Maine Board of Pesticides Control

Interim Report to Evaluate the Impact of Neonicotinoids on Pollinators, Humans and the Environment

ANNUAL REPORT
FISCAL YEAR 2026

MAINE DEPARTMENT OF AGRICULTURE CONSERVATION & FORESTRY

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Table of Contents

I. Acronyms and Definitions

BPC	Board of Pesticides Control
DACF	Department of Agriculture, Conservation and Forestry
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
LD_{50}	Lethal dose to 50 percent of a given test population
Listed species	Species that are federally threatened or endangered as defined by the ESA
MEPERLS	Maine Pesticide Enforcement, Registration, and Licensing Software
neonicotinoids	Neonicotinoid Pesticides
NPIRS	National Pesticide Information and Registration System
RfD	Human Reference Dose
SIGME	Stakeholder Information Gathering Meeting

Statement: No generative artificial intelligence (AI) was used in the creation of this report.

II. Overview and Background

Overview of LD 1323 Requirements

On June 12, 2025, the Governor signed LD 1323: Resolve, Directing the Board of Pesticides Control to Evaluate the Impact of Neonicotinoids on Pollinators, Humans and the Environment (Resolves 2025 c. 69) into law (Appendix A). This bill directs the Maine Board of Pesticides Control to create a research report related to neonicotinoid pesticides and neonicotinoid-treated seeds. This resolution also required the Board to host a stakeholder information gathering meeting to solicit information from the public and interested parties related to this bill. The report requires the Board to submit a preliminary report to the 132nd legislature on January 15, 2026, with a full report due on January 15, 2027. The goal of this preliminary report is to give an overall history of neonicotinoid regulations in Maine, outline any current data that the Board has related to neonicotinoids and neonicotinoid-treated seeds, and give a timeline for implementation of the full report.

Overview of Neonicotinoids

History and Development

Neonicotinoids are nicotine-like chemicals that represent the fourth generation of insecticides. neonicotinoids were preceded by earlier generations of insecticides, including carbamates, organophosphates, and pyrethroids. Compared to these earlier insecticides, the commercialization of neonicotinoids beginning in the 1990s was considered a major advancement in the development of insecticides for several reasons: they exhibit (*i)* efficacy and potency against a broad range of insects, (*ii)* flexible modes of application (*e.g.* spray, injections, and seed treatments), and (*iii)* decreased risk to mammals. Neonicotinoids are categorized into one of four classes or generations, which reflect their sequential development

(Thompson et al., 2020). This research report will focus on neonicotinoids binned to generations 1-3 for which Maine has product registrations; fourth-generation neonicotinoids have yet to be approved in Maine. Lastly, this section of the report seeks to (*i*) broadly introduce neonicotinoids and their various risks and (*ii*) compare these risks with the risks of other insecticides.

Neonicotinoids: Mode of Action

Neonicotinoids are insecticides that induce toxicity by binding to acetylcholine receptors, which regulate the nervous system and maintain physiological processes in insects. At very low concentrations, neonicotinoids cause insect mortality by overstimulating and dysregulating insects' nervous systems. Although other animals, including humans, also have acetylcholine receptors, the affinity of neonicotinoids towards insects is much greater compared to mammals, birds, and reptiles. This ensures the specificity of neonicotinoids towards insects and reduces the risk to off-target organisms.

Non-target Effects

The perceived "decreased" risk of neonicotinoids is not a "one-size-fits-all" assessment and is complicated by many factors and considerations. This makes an overall comparative risk assessment between neonicotinoids and earlier insecticides (*e.g*., carbamates, organophosphates, and pyrethroids) difficult, if not impractical. For example, although neonicotinoids are less toxic to humans and mammals compared to other insecticides, they are also more toxic to bees and earthworms. Additionally, neonicotinoids are very water-soluble. This feature creates a double-edged sword for environmental assessment: the water solubility of neonicotinoids increases their susceptibility to leach into groundwater, but at the same time decreases their bioaccumulation in the food chain.

Neonicotinoid vs. Alternatives Assessment

The Board is interested in assessing the risk of these chemistries to earlier types of insecticides. To meet this objective, we selected the three most commonly-used active ingredients in each insecticide class (*e.g.* carbamates, neonicotinoids, organophosphates, and pyrethroids. Collectively, we assessed and compared the risk of twelve insecticides. The risk assessments include environmental considerations, human health, and toxicity assays in a diverse group of animals. The data were collected from the EPA's Office of Pesticide Programs and the Pesticide Properties Database. Each dataset was then manually assembled into a heap map to show relative risks among the twelve different insecticides. Lastly, we assessed the risk of neonicotinoids in Maine relative to other states.

Environmental Risks

Figure 1 illustrates the inverse relationship that often exists between the impact of insecticides on two environmental risks: leaching and bioaccumulation. Most neonicotinoids have the potential to leach and contaminate groundwater and drinking supplies compared to organophosphates and pyrethroids. However, neonicotinoids are not bio-accumulative compared to carbamates, pyrethroids, and the popular organophosphate, chlorpyrifos. When consumed by mammals, water-soluble neonicotinoids are quickly excreted in the urine

compared to other insecticides (e.g., pyrethroids, chlorpyrifos, and carbamates), which are retained in the liver.

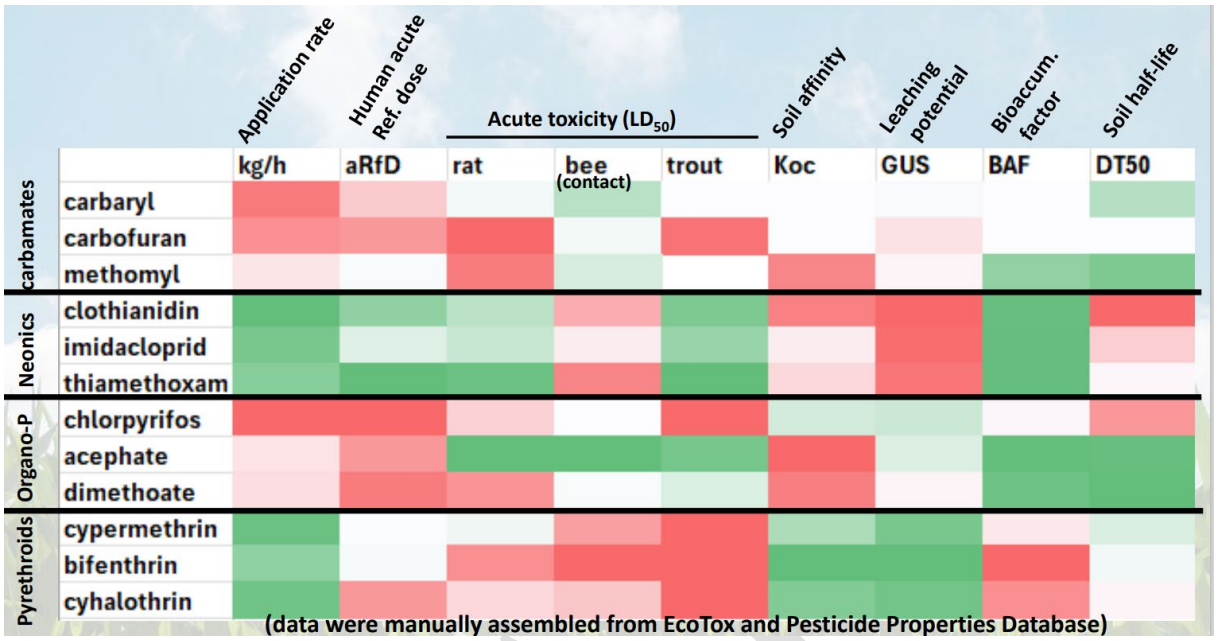


Figure 1. Heat map showing the relative risk of sixteen different pesticides. Dark red and dark green colors represent greatest risk and lowest risk, respectively.

Human Health

Although insecticide registrants cannot use humans in toxicity assays, the EPA establishes a Human Reference Dose (RfD) that is considered acceptable for both acute exposure (single high-dose) and chronic exposure (daily dose for a lifetime). Both values are calculated based on animal toxicity tests and then adjusted for uncertainty. Based on these RfD values, Figure 1 shows that neonicotinoids pose a lower risk to humans compared to earlier generations of insecticides. Humans are typically exposed to neonicotinoids via food and drink at levels below the RfD values; neonicotinoids consumed through the diet are eliminated quickly *via* urine (>90% in 24 h). Humans most at risk include applicators and children (<2 years) exposed to dog collars containing imidacloprid or indoor bed bug treatments. The mode of exposure to these infants is 40-100 times less than the concentration at which an adverse event is anticipated.

