Pollinator Health and the Use of Neonicotinoids in Maryland

DEPARTMENT OF LEGISLATIVE SERVICES 2015

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Department of Legislative Services
Office of Policy Analysis
Annapolis, Maryland

October 2015

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DEPARTMENT OF LEGISLATIVE SERVICES
OFFICE OF THE EXECUTIVE DIRECTOR
MARYLAND GENERAL ASSEMBLY

Warren G. Deschenaux
Executive Director

October 1, 2015

The Honorable Thomas V. Mike Miller, Jr., President of the Senate
The Honorable Michael E. Busch, Speaker of the House
Members of the Maryland General Assembly

Ladies and Gentlemen:

Pollinators, the animals that assist with pollination, are vitally important for food production and biodiversity and contribute billions to the U.S. economy. Of all of the pollinating species, honey bees are the most important. In 2011 alone, honey bees contributed more than $26 million in pollination services to crops grown in Maryland.

Honey bee populations have been declining for decades. However, in 2006, honey bee losses gained national attention when commercial beekeepers along the East Coast reported significant population declines of 30% to 90%. While scientists do not yet know the cause of honey bee losses, most agree that there are multiple stressors contributing to the population declines, including habitat loss, pests, disease, pesticides, nutritional deficiencies, and bee hive management practices. Of these stressors, neonicotinoid pesticides, the most widely used insecticides in the world, have garnered attention as a potential cause of honey bee losses.

In an effort to better understand the relationship between pollinator health and the use of neonicotinoid pesticides, the Natural Resources, Environment, and Transportation Workgroup researched this issue during the 2015 interim and developed this report. It provides (1) an overview of neonicotinoid pesticides and the effect of neonicotinoid use on honey bees, other pollinators, and the environment; (2) the current regulatory framework, including federal, state, and local actions; (3) best management practices for protecting pollinators; and (4) considerations for future research, monitoring, and decision making.

We trust this report will prove useful to the General Assembly in considering any legislation relating to pollinator health and neonicotinoid pesticides. This report was written by Cristen Flynn, Crystal Lemieux, and Kathy Selle, and prepared for publication by Kim Landry and Mary Alice Gehrdes. If you would like additional information regarding this report, please contact Ryane Necessary at (410) 946-5350.

Sincerely,

Warren G. Deschenaux
Executive Director

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The U.S. Department of Agriculture (USDA) estimates that overwintering losses of honey bee colonies in the United States have averaged nearly 30% each year since 2006. While scientists do not yet know the cause of honey bee losses, most agree that the research does not conclusively point to one single cause. Instead, many scientists believe that colony losses are due to a combination of stressors, such as pests, disease, habitat loss, and pesticides. Of these, the use of pesticides, neonicotinoids in particular, has been the focus of intense research and debate. Given the dependence of our food system on pollinators, reduced honey bee populations pose a significant threat to domestic agriculture, ecological health and stability, and our national economy.

This report provides an overview of neonicotinoids and the effects of neonicotinoid use on honey bees, other pollinators, and the environment. It describes the current regulatory framework applicable to neonicotinoids and summarizes actions to regulate pesticides and promote pollinator health on the federal, State, and local levels. Finally, it identifies best management practices for protecting pollinators and considerations for future research, monitoring, and decision making.

Background

The Importance of Pollinators

Pollination is the fertilization of a plant by an animal that moves pollen from one part of the plant to another part of the plant or to a different plant. Plants that are not fertilized are unable to produce fruit or seeds and cannot reproduce. The animals that assist with pollination are called pollinators. While the majority of pollinators are insects, such as honey bees, native bees, wasps, flies, beetles, ants, butterflies, and moths, other animals provide pollination services as well, including birds, bats, and lizards.

Pollinators are vitally important for food production and biodiversity. Approximately 85% of flowering plants in the world and 35% of world food production rely on pollinators. As shown in **Exhibit 1**, many agricultural crops depend on or are otherwise benefited by insect pollination. Additionally, pollinators contribute more than $24 billion to the U.S. economy.

Exhibit 1
Crops Dependent On or Benefitted by Insect Pollination

Legumes and Relatives	Beans, Cowpea, Lima Beans, Lupines, Mung Bean/Green or Golden Gram, Soybean
Vegetables	Artichoke, Asparagus, Beet, Broccoli, Brussels Sprouts, Cantaloupes, Carrot, Cauliflower, Celeriac, Celery, Cucumber, Eggplant, Endive, Green Pepper, Leek, Lettuce, Okra, Onion, Parsnip, Pumpkin, Radish, Rutabaga, Squash, Tomato, Turnip, White Gourd
Fruits, Berries and Nuts	Almonds, Apple, Apricot, Avocado, Blackberry, Blueberry, Cacao, Cashew, Cherry, Chestnut, Citrus, Coffee, Coconut, Crabapple, Cranberry, Currant, Date, Fig, Gooseberry, Grapes, Guava, Huckleberry, Kiwi, Kolanut, Litchi, Macadamia, Mango, Olive, Papaw, Papaya, Passionfruit, Peach, Pear, Persimmon, Plum, Pomegranate, Raspberry, Strawberry, Tung, Vanilla, Watermelon
Herbs and Spices	Allspice, Anise, Black Pepper, Caraway, Cardamom, Chive, Clove, Coriander, Dill, Fennel, Lavender, Mustard, Nutmeg, Parsley, Pimento, Tea, White Pepper
Oil, Seeds, and Grains	Alfalfa, Buckwheat, Canola, Flax, Oil Palm, Safflower, Sesame, Sunflower
Clover and Relatives	Alsike Clover, Arrowleaf Clover, Ball Clover, Berseem Clover, Black Medic/Yellow Trefoil, Cider Milkvetch, Crimson Clover, Lespedeza, Peanut, Persian Clover, Red Clover, Rose Clover, Strawberry Clover, Subterranean Clover, Sweet Clover, Trefoil, Vetch, White Clover
Other	Cotton, Kenaf

Source: U.S. Department of Agriculture

Of all the pollinating species, bees, and more specifically European honey bees, are the most important. The European honey bee (*Apis mellifera*) is responsible for contributing more than $15 billion in pollination services to the U.S. economy, and more than $200 billion worldwide. **Exhibit 2** illustrates the economic importance of honey bee pollination services to agriculture in Maryland – in 2011, honey bees contributed more than $26 million in pollination services to crops grown in the State. As an ever-growing population has put more pressure on food production, pollination demands have likewise increased. More than 65% of U.S. commercial bee colonies are managed for pollination services.

Exhibit 2
The Value of Honey Bees to Important Maryland Crops

Crop	2011 Value	x	Dependence on Insect Pollination	x	Proportion Attributed to Honey Bees	=	Value Attributable to Honey Bees
Apples	$7,650,000	x	1.0	x	0.9	=	$6,885,000
Peaches	4,735,000		0.6		0.8		2,272,800
Soybeans	204,094,000		0.1		0.5		10,204,700
Cantaloupes	1,320,000		0.8		0.9		950,400
Cucumbers	1,050,000		0.9		0.9		850,500
Watermelon	8,736,000		0.7		0.9		5,503,680
Total	**$227,585,000**						**$26,667,080**

Source: University of Maryland Extension; U.S. Department of Agriculture's *National Agricultural Statistics Survey*; Morse and Calderon, 2000

Healthy honey bee colonies are vital for meeting these increased food production needs. Interaction within a colony is extremely complex. Honey bees are social insects that live in large colonies. Individual bees within the colony are specialized to perform certain tasks – the queen and drones are responsible for reproduction, while the worker bees are responsible for colony maintenance, including tending to the brood, defending the hive, food storage, and foraging for food. Worker bees will forage up to 5.5 miles from the hive in search of pollen, nectar, and water to bring back to the hive and communicate the location of food to one another through an intricate "waggle dance." The ability of a worker bee to navigate and communicate is essential for colony survival.

