mites that clog the breathing ducts of adult bees. They are susceptible to diseases caused by bacteria and fungi as well and to a virus that targets their immune systems. Shipping bee colonies around the country for commercial pollination can weaken them, increasing vulnerability to these agents. Plus, they may bring diseases with them that will infect local bee populations. Beekeepers provide colonies with supplemental food—often sugar or corn syrup—to compensate for the lack of wild forage in agricultural monocultures and as a substitute for “raiding” the bees’ stores of honey, which is harvested for sale. Artificial bee foods, however, lack some of the nutrients in real honey that bees need to develop a strong immune system.

Loss and fragmentation of natural habitat. Replacement of natural habitat by agricultural or urban expansion results in shortages of plants that bees depend on for food. Monocultures of crops like corn and wheat offer relatively little in the way of pollen and nectar that bees need to survive. In addition, native wild bees typically have specific nesting requirements; bumble bees, for example, often construct their underground nest in abandoned rodent burrows. Because of habitat loss, nesting sites are limited and worker bees must forage greater distances to bring food back to the nest.

Insecticides. Bees may encounter insecticide residues on the crops they pollinate or on wildflowers or flowering weeds that are inadvertently sprayed. Many chemical insecticides used to control insect pests of lawns, landscapes and gardens are acutely toxic to bees, which is why they have label precautions not to apply them to plants that are in bloom when bees may be present. This potential hazard was punctuated by an incident in Oregon this past June that led to the deaths of some 50,000



An inside look at a bumblebee hive tested by UK researchers.

bumblebees when linden trees in bloom were sprayed with an insecticide, a violation of the pesticide label.

Because neonicotinoids are systemic, there also is potential for translocation of their residues into pollen and nectar. Even low-level exposures can adversely affect bees. For example, research has shown worker bees that ingest sublethal amounts of imidacloprid become intoxicated and neglect their duties in the hive. Such bees are less likely to learn essential tasks like locating patches of food plants, which can lead to food shortages and decreased colony success. Additionally, sublethal exposure to insecticides can weaken bees’ immune systems, making them more vulnerable to infection by parasites and pathogens.

A perfect storm of stresses. Most likely, bee declines are due to a combination of the aforementioned menaces acting together. In the case of honeybees, a one-two punch of varroa mites and viruses has been implicated in collapsing colonies, although lack of food and pesticide exposures can weaken colonies and make it easier for the mites and pathogens to finish them off. In the case of bumblebees, stresses from habitat loss and disease could be compounded by

pesticide exposures. Ongoing research does not point to a single causal agent for global bee declines; rather, the causes are multiple and complex.

LAWN INSECTICIDES AND BEES

We conducted a study to determine how turf care providers can reduce insecticide hazards to bees when treating lawns for grub control. The research, published last spring in *PLOS One*, showed when turf intermixed with flowering white clover is sprayed with a neonicotinoid insecticide, bumblebee workers foraging on the contaminated flowers were intoxicated or killed, reducing colony growth. Only the largest, most vigorous bumblebee colonies will produce queens by late summer, and those failing to do so are doomed because only the new queens survive the winter to start the next generation. We found even when they were moved to a “safe site” with no pesticide exposure, colonies that had foraged on treated flowers for just six days failed to produce new queens.

Notably, though, once the clover flowers present at the time of treatment were removed by mowing and new flowers grew to replace them, bees subsequently foraging on the site were not harmed. Indeed, residues in the nectar dropped from toxic to essentially nontoxic levels

» WEB EXTRA

Read Larson’s, Potter’s and Carl Redmond’s complete study, “Assessing Insecticide Hazard to Bumble Bees Foraging on Flowering Weeds in Treated Lawns,” at bit.ly/15S6oja.

once the turf was mowed. Thus, while the research validates EPA label precautionary statements not to apply neonicotinoids to blooming nectar-producing plants if bees may visit the treatment area, it also indicates that such applications don't pose a prolonged systemic hazard to bees. Another key finding was chlorantraniliprole (Acelepryn), representing a relatively new class of insecticides called anthranilic diamides, did not adversely affect bee colonies even when the workers foraged on flowering clover that had been directly sprayed.

UK research shows LCOs taking precautions can use neonicotinoids on turf without harming bees.

FIRST DO NO HARM

What can lawn care providers do to avoid harming resident bees? Clearly, direct contamination of flowers by neonicotinoids is a bee hazard, so applicators should follow label directions to not spray those products on turf when blooming weeds are present. But with a few sensible precautions—e.g., controlling flowering weeds with herbicides before application, delaying grub treatments until after peak bloom of spring-flowering weeds, using granular formulations, and/or notifying homeowners to mow off any flower heads before or soon after liquid applications have been watered-in—it should be possible to use neonicotinoid insecticides for grub and billbug control



without harming bees. Chlorantraniliprole, a relatively new chemistry, appears non-hazardous to bees.

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