Feb 4, 2026

Marc Korman, Chair
Environment and Transportation Committee,
House Office Building, Room 251
6 Bladen St., Annapolis, MD 21401

RE: Testimony of the Natural Resources Defense Council in Favor of HB 0091.

Dear Chair Korman and Members of the Committee:

We write and submit the following testimony on behalf of the Natural Resources Defense Council and its thousands of Maryland members in support of HB 0091, a bill to curb wasteful and unnecessary uses of neonicotinoid insecticides, or "neonics." Our testimony provides the following information:

- **Peer-reviewed research from the University of Maryland** finds that field crops planted in Maryland and across the Mid-Atlantic region saw **no yield benefit from neonic-treated seeds.** Despite this, neonic-coated seeds may now represent the **largest annual deployment of insecticides in U.S. history**, with pollution building up in Maryland's environment.

- Eliminating needless uses of neonics works. Since 2019, **Quebec, Canada, has eliminated virtually all neonic seed treatment use for corn, soybean, and wheat without reducing yields,** and **New York and Vermont adopted a similar model** in 2024. Minnesota, Colorado, New Hampshire, Massachusetts, and Pennsylvania are currently all considering comparable restrictions this year.

- **Lawn and garden neonic uses are also prophylactic and needless** or could be replaced with safer alternatives. New York, New Jersey, Connecticut, and Nevada have also similarly prohibited non-agricultural neonicotinoid lawn and garden use, except in certain cases to treat invasive species.

- The science is now unequivocal that **neonics are a lead cause of dramatic losses of bees and other pollinators** that cut into farmers' bottom lines, harm beneficial insects that naturally control pests, and threaten the viability of our food systems.

- Research **links neonic contamination to mass losses of birds and fish, the hollowing out of ecosystems, and birth defects and stillbirths in white-tailed deer.**

- **Neonics also threaten Marylanders' health.** Neonics appear in the bodies of half the U.S. population at any given time, and other research links neonics to **birth defects of the heart and brain and cognitive impairment** in prenatally exposed children, as well as lower testosterone, sperm count, and sperm quality in adults. More recent research **detected neonics in the bodies of more than 95% of pregnant women tested across the country**, with levels steadily rising, indicating worsening, widespread exposure.

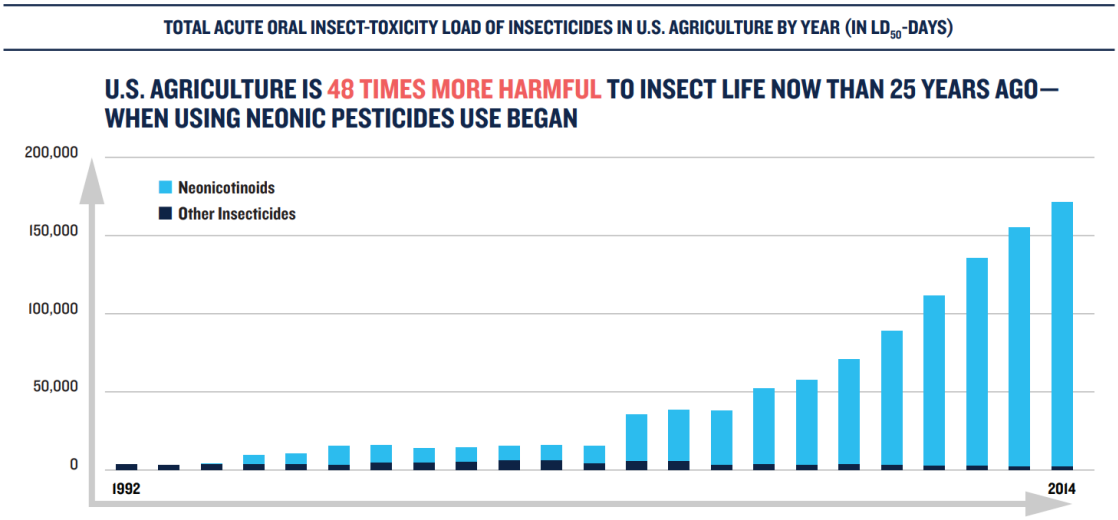
While federal actors have failed to address what many hail as a neonic driven "Second Silent Spring," this Committee has the power to act. NRDC strongly supports HB 0091's purpose to restrict wasteful neonic use. With more damage done every day, Maryland's legislature must act too.

