March 16, 2023

Representative Samantha Vang, Chair
Agriculture Finance and Policy Committee
Minnesota House of Representatives
100 Rev. Dr. Martin Luther King Jr. Blvd.
Saint Paul, MN 55155

RE: Testimony of NRDC in Support of HF2472

Dear Chair Vang and Members of the Committee:

On behalf of the Natural Resources Defense Council and its over 8,500 members in Minnesota, I submit the following testimony in strong support of HF2472. Building from past recommendations of the Minnesota Department of Agriculture (MDA), this common-sense bill ensures that the most widespread uses of toxic insecticides, like bee-killing neonicotinoids, are regulated and used only where they provide a benefit.

As explained at length in the following testimony, the science is now unequivocal that neonics are a lead cause of dramatic losses of bees and other pollinators, which cut into farmers' bottom lines and threaten the viability of our food systems and ecosystems. Already, pollinator losses undermine food production, threatening the availability of healthy and affordable foods.

Equally concerning is the profound scope and depth of the harms neonic pollution inflicts on the state's environment and its people. Neonics extensively contaminate Minnesota's water, soil, plant life, and even Minnesotans themselves. Neonics show up in Minnesota's surface water, ground water, and even rain, as well as 94% of deer from all over the state. Scientific evidence links such contamination to mass losses of birds and fish, the hollowing out of ecosystems, and birth defects and death in white-tailed deer.

Worse still, Centers for Disease Control and Prevention (CDC) monitoring finds neonics appear in the bodies of half the U.S. population at any given time, as other research links neonics to neurological and developmental disorders in people, including malformations of the developing heart and brain.

The number one use of neonics nationwide—including Minnesota—is in treated crop seeds. Nearly 100% of corn and up to 75% of soybean is grown from a seed pre-treated with neonics and other chemicals. Despite their widespread use, research increasingly demonstrates that these leading neonic seed treatment uses provide no net benefits to farmers.

Treated seeds are not just harmful and frequently needless—they are unregulated in Minnesota. While MDA regulates pesticide use statewide, the agency does not regulate treated seeds as "pesticides," and they escape all safeguards designed to protect people and the environment from chemicals designed to kill.

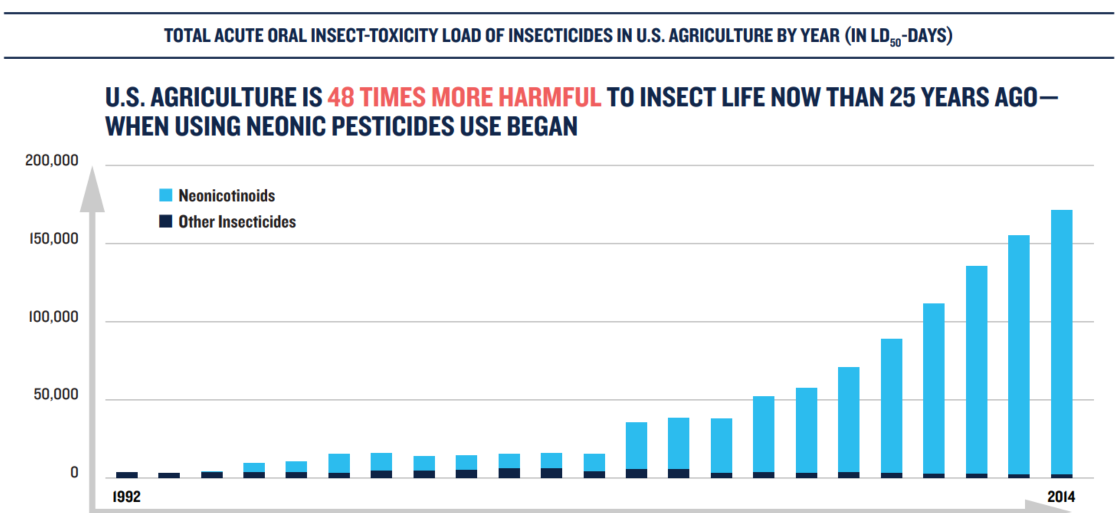
HF2472 does not prohibit any pesticide use. It simply creates a program to allow MDA to regulate treated seeds, and ensures that these seeds are used only where they actually benefit farmers. NRDC strongly urges your support for this common-sense bill.

