Testimony to the Agriculture, Conservation, and Forestry Committee in support of LB 1323

April 15, 2025

Emily May
Agricultural Conservation Lead, Pesticide Program
The Xerces Society for Invertebrate Conservation
emily.may@xerces.org

Thank you for the opportunity to testify in support of LD 1323. The Xerces Society for Invertebrate Conservation strongly supports this practical and evidence-based approach to reducing the most harmful uses of neonicotinoid insecticides while maintaining needed uses. As a science-driven organization that works directly with farmers and other land managers in Maine and throughout the country to conserve beneficial insects, we are well versed in the importance of balancing pest management strategies and environmental protections.

Most neonicotinoids are extremely toxic to pollinators and aquatic invertebrates, persistent in the environment, and move easily into surrounding soil, water, and plants.[1] Their widespread use has been linked to declines in populations of birds, butterflies, and aquatic life. Despite evidence of harm, neonicotinoids are still used widely and prophylactically, often as a result of systemic barriers that limit farmer choice. This runs counter to the principles of integrated pest management and contributes to widespread, unnecessary environmental contamination.

LD 1323 is not a blanket ban—instead, it is targeting use patterns that pose the highest risk to pollinators with the least benefit, such as the routine planting of neonicotinoid-treated seeds in crops like corn and soy. Nearly 100% of conventional corn is planted with neonic seed coatings, even though field trials in the Northeast consistently show limited to no yield benefit of the use of these seed coatings in corn and soy.[2]

More than 90% of the insecticide applied as a seed coating is not absorbed by the plant; instead, it moves into soil, water, and flowering plants in and around fields, where the residues can harm bees, other beneficial insects, and eventually aquatic life.[3] Recent research shows that neonic seed coatings can reduce weed seed control by insects in corn-soy rotations,[4] and negatively affect arthropod decomposers that break down crop residues and aid nutrient cycling.[5]

Importantly, neonic seed treatments pose higher risk to bees per acre than the possible alternatives for seed pests in corn, such as diamide seed treatments or in-furrow pyrethroid applications, because of their high toxicity and environmental persistence (*see analysis below*).

---

[1] Hladik, M. L., Main, A. R., & Goulson, D. (2018). https://doi.org/10.1021/acs.est.7b06388
[2] Grout, T. A., Koenig, P. A., Kapuvari, J. K., & McArt, S. H. (2020). *Neonicotinoid Insecticides in New York State: Economic Benefits and Risk to Pollinators*. Cornell University. Available: https://cornell.app.box.com/v/2020-neonicotinoid-report
[3] Krupke, C. H., & Tooker, J. F. (2020). https://doi.org/10.3389/fsufs.2020.595855
[4] Rowen, E. K., Pearsons, K. A., Smith, R. G., Wickings, K., & Tooker, J. F. (2025). https://doi.org/10.7717/peerj.18597
[5] Pearsons, K. A., & Tooker, J. F. (2021). https://doi.org/10.1016/j.apsoil.2020.103757

LD 1323 also restricts neonicotinoid sprays during crop bloom, on certain vegetable crops that flower before harvesting, and on ornamental plants - all of these are use cases where pollinator exposure is likely, making risks to pollinators especially high. Again, this bill is not a blanket restriction. It includes a reasonable process for emergency exemptions when pest pressure justifies use and no safer and effective alternatives are available.

Maine has already taken important steps to reduce neonic use in residential settings, and this bill is a logical next step. From our perspective, this bill uses a science-based and balanced approach that reduces the routine, prophylactic uses that drive pesticide resistance and harm pollinators, while preserving flexibility for growers facing real threats.

LD 1323 will strengthen Maine's leadership in safeguarding pollinators and natural resources while supporting resilient, sustainable farming systems. We urge the committee to support this bill.

Additional risk analysis: How do neonic seed treatments compare to alternatives in corn?

The amount or volume of a pesticide applied per acre is not a good indicator of its risk. Pesticide risk is driven by the combination of toxicity and exposure. A highly toxic pesticide applied at low rates can be more risky than a less toxic pesticide applied at higher rates. A pesticide applied at 2 ounces per acre is not less risky than something else applied at 10 pounds per acre, if the pesticide applied at 2 ounces an acre is 1000 times more toxic.