Neonics Are Toxic, Persistent, and All Around

Neonics are neurotoxic pesticides that kill insects by permanently binding to, overstimulating, and ultimately destroying their nerve cells.[1] Insects poisoned with neonics often exhibit twitching, followed by paralysis and then death.[2] There are three factors that make neonics especially problematic for the environment and public health.

First, neonics are extremely toxic to insects and other invertebrates**. Just one square foot of lawn treated with a neonic product at EPA-approved rates can contain enough neonic active ingredient to kill over one million bees.**[3] And even at miniscule, non-lethal doses, neonics weaken critical functions, such as an insect's immune system, navigational ability, stamina, memory, and fertility—making it harder or impossible for them to survive.[4] Recent research has shown that a single exposure to a neonic can reduce population growth rates for multiple generations.[5]

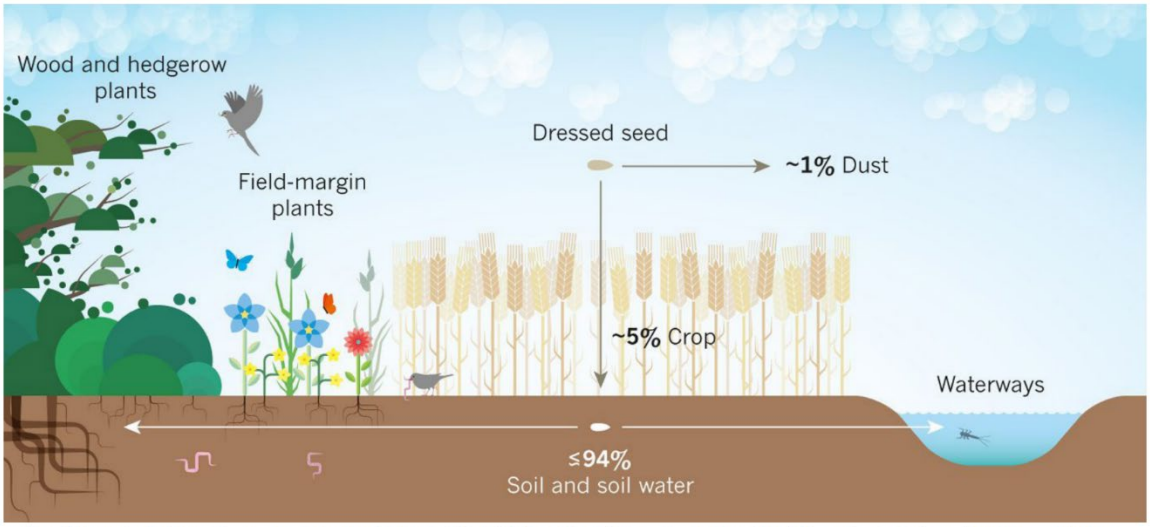
One study estimates that since neonics were first introduced, U.S. agriculture has become 48-times more harmful to insect life.[6] Ninety-eight percent of this increase was attributable to neonics, the number one use of which is on treated seeds.



Data from Michael DiBartolomeis et al., "An Assessment of Acute Insecticide Toxicity Loading (AITL) of Chemical Pesticides Used on Agricultural Land in the United States," *PLoS One* (August 6, 2019).

Second, neonics are exceptionally good at contaminating the entire environment. Unlike older, conventional insecticides, neonics are designed to be "systemic," meaning they are absorbed by plant tissues in order to make the plant itself—including its nectar, pollen, and fruit—toxic. This property allows neonics to be applied as a coating on a plant's seed, which the plant then absorbs as it grows.

Treated seed applications are remarkably inefficient and likely to lead to widespread pollution. Of the typical neonic treatment on a corn or soybean seed, **only 2-5% of the active ingredient is absorbed into the target plant—leaving the other 95+% in the soil,[7] where the chemicals persist for years.[8]** Once in the soil, neonics are easily carried considerable distances by rain or irrigation water to contaminate new soil, the plants in that soil (as they absorb the chemicals and also become toxic), and water supplies.[9]



Reprinted by permission from Springer Nature: Dave Goulson, "Pesticides Linked to Bird Declines," *Nature* 511, no. 7509 (July 2014): 295-96, https://go.nature.com/2rNOZcK.

