AMERICAN BIRD CONSERVANCY

Bringing back the birds

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Thank you for the opportunity to review the preliminary aquatic risk assessment to support the registration review of imidacloprid.

American Bird Conservancy applauds the Environmental Protection Agency for preparing such a detailed analysis of the freshwater and saltwater invertebrates affected by neonicotinoid insecticides. The results are incriminating. The EPA found extreme harm to the full range of aquatic insects. This contamination affects significantly the abundance of aquatic organisms and, thus, food availability for their predators including fish, birds, bats, and amphibians.

EPA's findings:
The risk assessment findings include:

- ***Imidacloprid is highly toxic to both freshwater and saltwater invertebrates***. The review states that imidacloprid's "very high toxicity to aquatic insects results in the vast majority of modeled imidacloprid use scenarios … having the potential to cause direct effects to sensitive aquatic invertebrates" (p. 100). EPA points out that these lethal and sub-lethal effects are resulting from registered uses (p. 102). The agency's findings are consistent with recent research including work by Morrissey, Mineau, et al., synthesizing the current state of knowledge on neonicotinoids in surface waters from 29 studies in nine countries worldwide together with published data on acute and chronic toxicity to 49 species of aquatic insects and crustaceans spanning 12 invertebrate orders. That review concluded, "neonicotinoids represent a significant risk to surface waters and the diverse aquatic and terrestrial fauna that these ecosystems support." [1]

- ***Aquatic insects (and Ephemeroptera, or mayflies, in particular) are among the most sensitive taxonomic groups tested to date with imidacloprid*** (pp 7, 11, 74, 102), especially in the summer

[1] Morrissey, CA, P Mineau, JH Devries, F Sanchez-Bayo, M Liess, MC Cavallaro, and K Liber. 2015. Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: A review. *Environment International*, 74: 291-303.
https://www.researchgate.net/publication/268333947_Neonicotinoid_contamination_of_global_surface_waters_and_associated_risk_to_aquatic_invertebrates_A_review
See also, Sánchez-Bayo F, Goka K and Hayasaka D. 2016. Contamination of the Aquatic Environment with Neonicotinoids and its Implication for Ecosystems. *Front. Environ. Sci. 4:71.* doi: 10.3389/fenvs.2016.00071.
http://journal.frontiersin.org/article/10.3389/fenvs.2016.00071/full

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months (p. 74). The mayflies ranked highest in both acute and chronic testing. The EPA points out, "It is notable that these studies did not measure other endpoints such as growth and reproduction, which conceivably could be more sensitive than survival or immobilization." (p. 80). Mayflies are an important food source for birds, fishes, and other organisms.

- ***There is huge variability in sensitivity of aquatic invertebrates exposed to imidacloprid*** (pp. 71, 110). The tested species represent a tiny fraction of the thousands of species found in North America (p. 110). EPA acknowledges that their standard freshwater invertebrate test species (*Daphnia magna*) should not be used for testing imidacloprid. "It is widely recognized in the published literature that *D. magna* is not ….suitable as a test species for assessing the effects of imidacloprid on freshwater invertebrate communities as a whole." (p. 70). This is in line with ABC's 2013 finding that EPA has grossly underestimated the toxicity of the neonicotinoids due in part to its reliance on a test species uniquely insensitive to neonicotinoids.[2]

- ***Imidacloprid and other neonicotinoid insecticides are causing widespread contamination of surface and ground waters across the United States***. Imidacloprid's high persistence in soils and predicted mobility "are characteristics of pesticides that are expected to leach and may contaminate vulnerable ground water resources." (p. 27, see also p. 31 on half-life.) Based on more than 7,000 samples spanning 15 years, EPA determined that "It is evident….that concentrations of imidacloprid detected in streams, rivers, lakes and drainage canals routinely exceed acute and chronic toxicity endpoints derived for freshwater invertebrates. Maximum values reported exceed the freshwater chronic toxicity endpoint by two orders of magnitude and the acute toxicity endpoint by one order of magnitude" (p. 121). These chemicals are now contaminating the nation's water bodies on a *massive* scale. The ubiquity of imidacloprid and five other neonicotinoids in streams across the United States is further confirmed by a recent survey by Hladik and Kolpin (2016), finding at least one neonicotinoid in 68 percent of the 48 streams sampled.[3]

- ***Not only are the acute and chronic toxicity values extremely high, but the immobilization and ataxia of test organisms "is often seen to occur at concentrations of 1-2 orders of magnitude lower than lethality"*** (p. 69). The EPA concludes, "such severe impacts on organism mobility are considered ecologically relevant and appropriate for risk assessment purposes since organisms cannot feed, swim, or avoid predation." This is true for mayflies and other taxa (p. 74). These findings are of enormous concern to bird conservation, as the mayflies, midges, and other aquatic invertebrates constitute an important dietary component for birds, bats, fishes, and other wildlife.