Neonicotinoids are orders of magnitude more toxic to bees than other chemicals that EPA classifies as highly toxic to bees. The EPA classifies pesticides as highly toxic, moderately toxic, slightly toxic, and practically non-toxic based on their LD50, or how much of the active ingredient kills 50% of the test population of adult honey bees. An active ingredient that has a 50% chance of killing an adult bee at 2 micrograms or less per bee is classified as "highly toxic." But the neonicotinoids clothianidin and thiamethoxam - the two most common seed treatment neonics - are in the range of 500 to 750 times more toxic than EPA's threshold of being highly toxic to bees. Very trace amounts of these chemicals can lead to harm.

In this section, I present information on the relative harm of different pesticides and application methods that can be used against seedcorn maggot and wireworms. Included in the analysis are:

- Two typical **neonic seed treatment** options for corn in ME (clothianidin, thiamethoxam);
- Two **diamide seed treatment** options (chlorantraniliprole and tetraniliprole);
- One **pyrethroid treatment** that can be applied to seeds in planter boxes; and
- Three **in-furrow at-planting insecticides** labeled for use against seedcorn maggot and wireworms (two pyrethroids and one organophosphate).

Using established methodology[6], I calculated **an index of risk that represents potential harm to honeybees** to compare **per-acre field rates** of neonicotinoid seed treatments against

[6] Methodology from DiBartolomeis et al. (2019) "An Assessment of Acute Insecticide Toxicity Loading (AITL) of Chemical Pesticides Used on Agricultural Land in the United States." PloS One 14 (8): e0220029. https://doi.org/10.1371/journal.pone.0220029

alternative chemical options. The index value accounts for the **toxicity** of the pesticide (LD50), its **application rate** according to the label (in ug per acre), and its **persistence** in the soil after application (half life). For seed treatments, we assumed a treatment of 1.25 mg of active ingredient per seed[7], a typical seeding rate of 32,000 corn seeds per acre, and a 30" row spacing to calculate total amounts per acre.

Step 1. Based on label application rates, we determined the total amount of active ingredient introduced by each treatment per acre.

Step 2. We divided this value by the LD50 value for adult honeybees for each treatment. We did this for oral and contact LD50s separately. The LD50 is the amount of active ingredient that is lethal to 50% of a test population of bees. This step yields a theoretical number of bees that can be killed by the amount of active ingredient applied to an acre.

Step 3. We then multiplied this value by the persistence of the chemical in soil (using an exponential decay function based on the number of days it takes for the chemical to break down by half in soil[i]).

Risk Analysis Takeaways:

- **Neonicotinoid seed treatments introduce the highest risk per acre** for bees of all of the seed and in-furrow alternatives included for comparison, based on the amount introduced per acre, environmental persistence, and toxicity by both contact and oral exposure.

- **The two neonicotinoid seed treatments were on average 11X more harmful to bees than alternatives by contact exposure, and 29X more harmful than alternatives by oral exposure.** This high level of risk is largely due to the long persistence of neonicotinoids in soil, and the very low dose that it takes to kill a bee in the case of oral exposure. Even when applied at the lowest label rate (0.25 mg ai/seed), neonicotinoid seed treatments were 2.5X more harmful by contact and 6X more harmful by oral exposure than non-neonic alternatives.

- Diamide seed treatments and the pyrethroid insecticide applied directly to seeds at planting introduce less toxicity per acre for bees compared to neonicotinoid seed treatments and in-furrow pesticide applications.

- However, while the chlorantraniliprole seed treatment has lower risk potential for bees than the other alternatives, it is highly toxic to monarch caterpillars, leading to a very high risk index for diamides for this species. This likely applies to other butterfly larvae as well as other diamide insecticides for which toxicity data does not exist.

[7] This is the maximum label rate for clothianidin or thiamethoxam on corn seeds, as labeled for corn rootworm (e.g., Cruiser 5FS: https://www.syngenta-us.com/current-label/cruiser_5fs). Some corn seeds are treated at a lower rate (0.25 to 0.8 mg active ingredient per seed), but data on usage of specific seed treatment products/rates in Maine are not available.