Third, **neonics are the most widely used insecticides in the United States. Nearly all conventional corn, about two-thirds of conventional soybean seeds, and roughly a quarter of wheat seeds are pretreated with neonics,[10] meaning neonics are used on over 848,000 acres in Maryland—for these three crops alone.[11]** But they are approved for use on over 140 crops, as well as on lawns and gardens nationwide. The five major neonic chemicals approved for outdoor use—acetamiprid, clothianidin, dinotefuran, imidacloprid, and thiamethoxam—appear in more than a thousand products.

Because neonics build up in areas of year-after-year use[12] and spread out with each rainfall or watering, their extensive and continual use means that there are large portions of the country where neonic contamination of soil, water, and plant life is virtually ubiquitous.

Neonics Drive Pollinator Losses, Threatening Farmers' Bottom Lines and Food Security

Pollinators are critical to agricultural production. Yet, **since the mid-2000s—**when annual losses of honey bee colonies skyrocketed nationwide—**Maryland beekeepers have consistently lost around 40% or more of their colonies each year**.[13] While total bee colony levels remain steady due to the considerable, expensive, and potentially unsustainable efforts of beekeepers to breed and replace lost colonies, the same is not true for disappearing populations of the state's 400+ wild bee species and other pollinators that contribute significantly to crop pollination.

Among all the stressors affecting bees, only the dramatic uptick in the use of neonicotinoid pesticides in the mid-2000s—mainly from increased use on corn and soybean seeds[14]—matches

the dramatic uptick in bee losses witnessed at precisely that time.[15] Since that time, **a large and growing body of research confirms neonics are a leading cause of bee and other pollinator declines, including several comprehensive global literature reviews[16] and the largest neonic field study to date—actually funded by the pesticide industry itself.**[17] In 2020, Cornell University published its own review of over 1,100 studies finding substantial harms from a broad variety of neonic uses, most notably from treated corn, soybean, and wheat seeds, as well as non-agricultural turf and ornamental uses.[18]

These neonic-driven pollinator losses are already harming farmers. A 2023 study estimates that inadequate pollinator populations are reducing production of fruits, vegetables, and nuts by 3-5% worldwide.[19] Reduced production of these healthy foods is, in turn, leading to an estimated 427,000 additional preventable deaths annually.[20] And these deaths are disproportionately in wealthier countries like the United States, where reduced access to healthy foods is more likely to shift people's diets to cheaper, unhealthy alternatives.

These findings are of particular concern to **Maryland, where pollination-depending crops make up a large portion of the agriculture sector and are valued at more than $40 million dollars.[21]** A major 2020 pollination study shows that many top fruit crops are "pollinator limited" across the nation, meaning that **a lack of bees (including wild bees) and other pollinators is currently lowering crop yields.**[22] Aside from the immediate economic impacts to farmers, **Dr. Winfree—a leading pollinator researcher** and one of the study's authors—spoke about the long-term implications of the study's findings for food security:

> Honeybee colonies are weaker than they used to be and wild bees are declining, probably by a lot. . . . Even if honeybees were healthy, it's risky to rely so much on a single bee species. It's predictable that parasites will target the one species we have in these monocultural crop fields.
>
> **The trends we are seeing now are setting us up for food security problems**. . . . We aren't yet in a complete crisis now but the trends aren't going in the right direction. Our study shows **this isn't a problem for 10 or 20 years from now – it's happening right now.[23]**

Accordingly, the current impact to farmers' bottom lines and the cost and availability of fresh, healthy foods—both of which likely disproportionately harm already vulnerable and disadvantaged communities—will likely worsen given current trends.