Decline in Honey Bee Population

U.S. honey bee populations have been declining for decades, with the population of domestic managed honey bees dropping from 6 million colonies in 1947 to 2.74 million in 2014. In 2006, honey bee losses gained national attention when commercial beekeepers along the East Coast reported significant population declines of 30% to 90%. The worker bees of these colonies disappeared and left behind the queen and live brood. Without worker bees, the hive cannot sustain itself, resulting in the eventual collapse of the entire colony within a few weeks. This phenomenon was named colony collapse disorder due to the unusual circumstances and severity of the colony declines. Scientists do not know what causes colony collapse disorder, but USDA reports that it may not be the only, or even the major, cause of colony losses. Rather, most

scientists agree that there are multiple stressors working in concert to cause population declines, including habitat loss, pests, disease, pesticides, nutritional deficiencies, and bee hive management practices.

In recent years, the number of managed honey bee colonies reported in the United States has generally increased, as shown in **Exhibit 3**. Similarly, in Maryland, as shown in **Exhibit 4,** honey bee colony and beekeeper registrations have also increased in recent years.

Exhibit 3
Number of Honey Bee Colonies Reported in the United States
2008-2014

Year	Honey Bee Colonies (In Millions)
2008	2,342
2009	2,498
2010	2,692
2011	2,491
2012	2,539
2013	2,640
2014	2,740

Source: U.S. Department of Agriculture's National Agricultural Statistics Survey

Exhibit 4
Beekeeper and Honey Bee Colony Registrations in Maryland
2008-2014

Year	Beekeeper Registrations	Colony Registrations
2008	1,152	9,378
2009	1,363	11,474
2010	1,425	11,650
2011	1,721	13,600
2012	1,782	13,924
2013	1,821	14,711
2014	1,838	14,466

Source: Maryland Department of Agriculture

Although these figures indicate the number of managed honey bee colonies are generally increasing, honey bee colonies are dying during the winter months at a rate well above the 15% to 17% overwintering loss rate that commercial beekeepers have identified as an economically sustainable average. As shown in **Exhibit 5**, in recent years, annual overwintering losses in the United States are averaging approximately 30%, and scientists agree that overwintering losses of commercial honey bee colonies are higher today than they were in the past. Additionally, Exhibit 5 shows that Maryland is also experiencing unsustainable overwintering losses – the rate of overwintering losses for the 2013-2014 reporting period was approximately 25% in the State. To compensate for these losses, beekeepers often split healthy colonies into separate colonies or replace losses with packaged bees which are available for purchase. Overall, an estimated 10 million bee hives were lost between 2006 through 2012, costing beekeepers in the United States $2 billion.

Exhibit 5
Overwintering Loss Data for the United States and Maryland

	Maryland		United States	
Survey Year	**Average Loss**	**Total Loss**	**Average Loss**	**Total Loss**
2006-2007*	27.8%	23.4%	37.6%	31.8%
2007-2008*	NA	7.3%	31%	35.8%
2008-2009*	NA	13.5%	32.7%	25.2%
2009-2010	36.3%	38.7%	34.4%	42.2%
2010-2011	37.2%	49.5%	38.4%	29.9%
2011-2012	18.5%	25.94%	25.4%	22.5%
2012-2013	57.04%	21.18%	44.8%	30.6%
2013-2014	40.7%	25.15	44.8%	23.7%

NA: not available

*Participation limited in these survey years.

Source: Maryland Department of Agriculture's Bee Informed Partnership

Pesticides and Insecticides: What are Neonicotinoids?

Pesticides and Insecticides

Pesticides refer generally to the chemicals that are used to prevent, repel, or destroy pests and kill organisms that can cause disease. Pests can be insects, mice, bacteria, viruses, and other animals, weeds, and fungi. Pesticides include products such as insecticides, herbicides, fungicides, rodenticides, and miticides.

Insecticides are used to control insects specifically. They are applied to crops and assist with crop productivity, preserving about one-fifth of crop yield. While insecticides are important for crop production, they target insects generally, killing both pests and beneficial insects. Consequently, the use of insecticides has both positive and negative effects on food security and the environment.

What are Neonicotinoids?

Neonicotinoids are a class of insecticides that were developed in the 1980s as an alternative to organophosphate insecticides, which are highly toxic to humans. Neonicotinoids are systemic insecticides, meaning that once the plant absorbs the chemical it will migrate throughout the entire plant, including pollen and nectar. This systemic action provides protection from boring, sucking, chewing, and root-feeding pests and provides the same level of protection regardless of application method. Neonicotinoids are a synthetic form of nicotine, a naturally occurring substance that was widely used as an insecticide before World War II. Neonicotinoids target the same nervous system receptors as nicotine, causing nervous system stimulation at low concentrations, but overstimulation, paralysis, and death at higher concentrations. Active ingredients in the most commonly applied neonicotinoids include imidacloprid, clothianidin, thiamethoxam, acetamiprid, dinotefuran, nitenpyram, and thiacloprid.

Neonicotinoids are the most widely used insecticides in the world and are registered for use on over 140 crops in 120 countries. They comprise nearly 30% of the global insecticide market and have an estimated global market value of $2.6 billion. In 2009, imidacloprid was the largest selling insecticide in the world, comprising 41% of the global neonicotinoid market with sales exceeding $1 billion. The U.S. Environmental Protection Agency (EPA) estimates that, from 2009 through 2011, more than 10.5 million pounds of neonicotinoids were applied to nearly 127 million acres of agricultural crops.

Benefits of Neonicotinoids

Neonicotinoids have attained a global dominance due to their efficacy and low toxicity to humans. EPA considers neonicotinoids to be a preferable alternative to some insecticides, and has approved conventional reduced risk pesticide status for some uses of neonicotinoids. A few of the benefits of neonicotinoids over other insecticides include:

- lower toxicity to mammals, birds, and fish;
- reduced risk to agricultural workers and consumers;
- target specificity;
- systemic movement that protects all parts of the plant, making the insecticide effective against a broad range of insect pests, including boring and root-feeding insects;

- lower application rates;
- long-lasting protection; and
- versatile application methods.

Uses and Application Methods

There are four main uses of neonicotinoids: (1) protection of crops and ornamentals against insects and mites; (2) urban pest control for cockroaches, ants, termites, wasps, and flies; (3) veterinary applications against fleas and ticks; and (4) control of rice water weevil infestations in rice crayfish aquaculture. The main use of neonicotinoids is for crop protection in agriculture, horticulture, forestry, and nursery settings. Neonicotinoids are authorized for more than 1,000 uses on a wide variety of plants, including cereal grains, corn, rice, soy, fruits, vegetables, cotton, ornamental plants, nursery plants, and seeds for export. Corn accounts for the largest single use of neonicotinoids, comprising 95% of the use of clothianidin in the United States in 2011.

Neonicotinoids can be applied using a variety of methods, including foliar spraying; seed dressing; seed pilling; soil treatment; granular application; dipping of seedlings; soil drenching; furrow application; trunk injection; mixing with irrigation water (chemigation); drenching of flower bulbs; and brush application. In the United States, the most common application methods are seed coatings, soil drenching (including chemigation), trunk injections, and foliar sprays. Globally, 60% of neonicotinoids are applied via seed and soil applications.

Exhibit 6 provides a sampling of the registered uses, application methods, and trademark names for the most frequently used neonicotinoids.