To better assess the risk of neonicotinoid alternatives, we compared the risk quotients of the top-three insecticides in each class (*e.g.* carbamates, organophosphates, and pyrethroids). This risk quotient was determined by dividing the maximum amount of insecticide that can be applied per hectare by the LD_{50} value in rats. Smaller values present a lower risk compared to greater values. These data were log-transformed to generate a heat map that visually represents the relative risk quotients for each insecticide. These data demonstrate that neonicotinoids present the least risk to applicators, while carbamates pose the greatest health risk to individuals working in agricultural settings.

	Raw value risk quotient	Log tranformed RQ (log)
carbaryl	4435	3.6
carbofuran	176000	5.2
methomyl	12000	4.1
clothianidin	20	1.3
imidacloprid	91	2.0
thiamethoxam	69	1.8
chlorpyrifos	8296	3.9
acephate	419	2.6
dimethoate	6833	3.8
cypermethrin	80	1.9
bifenthrin	1296	3.1
cyhalothrin	208	2.3

Figure 2. Risk quotient values both raw and log transformed for different insecticides. Larger numbers correspond to more risk. The risk quotient was determined by dividing the maximum concentration of an active ingredient that can be applied per hectare by the LD50 (lethal dose) in rats.

Animal Health

Figure 2 reveals that neonicotinoids pose minimal risk to humans compared to other insecticides. This trend is generally reflected in rats, bobcat quails, rainbow trout, shrimp, and midges.

Honeybees

Neonicotinoids are highly toxic to honeybees at low concentrations in both laboratory and field studies; this toxicity is observed for both contact and oral exposures. The increased risk of neonicotinoids compared to organophosphates and carbaryl also generally applies to other species of bees (Blacquiere et al., 2012). Figures 3 and 4 depict the results of a novel risk assessment that approximated the number of days it would take for a honeybee to reach LD_{50} if it were exposed to the average environmental concentrations of a given pesticide in the field. In particular, the study sheds light on the severe risks posed by neonicotinoids to honeybees through contact exposure. With the exception of acetamiprid, contact exposure to all neonicotinoids would cause 50% lethality in honeybees after four days or fewer. This risk of lethality increases to one-day for dinotefuran and thiamethoxam at the average environmental condition, which would be further exacerbated in cases where the concentration of these neonicotinoids on pollen exceeds the average.

Although it is widely accepted that neonicotinoids are extremely toxic to bees at low concentrations, there is a lack of consensus on whether or not they are a major driver contributing to population decline in the field. Recently, it was reported that pesticides, along with climate change and development, are contributing factors responsible for the extinction of pollinators on a national level (Cornelisse et al., 2025). While this may be particularly relevant to (*i*) midwestern states that heavily rely upon commodity crops or (*ii*) western states that contain a large number of threatened pollinators, this is more nuanced in Maine. For example, Maine was the only state where researchers were unable to isolate a major contributing factor that threatens pollinators.

There is only one study examining the prevalence and risk of pesticides to honeybees in Maine (Drummund et al., 2018). This study examined the concentration of pesticides in pollen at thirty-two honeybee colonies across Maine. The data demonstrate that herbicides and fungicides are detected more frequently in pollen compared to insecticides. Nine sites contained pollen tainted with insecticides, and neonicotinoids were only detected at two of these sites. Only one site contained tainted pollen at a risk quotient that was above a level of concern; this was for the insecticide phosmet. In this paper, the authors argue that land use (*i.e.* proximity to blueberry fields) is the largest predictor of contaminated pollen.

There is a dearth of data examining how pollinators respond to neonicotinoid-treated crops that are specific to Maine (*e.g.* blueberries and potatoes). A study in Michigan investigated the foraging behavior of honeybees in potato fields treated with or without neonicotinoids (Buchanan et al., 2017). In this study, neonicotinoids did not alter foraging behavior, as judged by examining the number of trips made per day and the length of time spent collecting pollen per trip. In summary, the limited datasets suggest that honeybees may not be at risk of NEO-toxicity when foraging on Maine-specific crops.

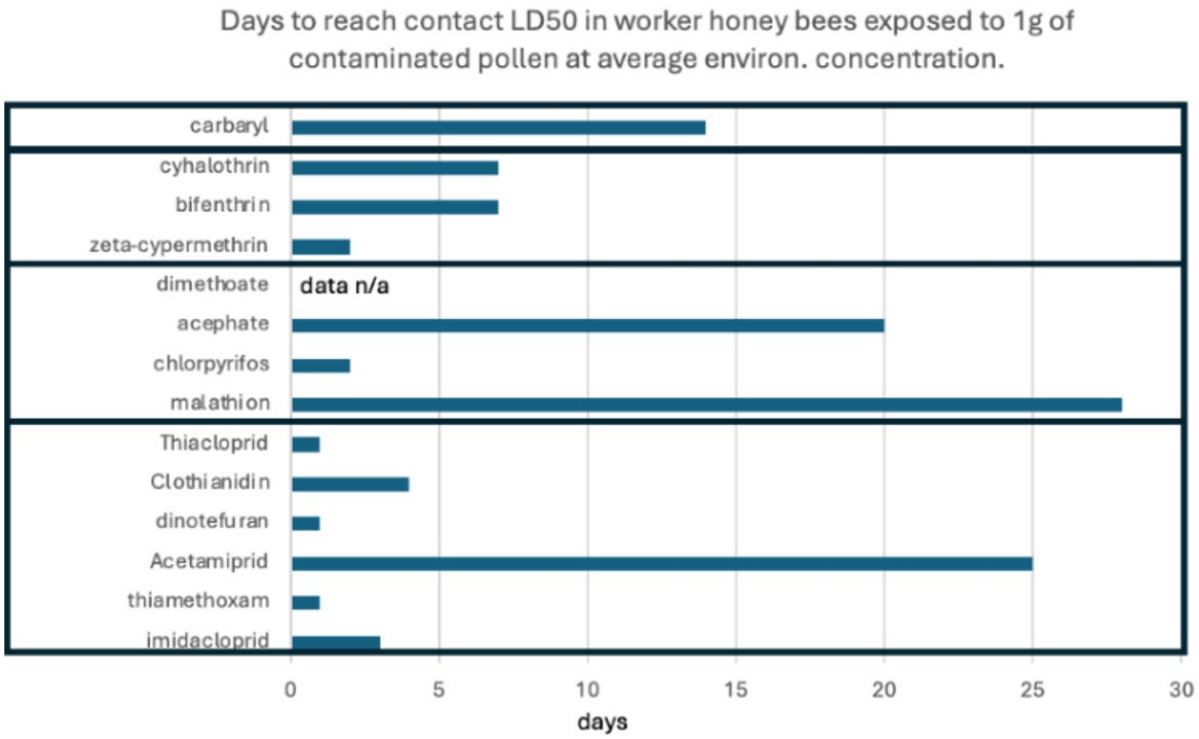


Figure 3. Risk assessment for honeybees from contact exposure to insecticides at their average environmental concentrations in the field. Data report the number of days to LD_{50} (lethal dose for half the population), which were originally reported by Sanchez-Bayo and Goka, 2014).