While statewide pollinator losses affect farmers whether or not they use neonics on their farm, studies show that—by driving pollinator losses—neonics can decrease yields even on the crops to which they are applied.[24] Off the farm, 87.5% of flowering plants require pollination by bees and other pollinators to reproduce, so further losses not only threaten Maryland's food system, but also its ecosystems.[25]

Beyond pollination, neonics harm other beneficial insects essential for farming—such as nematodes,[26] earthworms,[27] and pest predators[28]—and can disrupt other key components of soil health. Pest predators are especially at risk from eating contaminated insects, as the harmful

neonic levels can remain in insect prey,[29] leading to decreased yields as the beneficial predator populations die out.[30] **Research from Penn State found that in no-till systems, which are common throughout the Mid-Atlantic, neonics can indirectly increase slug damage and lower crop yields by poisoning insects that eat slugs.**[31] A study of northern Great Plains farms found that fields using neonics and other conventional insecticide treatments had 10 times the insect pressure and fewer profits compared with those employing regenerative farming methods, likely due to lower input costs, more "good bugs" that keep pest populations under control, and better crop marketability.[32] **Research also shows that neonics may harm soil health directly by changing the composition of soil microbial communities—**harming beneficial bacteria crucial for plant growth and health and soil fertility and quality.[33]

Neonics Contribute to Mass Losses of Birds, Other Pollinators and Entire Ecosystems

Populations of **bees, butterflies, and other beneficial insects across the globe have rapidly declined in the time since neonics were first introduced**—a trend sometimes likened to an "insect apocalypse." **Research increasingly identifies neonics as a leading cause**.[34] In 2024, researchers identified increase neonics use as "a major driver of changes in occupancy across hundreds of wild bee species."[35] Neonic use is also linked to significant declines in butterflies.[36] Indeed, neonic use—especially neonic-treated seed use—was the number one factor associated with the loss of Midwestern butterflies, including monarchs,[37] which can encounter harmful or deadly levels of neonics in farm fields or nearby wild plants that can absorb neonics and stay toxic for years.

As losses of insects multiply, insect-eating animals suffer too. Birds appear particularly vulnerable—96% of land-based birds feed insects to their young, with many species also relying on insect food sources as adults.[38] **In North America, 30% of birds have disappeared in the past fifty years,[39] with research linking neonics to large losses in bird biodiversity**, including annual losses of up to 12% in grassland species and 5% in insect-eating species.[40] Likewise in Europe, Dutch researchers have linked declining populations of insect-eating birds to the introduction of neonics—even in areas with exceptionally low neonic levels (20 parts per *trillion* in water)[41]—and the pesticides are also believed to play a key role in declines of French farmland birds.[42]

Neonics harm birds directly, too. Eating just one neonic-treated crop seed is enough to kill some songbirds.[43] And at nonlethal doses, neonics can damage birds' immune and reproductive systems, cause rapid weight loss, and impair navigation and migration ability—all reducing the likelihood of their surviving and reproducing in the wild.[44] With hundreds of millions of acres of U.S. farmland sown with neonic-treated seeds every year, birds are broadly at risk—particularly when, as commonly occurs, piles of seed are left out in the open or planted shallowly enough for birds to eat.[45] At least one assessment has made the case that bats can also be harmed directly or indirectly.[46]

Neonics are also devastating for aquatic ecosystems because they are highly toxic to aquatic invertebrates that fish and other species rely on for food. One study in Japan found that the introduction of imidacloprid—a neonic commonly used on lawns and gardens—to the area

surrounding a longstanding fishery caused the collapse of that fishery in just one year.[47] Researchers found that after neonics contaminated the water, plankton populations plummeted, along with the valuable fish species that fed on that plankton.

Similar effects may be felt across America. **Surveys by the U.S. Geological Survey have detected neonics in a about half of stream samples nationwide and in 59% of samples in the Chesapeake Bay. [48]**

Neonics Threaten the Health of Maryland's Residents, Especially Children

Neonics are chemically similar to nicotine, **attacking nerve sites** that insects and humans share, and which play a central role in the operations of our brain and nervous systems.[49] More specifically, critical parts of the brain are densely populated with nerves containing the particular nACh receptor area targeted by neonics (the α4β2 subunit), **including: the cortex (responsible for planning, judgment, creativity, inhibition, attention, memory, language); the thalamus (emotion, memory); and the cerebellum (posture, balance, coordination, speech).[50]**