Exhibit 6
Registered Uses of Neonicotinoids in the United States

Neonicotinoid	Registered Uses	Select Product Trademark Names
Acetamiprid	Application as foliar spray for leafy and fruiting vegetables, cole crops, citrus fruits, pome fruits, grapes, cotton, and ornamentals	*Agricultural*: Assail; Tristar *Turf, Ornamental, and Residential*: Ortho Flower, Fruit and Vegetable Insect Killer; Ortho Rose and Flower Insect Killer
Clothianidin	Seed treatment, application as foliar spray, or soil drench for a variety of field and tree crops, turf, and a variety of ornamentals	*Agricultural*: Arena; Belay; Clutch Poncho *Turf, Ornamental, and Residential*: Aloft; Arena; Bayer Advanced All-in-One Rose & Flower Care Granules; Green Light Grub Control with Arena

Exhibit 6 (Continued)

Neonicotinoid	Registered Uses	Select Product Trademark Names
Dinotefuran	Application as soil drench or foliar spray to leafy and fruiting vegetables, turf, and ornamental plants Also used as bait or granules in buildings for cockroach control	*Agricultural*: Scorpion; Venom *Turf, Ornamental, and Residential*: Green Light Tree & Shrub Insect Control with Safari 2 G; Zylam 20SG Systemic Turf Insecticide
Imidacloprid	Application as seed dressing, soil drench, granules, injection, or spray to a wide range of field and tree crops, and ornamental plants, trees, and turf	*Agricultural*: Admire; Gaucho; Imicide; Provado; Macho; Malice; Sepresto; Widow; Wrangler *Turf, Ornamental, and Residential*: Bayer Advanced 3-in-1 Insect, Disease, & Mite Control; Bayer Advanced Fruit, Citrus & Vegetable Insect Control; DIY Tree Care Products Multi-Insect Killer; Ferti-lome 2-N-1 Systemic; Hi-Yield Systemic Insect Spray; Knockout Ready-To-Use Grub Killer; Ortho Bug B Gon Year-Long Tree & Shrub Insect Control; Surrender Brand GrubZ Out
Nitenpyram	Tablet form to be taken orally	*Veterinarian*: Dog & Cat MD Maximum Defense Quick Tabs; Capstar Flea Tablets for Dogs & Cats; Sentry Capguard Oral Flea Treatment
Thiacloprid	Application as foliar spray to cotton and pome fruit crops	*Agricultural*: Calypso *Turf, Ornamental, and Residential*: None
Thiamethoxam	Application as seed dressing, soil drench, injection, granules, or foliar spray to a wide range of field crops, ornamental plants, and turf	*Agricultural*: Actara; Adage; Cruiser; Centric; Platinum *Turf, Ornamental, and Residential*: Flagship; Maxide Dual Action Insect Killer; Meridian

Source: U.S. Environmental Protection Agency; Xerces Society for Invertebrate Conservation

Use of Neonicotinoids in Maryland

The Maryland Pesticide Information and Reporting Workgroup, established by Chapters 523 and 524 of 2013, reported in its 2014 interim report that there are significant gaps in the information available about the use of pesticides in Maryland. The Department of Natural Resources reported that it has little data on the use of pesticides other than what is in annual reports from farmers who lease selected public lands for agricultural uses. In a 2011 joint report by the Maryland Department of Agriculture (MDA) and USDA, imidacloprid was reported as the second most frequently used insecticide in the State, with 231,323 pounds of the active ingredient being used on Maryland lands by farm operators, certified private pesticide applicators, commercially licensed businesses, and public agencies. Overall, imidacloprid came in ninth out of all the pesticides used in the State, with dinotefuran at one hundred and fortieth, thiamethoxam at one hundred and seventy-second, acetamiprid at one hundred and seventy-ninth, clothianidin at two hundred and thirty-second, and thiacloprid at two hundred and fifty-seventh.

Effects of Neonicotinoids on Honey Bees, Other Pollinators, and the Environment

As the use of neonicotinoids has increased, so has the concern surrounding the potential harm caused by their use. Conflicting research and research gaps make it difficult to determine the precise impact the increasing use of neonicotinoids has on nontarget organisms and the environment. The following provides an overview of results and conclusions from the research that has been conducted to date.

Honey Bees

Evidence shows that the application of pesticides, particularly insecticides, kills or weakens thousands of honey bee colonies in the United States each year. However, it is not clear whether pesticides, including neonicotinoids, are the single, or even a major, cause of honey bee population declines. What is known is that honey bees are routinely and chronically exposed to neonicotinoids.

Routes of Exposure

There are several pathways through which honey bees can be exposed to neonicotinoids. The most common pathways are orally through food and by direct contact. Because neonicotinoids are systemic, they permeate into every part of the plant, including pollen, nectar, and guttation fluid – all sources of food for honey bees. Pollen, nectar, and guttation fluid become contaminated by neonicotinoids regardless of the application method used due to the systemic nature of the insecticide. Neonicotinoids have been found in pollen loads brought to hives by honey bees, in pollen stored within honey bee hives, and in honey stored within hives.

Exposure of honey bees to neonicotinoids via direct contact occurs most often when neonicotinoids are applied as a foliar spray or from the dust that is released when coated seeds are planted. Exposure can also occur from dust or foliar spray drifting onto nearby plants and the use of contaminated water to cool hives or dilute honey for the honey bees' offspring.

It is important to note that the existence of a route of exposure does not mean that contamination has occurred or that there is a hazard to bees – it is simply one manner in which honey bees may be exposed to neonicotinoids. Additionally, exposure does not result in harm for all bees. Contact with neonicotinoids may cause lethal effects, sublethal effects, or no effect at all.

Lethal Effects

There is no direct link between the use of neonicotinoids and colony collapse disorder, and while neonicotinoids are highly toxic to honey bees at high concentrations, research shows that neonicotinoids generally are not lethal to honey bees unless they are improperly applied or formulated. Dusts from improperly formulated or applied seed treatments can acutely kill honey bees. Massive honey bee losses occurred in the United States, Canada, and several European Union countries due to dust produced by seed drilling machines. Since these losses occurred, improvements to the seed coating process have been made through better regulations and the use of deflectors on drilling equipment which direct dust to the soil and reduce the amount of dust drifting in the air. When seed dressings are correctly formulated and seeds are properly planted, the concentration of neonicotinoids found in pollen and nectar are nearly always below lethal concentration levels.

Contact with foliar sprays can be acutely poisonous, and foliar residues on plant surfaces may remain toxic to bees for several days. However, this is not unique to neonicotinoids, as most insecticides are likely to be problematic in this regard. Spraying certain neonicotinoids while the plant is flowering is restricted in most countries, and labeling instructions specifically warn against using foliar sprays during this time.

Sublethal Effects

The majority of research surrounding the use of neonicotinoids and their associated effect on honey bees focuses on the potential for sublethal effects. Sublethal effects do not result in the death of an organism, but instead impair the organism's ability to function properly. As previously mentioned, honey bees use an intricate form of communication to share information on flower location and have complex behaviors that allow them to navigate back to their hive and take care of their young. Scientists are concerned that neonicotinoids, a neurotoxin, may have sublethal effects on bee behavior that will compromise the ability of bees to forage and communicate with others, negatively affecting overall colony health as a result.

Whether the levels of neonicotinoids that honey bees are exposed to are high enough to affect bee behavior, and ultimately colony health, is the subject of intense debate and ongoing research. Many of the studies have conflicting results and conclusions. Lab studies have been criticized for not using realistic doses, while field studies are not easily reproduced and

determining the actual levels of neonicotinoid exposure of free foraging bees is difficult. However, a growing body of evidence suggests that persistent, low concentrations of neonicotinoids pose a significant risk to honey bees and other nontarget organisms. Studies have shown that exposure of honey bees to field-realistic levels of neonicotinoids have resulted in the following sublethal effects:

- reduced foraging success;
- difficulty navigating and orienting;
- impairment of memory and learning;
- impairment of brood and larval development;
- damage to the central nervous system;
- increased susceptibility to parasites, such as the *Varroa destructor* mite, and diseases, such as the *Nosema* infection; and
- reduced hive hygiene.

