Agricultural Innovation Board (AIB)
Agency of Agriculture, Food, and Markets
State of Vermont
116 State Street
Montpelier, Vt 05620-2901

December 11, 2023

Subject: Best Management Practices for Neonicotinoid Treated Seeds

To the members of the Agricultural Innovation Board:

The Xerces Society for Invertebrate Conservation respectfully submits these comments on best management practices for pesticide-treated seeds to Vermont's Agricultural Innovation Board. **The Xerces Society** is an international nonprofit that uses science-driven methods to protect invertebrate wildlife and their habitat. Our organization is recognized as a global leader in pollinator conservation, and we work with farmers across Vermont to safeguard pollinator populations. We provide training and technical support to growers interested in providing habitat for pollinators and reducing the impact of their pest management practices. **Ensuring the judicious use and proper disposal of pesticide-treated seed is an important issue for the Xerces Society**, and we appreciate the opportunity to offer suggestions and considerations for Vermont-specific BMPs. We have organized our comments around the main points discussed at the November 2023 AIB meeting.

Risks of Neonicotinoid Treated Seeds: Best Practices Should Reduce Use

Neonicotinoid seed treatments (NSTs) cause widespread harm to pollinators, aquatic invertebrates, and other wildlife. It is estimated that nearly all U.S. corn and the majority of soybeans are grown from insecticide-treated seed (Douglas & Tooker 2015). These chemicals are applied to tens of thousands of acres of Vermont farmland, largely in corn, where most field research from Vermont and other areas of the country suggests that the insecticide coatings provide little to no yield benefits on the vast majority of crop acreage. These insecticides are highly toxic to honey bees, and are even more toxic to some of our native pollinators; thiamethoxam is more than 3x more toxic to the common eastern bumble bee (*Bombus impatiens*) than it is to honey bees (Mundy-Heisz et al., 2022).

The available evidence from field crops suggests that the known environmental consequences of their continued widespread use are far greater than the unknown -

but likely limited - economic consequences to Vermont growers of switching to untreated seeds. **In Quebec, neonicotinoid seed treatments dropped from near-universal use in 2015 to use on less than 0.5% of corn acreage and no use in soybeans currently, with no associated crop failures or drop in crop yields** (Robert 2023). Importantly, neonicotinoid contamination of surface water in Quebec has decreased significantly as a result of the restrictions on NST use. These are both critical pieces of information for our decision making and guidance for farmers in Vermont.

Given the risks to Vermont wildlife and minimal economic benefit to farmers, we believe that the recommendations should center on the goals of **reducing use** of these seed treatments where possible, supporting farmers in the transition to more sustainable alternatives, and carefully mitigating risks to pollinators and minimizing off-site movement into surface water and nearby habitat where NSTs remain in use. **Reduction of neonicotinoid inputs into our soil, water, and air should be a primary goal of best management practices for treated seeds.**

Mitigation of Non-Target Drift During Planting

With the goal of reducing use and moving to more sustainable practices, **we recommend using a IPM-focused approach** similar to the Best Management Practices for Farmers Using Seeds Treated with Neonicotinoids developed in Connecticut: "Do not use seed treated with neonicotinoids unless there is a specific pest problem that can be effectively managed with a neonicotinoid seed treatment. When the use of neonicotinoids is not warranted, purchase seed that is not treated with this group of chemicals." This approach involves the use of integrated pest management (IPM), including use of scouting and monitoring to identify, quantify, and demonstrate a history of pest pressure in a given field. Neonicotinoid seeds should only be considered when scouting can demonstrate a field history of the pests that are controlled by those seed treatments (e.g., wireworm and seedcorn maggot). Our guidelines for making decisions about neonicotinoid seed treatments offers more detailed information on the corn and soybean pests that can warrant NST use - but only if field history of pest pressure can be demonstrated with appropriate scouting. UVM Extension also offers a variety of guidance materials for conducting fall and spring scouting for row crop pests. **Prophylactic use of NSTs with no evidence of pest history is not a best management practice.**

We recommend that the Board consider the following:

- **Provide additional recommendations for reducing dust off.** As noted by the Board at the November meeting, it is unclear whether alternative fluency agents

always offer meaningful reduction in dust emissions at planting (Schaafsma et al. 2019); some studies suggest they may reduce emissions by up to half, but field results have been somewhat mixed. Other modifications to planting timing and equipment can significantly reduce planter dust, e.g.:

