

Dear Senate and House Agriculture Committees,

2/17/2020

It was a pleasure to meet with you last week and talk about the important role NOFA-VT plays in supporting our agricultural communities. During our discussions the topic of neonicotinoid seed treatments came up. I have seen the powerpoint deck that the Agency of Agriculture presented and I wanted to express my unease over the lack of concern they seem to be conveying through their findings. I appreciate their effort to collect data, but I have a few questions and rebuttals about their presentation. I am including a body of more rigorous scientific peer reviewed research that contradicts their conclusions. The legislatively mandated Pollinator Protection Committee (of which I was a member) also came to different conclusions about the risks and benefits of neonic seed treatment and were in favor of more constraints around their use.

- 1) Risk:Benefit analysis. Where are the proven benefits to neonic seed treatments? The Agency presentation highlights some sporadic minor pests (seed corn maggot, white grub, wireworm) that during my career as a corn/soybean IPM consultant and researcher have been shown to be rare, local, and seldom high enough to decrease yield. The Agency shows no information on pest incidence or economic injury levels which are the first steps to understanding whether a pesticide treatment is necessary or not under an Integrated Pest Management program.
- 2) The Agency's slide that conflates no-till (which is a great practice for improving soil health) with increased pest pressure is not substantiated unless they are referring to rodents and slugs which can increase. This report from Penn State shows non-target impacts of seed treatment that created toxic slugs which poison predators and caused worse pest outbreaks.  
<https://news.psu.edu/story/336981/2014/12/04/research/insecticides-foster-toxic-slugs-reduce-crop-yields>
- 3) The measurements of neonics from their water sampling work is all reported based on an acute toxicity benchmark. However, measurements reported exceed the chronic toxicity benchmarks. Why wasn't that highlighted? What does "No implications for chronic exposure exceedances" even mean? Chronic exposure is what concerns me most as it is insidious and difficult to measure. We know from peer reviewed studies (see below) that neonics can negatively affect insect sperm count, egg laying, immune systems, navigation systems and more. 70% of our native bees nest in soil and are constantly exposed to low levels of these insecticides. Insect populations (and birds which rely on them) are plummeting worldwide. We should take a precautionary approach with these toxins.

At this point the research shows a high risk for negative impacts on non-target organisms from the use of neonic treated seeds. As a proponent of Integrated Pest Management and a fruit farmer whose livelihood relies on pollinators, I would like to see a moratorium on these pesticides. At the very least farmers using them should be required to show a need. I believe farmers are being duped by the pesticide companies to pay more for unnecessary inputs to avoid a miniscule risk.

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## Literature on the Effects of Neonicotinoid Pesticides (with thanks to Judy Bellairs)

### Invertebrates:

1. [Effects of neonicotinoids and fipronil on non-target Invertebrates \(2014\)](#)

Excerpt: We assessed the state of knowledge regarding the effects of large-scale pollution with neonicotinoid insecticides and fipronil on non-target invertebrate species of terrestrial, freshwater and marine environments. . . Given the clear body of evidence presented in this paper showing that existing levels of pollution with neonicotinoids and fipronil resulting from presently authorized uses frequently exceed lowest observed adverse effect concentrations and are thus likely to have large-scale and wide ranging negative biological and ecological impacts, the authors strongly suggest that regulatory agencies apply more precautionary principles and tighten regulations on neonicotinoids and fipronil.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4284392/>

2. [Environmental Risks and Challenges Associated with Neonicotinoid Insecticides \(2018\)](#)

Excerpt: A review of 214 acute and chronic toxicity tests indicate that the orders Ephemeroptera (mayflies), Trichoptera (caddisflies), and Diptera (flies including Chironomid midges) were consistently the most sensitive taxa to neonicotinoids.<sup>59</sup> Although direct toxicity of neonicotinoids is a concern, within aquatic insects, several sublethal end points including behavior, reproduction, immobility, feeding inhibition, and delayed emergence are all shown to be impacted by neonicotinoids.<sup>60–64</sup>

<https://pubs.acs.org/doi/pdfplus/10.1021/acs.est.7b06388>

3. [Contamination of the Aquatic Environment with Neonicotinoids and its Implication for Ecosystems \(2016\)](#)

Excerpt: Negative impacts of neonicotinoids in aquatic environments are a reality. Initial assessments that considered these insecticides harmless to aquatic organisms may have led to a relaxation of monitoring efforts, resulting in the worldwide contamination of many aquatic ecosystems with neonicotinoids. The decline of many populations of invertebrates, due mostly to the widespread presence of waterborne residues and the extreme chronic toxicity of neonicotinoids, is affecting the structure and function of aquatic ecosystems. Consequently, vertebrates that depend on insects and other aquatic invertebrates as their sole or main food resource are being affected. Declines of insectivore bird species are quite evident so far, but many other terrestrial and amphibian species may be at risk.