Additionally, two new lab studies show that honey bees cannot taste neonicotinoids and are not repelled by them. Instead, honey bees in the studies preferred the solutions treated with neonicotinoids, even though this caused them to eat less food overall. Researchers are concerned that, like nicotine, neonicotinoids may make food containing the pesticide more rewarding, thus increasing the likelihood that a honey bee will face chronic exposure. It is not clear whether this preference would occur in the wild.

Effect of Multiple Stressors

There is a general consensus among scientists that honey bee population declines are not being caused by one single factor, but instead are the result of multiple stressors that, when taken together, can have a significant negative impact on a colony. **Exhibit 7** shows the impact that the most researched stressors have on honey bees. In addition, the toxicity of neonicotinoids can be amplified by other agrochemicals, increasing their toxicity and making honey bees more susceptible to parasites.

Exhibit 7
Impact of Various Stressors on Honey Bees

Stressor	Impact
Parasites	*Varroa destructor* mite is the single most detrimental pest to honey bees; 8 of the 24 known viral diseases of bees are transmitted by the *Varroa* mite, which parasitizes bees and acts as a vector for a number of debilitating and paralytic honey bee viruses
Diseases	Most common disease is the *Nosema* fungus, which can cause shortened life spans, reduced honey yields, and colony loss
Poor nutrition	Reduced diversity of food sources, particularly as agriculture has moved towards large-scale monocultures, can shorten life spans of honey bees and colonies
Inadequate management practices	Honey bees are transported long distances to provide pollination services, often immediately after overwintering, which can stress colonies and reduce overall bee health
Pesticides	Direct mortality from pesticides is limited to isolated incidents at high concentration levels, but total pesticide load may influence honey bee health
Habitat loss	Weed control methods in agriculture, forestry, and states' rights-of-way has reduced availability of nutritious plants, harming overall honey bee health

Source: U.S. Department of Agriculture, Congressional Research Service

Other Pollinators and the Environment

In addition to the impact on honey bees, neonicotinoids also affect other pollinators, nontarget organisms, and the environment. The majority of research suggests that neonicotinoids are harmful to a variety of beneficial insects. A 2014 review of over 800 peer-reviewed reports concluded that neonicotinoids "pose a serious risk to honey bees and other pollinators such as butterflies and to a wide range of other invertebrates such as earthworms and vertebrates including birds." Neonicotinoids may also have negative impacts on other invertebrates in terrestrial, aquatic, wetland, marine, and benthic habitats.

Neonicotinoids have long soil half-lives, meaning they can persist in the soil after the treated crop has been harvested. Imidacloprid residues have been found in hemlock trees up to three years after application and in rhododendron flowers up to six years after initial treatment. This long-lasting persistence makes it likely that neonicotinoids can accumulate in soils if treated crops are grown repeatedly in the same field, but there is no evidence to confirm this. However, studies have shown that plants can pick up neonicotinoid residues remaining in the soil from applications in previous years. Typically more than 90% of the active ingredient in neonicotinoids enters the soil.

Neonicotinoids are water soluble and have been found in groundwater, streams, stormwater ponds, and tidal creeks. One study found imidacloprid in 89% of the water samples taken from rivers, creeks, and drains in California, and 19% of the samples taken exceeded EPA guideline concentrations. However, neonicotinoids are not detected in many groundwater and runoff samples collected in treatment areas because they are only present in water for a short period after application.

While the majority of neonicotinoids used in the United States is for agricultural purposes, the use of neonicotinoids by homeowners and for nonagricultural purposes poses a significantly greater risk of pollen and nectar containing lethal levels of the substance due to the approved application rate of home and garden products. For example, a homeowner can apply 12 to 16 times the amount of imidacloprid to trees in their garden than a farmer could in an agricultural setting. Additionally, home and garden products may be applied by foliar spray during flowering, something that is discouraged in agricultural settings due to the risk associated with higher levels of neonicotinoid residues in pollen and nectar when the product is applied during bloom.

Other concerns associated with the use of neonicotinoids include:

- transitioning away from the use of integrated pest management, a framework used to minimize the effects of pesticides on nontarget organisms by using less hazardous pest management options;
- potential development of insects that are resistant to neonicotinoids; and
- the inability of farmers to obtain untreated nonorganic seeds.

Regulation of Neonicotinoids and Pollinator Health Actions at the Federal Level

Federal Regulation of Neonicotinoids

Registration

EPA primarily regulates the sale, use, and distribution of pesticides, including neonicotinoids, under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetic Act. The FIFRA prohibits the sale or distribution in the United States of a pesticide that is not registered or exempted from registration by EPA. Before EPA may register a pesticide, however, they must determine that the pesticide (1) will perform its intended function without unreasonable adverse effects on human health or the environment; and (2) will not generally cause unreasonable adverse effects on human health or the environment when used in accordance with widespread and commonly recognized practice. Accordingly, EPA assesses a range of potential human health and environmental effects associated with the proposed use of the pesticide during the evaluation of an application. Among other things, EPA reviews the pesticide formulation, site and method of use, storage and disposal practices, labeling and directions for use, and research data on the pesticide's efficacy and potential risks.

EPA regulations allow an exemption from FIFRA registration for certain treated articles or substances. To qualify for the exemption, a product must be treated with or contain a pesticide to protect the article or substance itself and the pesticide must be registered for that use. EPA typically applies the exemption to articles or products that have been treated with an antimicrobial pesticide, but has also applied the exemption to seeds coated with neonicotinoid pesticides.

Classification

EPA classifies each registered pesticide for general or restricted-use based on the potential for harm, formulation, method of use, and site of application. General-use pesticides may be purchased at a retail outlet and used by the general public. Restricted-use pesticides may be applied only by or under the direct supervision of certified pesticide applicators. The neonicotinoid pesticide active ingredients are classified as general-use pesticides.

Labeling

All labeling attached to, accompanying, or referenced on a pesticide must conform to EPA requirements and be approved by EPA. Among other things, labels must contain the approved uses, directions, and conditions of use, including instructions for the safe storage and disposal of the pesticides and pesticide containers, hazards, and precautionary statements. Using a pesticide in a manner that is inconsistent with the use directions on the label is a violation of the FIFRA. In August 2013, EPA issued guidance requiring label changes for all registered products, except granulars, that have directions for outdoor application to foliage and contain clothianidin, dinotefuran, imidacloprid, or thiamethoxam. EPA explained that the label changes would

highlight measures necessary to better protect pollinators and help achieve label clarity and consistency. The changes included a new "Pollinator Protection Box," as shown in **Appendix 1** and the addition of pollinator protection language to the directions for use.

Pesticide Registration Review

EPA must reevaluate every registered pesticide at least once every 15 years to ensure that the products continue to meet statutory and scientific standards. In light of changes in science, public policy, and use practices, EPA has accelerated the review of the neonicotinoid pesticides class (thiacloprid is no longer included due to voluntary cancellation of the registration), with planned completion in 2018-2019. The registration review process requires registrants to submit specified new data, including data from pollinator hazard and exposure studies, for EPA's ecological and human health risk assessments.