- Avoid planting on windy days (>10 mph).
- Use no till planting and other reduced tillage practices to help avoid generating field dust. Plant residue on the soil surface can reduce the amount of particulate matter (PM) generated at planting and moved off-site with the wind. Conservation tillage can reduce PM emissions from dairy forage by 50-80% (Madden et al. 2008).
- Dry soil conditions can increase dust generation during planting resulting from a drier soil surface and from increased pressure settings on planters. If conditions are very dry, consider whether planting could wait for additional rainfall.
- Consult with your equipment manufacturer or dealer to determine appropriate air deflectors or other devices that reduce dust drift for your equipment. Deflectors that reduce air speed and direct air close to the soil or into furrows can reduce airborne dust (Nuyttens and Verboven, 2015). Some air deflector kits can reduce the concentration of neonicotinoids in the air by 70-90%.
- The most effective equipment modifications appear to target reduction of the flow rate/velocity of air released into the atmosphere (Friessleben et al. 2010). These types of modifications include tubes that divide the air stream generated by the fan and release it close to the ground. The exhaust air can be further reduced with filters, diffusers, cushions, or other modifications to reduce velocity as it is released. At a minimum, on vacuum or positive air pressure planters, direct air exhaust downward towards the soil surface.
- Additional equipment modifications could include use of electrostatic or other air filters that can capture particulate matter containing the neonicotinoid dust (Biocca et al. 2017). The commercial availability of these types of filters may be low, but field results from Ontario presented to the Board in June 2023 suggest that filtering is the most effective option for reducing dust emissions from vacuum planters.
- Use the proper rate for any lubricant.

- **Include recommendations for mitigations for other off-site transport (runoff and erosion) besides dust**, such as filter strips consisting of perennial grasses planted on the downslope edges of fields planted with treated seeds. Mitigations designed to capture pesticides via runoff, erosion, or dust at the field edge should consist primarily of plants that are not attractive to pollinators, such as grasses and non-flowering trees and shrubs. Some of the possible mitigations for off-site

transport are discussed in more detail in US EPA's *ESA Workplan Update: Nontarget Species Mitigation for Registration Review and Other FIFRA Actions* (US EPA, 2022a).

Planters and seed boxes will be contaminated with these water-soluble chemicals after planting. If cleaning equipment after use, recommend that users move as far from pollinator habitat, water bodies, honey bee hives, and other sensitive environmental areas as possible and take steps to minimize rinse water that can move neonicotinoids into soil, ground or surface water, and flowering plants.

- At the November meeting, the Board discussed including language about choosing lower toxicity seed treatments, citing clothianidin as lower toxicity than thiamethoxam. Please note that all of the primary neonicotinoid seed treatments on row crops (imidacloprid, thiamethoxam, and clothianidin) are very highly toxic to bees, and **at this level of toxicity there is not a meaningful difference between imidacloprid, thiamethoxam, and clothianidin seed treatments in terms of their impacts on pollinators**. Different laboratory studies have found overlapping ranges of LD50s for clothianidin and thiamethoxam. The US EPA's comparison of acute mortality toxicity data for terrestrial invertebrates found very similar toxicity profiles for these two chemicals, with a contact LD50 for honey bees equal to 0.0275 µg/bee/day for clothianidin and 0.021 µg/bee/day for thiamethoxam, and an oral LD50 equal to 0.0037 µg/bee/day for clothianidin and 0.0038 µg/bee/day for thiamethoxam (US EPA, 2022b).

Pollinator Habitat Protections

We do not support the recommendation to eliminate flowering plants in field borders, unless it is limited to mechanical methods such as mowing or tilling of field edges where annual/biennial weedy plants are in bloom at the time of planting. Pollinators need three main things: food, shelter, and protection from pesticides; habitat is a critical component of successful conservation of native and managed pollinators in working lands. While we encourage efforts to better protect habitat from pesticides by reducing use of pesticides and mitigating drift close to valuable habitat, we do not believe that removing early season woody resources in wooded edges or eliminating perennial flowering field borders with herbicides would achieve the stated goal of protecting pollinators.

We recommend that farmers consider planting non-attractive windbreaks or shelterbelts, such as rows of dense conifers, between fields planted with NSTs and perennial pollinator habitat or apiaries, particularly if those areas are typically located downwind of planting operations. Permanent windbreaks could help to capture dust

off during and after planting and provide protection to sensitive areas. NRCS offers a Windbreak/Shelterbelt Establishment conservation practice (380) that could apply to these situations, and can offer technical assistance to help growers design an effective windbreak.