- ***Imidacloprid's enormously high usage*** involves more than 400 section 3 and section 24(c) registrations in the US in addition to 20 registrations for technical grade active ingredient and 12

[2] Mineau, P and C Palmer. 2013. *The Impact of the Nation's Most Widely Used Insecticides on Birds*. Report by American Bird Conservancy. Online at: www.abcbirds.org/abcprograms/policy/toxins/Neonic_FINAL.pdf

[3] Hladik, ML, and DW Kolpin. 2016. First national-scale reconnaissance of neonicotinoid insecticides in streams across the USA. *Environ. Chem*. http://dx.doi.org/10.1071/EN15061 https://ca.water.usgs.gov/pubs/2015/HladikKolpin2015.pdf

formulation intermediates. The insecticide is applied as granules, seed coatings, pellets, liquid sprays, wettable powders, etc. (pp. 19, 147). Usage has increased significantly on soybeans and other crops (pp. 22-23). Agricultural application has risen from less than one-quarter million pounds per year in 2000 to two million pounds per year in 2014 (p. 24). This does not include the vast quantities used in the non-agricultural sector, which are reported only for California (note that the California data does *not* include homeowner usage – nor is it captured in the US government data) (p. 26).

Not surprisingly, the assessment states that the significant contamination is expected when dust formulations are used as a dry mixture, and also from coated seed abrasion (p. 148). In particular, "the highest exposure is expected from farmer treatments of barley and wheat with dust formulations of Enhance AW and Enhance Plus; bean and peas with dust formulation Enhance Plus, and corn (field, pop, and sweet), sorghum and soybeans with dust formulations of Sopresto75 WS…" (p. 148).

- ***The identified sources of major non-agricultural pest control raise questions about actual uses***. Public health control is listed as 10 percent (p. 26). Yet in figure 3.7 (p. 27), public health is identified as only one percent, while "regulatory pest control," which can involve quarantine, suppression, and other vector control strategies, is graphed at 10 percent. It is not clear how EPA is distinguishing between these categories, and specifically why the discrepancy between the 1 and 10 percent figures for public health control. It is also disappointing that there is no accounting for the vast amounts of imidacloprid and other neonicotinoids used by homeowners.

Related issues:

Still waiting for assessment on non-insect terrestrial organisms.

EPA states that "…very little new data have been generated on the toxicity of imidacloprid to birds and mammals since the agency's most recent ecological assessments. The agency therefore will rely on its previously conducted assessments for characterizing the risk of imidacloprid to non-insect terrestrial organisms" (pp. 7, 12). As the prior "ecological" assessment on imidacloprid focused on risks to pollinating insects and in particular managed bee populations, it is not clear what EPA is referencing, and why the need to limit any review of bird and mammal data to only the science that has come out in the past several months, given the lack of a prior review. It is confusing how EPA is using the term "ecological," as some references suggest that this preliminary aquatic invertebrate risk assessment is itself the "preliminary ecological risk assessment." (p. 114). In any case, ABC looks forward to seeing EPA's final ecological risk assessment, which will "fully evaluate risks to birds, mammals and terrestrial plants" (p. 7).

Need a cumulative risk assessment.

This document offers a very solid starting point in the assessment of neonicotinoid impacts on aquatic invertebrates. We emphasize, however, that the piecemeal approach to the review of pesticide impacts – looking at single neonicotinoid residues on isolated crops – does not reflect real world conditions of chemicals that act together with a common mechanism of action.

EPA explains that the agency has adjusted its timelines to have their nitroguanadine risk assessments in sync. Reviewing the pesticides in parallel, however, is not the same as a cumulative review. The reality is that a full suite of neonicotinoids and other pesticides is often applied simultaneously, leaving multiple residues on crops. EPA's preliminary assessment does not address the combined and synergistic risks when multiple chemicals are used in concert.