EPA indicated in the neonicotinoid pesticides review schedule that it would pursue pollinator risk mitigation if appropriate during the review process. In addition, in April 2015, EPA advised registrants of products containing nitroguanidine neonicotinoid pesticides (imidacloprid, clothianidin, thiamethoxam, and dinotefuran) with outdoor uses and applicants for new outdoor uses of the pesticides that EPA is unlikely to be in a position to approve new or expanded outdoor uses until the new pollinator health data is submitted and assessed. EPA also requested the withdrawal or modification of any pending application for a new outdoor use of a nitroguanidine neonicotinoid product.

Proposed Federal Regulations

On May 29, 2015, EPA published notice seeking public comment on its proposal to adopt mandatory pesticide label restrictions to protect managed bees under contract pollination services from foliar application of pesticides that are acutely toxic to bees on a contact exposure basis. The label restrictions would prohibit applications of "acutely toxic pesticides" during bloom times in areas where bee colonies are under contract to provide pollination services. EPA also sought comment on its proposal to rely on efforts made by states and tribes to reduce pesticide exposures for application sites not under contracted services through the development of managed pollinator protection plans containing locally based measures. Finally, EPA sought comment on a number of other issues (uncertainties) regarding chemicals and exposure scenarios. The comment period ended on July 29, 2015.

Federal Legislative Proposals

Legislation addressing the use of neonicotinoids has been introduced at the federal level. The Saving America's Pollinators Act of 2015 (H.R. 1284), introduced in the U.S. House of Representatives on March 4, 2015, requires EPA to suspend the registration of four neonicotinoids and withhold the issuance of new registrations for any seed treatment, soil application, and foliar treatment on bee-attractive plants, trees, and cereals until EPA has determined that use of the pesticide will not cause unreasonable adverse effects on pollinators. EPA must base the

determination on an evaluation of published and peer-reviewed scientific evidence and a completed field study that evaluates residues, chronic low-dose exposure, cumulative effects of multiple chemical exposures, and any other necessary protocol. The bill also requires the Secretary of the U.S. Department of the Interior, in coordination with EPA, to monitor the health and population status of native bees in various habitats, identify the scope and likely causes of unusual native bee mortality, and report annually. Similar legislation was introduced in 2013 (H.R. 2692).

Other federal legislation has focused on pollinator health and habitat. H.R. 2738, introduced June 11, 2015, in the 114th Congress (2015-2016), directs the Secretary of the U.S. Department of Transportation, in conjunction with willing states, to encourage and facilitate integrated vegetation management practices on roadsides and other transportation rights-of-ways; the development of habitat and forage for pollinators through planting of native forbs and grasses; research and demonstration projects on economic and environmental benefits and best practices; and participation in such activities by representatives of transportation landscape management, pollinator health, agriculture, horticulture, and other affected communities. The bill also authorizes the use of federal funds for the provision of habitat, forage, and migratory way stations for specified pollinators if related to a federally funded transportation project.

H.R. 5447, in the 113th Congress (2013-2014), would have amended federal pesticide laws to expedite the review and approval of products to control "parasitic pests" in managed commercial bee colonies, and would have required USDA and EPA to evaluate threats to pollinators and the availability of pesticides to manage bee pests.

Federal Action Regarding Pollinator Health

National Health Strategy to Promote the Health of Honey Bees and Other Pollinators

In 2014, President Barack Obama issued a memorandum that established the Pollinator Health Task Force that called on federal agencies to take steps to reverse pollinator losses and to help restore pollinator populations. In addition to actions by federal agencies, President Obama also recognized the importance of public-private partnerships and citizen engagement in addressing pollinator loss. The task force worked with federal agencies in developing the National Strategy to Promote the Health of Honey Bees and Other Pollinators (Strategy), which outlines a comprehensive approach to promote the health of honey bees and other managed bees, wild bees (both native and introduced species), butterflies, and other pollinating insects, and birds and bats. The Strategy addresses a variety of factors that impact pollinator health, including certain land-use practices, declining forage and nesting resources, pests and diseases, pesticides, and bee biology. The targeted outcomes of the Strategy include:

- restoring honey bee colony health to sustainable levels by 2025;
- increasing the Eastern monarch butterfly populations to 225 million butterflies by year 2020; and

- restoring or enhancing seven million acres of land for pollinators over a five-year period.

To achieve these goals, the Strategy details specific actions which generally fall under one of five strategy areas: (1) the Pollinator Research Action Plan; (2) pollinator public education and outreach; (3) public-private partnerships; (4) increasing and improving pollinator habitat; (5) and protecting pollinators from exposure to pesticides. A brief description of each strategy is provided below.

Pollinator Research Action Plan: The plan outlines research strategies to focus federal action on producing the scientific information needed to understand both the individual stressors and the cumulative impact of these stressors on overall pollinator health. These strategies include plans for researching population status and trends, habitat (including stressors), nutrition, pollinator pathogens and pests, pesticides and toxins, and genetics, breeding, and biology, among others. Each strategy generally identifies key themes for research as well as identifying existing research and research gaps.

Pollinator Public Education and Outreach: The strategy for expanding pollinator public education and outreach identifies a variety of federal agency actions to engage multiple audiences, such as individuals, businesses, schools, and libraries, to assist in the restoration of pollinator populations in their native habitats. Some of these activities include developing an interagency pollinator outreach toolkit to provide a standard template with basic messages about pollinators, connecting school communities to pollinator education and habitat resources; and expanding public outreach to farmers and beekeepers.

Public-private Partnerships: The strategy to facilitate public-private partnerships seeks to support existing stakeholder collaboration as well as encouraging new collaborations where appropriate.

Increasing and Improving Pollinator Habitat: The strategy for increasing and improving pollinator habitat identifies a long-term process to incorporate goals to achieve pollinator health into federal land management strategies. The strategy intends to align with state, private-sector, and philanthropic resources and activities to increase pollinator habitat.

Protecting Pollinators from Exposure to Pesticides: The strategy to protect pollinators from exposure to pesticides identifies EPA as the primary agency to assess the effects of pesticides, including neonicotinoids, on the health of bees and other pollinators and to take appropriate actions to protect pollinators. EPA is expected to implement a variety of actions over the next several years, including reevaluating the neonicotinoid class of pesticides, as discussed previously. Additionally, EPA intends to, among other things:

- restrict the use of pesticides that are acutely toxic to bees during bloom for sites with bees on-site under contract;

- work with states on developing and issuing pollinator protection plans;

- expedite its review of new varroa mite control products; and
- issue a cost-benefit analysis for the use of neonicotinoid-treated soybeans.

Farm Bill

The 2014 Farm Bill (the Agricultural Act of 2014) (P.L. 113-79) continued the provisions of the 2008 Farm Bill and earlier actions to conserve pollinator habitat and added targeted support for the creation of honey bee habitat in five Midwestern states.

Regulation of Neonicotinoids and Pollinator Health Actions in Maryland

State Regulation of Pesticides

Under FIFRA and a cooperative agreement with EPA, Maryland has primary enforcement responsibility for violations of federal pesticide laws. Maryland also has broad authority to adopt regulatory measures, other than labeling or packaging requirements, that are at least as restrictive as federal pesticide laws. Regarding labeling and packaging requirements, both federal and state law recognize that uniformity reduces confusion, promotes clarity and safety, and helps control costs. Accordingly, the Maryland Pesticide Registration and Labeling Law and the Pesticide Applicator's Law authorize MDA to adopt EPA regulations and additional regulations governing the sale, distribution, use, storage, and disposal of pesticides, including neonicotinoids.

Registration Requirement

To be sold, distributed, or used in Maryland, a pesticide must be registered by both MDA and EPA. Each pesticide registration must be renewed annually. MDA may refuse to register, or suspend or cancel the registration of, any pesticide for noncompliance with registration or labeling requirements.