Farmer Support and Incentives

We support incentives to encourage growers to adopt more sustainable practices, including the planting of untreated seed, use of scouting and monitoring to determine whether NSTs are warranted based on documented pest pressure, establishment of windbreaks and other mitigations to reduce off-site movement of neonicotinoids, and establishment of pollinator habitat in more protected areas of their properties.

At the November meeting, Alexander Sereno (USDA Risk Management Agency) stated that federal crop insurance may not pay out if pest control measures were not adequate or typical for defense against yield impacts from a particular insect pest. We recommend following up with Director Sereno with the question: would the agency hold growers liable for decisions that are made based on state policy? The agency may not be able to hold growers liable for pest management decisions (for example, the planting of treated vs. untreated seed) that are limited by state policies and regulations - an important distinction that would provide assurances to growers moving to untreated seed as a result of state-specific rules.

Research and Monitoring

We strongly support that the Board recommend and fund research on the impacts of neonicotinoids on pollinators, soil health, pest populations. and crop yields, as well as environmental monitoring of the neonicotinoid contamination in water (including drinking water), air, soil, and pollen. In addition to better understanding the extent of potential impacts, these efforts would establish a baseline for monitoring changes in concentrations due to changes in farm practices.

We recommend that the Board establish a plan to evaluate efficacy of these best management practices over time, including surveys to detail changes in grower practices, such as use of IPM or untreated seeds, as well as monitoring efforts to determine whether the implementation of mitigations at planting reduces dust emissions. These would be valuable for our state efforts as well as for other states considering different approaches to reduce use and impacts from NSTs.

Training and Education

We strongly support all efforts to increase farmer and seed dealer understanding of the risks of neonicotinoid seed treatments to pollinators, aquatic invertebrates, other wildlife, and human health, and best practices for reducing off-site movement, minimizing pollinator exposure, and disposing of unused seeds. Some additional specific efforts that we recommend:

- Provide clear guidance and educational materials to support farmers that want to transition away from NSTs. FAQs could include, for example, how, when, and where growers can order untreated seeds in advance. We recognize that this guidance could change over time as markets adapt to new policies.
- Consider additional education/training to support farmer understanding of the impacts of neonicotinoid seed treatments on soil health and biology. Neonicotinoid seed treatments reduce densities of important arthropod decomposers in crop soils, slowing the breakdown of plant residues and nutrient cycling (Chagnon et al. 2015, Pearsons and Tooker 2021, Zaller et al. 2016). It is possible that the extensive use of NSTs could affect decomposition rate of organic matter, export of nutrients into Lake Champlain, and in some cases crop yields due to their impacts on soil arthropods and microbial communities.

Treated Seed Disposal

Because the EPA classifies treated seed as a "treated article," this form of pesticide delivery has been exempt from the same scrutiny given to other pesticides under FIFRA. As a result, there is very little information available not only on the sales and use of treated seed, but also the fate of excess or "waste" treated seed at the end of a growing season. We encourage the Board to craft specific guidance on best practices for pesticide-treated seed disposal. We offer the following recommendations.

1. **We encourage AIB to recommend that end-users track the amount of excess treated seed they produce each season by crop. Over time, this information could help end-users to calibrate their orders to reduce waste seed.** It would also be helpful to record the methods used for disposal (e.g., planting on site, landfill, etc.). If Vermont agencies were to collect this information, it would aid in estimating and anticipating how much treated seed is or will be making its way to landfills or waste-to-energy (WTE) facilities. In turn, this would allow the state to ensure it has the resources and means to handle this waste stream over time. It

might also allow treated seed manufacturers and distributors to calibrate treated seed production to prevent excess waste.

2. **Recommend that end-users handle pesticide-treated seeds and contaminated seed bags entering the solid waste stream as hazardous materials.** Pesticides are generally considered hazardous materials and we ask AIB to consider recommending that end users dispose of pesticide-treated seed and their byproducts (e.g., dust, packaging, etc.) using waste facilities equipped to protect against the leaching of concentrated pesticides into soil and groundwater. Depending on the active ingredient, many pesticide-treated seed labels - such as those for products containing imidacloprid - indicate their danger to human health, wildlife, and waterways. Seeds treated with toxic substances should be subject to the same "cradle-to-grave" oversight that is applied to other hazardous materials.

   We encourage AIB to explore the possibility of reducing logistical burdens on farmers by creating collection programs whereby end-users may send their waste pesticide-treated seed and related materials, such as seed bags and equipment filters, back to the entity that treated the seed (e.g., manufacturer), who is then responsible for proper disposal.