Health experts have long been concerned about the impact of nicotine-like substances on the brain—a reason they have long warned pregnant women to avoid nicotine.[51] Perhaps unsurprisingly, then, a growing body **of research now links neonic exposures to elevated risk of developmental or neurological damage in humans, particularly in infants and young children.**[52] These include malformations of the developing heart and brain, autism spectrum disorder, cognitive impairment, and a cluster of symptoms including memory loss and tremors.[53] Research also finds associations between higher neonic exposure and impairments to metabolic processes like insulin regulation and fat metabolism.[54]

Animal testing shows an even broader range of concerning injuries with implications for human health, including: multiple birth defects and increased rates of death for the fawns of white-tailed deer fed "field realistic" (i.e., "real world") levels of neonics in water;[55] reduced thyroid functioning in deer;[56] and in toxicology experiments with pregnant rats exposed to neonics resulted in offspring with statistically significant deficits such as thinner brain cortexes and other brain abnormalities, altered behavioral reflexes, and decreased sperm and testosterone levels.[57] New research also shows neonics can target mammalian ovaries, resulting in significantly fewer egg follicles, and more unhealthy ones.[58] All of these studies have implications for similar risks to people.

Information and studies collected by the U.S. Environmental Protection Agency (EPA) reaffirm the risks posed by neonics, yet these risks are often undercounted and ignored in regulatory decision-making. EPA poisoning reports reveal that hundreds of people have been poisoned with neonics, with some fatalities reported.[59] **And a recent analysis of pesticide manufacturer-submitted toxicity studies concluded that EPA is ignoring statistically significant harms in those studies, meaning EPA's regulatory standards are likely inadequate to protect Americans from widespread exposure.[60]**

These data likely raise concerns for all Maryland residents. In 2019, the Centers for Disease Control and Prevention (CDC) published the updated results of its national biomonitoring program, which measures pesticides in the urine of thousands of Americans age three and

older.[61] The update included data from 2015-16, and was the first to include neonics. **The results showed that roughly half of the U.S. general population is exposed to neonics on a regular basis, with children having higher levels than adults.[62]**

More recent data suggests that neonic exposures have grown significantly in recent years, with risks of exposure especially acute for pregnant women and young children. **A 2022 multistate study of 171 pregnant women found that over 95% had neonics or neonic degradates in their bodies.[63]** Detection levels generally exceeded previous CDC findings and, alarmingly, detection also steadily increased over the course of the four-year study period (2017-2020) – both in frequency and in magnitude – with the highest levels in Hispanic women.

These widespread and growing exposures are a considerable concern for childhood neurological development, as we now know the pesticides pass readily from pregnant women to unborn fetuses. A 2022 study shows that **neonics flow through the placenta from mothers to their fetus, and then to all the fetal tissues including the developing brain and nervous system.[64]** Previously, Japanese researchers had identified neonics in the urine of newborn babies, further supporting the idea that neonics pass from a pregnant mother to her developing fetus.[65] This is highly concerning given the multitude of studies suggesting developmental risks from neonic exposure.

Emerging research links neonic exposures to elevated risk of developmental and neurological damage in humans, particularly in infants and young children.

People are commonly exposed to neonics through food and water.[66] Conventional chlorination alone, without carbon filtration treatment, generally fails to remove neonics from drinking water.[67] More concerning still, neonics break down in water, forming chemicals that can be several hundred times more toxic to people than the original neonic chemical, which then may be made more toxic still through the chlorination process.[68]

Neonic-Treated Seeds Often Provide No Benefits for Farmers, According to Research from Maryland and Beyond

Peer-reviewed research from the University of Maryland found that field crops planted in Maryland and across the Mid-Atlantic region saw no yield benefit from using neonic treated seeds. *See* Cramer and Hamby 2025 (study finding that neonic seed treatments "did not increase yields in Mid-Atlantic corn" and concludes that the region, including Maryland, does not experience "sufficient seedling pest pressure to justify routine use of [neonic seed treatments]"); Dubey et al. 2020 (Maryland researchers "did not observe any yield benefit" from using neonic seed treatments on corn, soybean, and wheat in common Mid-Atlantic field crop rotations" and determined that "[neonic seed treatments] are not warranted in Maryland grain production, outside of specific instances of high pest pressure.").