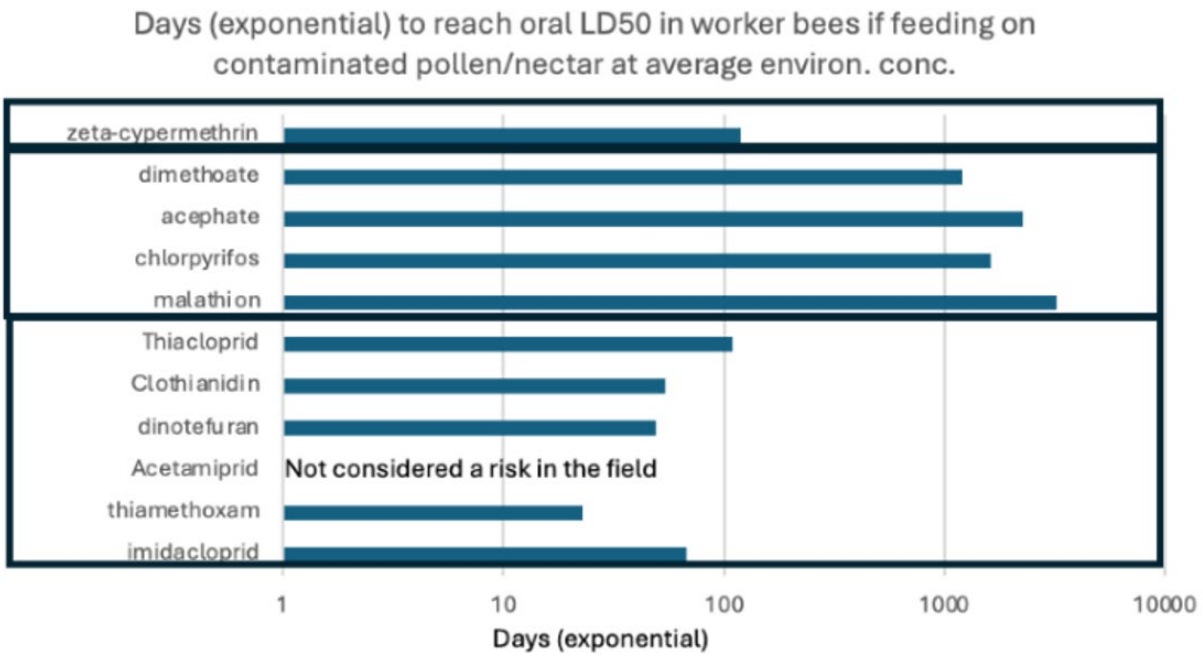
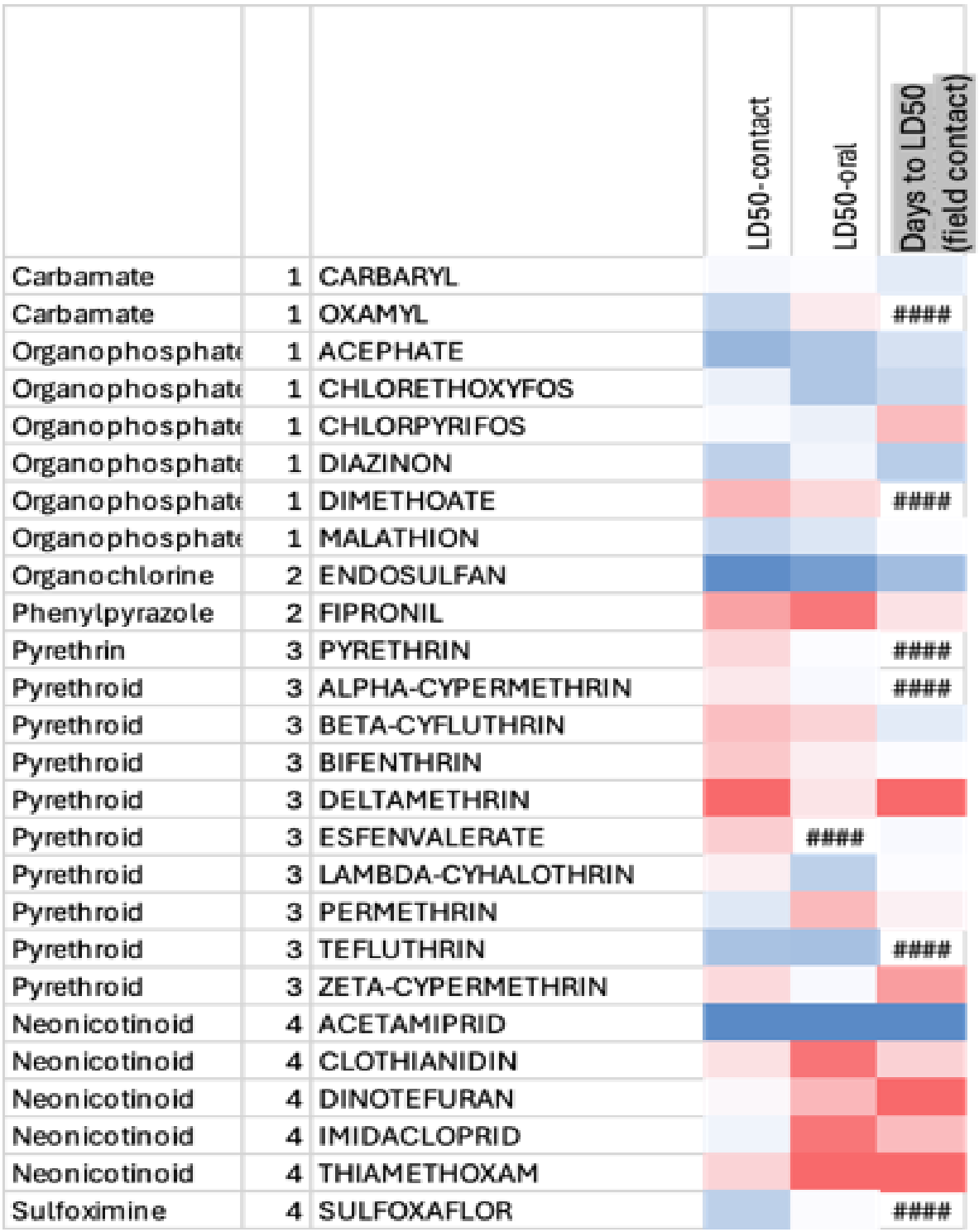


Figure 4. Risk assessment for honeybees from oral/diet exposure to insecticides at their average environmental concentrations in the field. Data report the number of days to LD_{50} (lethal dose for half the population), which were originally reported by Sanchez-Bayo and Goka, 2014).

Next, we further investigated the toxic effects of insecticides on honeybees by increasing our list to twenty-six pesticides. This more comprehensive examination further reveals the elevated risk neonicotinoids exhibit towards honeybees compared to other insecticides (Figure 5). These data reinforce the risk to honeybees that have contact with NEO-contaminated pollen in the field.



Carbamate	1	CARBARYL			
Carbamate	1	OXAMYL			####
Organophosphate	1	ACEPHATE			
Organophosphate	1	CHLORETHOXYFOS			
Organophosphate	1	CHLORPYRIFOS			
Organophosphate	1	DIAZINON			
Organophosphate	1	DIMETHOATE			####
Organophosphate	1	MALATHION			
Organochlorine	2	ENDOSULFAN			
Phenylpyrazole	2	FIPRONIL			
Pyrethrin	3	PYRETHRIN			####
Pyrethroid	3	ALPHA-CYPERMETHRIN			####
Pyrethroid	3	BETA-CYFLUTHRIN			
Pyrethroid	3	BIFENTHRIN			
Pyrethroid	3	DELTAMETHRIN			
Pyrethroid	3	ESFENVALERATE		####	
Pyrethroid	3	LAMBDA-CYHALOTHRIN			
Pyrethroid	3	PERMETHRIN			
Pyrethroid	3	TEFLUTHRIN			####
Pyrethroid	3	ZETA-CYPERMETHRIN			
Neonicotinoid	4	ACETAMIPRID			
Neonicotinoid	4	CLOTHIANIDIN			
Neonicotinoid	4	DINOTEFURAN			
Neonicotinoid	4	IMIDACLOPRID			
Neonicotinoid	4	THIAMETHOXAM			
Sulfoximine	4	SULFOXAFLOR			####

Figure 5. LD_{50} data for 26 insecticides for honeybee (*Apis meliferra)* oral and contact exposures. Dark red and dark blue colors represent greatest risk and lowest risk, respectively.

neonicotinoids also exhibit greater toxicity to earthworms compared to organophosphates. This heightened risk partially stems from the persistence of neonicotinoids in the soil, which can range from days to three years (Figure 6). With the exception of chlorpyrifos, the soil longevity of neonicotinoids compared to other insecticides increases the likelihood that earthworms will be exposed to neonicotinoids, and consequently, their risk.