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 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]

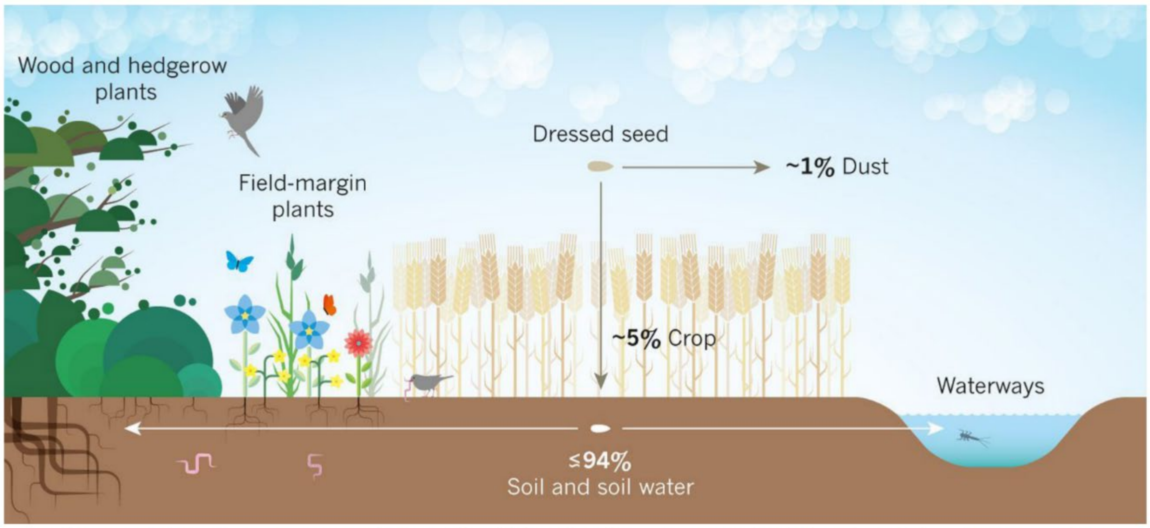
One study estimates that since neonics were first introduced, U.S. agriculture has become 48-times more harmful to insect life.[6] 98% of this increase was attributable to neonics, the number one use of which is on treated seeds.



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 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 and 75% of conventional soybean seeds are pretreated with neonics,[10] meaning neonics are used on over 12 million acres in Minnesota—on corn and soybean alone. 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[11] 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. Evidence of widespread contamination is especially strong in Minnesota. Testing of white-tailed deer by the Minnesota Department of Natural Resources (DNR) has detected neonics in 94% of Minnesota's deer, with 64% at levels that have been shown in other studies to increase fawn mortality.[12] And water testing has frequently detected neonics in surface waters and groundwater throughout the state—and even in rain.[13]

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—Minnesota beekeepers have consistently lost 40% or more of their colonies each year.[14] Last year, Minnesota beekeepers lost 58% of their colonies, the worst year on record.[15]

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 450+ wild bee species and other pollinators that contribute significantly to crop pollination. For example, Minnesota's state bee, the rusty patched bumble bee, has declined by nearly 90% in recent decades. The U.S. Fish and Wildlife Service has identified pesticides, and specifically neonics, as a likely driver of this precipitous decline.[16]

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[17]—matches the dramatic uptick in bee losses witnessed at precisely that time.[18] 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[19] and the largest neonic field study to date—actually funded by the pesticide industry itself.[20] 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] including non-agricultural turf and ornamental uses.[21]

Other research identifies how these neonic-driven bee losses are already harming farmers. A recent study estimates that inadequate pollinator populations are reducing production of fruits, vegetables, and nuts by 3-5% worldwide.[22] Reduced production of these health foods is, in turn, leading to an estimated 427,000 additional preventable deaths annually.[23] 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.

Similarly, 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.[24] 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.[25]

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.[26] Off the farm, 87.5% of flowering plants require pollination by bees and other pollinators to reproduce, so further losses not only threaten Minnesota's food system, but also its ecosystems.[27]

Beyond pollination, neonics harm other beneficial insects essential for farming—such as nematodes,[28] earthworms,[29] and pest predators[30]—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,[31] leading to decreased yields as the beneficial predator populations die out.[32] Perhaps unsurprisingly, 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.[33] 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.[34]

Neonics Drive Losses of Birds and Other Pollinators

Like bees, populations of 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"—and new research is increasingly identifying neonics as a leading cause.[35] For example, recent studies have connected neonic use with significant declines in butterflies,[36] as well as harms to monarch butterflies,[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. Contaminated soil itself may also pose a hazard to populations of ground-dwelling insects and organisms.[38]

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.[39] In North America, 30% of birds have disappeared in the past fifty years,[40] 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.[41] 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)[42]—and the pesticides are also believed to play a key role in declines of French farmland birds.[43]