In 2015 American Bird Conservancy tested 66 food samples from the cafeterias of the US Congress and found that 60 samples (91 percent) contained neonicotinoids, and that most samples were contaminated with two or more neonicotinoids. Of the 40 food samples that contained imidacloprid, 34 foods (85 percent) tested positive for other neonicotinoids as well.[4] ABC tested only for neonicotinoids, but many other insecticides, fungicides and herbicides may be used on the same crops or in the surrounding geographic area. It is clear that a risk assessment evaluating the combined effects of multiple simultaneous exposures is needed.

Seed coatings and abraded seed coat dust as a critical pathway.

While acknowledging that the seed coatings constituted 56 percent of imidacloprid crop usage between 2004 and 2013 (p. 21), the risk assessment sidesteps the threat of contaminated dust from coated seeds. "This modeling does not take into account the potential contamination from deposition of abraded seed coat dust onto the treated field or adjacent areas and therefore, may underestimate aquatic exposure from the planting of treated seeds. Currently EPA does not have standardized methods for quantitatively modeling dust off from abraded coating from treated seeds" (pp. 8-9, 93, 121). This is a huge omission and puts into question the finding that the "exposure modeling for soil application methods indicates less loading to aquatic ecosystem from spray drift relative to foliar/combined methods" (p. 100).

We are puzzled as well by the fanciful assumption that neonicotinoid chemicals applied as coatings on seeds planted below two centimeters do not move into surface waters and therefore present minimal risk. EPA's models do not account for lateral movement of these chemicals in soil and run-off. We ask the EPA to please review the literature on contamination from seed coatings, including Krupke et al. (2017), *Planting of neonicotinoid-treated maize poses risks for honey bees and other non-target organisms over a wide area without consistent crop yield benefit*.[5] It is evident that the near-ubiquitous use of these coatings is having deleterious effects on both aquatic and terrestrial ecosystems.

[4] Palmer, C. 2015. *Neonicotinoid Insecticides Harmful to Birds and Bees Found in Congressional Cafeteria Food*. Report by American Bird Conservancy. Online at https://abcbirds.org/behind-the-report-neonicotinoid-insecticides-harm-the-little-creatures/

[5] Krupke, CH, et al. 2017. Planting of neonicotinoid-treated maize poses risks for honey bees and other non-target organisms over a wide area without consistent crop yield benefit. *J Appl Ecol*. doi: 10.1111/1365-2664.12924. http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12924/full

In practice, as much as 90 percent of the chemical coating can move off the seed to contaminate the air, soil, marginal vegetation and waters.[6] It is likely that these seed coatings contribute significantly to the waterway contamination reported for streams, rivers, lakes and drainage systems, even though the assessment states that the elevated levels of imidacloprid in surface water "cannot be attributed to a particular type of application method" (p. 102).

EPA states that, "With respect to potential exposure via drift of abraded seed coat dust, the agency is working with different stakeholders to identify best management practices and to promote technology-based solutions that reduce this potential route of exposure." (p. 9). But consulting with industry and developing best management practices does not justify excluding an identified risk from a risk assessment. If the risk to be mitigated is unknown, the mitigation strategy is being developed in the dark. Moreover, we understand that whatever practices the Agency negotiates with industry will be voluntary – the label will not require the pesticide user to follow the suggested practices. This doubles down on the inadequacy of the process, leaving precatory voluntary practices in place of a hard look at the nature and extent of the risk.

The EPA incident reporting system needs an overhaul.

In discussing the elevated levels of imidacloprid in lakes, streams, rivers and drainage canals, EPA writes, "Only one aquatic incident was identified that involved a registered use of imidacloprid to turf." (p. 10. See also pp. 83-84.). Statements like this one, devoid of context, mislead the reader into assuming a lack of real-world impacts on aquatics. EPA later states (p. 100), "…the limited information currently available on aquatic incidents involving imidacloprid does not suggest that registered uses of imidacloprid are having direct adverse impacts on fish." It is true that we cannot learn much about imidacloprid from the fact that there are hardly any relevant incident reports in the EPA database.