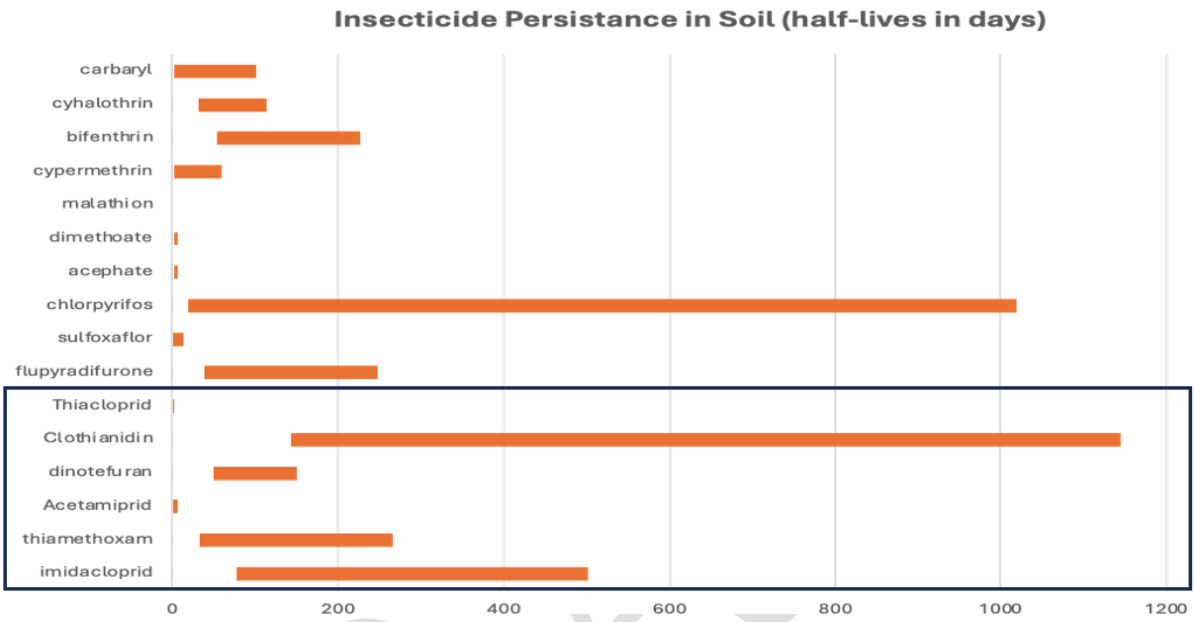


Figure 6. Range of reported half-lives (HT_{50}) of insecticides in soil medium, active ingredients highlighted in the blue box are neonicotinoids. The data collected are from lab-based studies conducted in controlled environments. Boxed active ingredients represent neonicotinoids.

Most neonicotinoids are applied to maize, soy, and cotton (USGS 2019, Figure 8). Maine does not produce large amounts of these crops compared to midwestern states (Figure 7). This predictably coincides with the relatively low usage of neonicotinoids in Maine in 2019. In states that grow a lot of crops and where neonicotinoids are applied in great quantities, it is statistically associated with decreased populations of birds (Li et al., 2020). These data suggest that bird populations can serve as a bellwether for the use of neonicotinoids. Notably, Maine appears to be the only state in the eastern USA that had a modest overall increase in bird populations (Figure 9). Although there are other contributing factors that can explain the increased bird populations in Maine, collectively the dataset hint that the risks of NEO are not as severe in Maine as they are in other states are heavily dependent upon maize, corn, cotton, or grapes (Figure 7).

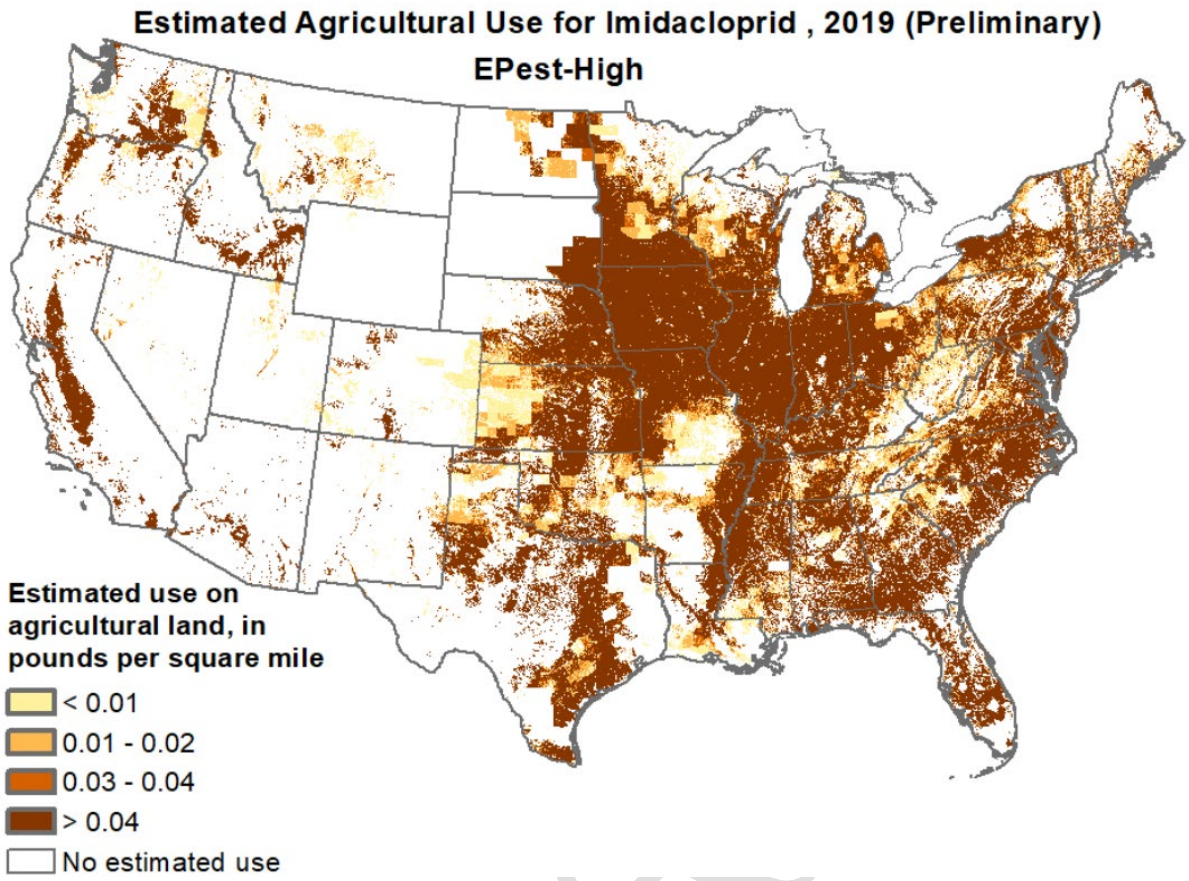


Figure 7. National trends of estimated imidacloprid use in 2019. This figure uses the EPest-High estimates, which include more extensive estimates of pesticide use not reported in surveys, which sometimes include States or areas where use restrictions have been imposed. This data is originally reported through the USGS Pesticide National Synthesis Project.