Restricted-use Pesticides

Specified pesticides that have greater potential for causing harm are designated as restricted-use pesticides. A person who sells or distributes a restricted-use pesticide must hold a dealer permit issued by MDA and maintain specified records. A permitted dealer may sell or distribute a restricted-use pesticide only to another permitted dealer or a certified applicator or that person's authorized representative. According to MDA, EPA's list of restricted-use pesticides is effectively the list of restricted-use pesticides for purposes of Maryland's regulation of restricted-use pesticides. As mentioned previously, EPA regulates neonicotinoids as general-use pesticides.

Pesticide Use Restrictions and Requirements

All pesticides must be used in accordance with label directions. Pesticide users also must comply with MDA requirements regarding the application, storage, and transport of pesticides. Pesticides may not be applied without the express permission of the property's owner or other person with authority to exercise control, management, or possession of the property. Pest inspections must be performed in accordance with specified standards.

In addition, MDA issues licenses to pest control businesses and permits to public agencies that apply general or restricted-use pesticides, issues licenses to pest control consultants who identify pests or recommend pesticides, certifies private and commercial applicators, and registers employees who work under the supervision of certified commercial applicators. Private applicators are farmers and other individuals who apply restricted-use pesticides to their own land or rented land to produce agricultural commodities. Commercial applicators apply general-use and restricted-use pesticides as employees of pest control businesses and public agencies. All employees who perform pest control services must complete an approved training program and be registered with MDA within 30 days of employment.

Under MDA's regulations, pesticide applicators must consider alternative pest control measures, including mechanical, cultural, and biological control. Pesticide applicators also must take specified precautions to prevent off-target movement of pesticides, including into a water system, or other harm to humans, animals, or the environment. An applicator must notify MDA immediately of any accident or spill involving a pesticide. Only a certified applicator or a person working under the supervision of a certified applicator may use a restricted-use pesticide.

Pest control businesses must provide customers with specified information regarding the business and the pesticide applied, including the product label or an approved document containing health, safety, or precautionary information. Signs must be posted whenever a pesticide is applied to a lawn or exterior landscape plant. In addition, licensed businesses and public agencies must notify registered pesticide sensitive individuals prior to making lawn or ornamental pesticide applications to adjacent properties.

Enforcement

MDA's enforcement program includes routine inspections of pest control businesses, public agencies, private applicators, and restricted-use pesticide dealers. The inspections include a review of records, pesticide application equipment, personal protective and safety equipment, pesticide storage areas, and vehicles. MDA also conducts inspections of pesticide producing establishments, places where pesticide are sold or distributed, and pesticide products imported to or exported from the United States.

In addition, MDA observes actual pesticide applications to ensure compliance with labeled directions and regulations. MDA also collects samples and performs chemical analyses of pesticides, monitors produce for unacceptable levels of pesticides, investigates pesticide accidents

and consumer complaints regarding pesticide applications and pest inspections, and investigates suspected pesticide misuse.

MDA has the authority to issue several pesticide enforcement actions ranging from a letter of reprimand or a stop sale order to a civil penalty of not more than $2,500 for a first violation and not more than $5,000 for each subsequent violation. MDA may suspend, revoke, or deny any license, certificate, permit, or registered employee identification card. In addition, a person who violates any provision of the Pesticide Applicators Law or regulations is guilty of a misdemeanor and, upon conviction, is subject to a fine up to $1,000 or imprisonment up to 60 days.

Recordkeeping and Reporting

MDA is required to collect, analyze, and annually report data on pesticide use in the State. The reported data must include the number, types, and uses of pesticides and the number and types of enforcement actions. Licensees, permittees, and certified private applicators must keep specified records on all pesticides applied or recommended and pest identifications made. Dealers must maintain records on the sale or distribution of restricted-use pesticides. The records must be maintained for two years and available to MDA upon request. In addition, MDA has contracted with the U.S. Department of Agriculture's National Agricultural Statistics Service to conduct statewide surveys relating to pesticide use, most recently for the years 2011 and 2014-2015.

Schools and Child Care Facilities

Each public school system in the State is required to implement an integrated pest management program to minimize the use of pesticides in its school buildings and on school grounds. Integrated pest management is a pest control program that uses inspections, monitoring, and various methods of pest control, such as sanitation, structural repair, and other nonchemical methods, to keep pests from causing economic, health-related, or aesthetic damage. Pesticides may be used when nontoxic options are unreasonable or have been exhausted.

Each school system must designate a contact person to answer questions about the pest management program and to maintain a file of pesticide product labels and material safety data sheets. Schools must provide specified notices at the beginning of each school year, before a pesticide application, and within 24 hours after an emergency pesticide application.

In child care facilities licensed by the Maryland State Department of Education, a pesticide may be used only if the pesticide is (1) approved by EPA; (2) used according to the manufacturer's instructions; (3) used only when children are not in care; and (4) stored apart from food, beverages, and cleaning agents.

State Legislative Proposals

Senate Bill 163/House Bill 605 of 2015 would have (1) established a labeling requirement for any seed, plant material, or plant that has been treated with a neonicotinoid pesticide;

(2) prohibited a person from selling a neonicotinoid pesticide in the State unless the person also sells a restricted-use pesticide; and (3) prohibited a person from using a neonicotinoid pesticide unless the person is a certified applicator, a farmer who uses the product for agricultural purposes, or a veterinarian. The required label would have read: "WARNING: Bees are essential to many agricultural crops. This product has been treated with neonicotinoid pesticides, found to be a major contributor to bee deaths and the depletion of the bee population."

The General Assembly received extensive testimony on the legislation from a variety of stakeholders, including MDA, public health experts, beekeepers, pesticide applicators, and representatives from the agricultural community, the environmental community, and the public. Proponents of the legislation indicated that scientific studies support concerns that neonicotinoid use has adverse impacts on bees and other beneficial insects, aquatic organisms, birds, other wildlife, pets, humans, and ripple effects on agriculture, commercial and recreational fisheries, the food supply, and entire ecosystems. Additional issues raised by the proponents included improving consumers' ability to make informed decisions about plant purchases, reducing the misuse of neonicotinoid pesticides by home gardeners, the availability of less toxic pest management options, and concerns about current registration procedures and risk assessment methods. Many proponents advocated some use restrictions, pending further study results. Opponents of the legislation also raised many concerns, arguing among other things that:

- EPA is the lead agency on pesticide registration and labeling issues and initiating changes at the State level would lead to confusion and possibly compromise compliance;
- the labeling statement in the 2015 bills is incorrect, misleading, and unsubstantiated;
- the peer-reviewed studies published in reputable journals have not definitively demonstrated lethal or sublethal impacts in field studies conducted using realistic dosages;
- many factors negatively impact honey bee health, including habitat loss, decreased forage area, parasites, diseases, weather, hive management practices, and the incorrect use of pesticides;
- neonicotinoid pesticides are already highly regulated and, when used according to label instructions, are effective, efficient, inexpensive, and safe;
- restricting the use of neonicotinoids would result in increased use of older, more toxic, classes of pesticides;
- Maryland producers and sellers would be placed at a competitive disadvantage; and
- no action should be taken before more credible data is available and the presidentially mandated studies and EPA's review of neonicotinoid pesticides are complete.

State Actions Regarding Pollinator Health

Managed Pollinator Protection Plan

According to MDA, the department, in cooperation with the University of Maryland, is developing a Managed Pollinator Protection Plan (MP3), as promoted by the White House, EPA, and the National Association of State Departments of Agriculture. The primary purpose of the MP3 is to establish a systematic and comprehensive method for beekeepers, agricultural producers, pesticide applicators, and landowners, to cooperate and communicate in a timely manner that allows all parties to operate successfully within the State. It is intended that such communication facilitate practices that support both crop production and beekeeping. According to the National Association of State Departments of Agriculture, common elements of MP3's include, a public stakeholder participation process, a mechanism to identify managed pollinator colony locations, a method for growers and applicators to identify and contact beekeepers prior to application, and best management practices for both applicators and beekeepers to minimize the risk of pesticides to bees.