EPA's incident reporting system is badly broken. The agency collects a smattering of voluntary reports, plus required reports from registrants in the rare circumstances where the number of dead wildlife observed reaches certain floors or thresholds. These reports are only required when the registrant happens to find multiple animals of a single species in one location: 50 dead mammals of a herding species, 1000 dead fish of a schooling species, 200 birds of a flocking species, 50 songbirds, or 5 raptors. The requirements exclude insects and "other non-targets" from the reporting categories. Those incidents which land in the EPA database are usually relegated to an "aggregate" category that does not even identify what organism was affected. So the fact that even a single incident was reported is a minor miracle, not a throwaway circumstance deserving of the "only one" notation.

American Bird Conservancy and more than 80 co-petitioners proposed in a 2016 rulemaking petition that in addition to removing the absurdly high reporting thresholds, EPA should add a category for aquatic and terrestrial invertebrates: the *absence* of expected biota. The ecological importance of invertebrates is in inverse proportion to their size. They pollinate flowering plants, filter the waterways, compost and turn the soil, and provide critical nutrition for birds and other wildlife. Yet invertebrates

[6] Goulson D. 2013. An overview of the environmental risks posed by neonicotinoid insecticides. *J Appl Ecol* 50, 977–987. http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12111/abstract

rarely get counted in their dead or dying state. If a farmer who regularly tests surface waters near his organic fields finds that the waterways have been depleted of aquatic invertebrates, and test high for pesticide active ingredients, EPA databases should capture that information. These findings would offer one more piece of important information among the many variables that risk managers could weigh in their assessments.

Impacts on endangered species.

EPA should not consider re-registering imidacloprid until it completes a thorough assessment of the effects on endangered species. The risk assessment states that "once the agencies have fully developed and implemented the scientific methods necessary to complete risk assessments for listed species and their designated critical habitats, these methods will be applied to subsequent analyses of imidacloprid as part of completing this registration review"(p. 119). ABC supports the plan to conduct thorough ESA evaluations of the neonicotinoid insecticides using the latest scientific methods. But given the serious risk to threatened and endangered species, we urge the agency to suspend the use of these chemicals until completion of the Endangered Species Act reviews.

The danger to invertebrates, birds, and other organisms is wide-reaching. The seed coatings are strongly implicated as a factor in the "endangered" classification that the Fish and Wildlife Service gave to the Rusty Patched Bumble Bee[7] and to two butterflies, the Dakota Skipper and the Poweshiek skipperling. It is highly likely that aquatic invertebrates are affected as well.

Among the other endangered species affected, internationally recognized experts John Stark of Washington State University, John Losey of Cornell University, and Pierre Mineau, formerly with Environment Canada, have identified the Hines Emerald Dragonfly, Salt Creek Tiger Beetle, Mississippi Sandhill Crane, Whooping Crane, and Attwater's Prairie Chicken. Many other organisms are likely at risk as well. The hundreds of millions of acres in this country on which neonicotinoids are used overlap the habitats of hundreds of listed species, which may now face severe jeopardy of extinction. Noncompliance with the Endangered Species Act is not acceptable.

Food for birds and other wildlife.

Bird, bats, fishes, and other organisms rely on the many aquatic invertebrates affected by imidacloprid.[8] The EPA risk assessment found that mayflies top the list in their susceptibility to this neonicotinoid. The

[7] Department of the Interior, US Fish and Wildlife Service. Final rule, Endangered Species Status for Rusty Patched Bumble Bee, 82 Fed. Reg. 3186, Jan. 11, 2017. ("Neonicotinoids are a class of insecticides used to target pests of agricultural crops, forests …, turf, gardens, and pets and have been strongly implicated as the cause of the decline of bees in general (European Food Safety Authority 2015, p. 4211; Pisa et al. 2015, p. 69; Goulson 2013, pp. 7–8), and specifically for rusty patched bumble bees, due to the contemporaneous introduction of neonicotinoid use and the precipitous decline of the species (Colla and Packer 2008, p. 10)." *Id.* at 3190