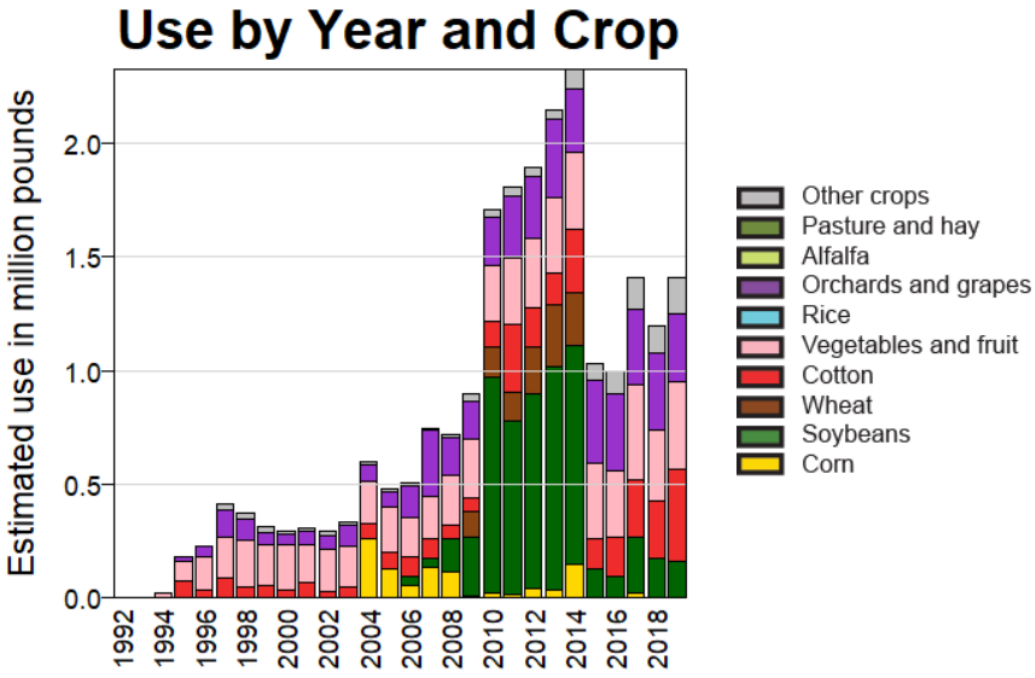


Figure 8. National trends of estimated imidacloprid use in 2019 by crop type. This figure uses the EPest-High estimates, which include more extensive estimates of pesticide use not reported in surveys, which sometimes include States or areas where use restrictions have been imposed. This data is originally reported through the USGS Pesticide National Synthesis Project.

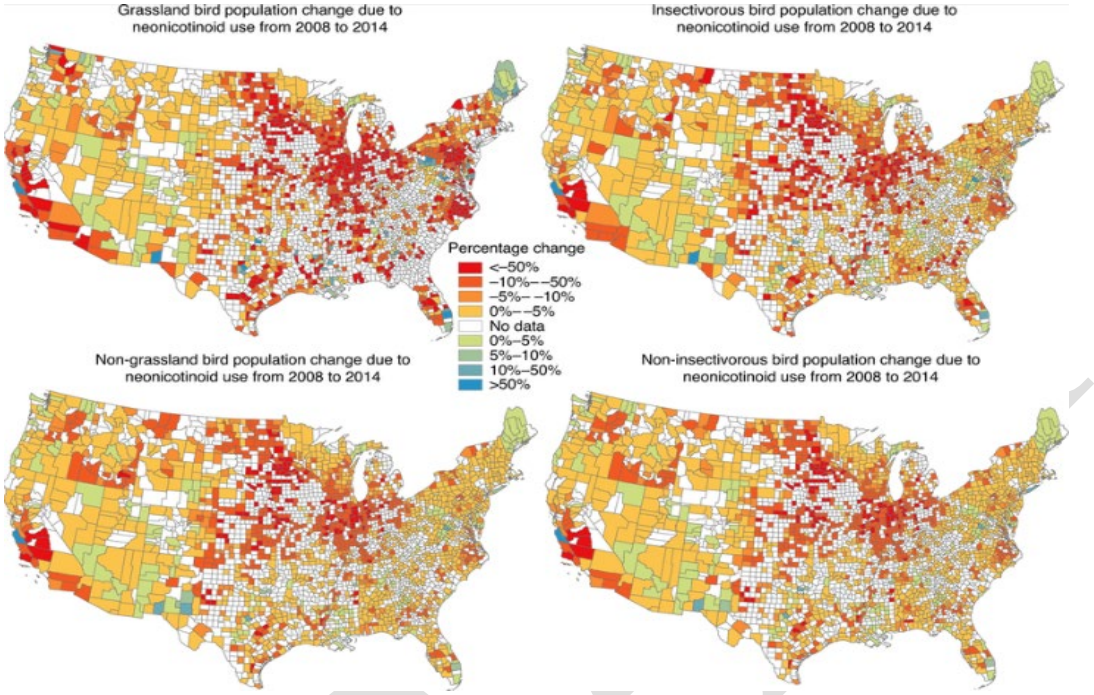


Figure 9. Estimated percent change in bird populations from 2008 to 2014 caused by neonicotinoids (Li et al. 2020).

Overview of Treated Seeds

Treated seeds are defined as seeds that are coated with a pesticide to reduce, control or repel disease organisms, insects or other pests that attack seed (US EPA 2022). Typically, the pesticide application is also accompanied by an application of a colorant to distinguish seeds that have been treated with a pesticide, often times utilizing a dye, dust, mist, or clay. Under 40 C.F.R. §152.25(a), treated articles (including seeds) are exempted from registration, so long as the pesticide used to treat the article or seeds are registered for use. This exemption has created confusion in the pesticide-regulated community, as it can complicate tracking the use of treated seed. Given this, there is limited information regarding the use of neonicotinoid-treated seeds, other than information available from pesticide registrant companies, dealers, and distributors. BPC anticipates including information gathered from the selected contractor for the full research report in 2027.

III. EPA Regulations and Activities Related to Neonicotinoids and Treated Seeds

EPA and ESA Reviews

In recent years, the U.S. Environmental Protection Agency (EPA) has been responding to litigation related to its implementation of the Endangered Species Act (ESA) in evaluating how pesticides might impact threatened or endangered species. Initially, the EPA planned to address its ESA obligations as each active ingredient underwent the Registration Review reevaluation process, which is required by FIFRA every 15 years. Since ESA requires that EPA consult with U.S. Fish and Wildlife Service and the National Marine Fisheries Service before making final registration review decisions, it was determined that addressing each active ingredient individually would take too long to implement any risk mitigation measures that may be needed to address ESA concerns. Therefore, EPA has since adopted the ESA workplan to evaluate pesticides in groups (Appendix B-1). Neonicotinoids are included in the insecticide strategy, which EPA plans to implement by issuing amended Proposed Interim Decisions for each active ingredient. EPA's goal had been to complete that in 2025, but due to other priorities and the federal government shutdown, the timeframe for the amended neonicotinoid PIDs is yet to be determined.

Key events in the EPA reevaluation of neonicotinoids:

- January 2020 - EPA completed Proposed Interim Registration Review Decisions on acetamiprid, clothianidin, thiamethoxam, dinotefuran and imidacloprid. In these documents, the agency proposed label changes to products containing these active ingredients to reduce exposure and risk to pollinators and other non-target organisms, including listed species. The proposals were released to the public for comments. These documents did not result in any mandatory label changes.
    - Appendix B-2
- June 2022- EPA released Biological Evaluations (BEs) for clothianidin, imidacloprid, and thiamethoxam. These BEs outlined the risk of active ingredients to listed species, which is summarized in Table 1 below. These documents did not result in any mandatory label changes.
    - Appendix B-3
- April 2025 - The final insecticide strategy plan was published in April 2025
    - Appendix B-4

Table 1. Biological Evaluations (BEs) from EPA. The BEs evaluate the effects of clothianidin, imidacloprid, and thiamethoxam on over 1,700 listed species and over 800 designated critical habitats in the United States. The full BEs can be found in Appendix B-3.

Clothianidin	• Will have no effect on 14 % of species and 17 % of critical habitats; • May affect but is not likely to adversely affect 19 % of species and 27 % of critical habitats; and • Is likely to adversely affect 67 % of species and 56 % of critical habitats.
Imidacloprid	• Will have no effect on 11 % of species and 10 % of critical habitats; • May affect but is not likely to adversely affect 9 % of species and 7 % of critical habitats;

	• Is likely to adversely affect 79 % of species and 83 % of critical habitats.
Thiamethoxam	• Will have no effect on 12 % of of species and 11 % of critical habitats; • May affect but is not likely to adversely affect 11 % of species and 7 % of critical habitats; and • Is likely to adversely affect 77 % of species and 81 % of critical habitats.

As a result of these findings, EPA has started the formal process of working in consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service (USFWS and NMFS, or "Services" in official EPA documents) to create formal biological opinions (BiOps) for each individual relevant listed species, which will use EPA's BEs and input from stakeholders. EPA will use these BEs and BiOps to make informed decisions on mitigation measures needed to protect species.

In the meantime, to implement some level of protection for listed species, the final insecticide strategy plan was published in April 2025 (Appendix B-4). The goal of this plan is to identify practical risk mitigation solutions for federally listed endangered and threatened species from the use of insecticides, while keeping other stakeholders like growers and pesticide users in mind.