Neonics harm birds directly, too. Eating just one neonic-treated crop seed is enough to kill some songbirds.[44] 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.[45] 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.[46] At least one assessment has made the case that bats can also be harmed directly or indirectly.[47]

Neonics Threaten the Health of Minnesotans, Especially Children

Neonicotinoids 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.[48] 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).[49]

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.[50] 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.[51] These include malformations of the developing heart and brain, autism spectrum disorder, and a cluster of symptoms including memory loss and tremors.[52] 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;[53] reduced thyroid functioning in deer;[54] 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.[55]

These data likely raise concerns for all Minnesotans. 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.[56] 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.[57]

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. Levels detected were generally greater than those detected by the CDC, and further, levels steadily increased over the course of the four-year study period (2017), with Hispanic women having the highest levels. Similarly, surveys of deer in Minnesota show increasing contamination over time—from 61% of deer in 2019 to 94% in 2021.[58]

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 along with oxygen and critical nutrients from mothers to their fetus, and then to all the fetal tissues including the developing brain and nervous system.[59] 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.[60] This is highly concerning given the multitude of studies suggesting developmental risks from neonic exposure.

People are commonly exposed to neonics through food and water.[61] Conventional chlorination alone, without carbon filtration treatment, generally fails to remove neonics from drinking water.[62] 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.[63]

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

Neonic-Treated Seeds Often Provide No Benefits for Farmers

Peer-reviewed research demonstrates that the most common uses of neonic-treated seeds—those on corn and soybean—often 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"). That is especially true in northern climates, like Minnesota.[64] Despite this lack of efficacy, neonic seed treatments are used on nearly all conventional corn, and more than half of conventional soybean acres. [65]

Furthermore, research in Quebec, Canada, suggests that *any* insecticide seed treatment is unnecessary in the vast majority of circumstances. Labrie et al. demonstrated that although targeted pests (like wireworm) were more prevalent in fields without neonic seed treatments, yield was unchanged.[66] In other words, the presence of pests targeted by seed treatments did not reduce crop yields. Insecticide seed treatments were simply not necessary.

Other Systemic Insecticides Threaten to Replace Neonic Seed Treatments, but Pose Many of the Same Risks

Currently, neonics are by far the most commonly used insecticides in seed treatments. But newer classes of pesticides, like diamides, are similarly approved as seed treatments. Both neonics and diamides are systemic pesticides, meaning they are similarly adept at contaminating the environment. Diamides like chlorantraniliprole are generally more persistent in the environment than neonics[67] and research suggests they present significant risks to monarchs and other butterflies.[68]

At the same time, research suggests that diamides are similarly not beneficial to farmers because, as explained above, presence of early-season soil pests targeted by seed treatments do not decrease crop yields. It is, therefore, important to not only address neonic-seed treatments, but systemic insecticides generally, to ensure that newer, similarly harmful pesticides do not simply replace neonics on millions of acres across Minnesota.

HF2472 Addresses a Gaping Regulatory Loophole that Allows Widespread, High-Risk, and Low-Benefit Pesticide Uses to Go Unchecked

HF2472 empowers Minnesota to address widespread and largely unnecessary pesticide contamination that harms the state's people, pollinators, and wildlife. Currently, MDA does not exercise any regulatory authority over pesticide-treated seeds. This means it does not know what pesticides are used on treated seeds or where they are used and is unable to mitigate any harms associated with treated seed use. For this reason, MDA suggested in 2016 that the legislature give it authority to regulate pesticide-treated seeds. HF2472 would do just that.

The regulatory program in HF2472 would also include a "verification of need" program for seeds treated with systemic insecticides, like neonics and diamides. This provision would guard against widespread use of harmful pesticides that provide no actual benefits to farmers—as is currently the case on millions of acres across Minnesota. MDA proposed developing a verification of need program for all neonics in 2016 because of their widespread prophylactic use in circumstances when no insecticide is needed. This bill builds on those recommendations, and it is time for the legislature to act.

Conclusion

Treated seeds likely make up the vast majority of neonic use in Minnesota. Ubiquitous neonic contamination drives declines in pollinators that are critical to food production, threats wildlife from birds to fish, and presents serious risks to the health of Minnesotans, especially children and pregnant women. Despite these risks, MDA currently exercises no regulatory authority over pesticide-treated seeds. HF2472 would direct MDA to address this massive regulatory loophole and ensure that these harmful pesticides are used only where they benefit farmers, all in a way that works for Minnesota. **<u>For these reasons, NRDC strongly supports HF2472 and urges the Committee to advance this bill.</u>**

Respectfully,

Lucas Rhoads
Attorney, Pollinator Initiative
Natural Resources Defense Council

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