[8] Gibbons, D, Morrissey, C, Mineau, P. 2015. A review of the direct and indirect effects of neonicotinoids and fipronil on vertebrate wildlife. *Environ. Sci. Pollut. Res. Int*. 22:103-118. http://dx.doi.org/10.1007/s11356-014-3180-5. For research on bird population-level effects from reduced food abundance, see: Hallmann CA, et al. 2014. Declines in insectivorous birds are associated with high neonicotinoid concentrations. *Nature* doi:10.1038/nature13531. https://www.nature.com/nature/journal/v511/n7509/full/nature13531.html Full text:

domino effects from even this one invertebrate can be devastating. Decimating the mayfly population can in turn affect bird species that consume the mayflies -- the Common Nighthawk, Tree and Barn Swallows, Bank Swallow, Cliff Swallow, American Dipper, American Pipit, Chimney Swift, Black Swift, Purple Martin, Louisiana and Northern Waterthrush, Prothonotary Warbler, Palm Warbler, Wilson's Warbler, Yellow-breasted Chat, Great Crested Flycatcher, Eastern Wood-Pewee, Eastern Phoebe, White-eyed Vireo, Eastern Bluebird, and Cedar Waxwing[9]. These include birds that are already experiencing elevated vulnerabilities, in particular the Common Nighthawk, Whip-poor-will, Black Swift, Purple Martin, Prothonotary Warbler and the Louisiana and Northern Water thrushes. It is worth noting that mayflies are harmless to humans and do not carry diseases. Rather, we rely on them to support the species we care about, such as trout. They are eaten by a range of fishes and by many bats, as well, especially in the vicinity of Lake Huron and other Great Lakes of the United States.

EPA's findings are in line with a meticulous 2017 review of the most recent science, *The Environmental Risks of Neonicotinoid Pesticides: A review of the evidence post-2013*, [10] which speaks to the ongoing risks of neonicotinoids' lethal and sub-lethal effects on a wide range of taxa. The review highlights the extreme sensitivity of aquatic invertebrates, particularly insect larvae, at levels regularly exceeded in surface waters in the United States and around the world. The authors conclude that this contamination is likely to impact significantly the abundance of aquatic insects and, thus, food availability for their predators, including fish, birds, and amphibians. The review states that "new research strengthens arguments for the imposition of a moratorium, in particular because it has become evident that [the neonicotinoids] pose significant risks to many non-target organisms, not just bees."

Next steps

The use of the neonicotinoids is extremely widespread, and yet there is scant evidence of their contribution to agricultural productivity – a finding reached by EPA scientists in their assessment of treated soybean seeds, and independently confirmed by peer-reviewed researchers.[11] Moreover,

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https://pdfs.semanticscholar.org/ffa8/f7a41a8c377a613107994bde29f0e5553253.pdf?_ga=2.32271095.816967692.1498753472-614696370.1498753472

[9] The Cornell Lab of Ornithology. 2017. Birds of North America. https://birdsna.org/Species-Account/bna/home

[10] Wood, TJ and D Goulson. 2017. *The Environmental Risks of Neonicotinoid Pesticides: A review of the evidence post-2013.* http://biorxiv.org/content/biorxiv/early/2017/01/06/098897.full.pdf

[11] Hodgson, E.W., and G. VanNostrand. 2014. 2014 Yellow Book Report of insecticide evaluation for soybean pests, 21 pp. Department of Entomology, Iowa State University, Publication 296-14. As reported in: http://ento.psu.edu/extension/field-crops/fact-sheet-Effectiveness-of-Neonicotinoid-Seed-Treatments-in-Soybean; Seagraves, M.P., and J.G. Lundgren. 2012. Effects of neonicotinoid seed treatments on soybean aphid and its natural enemies. Journal of Pest Science. 85: 125-132.; Bailey, Wayne et. al. 2015. The Effectiveness of Neonicotinoid Seed Treatments in Soybean." Purdue Extension Service (and others), E-268. December. http://ento.psu.edu/extension/field-crops/fact-sheet-Effectiveness-of-Neonicotinoid-Seed-Treatments-in-Soybean; Krupke CH, Holland JD, Long EY. and Eitzer BD. 2017. Planting of neonicotinoid-treated maize poses risks for honey bees and other non-target organisms over a wide area without consistent crop yield benefit. J Appl Ecol.; Center for Food Safety report. 2017. Alternatives to Neonicotinoid Insecticide-Coated Corn Seed: Agroecological Methods are better for Farmers and the Environment. http://www.centerforfoodsafety.org/issues/304/pollinators-and-pesticides/press-releases/4957/landmark-report-shows-bee-killing-seed-coatings-arent-worth-the-harm; EPA. 2014. Benefits of Neonicotinoid Seed Treatments to