EPA Determinations on Treated Articles and Treated Seeds

FIFRA exempts treated articles from pesticide registration (40 C.F.R. §152.25(a)), but it does regulate the pesticides used to treat articles, which must be registered. Pesticide labels must also list 'treating seeds' as a use site if products can be used as a treated article or as a seed treatment. In 2016, EPA published a memorandum titled "Refinements for Risk Assessment of Pesticide Treated Seeds – Interim Guidance" (Appendix C). This document outlines the agency's policy for conducting risk assessments of pesticides used as seed treatments, ensuring the use of appropriate risk assessment methodologies and providing potential options for refinement. In 2022, EPA responded to a petition from the Center for Food Safety (CFS), which requested that EPA change its article exemptions to not include seeds treated with pesticides from registration. This petition specifically outlined that EPA did not meet its obligations to assess risk by these treated seeds, specifically citing those that utilize systemic pesticides. In response, EPA did not agree with the petition and denied its requests. EPA's position was upheld in 2024 by a Federal court in California (*Center for Food Safety v. Environmental Protection Agency,* 3:23-cv-02714) in EPA's petition response, the agency mentioned its intent to issue an Advanced Notice of Proposed Rulemaking (ANPRM) to explore the option of rulemaking to further regulate the use of treated seed. The ANPRM was released for public comment in October 2023 (https://www.epa.gov/pesticides/epa-issues-advanced-notice-proposed-rulemaking-public-comment-seek-additional). It is unclear if this denial has satisfied the petitioner or if there will be further action by the agency.

Neonicotinoid and Neonicotinoid Treated Seed Regulations in Other States

California

In 2023, Assembly Bill No. 363 passed the California legislature, tasking the California Department of Pesticide Regulation with restricting the use of neonicotinoids. This bill requires that by January 1, 2025, neonicotinoid pesticide products used for non-agricultural uses on outdoor trees, turf, or ornamental plants can only be sold by licensed dealers and used by certified applicators.

Colorado

In 2023, the Colorado legislature passed Seante Bill 23-266. This bill states that on or before January 1, 2024, neonicotinoid pesticides shall be designated limited-use pesticides, and on or before July 1, 2024, neonicotinoid pesticides shall only be sold by licensed dealers.

Connecticut

In 2025, Connecticut's legislature passed Public Act no. 25-33, which provides that not later than January 1, 2018, the commissioner shall classify all neonicotinoids that are labeled for treating plants, as restricted use.

Nevada

Nevada's legislature passed Assembly Bill 162 in 2023, which prohibits the purchase or use of neonicotinoid pesticides on plants in this State except for commercial agricultural use.

New York

In New York, recent legislation regarding neonicotinoid and treated seeds has also been passed. Beginning December 31, 2024, Article 33 (ECL 33-1301(13)) prohibits the treatment of outdoor ornamental plants and turf with pesticide products containing clothianidin or dinotefuran and beginning December 31, 2026, this prohibition is further expanded to include pesticide products containing imidacloprid, thiamethoxam, or acetamiprid.

There are several exemptions to this prohibition which would allow the application of pesticide products containing clothianidin, dinotefuran, imidacloprid, thiamethoxam, or acetamiprid. These exemptions include:

- Applications on agricultural commodities;
- Structural commercial applications within one foot of a building foundation perimeter to manage structural pests provided that the application is not conducted on any blooming plants;
- Applications by, or under the supervision of, a certified applicator for treatment against invasive species affecting woody plants; and
- Applications conducted in accordance with a New York State Department of Environmental Conservation (NYSDEC) written order to address an environmental emergency.

Beginning January 1, 2029, Article 33 (ECL 37-1101(11)) prohibits the sale, offer for sale or use, or distribution of any corn, soybean, or wheat seeds coated or treated with pesticides containing clothianidin, imidacloprid, thiamethoxam, or any other neonicotinoid as determined by NYSDEC regulation in New York State.

There is an exemption to this prohibition which allows farms to request a waiver from NYSDEC to use corn, soybean, or wheat seeds coated or treated with pesticides containing clothianidin, imidacloprid, or thiamethoxam.

Vermont

In Vertmont, beginning July 1, 2025, pursuant to Vermont Act 182 of 2024, the following uses of neonicotinoid pesticides will be prohibited:

- Outdoor Application to Crops in Bloom
- Outdoor Application to Soybeans or Cereal Grains
- Outdoor Application to Certain Leafy and Bulb Vegetables, Herbs and Spices
- Application to Ornamental Plants

Neonicotinoid treated article seeds, commonly used in crops like soybeans and corn, are prohibited under Act 182. Specifically, the Act prohibits the sale, distribution, or use of neonicotinoid treated seeds for soybeans or any crop in the cereal grains crop group (crop groups 15, 15-22, 16, and 16-22) beginning January 1, 2029.

Washington

In Washington, beginning January 1, 2026, pursuant to RCW 15.58.485, a person may not use neonicotinoid insecticides on nonproduction outdoor ornamental plants, trees, and turf in this state, unless the application is made as part of a licensed application, a tree injection, or during the production of an agricultural commodity.

IV. Board Authority and Existing Rules

BPC Authority

The Maine Board of Pesticides Control (BPC) is the state-lead agency with governance over pesticides in Maine. Primacy for enforcement is given to Maine by the U. S. Environmental Protection Agency (EPA) through the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA, 7 U.S.C. §136-136y) and the Maine Revised Statutes Title 7 and Tile 22. The BPC is a 7-member public policy board with members appointed by the governor. These members hold 4-year terms, and must be comprised of individuals that fulfill specific criteria outlined in 7 MRSA §1471-B as follows:

To provide the knowledge and experience necessary for carrying out the duties of the board, the board must consist of the following members:

- *one person with practical experience and knowledge regarding the agricultural use of chemicals;*
- *one person who has practical experience and knowledge regarding the use of chemicals in forest management;*
- *one person from the medical community; a scientist from the University of Maine System specializing in agronomy, entomology or plant pathology having practical experience and expertise in integrated pest management;*
- *one commercial applicator;*
- *and 2 persons appointed to represent the public.*

The 2 members appointed to represent the public must have a demonstrated interest in environmental protection. A member appointed to represent the public may not have a financial interest in activities regulated by the board and may not be an individual who has been or is licensed, certified or given a permit in this State or any other state for activities regulated by the board. The term must be for 4 years, except that of the initial appointees, 2 serve 4-year terms, 2 serve 3-year terms, 2 serve 2-year terms and one serves a one-year term. Any vacancy must be filled by an appointment for the remainder of the unexpired term.

In addition to the Board, the BPC is also comprised of staff, who are the individuals employed by the state to operate and facilitate the day-to-day functions of the Board. These operations include conducting Board meetings, registering pesticide products, administering examinations and licensures, offering educational credits to existing licensees, providing toxicological guidance and research, enforcing compliance with regulations, and other related tasks. A complete organizational chart is available in Appendix B.

Existing Maine Neonicotinoid Rules

On June 10, 2021, the 130th legislature passed LD 155: Resolve, Directing the Board of Pesticides Control To Prohibit the Use of Certain Neonicotinoids for Outdoor Residential Use (2021 Resolves c. 33), which directed the BPC to prohibit the use of four neonicotinoid pesticides, dinotefuran, clothianidin, imidacloprid or thiamethoxam, from outdoor residential use unless otherwise exempted. This resolution presented a regulatory challenge for the Board, and the solution was comprised of language that prohibited their use in 'outdoor residential landscapes' and exempted certain uses in ornamental plant and turf to private or commercial applicators under Chapter 41: Special Restrictions on Pesticide Use (Appendix C, Table 2). Applicators or landowners seeking to apply these materials to outdoor residential settings outside of listed exemptions must submit a request to the Board for either:

a. A pest that could be added to the existing list (Table 2) that meets the definition of invasive invertebrate pests under CMR 01-026 Chapter 41, or
b. An emergency use permit that details the need for use of these materials in specific situations.