Sentinel Hive Program

In 2015, the University of Maryland initiated a pilot Sentinel Hive Program in Maryland to monitor honey bee health in real time by tracking, among other things, colony weight gain or loss and disease. Additionally, MDA will test pollen collected from these hives for pesticide residues to determine if and which pesticide residues may be impacting pollinators in the State. The purpose of the pilot program is to act as an early warning system to alert beekeepers of escalating health issues within the bee population and to inform the development of best management practices for beekeepers to improve honey bee health.

Habitat Increase

The Maryland Association of Soil Conservation Districts has worked with farmers in Maryland to establish 49 acres of pollinator friendly habitat on 53 farms in 15 counties under a USDA grant program.

Regulation of Pesticides at the Local Level

Local Law

Federal and State pesticide laws do not specifically address whether local jurisdictions may regulate pesticides. Consequently, a local jurisdiction may regulate pesticides in a manner that is at least as restrictive as, and consistent with, the applicable federal and State laws (*Wisconsin Public Intervenor v. Mortier*, 501 U.S. 597 (1991)). Examples of local regulations include sign requirements in Prince George's County, consumer information requirements in

Montgomery County, and an integrated pest management plan for county parks and athletic facilities in Anne Arundel County.

In addition, in 2013, Takoma Park generally restricted the use of certain cosmetic lawn pesticides, including several neonicotinoids, on private and public property. Ordinance 2013-28 phased in the restrictions, exempted specified types of pesticides and applications, and included penalty and public education provisions.

Local Legislative Proposals

More comprehensive pesticide legislation was introduced in Montgomery County in 2014, but as of September 2015, the Montgomery County Council has not yet voted on the proposal. Montgomery County Bill 52-14 generally bans the application of a nonessential pesticide to a lawn, restricts certain uses of nonessential and neonicotinoid pesticides on county property, adds a sign requirement, requires the Montgomery County Executive to make lists of nonessential pesticides and invasive species, and requires the adoption of an integrated pest management program for county property. In letters dated April 1, 2015 and May 21, 2015, in response to questions from members of the General Assembly, Assistant Attorney General Kathryn M. Rowe advised that, while a reviewing court may find that the proposed general ban on the application of nonessential pesticides to lawns is preempted by State law, the other parts of the legislation most likely would not be preempted.

Other Neonicotinoid Regulation and Pollinator Health Actions

Actions in Other States

Over 30 bills in 17 states, including Maryland, were introduced in 2015 to address pollinator health – 18 of these bills addressed the use of neonicotinoids. As of October 2015, none of these proposals have passed. In recent years, however, at least 14 states have enacted legislation regarding pollinator health. Generally, the legislation falls into one of five categories: research, pesticides, habitat protection, public awareness, and beekeeping.

Research

California, Kentucky, Massachusetts, Oregon, Virginia, and Washington have enacted legislation to study issues regarding pollinator health, including studies on pesticide use, the beekeeping industry, and Colony Collapse Disorder. More specifically, enacted legislation includes:

- California Assembly Bill 1912 of 2010 which created the California Apiary Research Commission to conduct research and develop education programs related to the health of honey bees and the beekeeping industry;

- Kentucky House Resolution 151 of 2014 which called on its universities to intensify research efforts regarding the decline of Kentucky's honey bee population and to work with farmers to manage crops impacted by honey bee losses;

- Oregon House Bill 4139 of 2014 which established the Task Force on Pollinator Health to, in part, examine regulations, education programs, and data collection methods of other jurisdictions. The task force made many recommendations including recommendations on labeling, applicator training, the use of best management practices, and research needs; and

- Washington Senate Bill 5882 of 2013 which required the State Department of Agriculture to convene a work group to address challenges facing beekeepers in Washington and to offer solutions. The workgroup's recommendations largely focused on promoting bee-friendly practices among beekeepers, farmers, state land managers, and weed control boards.

Pesticides

Arizona, California, Idaho, Indiana, Minnesota, Oregon, and Vermont have enacted legislation to protect pollinators from the effects of pesticides. The following are examples of recent enacted legislation:

- California Assembly Bill 1789 of 2014 required the state Department of Pesticide Regulation to complete the reevaluation of products containing neonicotinoids by July 1, 2018. The purpose of this reevaluation is to better understand the impact of neonicotinoid use on pollinator health;

- Indiana Senate Bill 314 of 2008 prohibits individuals from producing, transporting, storing, handling, or disposing of any pesticide or pesticide container in a manner that may cause injury to beneficial insects, including pollinators;

- Minnesota House Bill 3172 of 2014 authorized the commissioner of agriculture to take enforcement action for violations of law that result in harm to pollinators, including applying a pesticide in a manner inconsistent with the product's label;

- Oregon House Bill 4139 of 2014 required Oregon State University to develop educational materials regarding best practices for avoiding adverse effects of pesticides on populations of bees and other pollinating insect. The materials must be included as part of the education required for the pesticide applicator licensing examination; and

- Vermont House Bill 869 of 2014 required the state's agricultural agency to evaluate the effect of neonicotinoid pesticides on human health and the health of bees and other pollinators.

Habitat Protection

Kentucky and Minnesota have enacted legislation to protect and restore habitat suitable for pollinators. In Kentucky, state agencies must develop a plan to encourage coal licensees to locate and protect pollinator habitat on reclamation sites and to use high value trees and shrubs to aid in pollen transfer. Minnesota has appropriated funding to develop best management practices that protect pollinators by providing habitat necessary for their survival and reproduction. These practices must also be incorporated into pesticide applicator and county agricultural inspector training.

Public Awareness

Kentucky, New Jersey, Pennsylvania, and Virginia have enacted legislation to increase public awareness of the importance of pollinators. Examples of recent enacted legislation include official state designations, specialty license plates, and educational programs.

Beekeeping

Several states have enacted legislation to support beekeeping operations, including Hawaii, Idaho, Virginia, and Washington. Among the enacted legislation includes minimizing administrative burdens, fee and tax relief, and providing technical assistance to beekeepers.

Actions in Other Countries

Ontario, Canada

In July 2015, the Canadian province of Ontario adopted regulations restricting the sale and use of neonicotinoid-treated seeds to ensure that treated corn and soybean seeds are used only when there is a demonstrated pest problem. The regulations create a new class of pesticides, known as Class 12, for corn and soybean seeds treated with imidacloprid, thiamethoxam, or clothianidin. Under the regulations, a Class 12 pesticides vendor must be licensed and may not, beginning August 31, 2016, sell neonicotinoid-treated seeds to a person unless the person has completed integrated pest management (IPM) training, considers IPM principles before purchasing a Class 12 pesticide, and documents proof that there is a pest problem requiring the use of neonicotinoid-treated seed to control the pests. A Class 12 pesticides vendor is also subject to various reporting and advertising requirements.

European Union

In December 2013, the European Commission adopted a two-year restriction on the use of imidacloprid, thiamethoxam, and clothianidin for seed treatment, soil application, and foliar treatment on bee attractive plants and cereals, except for uses in greenhouses, for winter cereals, and for post-flowering applications. In May 2015, the European Food Safety Authority put out an

open call for new scientific information relevant to the evaluation of the risk to bees from the uses of imidacloprid, thiamethoxam, and clothianidin.