pesticide use data indicate that application of older chemicals such as carbamates and organophosphorous pesticides continues to climb even with the skyrocketing use of neonicotinoids. The neonicotinoids are not replacing but rather adding to these older categories of pesticides. By harming pollinators like bees and butterflies, and natural pest control agents like birds and beneficial insects, imidacloprid and other neonicotinoids leave agricultural lands more vulnerable to pest pressures, requiring large inputs of organophosphates and other pesticides later in the growing cycle.

EPA needs to move expeditiously to rein in the use of imidacloprid, following the lead of Europe and Canada as well as many U.S. companies (including Home Depot, Lowe's, Walmart, True Value, and BJ's Wholesale Club), as well as state and local legislatures. EPA's findings mirror those of Canada's Pest Management Regulatory Agency (PMRA), which recently completed its aquatic risk assessment for imidacloprid concluding that, "in aquatic environments in Canada, imidacloprid is being measured at levels that are harmful to aquatic insects. These insects are an important part of the ecosystem, including as a food source for fish, birds and other animals. Based on currently available information, the continued high volume use of imidacloprid in agricultural areas is not sustainable." The Canadian assessment also found that "there is a potential risk to birds and small mammals from feeding on seeds that are treated with imidacloprid…" Given the seriousness of the environmental threat, "PMRA is proposing to phase-out all the agricultural and a majority of other outdoor uses of imidacloprid over three to five years."[12]

The PMRA explains why it is proposing a ban:

> Given the risks that have been identified and considering the available information, effective risk mitigation through a use-reduction strategy would be difficult to achieve for several reasons. It would be difficult to identify the specific uses that are causing the elevated levels in water given that much of the water monitoring data were from mixed-use areas of agriculture. In addition, it is not possible to accurately predict how much use reduction would be necessary to achieve acceptable levels of imidacloprid in the environment and, therefore, any use-reduction strategy would require extensive and comprehensive water monitoring information to confirm that risk reduction targets are being achieved. It is also not possible to estimate how long a reduction in environmental levels would take. In addition, in sectors where imidacloprid is approved for use but not currently used extensively, intensification of use in the future may lead to additional

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Soybean Production. https://www.epa.gov/sites/production/files/2014-10/documents/benefits_of_neonicotinoid_seed_treatments_to_soybean_production_2.pdf; Seagraves, M.P., and J.G. Lundgren. 2012. Effects of neonicotinoid seed treatments on soybean aphid and its natural enemies. Journal of Pest Science. 85: 125-132; Douglas, M.R., J.R. Rohr, and J.F. Tooker. 2014. Neonicotinoid insecticide travels through a soil food chain, disrupting biological control of non-target pests and decreasing soybean yield. Journal of Applied Ecology; Douglas, M.R. and J.F. Tooker. 2015. Large scale deployment of seed treatments has driven rapid increase in use of neonicotinoid insecticides and preemptive pest management in US field crops. Environmental Science and Technology.

[12] Health Canada, Pest Management Regulatory Agency. 2017. Proposed Re-evaluation Decision PRVD2016-20, *Imidacloprid*. https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/consultations/proposed-re-evaluation-decisions/2016/imidacloprid/document.html

risks of concern. Given the above, phase-out of all outdoor agricultural, ornamental, turf, and tree uses (except tree injection uses) and greenhouse uses of imidacloprid is being proposed.[13]

We urge the US EPA to take similar steps.

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The EPA risk assessment confirms that imidacloprid and other neonicotinoids are extremely harmful to a wide range of aquatic invertebrates. These organisms support the birds, bats, fishes, and other species on which we all depend. It is time that EPA take action to protect wildlife and people from this proliferating threat.

Thanks for your attention.

Sincerely,

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[13] Pest Management Regulatory Agency, 23 November 2016, ISSN: 1925-0967. Catalogue number: H113-27/2016-20E-PDF. Proposed Re-evaluation Decision PRVD2016-20, Imidacloprid. http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_prvd2016-20/prvd2016-20-eng.php#s1