Other research from across the United States and Canada likewise demonstrates that the most common uses of neonic-treated seeds—i.e., for corn and soybean—typically provide *no economic benefit for farmers.* *See* Grout et al. 2020 (review of 1,100+ peer-reviewed studies finding neonics provide "no overall net income benefit" to growers); Smith et al. (2020) (4-yr study of 160 corn and soybean fields in Ontario finding "that widespread use of seed-applied insecticides in corn and soybean is unlikely to provide benefit to producers"); Labrie et al. (2020) ("neonicotinoid seed treatments in field crops in Quebec are useful in less than 5% of cases, given the very low level of pest-associated pressure and damage, and [] **they should not be used prophylactically.**"); Pacenka et al. (2021) (4-yr Purdue University study finding "the absence of a neonicotinoid [corn] seed treatment had no impact on yields"). **Despite this lack of efficacy, neonic seed treatments are used on nearly all conventional corn, and more than half of conventional soybean acres.** [69]

Furthermore, research in Quebec, Canada, suggests that *any* insecticide seed treatment is unnecessary in the vast majority of circumstances. Labrie et al. (2020) demonstrated that although targeted pests (like wireworm) were more prevalent in fields without neonic seed treatments, yield was unchanged.[70] In other words, the presence of pests targeted by seed treatments did not reduce crop yields. Insecticide seed treatments were simply not necessary.

Though seed prices vary, farmers are likely paying a premium for seeds that ultimately do not provide an economic return. Using prices provided by Bayer CropScience, one study found that **untreated corn seeds cost $20.15 less per acre than neonic-treated seeds, and fungicide-only seeds cost $6.80 less.**[71] **For soybeans, untreated seeds cost $20.70 less than neonic-treated seeds, and fungicide-only seeds cost $5.10 less** based upon farm-level data from independent research.[72]

HB0091 Follows Successful Models for Restricting Unnecessary Neonic Seed Coatings

If HB 0091 were enacted, Maryland would not be alone in tackling the neonic problem. **Quebec, Canada, provides one model for eliminating the needless use of neonicotinoid seed coatings in field crops. Effective 2019, the province eliminated virtually all** seed treatments in corn, soybean and wheat, in addition to other field crops. **Neonic contamination has since plummeted, while crop yields have been unaffected by the new restrictions**.[73] Quebec is now moving to expand the program to all insecticide seed treatments,[74] consistent with the research showing that insecticide seed treatments in corn and soybeans generally do not benefit farmers.

In 2024, New York and Vermont became the first states to pass bills to limit neonic-treated seed use, following the success in Quebec. The provisions of those bills regarding restrictions on neonic field crop seed coatings will take effect on January 1, 2029.[75]

HB 0091 Helps to Eliminate Other High-Risk, Low Benefit Uses of Neonics

Although treated seeds likely make up the majority of neonic use in Maryland, uses are also common in non-agricultural settings like turf and commercial ornamental uses. **Other states like Nevada,[76] New Jersey,[77] and Maine[78] have already prohibited most nonagricultural uses of neonics. Maryland has as well, but current restrictions are only limited to consumer use.**[79]

Other commercial non-agricultural uses still contribute to neonic contamination in urban and suburban areas where people live, work, and play, at use rates that far exceed those in agriculture, often leading to hotspots of neonic contamination in urban and suburban areas.

These **nonagricultural neonic uses are also unnecessary**. Because of neonics' systemic mode of action, they are nearly always **applied preventatively** before there is any evidence of a pest problem. As a result, neonics are often used where no insecticide is needed.[80] **But even where pest control is desirable, there are numerous organic and minimum risk products available to control pests,** [81] as well as non-chemical practices that effectively reduce pest populations in these highly populated areas.

Conclusion

HB 0091 is a carefully tailored bill which prohibits neonic uses that are both harmful and unnecessary – a win-win for pollinators, pollinator-dependent farmers, Maryland's environment, and all Marylanders who value clean water and a healthy environment. **For these reasons, NRDC is strongly in favor of HB 0091 and urges your support for this bill.**

Respectfully,

Dan Raichel,
Director, Pollinators & Pesticides
Natural Resources Defense Council

Maya Korb,
Fellow, Pollinators & Pesticides
Natural Resources Defense Council

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