Private Retailer and Industry Action

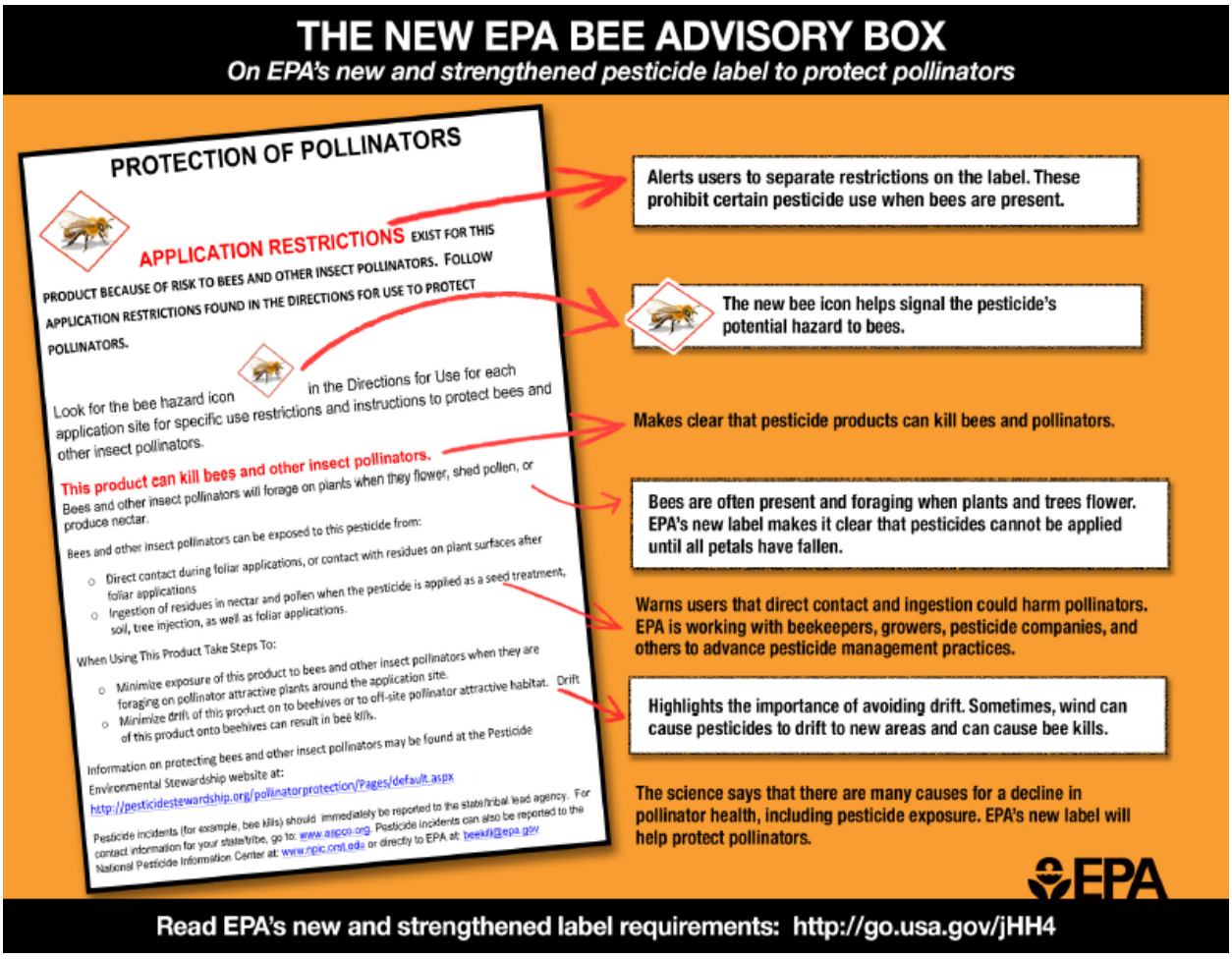
Several retailers of insecticides and plants treated with insecticides have also taken action. In response to consumer demand, at least one major retailer requires all plants that have been treated with neonicotinoids to be labeled as such. In April 2015, another major retailer expressed intent to phase out products containing neonicotinoids by 2019. Additionally, some nurseries, growers, and seed companies elect not to use neonicotinoids.

Conclusion

There is no clear indication that pesticides, including neonicotinoids, are the cause of honey bee population declines. While pesticides can be toxic to honey bees, the growing weight of evidence is that population losses are due to a combination of stressors. Neonicotinoids have not been shown to be lethal to honey bees if used properly, but are likely to have sublethal effects that scientists are continuing to research. A variety of best management practices are available and should be promoted for protecting honey bees and other important pollinators. Included among these practices:

- continue the use of integrated pest management practices;
- reduce the use of pesticides while hives are on site;
- follow label instructions to ensure proper application of pesticides;
- spray pesticides in the evening, night, or early morning when bees and pollen are not present;
- avoid spraying pesticides during flowering or when plants nearby are flowering;
- avoid application of pesticides for cosmetic purposes;
- notify nearby beekeepers and farms prior to pesticide application;
- dispose of pesticides and used containers properly; and
- increase honey bee habitat throughout the State, specifically around agricultural land.

As we continue to learn about the effects of neonicotinoids on pollinators and the environment, the State may consider allocating more resources to support the research and monitoring of honey bee and other pollinator populations, including research on the various stressors contributing to pollinator decline. EPA is reviewing neonicotinoids and pollinator health data and the State should monitor these activities. Additionally, several states have enacted legislation relating to neonicotinoids and pollinator health and many proposals are pending – these actions should also be monitored. Finally, when making decisions regarding neonicotinoid use and pollinator health, State lawmakers and regulators must be mindful of the many policies, laws, and regulations that exist at both the federal and State level.


THE NEW EPA BEE ADVISORY BOX
On EPA's new and strengthened pesticide label to protect pollinators
PROTECTION OF POLLINATORS
APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.
Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.
This product can kill bees and other insect pollinators.
Bees and other insect pollinators will forage on plants when they flower, shed pollen, or produce nectar.
Bees and other insect pollinators can be exposed to this pesticide from:
Direct contact during foliar applications, or contact with residues on plant surfaces after foliar applications
Ingestion of residues in nectar and pollen when the pesticide is applied as a seed treatment, soil, tree injection, as well as foliar applications.
When Using This Product Take Steps To:
Minimize exposure of this product to bees and other insect pollinators when they are foraging on pollinator attractive plants around the application site.
Minimize drift of this product on to beehives or to off-site pollinator attractive habitat. Drift of this product onto beehives can result in bee kills.
Information on protecting bees and other insect pollinators may be found at the Pesticide Environmental Stewardship website at:
http://pesticidestewardship.org/pollinatorprotection/Pages/default.aspx
Pesticide incidents (for example, bee kills) should immediately be reported to the state/tribal lead agency. For contact information for your state/tribe, go to: www.aapco.org. Pesticide incidents can also be reported to the National Pesticide Information Center at: www.npic.orst.edu or directly to EPA at: beekill@epa.gov
Alerts users to separate restrictions on the label. These prohibit certain pesticide use when bees are present.
The new bee icon helps signal the pesticide's potential hazard to bees.
Makes clear that pesticide products can kill bees and pollinators.
Bees are often present and foraging when plants and trees flower. EPA's new label makes it clear that pesticides cannot be applied until all petals have fallen.
Warns users that direct contact and ingestion could harm pollinators. EPA is working with beekeepers, growers, pesticide companies, and others to advance pesticide management practices.
Highlights the importance of avoiding drift. Sometimes, wind can cause pesticides to drift to new areas and can cause bee kills.
The science says that there are many causes for a decline in pollinator health, including pesticide exposure. EPA's new label will help protect pollinators.
EPA
Read EPA's new and strengthened label requirements: http://go.usa.gov/jHH4