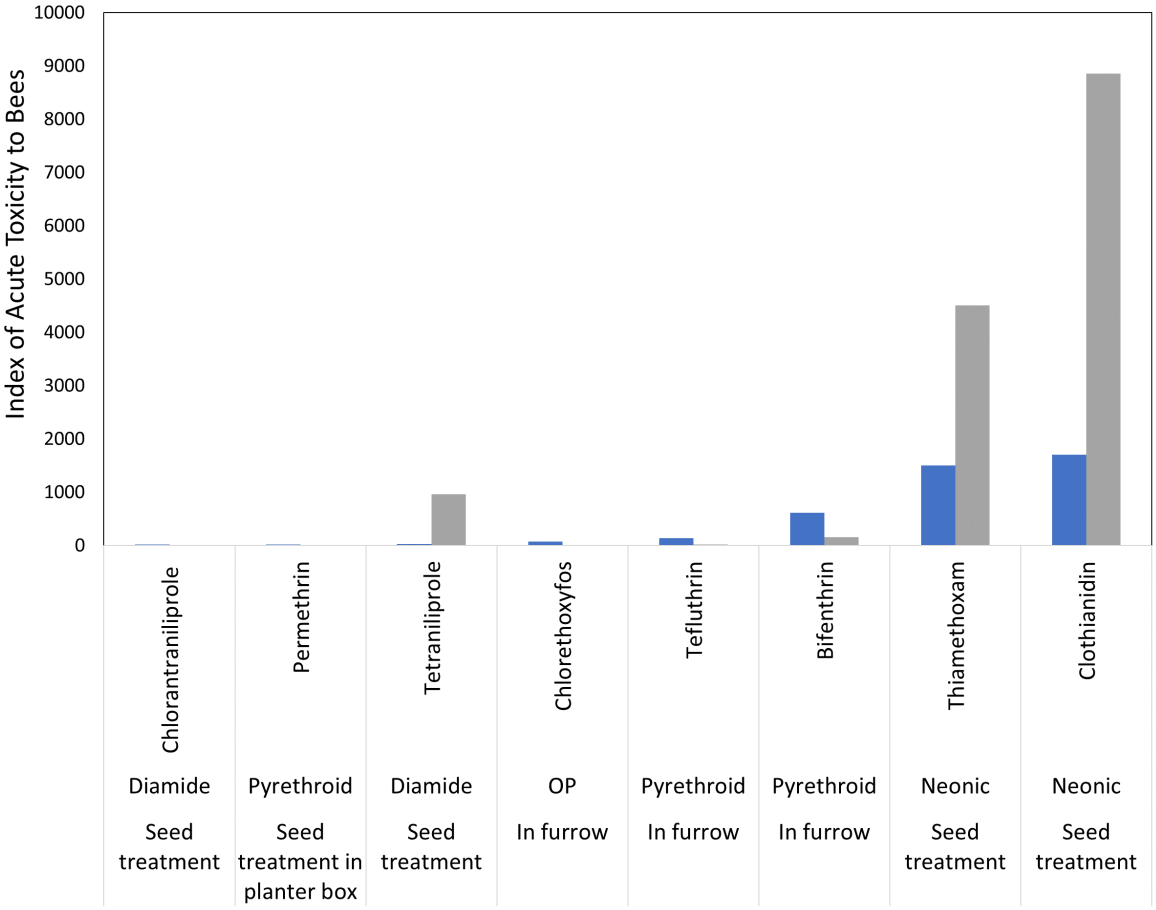

Figure 2. Index of relative harm to bees of different pesticides and application methods that can be used against seedcorn maggot and wireworms. See above for an explanation of the index calculation. Blue bars were calculated using acute contact LD50s for honey bees, and gray bars were calculated using acute oral LD50s for each of the active ingredients. In this case, ***larger numbers represent higher risk*.**

Concluding Remarks

We encourage the use of integrated pest management (IPM) to tolerate acceptable levels of pest pressure, reduce chemical inputs, and justify chemical interventions through scouting, monitoring, and use of economic thresholds. In the case of treated seeds, we are using insecticides with known environmental cost on nearly all corn acreage in the state with no evidence for a benefit on the vast majority of that acreage.

Thank you again for your time and consideration of these important issues. Please do not hesitate to reach out with any follow up questions you may have.

Emily May
Agricultural Conservation Lead, Pesticide Program
The Xerces Society for Invertebrate Conservation
emily.may@xerces.org