Table 2. Definitions for terms related to CMR 01-026 Chapter 41

Commercial Applicator	For professionals using any pesticide in a variety of occupations, a commercial license is required in all of the following situations: Application of any restricted-use pesticide for purposes other than producing an agricultural commodity; Use of any pesticide as a service for which compensation is received. Examples include lawn and landscape care; tree and shrub care; and home pest control; Use of any pesticide in a licensed food or eating establishment; Use of any pesticide in connection with duties as an official or employee of federal, state or local government; Use of any pesticide on non-agricultural sites open to public use. Examples include office and apartment buildings and grounds; golf course, campgrounds, and other outdoor recreation facilities; hospitals and nursing homes; and retail and commercial spaces.
Emergency Use	Under CMR 01-026 Chapter 41: Special Restrictions on Pesticide

Permit	Use, Section 5, emergency use permits may be granted to certified applicators seeking to use dinotefuran, clothianidin, imidacloprid or thiamethoxam in outdoor residential settings. Requirements for emergency use permit applications are as follows: Emergency use permit applications shall be made on such forms as the Board provides and shall include at least the following information: I. The name, address and telephone number of the applicant; II. The area(s) where pesticides will be applied; III. The purpose for which the pesticide application(s) will be made; IV. The approximate application date(s); V. The type(s) of application equipment to be employed; VI. The approved pest species for which the application is being made as defined in policy or by the board; and VII. The particular reasons why the applicant seeks a variance from the requirements of this section, including a detailed description of the techniques to be employed to assure that a reasonably equivalent degree of protection of surrounding nontarget vegetation will be obtained.
Invasive Invertebrate Pest	"Emerging Invasive Invertebrate Pests" means any invertebrate, including its eggs or other biological material capable of propagating that species that occurs outside of its eco-region and its introduction causes or is likely to cause economic or environmental harm, or harm to human, animal, or plant health, to include: Species both known now and unknown now but showing up at a later date; Species that occur outside of their eco-region (level III) as defined by EPA; and Species on a Board approved list. Current species on the Board approved list are outlined in the Board policy "Policy On Approved Invasive Invertebrate Pests On Ornamental Vegetation In Outdoor Residential Landscapes For Neonicotinoids Exemption" and include 3 species: • Asian long-horned beetle (Anoplophora glabripennis) • Emerald ash borer (Agrilus planipennis)

	• Hemlock woolly adelgid (Adelges tsugae)
Private Applicators	For growers who annually sell more than $1,000 of plants or plant products intended for human consumption and who use only general-use (over-the-counter) pesticides on property owned or leased by them. These include: Growers of fruits, vegetables, herbs, and grains for human consumption; Growers of the above crops who make bread, jam, french fries, wine, cider, juice, etc., or who sell produce to be processed into these products; and Greenhouse growers selling fruit, vegetable, and herb seedlings. Medical marijuana growers

To date, the Board has not granted any emergency use permits nor has it added additional pests to the exempted list of applicable pests since these rules were established.

Treated Articles and Treated Seed Regulation in Maine

Given that treated seeds and articles are exempted under EPA's 40 C.F.R. §152.25(a), they are treated similarly in Maine. Seeds themselves are not registered for use, but the products used on seeds are regulated. Maine does have a treated seed (category 4) commodity category for commercial applicators who treat their own seeds with pesticides within Maine. The competency standards and requirements are outlined in CMR 01-026 Chapter 31: Certification And Licensing Provisions/Commercial Applicators (Appendix E):

Section 2 ***Categories of Commercial Applicators***
IV. ***Seed Treatment***

This category includes commercial applicators using or supervising the use of pesticides on seeds.

Section 3 ***Competency Standards for Certification of Commercial Applicators***
IV. ***Seed Treatment***

Applicants seeking certification in the category of Seed Treatment as described in Section 2(A)(IV) must demonstrate practical knowledge of seed types and problems requiring chemical treatment. Such knowledge shall include seed coloring agents, carriers and binders which may affect germination, hazards associated with handling, sorting, and mixing in the treatment process, hazards of introduction of treated seed into food and feed channels, and proper disposal of unused treated seeds.

To date, there is 1 applicator with seed treatment commodity in Maine. This category is unpopular, given that most seeds can be treated outside of Maine and imported, so long as the pesticide is registered in Maine.

Registrations of Neonicotinoids in Maine

Both FIFRA Section 3 and 25 (b) exempted pesticides are regulated by the BPC in Maine. Table 2 lists all of the neonicotinoid pesticides in Maine, by active ingredient, that are currently registered for use.

Table 3. Neonicotinoid pesticides registered for use in Maine 2025 - 2026. As registrations fluctuate throughout the year, this list was created on November 17, 2025, and only represents products that were registered before this date. "Restricted" products refer to those identified to contain dinotefuran, clothianidin, imidacloprid or thiamethoxam that have residential outdoor uses and are subject to the restrictions in CMR 01-026 Chapter 41, Section 5 (Appendix C). Registration information compiled using the National Pesticide Information Retrieval System.

Active Ingredient	**Number of Active Registrations**
Imidacloprid	343
Dinotefuran	36
Clothianidin	29
Thiamethoxam	27
Acetamiprid	31
Thiacloprid	0
State Restricted Neonicotinoid Registrations	112
Total Neonicotinoid Registrations 2025-2026 *(Some neonicotinoid products contain more than one neonicotinoid active ingredient)*	463

Currently, 26 neonicotinoids are registered for use as seed treatments. These products are applied to crop seeds and are often formulated in combination with fungicides to protect the seeds before planting. Two of the 26 seed treatment products are state-restricted, none are federally restricted.

Assessing patterns of neonicotinoid registrations in Maine

During the development of the rules implemented for neonicotinoids, some public commentary indicated that product registrations might decline after restrictions on use types were set in 2021. To analyze this, Maine registrations and registered uses were mined in the National Pesticide Retrieval Information System (NPIRS) for 2021 and 2025. The number of registrations and label use sites were compared between 2021 and 2025 (Table 4, Figure 9). Registrations for imidacloprid decreased in Maine in 2025, but the number of uses nearly stayed the same compared to 2021. Overall, these data suggest that legislation enacted in 2021 did not alter the number of neonicotinoid registrations. However, it is worth noting that the number of registrations may not directly correlate with the amount applied.

Table 4. Neonicotinoid Registrations and Uses in Maine. Registration information compiled using the National Pesticide Information Retrieval System (NPIRS).

	Clothianidin	**Dinotefuran**	**Thiamethoxam**	**Imidacloprid**
2021 Registrations in Maine	28	26	29	390
2025 Registrations in Maine	28	36	27	327
Uses				
Ornamental Plants (2021)	10	11	16	195
Ornamental Plants (2025)	11	11	19	177
Non-crop, Wide Area and General (2021)	11	6	5	127
Non-crop, Wide Area and General (2025)	11	6	5	126
Miscellaneous Uses (2021)	9	7	16	53
Miscellaneous Uses (2025)	10	9	17	58
Agricultural (2021)	10	7	18	107
Agricultural (2025)	10	3	15	105
Pets and Domestic Animals (2021)	65	9	3	157
Pets and Domestic Animals (2025)	12	23	3	138
Wood or Wood Structure Treatments (2021)	8	2	3	52
Wood or Wood Structure Treatments (2025)	7	2	3	55
Domestic and Human Uses (2021)	10	10	12	61
Domestic and Human Uses (2025)	10	12	11	68

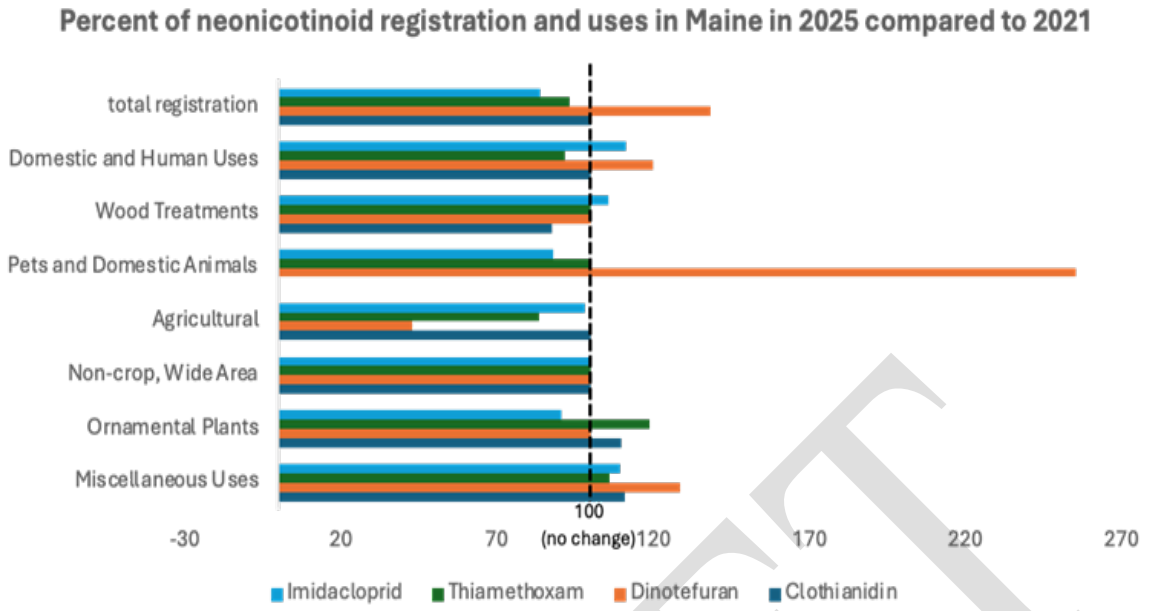


Figure 9. Percent of neonicotinoid registration uses in Maine in 2025 compared to 2021. Registration information compiled using the National Pesticide Information Retrieval System (NPIRS) and Maine Pesticide Enforcement, Registration, and Licensing Software (MEPERLS).