<https://www.frontiersin.org/articles/10.3389/fenvs.2016.00071/full>

4. Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: A review

Excerpt: 2015. Overall, neonicotinoids can exert adverse effects on survival, growth, emergence, mobility, and behavior of many sensitive aquatic invertebrate taxa at concentrations at or below 1 µg/L under acute exposure and 0.1 µg/L for chronic exposure. . Therefore, it appears that environmentally relevant concentrations of neonicotinoids in surface waters worldwide are well within the range where both short- and long-term impacts on aquatic invertebrate species are possible over broad spatial scales.

[https://www.ontariobee.com/sites/ontariobee.com/files/Morrissey%20et%20al%202015\\_Review%20neonicotinoids%20surface%20water%20risk%20to%20aquatic%20invertebrates.pdf](https://www.ontariobee.com/sites/ontariobee.com/files/Morrissey%20et%20al%202015_Review%20neonicotinoids%20surface%20water%20risk%20to%20aquatic%20invertebrates.pdf)

**Birds:**

1. Imidacloprid and chlorpyrifos insecticide impair migratory ability in a seed-eating songbird (2017)

Excerpt: These results suggest that wild songbirds consuming the equivalent of just four imidacloprid-treated canola seeds or eight chlorpyrifos granules per day over 3 days could suffer impaired condition, migration delays and improper migratory direction, which could lead to increased risk of mortality or lost breeding opportunity.

[https://www.nature.com/articles/s41598-017-15446-x.epdf?author\\_access\\_token=60vOAq7fy3uoItENRL\\_WLrRgN0jAjWel9jnR3ZoTv0PBos7CYdu4-aOFIzRGcQZYPhLZT79bnumB3G0JwKQDqd8sXxokuXX20RybZGim1WNULlibibaVSnXR6616CbBcOjFXccxNhEZR\\_Q54lKeJgg%3D%3D](https://www.nature.com/articles/s41598-017-15446-x.epdf?author_access_token=60vOAq7fy3uoItENRL_WLrRgN0jAjWel9jnR3ZoTv0PBos7CYdu4-aOFIzRGcQZYPhLZT79bnumB3G0JwKQDqd8sXxokuXX20RybZGim1WNULlibibaVSnXR6616CbBcOjFXccxNhEZR_Q54lKeJgg%3D%3D)

2. Controversial insecticides shown to threaten survival of wild birds (2019)

Excerpt: 2019. The study found that white-crowned sparrows who consumed small doses of an insecticide called imidacloprid suffered weight loss and delays to their migration -- effects that could severely harm the birds' chances of surviving and reproducing. "We saw these effects using doses well within the range of what a bird could realistically consume in the wild -- equivalent to eating just a few treated seeds,"

The three researchers examined the effects of neonicotinoids in a previous study using captive sparrows. The new research reinforces the weight loss effect seen in that 2017 study. Captive birds in the earlier study were also found to become disoriented as a result of neonicotinoid exposure.

In North America, three-quarters of bird species that rely on agricultural habitat have significantly declined in population since 1966. The results of the new study show a mechanism by which pesticides could be directly contributing to this drop-off.

<https://www.sciencedaily.com/releases/2019/09/190912140456.htm>

3. Declines in insectivorous birds are associated with high neonicotinoid concentrations (2014)

Excerpt: We investigated the hypothesis that the most widely used neonicotinoid insecticide, imidacloprid, has a negative impact on insectivorous bird populations. Here we show that, in the Netherlands, local population trends were significantly more negative in areas with higher surface-water concentrations of imidacloprid . . . Additional analyses revealed that this spatial pattern of decline appeared only after the introduction of imidacloprid to the Netherlands, in the mid-1990s. <https://www.nature.com/articles/nature13531>

**Deer:**

Effects of Neonicotinoid Insecticides on Physiology and Reproductive Characteristics of Captive Female and Fawn White-tailed Deer (2019)

Excerpt: 2019. Results indicated that 1) control deer consumed more water than treatment groups, 2) imidacloprid was present in the organs of our control group, indicating environmental contamination, 3) as imidacloprid increased in the spleen, fawn survival, thyroxine levels, jawbone lengths, body weight, and organ weights decreased, 4) adult female imidacloprid levels in the genitals were negatively correlated with genital organ weight and, 5) behavioral observations indicated that imidacloprid levels in spleens were negatively correlated with activity levels in adult females and fawns. Results demonstrate that imidacloprid has direct effects on white-tailed deer when administered at field-relevant doses.