3. **Recommend that waste facilities immediately cover pesticide treated seeds to protect wildlife from ingesting seed.** We recognize that BMPs are intended for farmers; however, it is crucial that recommendations extend to all entities that may handle treated seed. The Minnesota Pollution Control Agency, for example, requires this of waste facilities (see summary of guidelines).

4. **Recommend *against* the use of pesticide-treated seed, especially insecticide-treated seed, for wildlife habitat.** We encourage AIB to create guidelines that strongly discourage the use of treated seed for habitat plantings, especially on refuge lands and state-managed wildlife lands (state parks, wildlife management areas, etc.).

   Excess treated seed is often sold at discounted rates for spring food lots - a form of wildlife habitat that is usually planted to support game species. Food lots with plants grown from insecticide-treated seeds are a risk to the very animals they are intended to sustain. The high water solubility of treatment active ingredients makes them liable to contaminate local waterways, leading to non-target invertebrate impacts and, ultimately, aquatic habitats and ecosystems with lower productivity (Hallmann 2014, Hladik et al. 2018). We encourage AIB to clearly articulate in BMPs that treated seed should not be used for wildlife habitat.

   Though habitat is being created with conservation in mind, sowing insecticide-treated seeds carries risks for wildlife. The widespread, prophylactic use of neonicotinoid treated seeds on various crops, including corn, soy, wheat, and even alfalfa - a pollinator-attractive plant - is causing harm to pollinator populations

(Hopwood et al. 2018), birds (Mineau & Kern 2023), and waterways (Schepker et al., 20202; The Xerces Society, 2021). Seed treatments can also disrupt soil communities (Parizedah et al. 2021). Recent research found high levels of neonicotinoids in wild white-tailed deer in North Dakota and linked neonicotinoid levels in the spleens of deer to deformities and reduced health (Berheim et al. 2019). Neonicotinoids are also being found in pheasants, possibly owing to contaminated forage (Daley 2019), which can have harmful effects at high levels (Sundall 2020).

5. **Recommend against the use of waste treated seeds for ethanol, biodiesel, or other fermentation or oil processing. End users should be cautioned that treated seed packaging instructions for disposal may not be in line with current understanding of best practices.**

   In early 2021, a worst-case scenario involving improper disposal was uncovered. Severe pesticide contamination was detected at an ethanol plant outside of Mead, Nebraska. Nearby bee-kills led to the discovery that the plant was accepting the vast majority of excess treated corn seed in North America and processing it into ethanol – resulting in byproducts with astronomical levels of pesticide contamination. These byproducts were then spread on local fields as soil conditioners or via irrigation, and contaminated the surrounding area and its waterways with pesticides. Cleaning up the contaminated plant is expensive and challenging, and it will continue to pose risks to the area for some time. In spite of this incident, many seed labels continue to indicate that ethanol production is an acceptable use for waste treated seed, making it incumbent upon states to clarify best practices.

6. **Recommend against concentrated burial of large quantities of seed as a disposal method and encourage solid waste disposal in these cases.** Burial of large quantities of excess seed is a concern because this can further contribute to soil and surface and groundwater contamination. Neonicotinoids, which are the most common insecticide seed treatments, are water soluble and thus often end up in waterways. Most of the neonicotinoids applied to seeds are not absorbed by the growing plants, leaving 80–98% of the pesticides in the soil, where they can then move into surface or groundwater (Alford & Krupke 2017). As a result, neonicotinoids are present in Midwestern waterways throughout the year, often at levels that pose risk to aquatic species (Hladik et al. 2018, Schepker et al. 2020). Broader studies across the Midwest have also noted elevated pulses of neonics in waterways during crop planting, attributed to seed treatments (Hladik et al. 2014, Berens et al. 2021). For all the reasons noted above, we encourage sending large amounts of excess treated seed to properly equipped industrial solid waste disposal facilities that will contain them or WTE facilities that will incinerate them. Burial of excess seed introduces unnecessary risks to the environment, including soil and water contamination and ingestion by wildlife. We reiterate that

manufacturers could play a role in lessening the burden of excess seed on farmers by accepting the seed and handling its proper disposal.

We appreciate the opportunity to comment on the proposed framework for neonicotinoid treated seeds in Vermont, and would be happy to discuss any aspects of these comments further with the Board. We look forward to providing education and training to Vermont growers on pollinator protection and implementation of the BMPs.

Sincerely,

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