Regulatory Challenges with Existing Rules

The existing rules for neonicotinoids pose several challenges. These rules require the Board to maintain a whitelist of species, invasive invertebrate pests, for which treatments may be made by commercial and private applicators. Board staff have been maintaining an annual list of state-restricted neonicotinoids since the passage of LD 155 (2021 Resolves c. 33) in 2021. The first list was produced in the spring of 2022. Products included in the list contain the active ingredient dinotefuran, clothianidin, imidacloprid, or thiamethoxam and are labeled for applications in outdoor residential landscapes. Prohibiting specific neonicotinoid applications and use types, like 'outdoor residential landscapes', presents a challenge for Board staff. Ensuring an accurate list requires intensive label interpretation and constant surveillance of label updates from product registrants and EPA. Database tools, like NPIRS, can assist in creating an annual list, but it may be incomplete if the registrant has not listed all possible use types. Furthermore, restricting a single-use type would not limit the language on labels distributed nationally. Products in Maine would still outline instructions for the use types that are not nationally restricted in the Directions for Use section of the label, which, without public outreach to educate homeowners, could cause confusion.

V. Maine Neonicotinoid Data

Crop Types and Sales and Use Data

According to the USDA 2024 State Agriculture Overview, Maine's major harvested crops are potatoes, wild blueberries, hay and hay silage, corn, maple syrup, barley, and oats (USDA, 2024). Additionally, Maine produces a high amount of dairy, which is reflected in its corn production and is often grown for feed. BPC anticipates including a breakdown of each of the

major crops in Maine and how neonicotinoids might be used in each crop type in the full research report in 2027.

In addition to crop type, BPC also anticipates including its available data on sales and use of neonicotinoid pesticides in Maine. As of this year, Maine now requires that annual sales reports (Pesticide Dealers) and annual use reports (Commercial Applicators) must be submitted electronically via the BPC's portal, Maine Pesticide Enforcement Registration and Licensing Software (MEPERLS). While useful, this data is self-reported and BPC does not have additional staff or resources to fully validate and quality control these data.

Cultivated Bee Data

The Maine Apiary Program, located within DACF, is designed to prevent the introduction and/or spread of regulated honeybee diseases, parasites, and undesirable genetic material in resident and migratory honeybee colonies, as well as encourage and maintain interstate movement of honeybees for crop pollination and honey production. Additionally, this program tests for pesticides and contaminants every three years, alternating between wax and pollen.

Since 2018, only one detection of a neonicotinoid pesticide has been recorded in these samples, which occurred in bee bread (pollen) samples from one hive in Washington County in 2022 at 7 ppb (parts per billion), just two ppb above the detection limit. There were no detections of neonicotinoids in other data provided for 2018 – 2024. BPC anticipates including discussions about recent research related to neonicotinoids and pollinators in the full report. Maine published a Pollinator Protection Plan in 2017, which is included in Appendix D.

Water Quality Data

The Board of Pesticides Control has maintained its long-standing commitment to testing, recording, and publishing data regarding pesticide presence in Maine's waters. In recent years, testing for specific active ingredients has expanded to include neonicotinoids.

The results below represent all water samples tested for neonicotinoids to date. It is essential to note that these samples were obtained from various sources, under different sampling designs, and are subject to varying Quality Assurance and Quality Control practices. They were not derived from a single, statewide study aimed at characterizing the presence of neonicotinoids in water. However, these findings may offer initial evidence that neonicotinoids have been detected in the ground and surface water in Maine. Full reports of all of these water quality reports can be found on the BPC's water quality program webpage.

BPC Water Quality Instances of Neonicotinoid Detection

2014 Groundwater Update to the Board

- 50 samples were taken from 47 domestic wells
- Clothiaidin – 1 detection at 0.032 ppb
- Imidacloprid—7 detections, highest detection 0.033 ppb
- Thiamethoxam – 5 detections, highest detection 3.8 ppb

2021 Water Quality Study

- Imidacloprid – 14 Detections, highest detection 0.11ppb
- Clothianidin – 2 Detections
- Thiamethoxam was tested for but not detected; all other neonicotinoids were not included in the study

2023 Aerial Forestry Study

- Imidacloprid – 2 Detections, highest detection 0.0043
- Thiamethoxam and clothianidin were tested for with no detections; all other neonicotinoids were not included in the study

2025 Variance Study

Results are not complete as of November 18, 2025

- Clothianidin – tested for and not detected
- Imidacloprid – 5 detections, highest detection 0.1 ppb
- Thiamethoxam was tested for but not detected; all other neonicotinoids were not included in the study

A full 2025 variance study report is expected in Spring 2026 for samples taken in 2025 at pesticide variance permit application sites.

VI. Anticipated Implementation of LD 1323 (2025 Resolves c. 69)

Requirements of LD 1323

The Board anticipates hiring an outside consulting firm to assist in the creation of the full report, which is due in January 2027. Currently, board staff are preparing a Request for Proposals (RFP) for a contract with a firm that will create a research report that covers the major provisions of LD 1323. The main areas of topic for the full research report include:

1. The impacts of neonicotinoids, including neonicotinoid-treated seeds, on pollinators;
2. The costs and benefits of neonicotinoid-treated seeds compared to untreated seeds, including the market availability of neonicotinoid-treated seeds compared to untreated seeds;
3. The impact of neonicotinoids on the environment, including, but not limited to, soil, water and plant tissues;
4. The toxicity of neonicotinoids to humans;
5. Alternatives to neonicotinoid seed treatments for the protection of crops from damaging pests and disease;
6. The toxicity of effective alternatives to neonicotinoids and neonicotinoid-treated seeds that may be used for the protection of crops from damaging pests and disease; and
7. Methods of application of alternatives to neonicotinoids and neonicotinoid-treated seeds and the required number of applications for effectiveness.
8. Special consideration to effects on potato crops and corn crops

Board staff also anticipate providing information, data, and resources on additional topics related to neonicotinoids and neonicotinoid-treated seeds in order to complete a fully cohesive research report that will better inform future policy specific to Maine.

As required by Section 2 of the Resolve, the Board will also conduct Stakeholder Informational Gathering Meetings (SIGME) to solicit feedback from interested parties on information and resources they would like included in the full report, as well as general feedback about neonicotinoids and neonicotinoid-treated seed use in Maine. The Board anticipates holding these meetings during their March 2026 Board meeting, with a date TBD pending the 2026 Board meeting schedules, which are typically every 6 weeks. To best reach this audience, the Board will announce the SIGME through the GovDelivery system, on its public-facing website, and on its existing social media accounts.

VII. Appendices

Appendix A: LD 1323
Appendix B-1: ESA Workplan
Appendix B-2: Proposed Interim Registration Review Decisions on Acetamiprid, Clothianidin, Thiamethoxam, Imidacloprid, and Dinotefuran
Appendix B-3: EPA BE's for Imidacloprid, Thiamethoxam and Clothianidin
Appendix B-4: EPA Final Insecticide strategy
Appendix C: CMR 01-026 Chapter 41: Special Restrictions on Pesticide Use
Appendix D: Pollinator Protection Plan
Appendix E: CMR 01-026 Chapter 31: Certification And Licensing Provisions/Commercial Applicators

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