[https://www.researchgate.net/publication/331746065\\_Effects\\_of\\_Neonicotinoid\\_Insecticides\\_on\\_Physiology\\_and\\_Reproductive\\_Characteristics\\_of\\_Captive\\_Female\\_and\\_Fawn\\_White-tailed\\_Deer](https://www.researchgate.net/publication/331746065_Effects_of_Neonicotinoid_Insecticides_on_Physiology_and_Reproductive_Characteristics_of_Captive_Female_and_Fawn_White-tailed_Deer)

**Fish & Lizards:**

A review of the direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife (2014)

Excerpt: 2014. Our research revealed two field case studies of indirect effects. In one, reductions in invertebrate prey from both imidacloprid and fipronil uses led to impaired growth in a fish species, and in another, reductions in populations in two lizard species were linked to effects of fipronil on termite prey. Evidence presented here suggests that the systemic

insecticides, neonicotinoids and fipronil, are capable of exerting direct and indirect effects on terrestrial and aquatic vertebrate wildlife, thus warranting further review of their environmental safety.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4284370/>

#### **Mice:**

Mammalian Susceptibility to a Neonicotinoid Insecticide after Fetal and Early Postnatal Exposure (2018)

Excerpt: Our results demonstrate that transient exposure to a neonicotinoid over the early developmental period induces long-lasting changes in behavior and brain function in mice.

<https://www.nature.com/articles/s41598-018-35129-5>

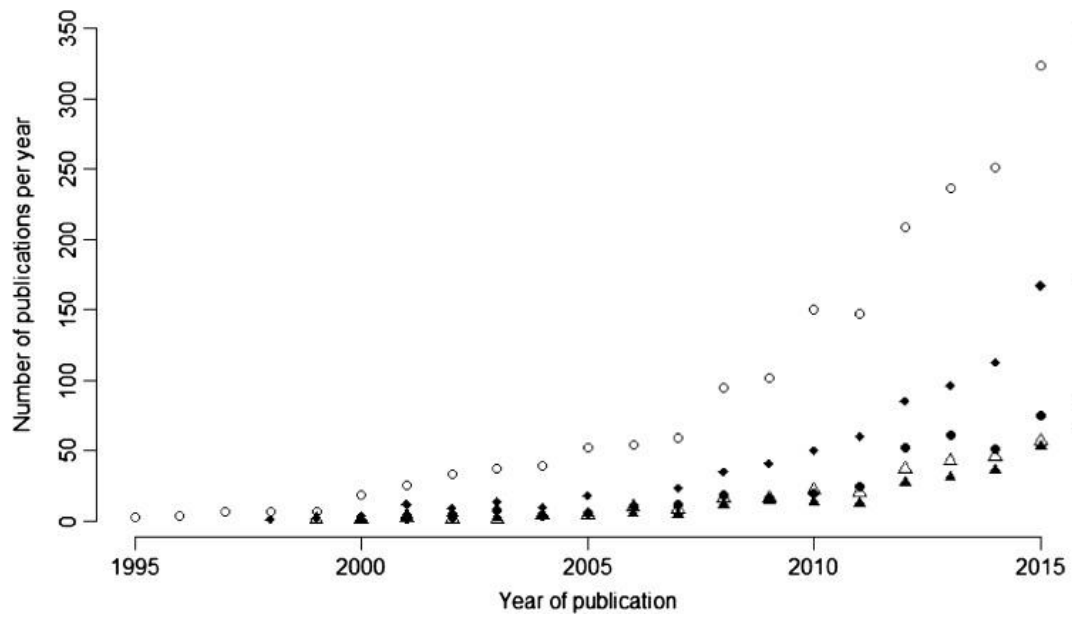
#### **Wild Turkeys:**

Neonicotinoid detection in wild turkeys (*Meleagris gallopavo silvestris*) in Ontario, Canada (2018)

Excerpt: Wild turkeys (*Meleagris gallopavo*), and other avian species such as gray partridges (*Perdix perdix*) and pigeons (*Columba palumbus*, *C. livia*, and *C. oenas*), readily ingest treated corn or soya seeds (Mineau and Palmer [2013](#); Millot et al. [2017](#)); in fact, depending on food availability, these resources comprise a significant portion of the wild turkey's diet (OMNRF [2007](#)). These seeds can contain some of the highest concentrations of NNIs (Gibbons et al. [2015](#)), making them of particular concern because of their availability to birds and the potential for repeat or ongoing exposure. A single corn kernel is typically treated with approximately 1 mg of active ingredient (Rexrode et al. [2003](#)) and consumption of just one imidacloprid-treated corn seed, or a few clothianidin- or thiamethoxam-treated seeds, could be lethally toxic to a bird the size of a blue jay (Mineau and Palmer [2013](#)). . . There has also been growing concern among natural resource managers, conservationists, and hunters about whether NNI use may be linked to poor reproductive output of wild turkeys and potential bioaccumulation of NNIs in wild turkey meat intended for human consumption.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5984634/>

The studies above are only the tip of the iceberg.



Number of studies containing the words neonicotinoid (open circle), neonicotinoid + bee (filled diamond), neonicotinoid, + residue (filled circle), neonicotinoid + water (open triangle), neonicotinoid + soil (filled triangle)

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5533829/figure/Fig2/>