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Please see comment letter attached.

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Sierra Club North Star Chapter Comments on the MPCA 2025-2027 Triennial Standards Review

We write on behalf of the Sierra Club North Star Chapter in Minnesota, a non-profit environmental organization representing over 50,000 members and supporters across Minnesota. We have reviewed the MPCA's proposed water quality standards work plan for 2025-2027 and would like to strongly support the MPCA's work on developing standards to protect aquatic life for the 1) the two neonicotinoids, 2) nitrate, and 3) ammonia. We have a few concerns as noted in the sections below, but we urge the MPCA to move forward with implementing these standards.

I. **Imidacloprid and Clothianidin Neonicotinoids**: Develop and promulgate numeric water quality standards for aquatic life for each chemical and a compound water quality standard for the both of them together.

Neonicotinoids in Minnesota Waters

Neonicotinoids (neonics) are long-lived, water soluble, easily dispersed insecticides. Every monitoring program that looks for pesticides in MN is finding the two most used neonics, imidacloprid and clothianidin, in concentrations that can harm aquatic life. Thus, it is extremely important that the MPCA implement water quality standard for these neonics.

A recent report on neonics in Minnesota waters, Neonicotinoid Pesticides in Minnesota Water: Their Contamination of and Threats to the State's Aquatic Ecosystems, investigates all aspects of neonics in the waters of Minnesota. Dr. Pierre Mineau, the author, has been tracking, researching, and reporting on neonics for more than a decade.

Based on this report, and other recent publications, the Sierra Club recommends that the MPCA:

1. Carefully evaluate the EPA's aquatic life benchmarks and the European Union's acute impact thresholds to determine a concentration that will protect aquatic life from these two neonics (See Appendix A of the Mineau Report for a careful dissection of the protecting concentrations.)
2. Focus on concentrations that have a long term and chronic impact on surface water aquatic organisms.
3. Promulgate water quality standards for the individual compounds, as well as a combined standard for when the two are found together.

The Concentrations in Water That Affect Aquatic Life

The EPA developed Aquatic Life Benchmarks (ALB) for imidacloprid and clothianidin in 2016 and 2017 respectively (EPA, 2016) (EPA, 2017). Based on more recent studies and the toxicity testing of other countries, the EPA's benchmarks appear to be outdated. The differences in toxicity between different neonic compounds appear to be small and it is possible that clothianidin is more toxic than imidacloprid in contradiction to the EPA's ALBs. Several researchers are suggesting lower concentrations benchmarks (Schmidt, 2022). We urge you to investigate Appendix A of the Mineau report for more information on concentrations of these compounds that are toxic to aquatic life. Here is an example from page 30 of that report:

> "Aside from perhaps the currently listed imidacloprid chronic benchmark of 10 ng/L, EPA benchmarks for the main neonic insecticides are still out of step with those of European regulatory agencies and, as argued in the text on methodological grounds, not sufficiently protective."

We understand that the MPCA has a close relationship with the EPA. However, it is also clear that the MPCA can set reasonable water quality standards that are more strict than the EPA seems to recommend.

Focus on Chronic Exposures Toxicity

Although there are local situations and runoff events where acute benchmarks are extremely important, meeting or staying below chronic benchmarks is a key factor in broader ecosystem impacts. Several studies indicate that the toxic effects of neonicotinoids at a given concentration increase as time of exposure increases (Review paper by Morrissey, et. al., 2015). Other researchers, who examine the time-dependent toxicity of neonicotinoids also point out the importance of exposure duration and its effects (Tennekes, 2010).

The Minnesota Department of Agriculture (MDA, 2020) acknowledged "that focusing on acute exposures likely under-estimates the risks to aquatic life because it does not include long-term (chronic) exposure that may also occur in the waterbody". The MDA goes on to extend their sample measurements into 21-day averages, in order to establish a value to compare to EPA's chronic ALBs for neonicotinoids.

Neonicotinoids are very persistent in the soil. An EPA review of five field studies with a single application of clothianidin to bare soil found a range in half-life from 277 to 1386 days. This, and the fact that plants from coated seeds take up only five percent of the pesticide, can mean that long-term exposures are probable. Thus, there is substantial residual material in the soil that can be readily and steadily sent into streams or wetlands.

Here is another quote from the Mineau Report (page 38)

> "Neonic residues have been detected in watersheds for more than a year post-application. Consequently, even chronic toxicity benchmarks, which are based on 21- to 28-day tests, are inadequate. Following this logic, impacts on aquatic life are expected at levels far below the established chronic toxicity thresholds. Furthermore, experimental evidence suggests that even brief pulses of neonics can result in delayed mortality in exposed aquatic invertebrates, an effect not captured by current testing protocols."

Therefore. It is essential that the critical water quality standards for these compounds will be ones based on long term or chronic exposure. We urge the MPCA to adopt such a standard for imidacloprid, clothianidin, and their combination.

The Impact of Different Varieties of Neonicotinoids Is Additive or Synergistic

In a broad review of the available literature, Morrisey found that the toxic effects of neonicotinoids are additive or synergistic except at high concentrations (Morrissey, 2015). Although they may bind to slightly different receptors, all neonics have similar modes of action.

Importantly, in more recent research, Schmidt, et. al. found neonics to be at least additive and likely synergistic (Schmidt, 2022).

From the Mineau report on page 37

> "Monitoring data makes it clear that a compound-by-compound approach, as currently employed by American and Canadian regulatory bodies, is not tenable in light of the frequent detection of multiple residues across various aquatic ecosystems. Morrissey et al. (2015) similarly advocated for assessing summed residues, contending that toxicity benchmarks were proximate enough to warrant a joint toxicity benchmark."

If we are interested in preventing damage to our aquatic environments, the additive effect of neonicotinoid pesticides need to be strongly considered.

Neonicotinoid Conclusion

Neonicotinoids are persistent in the environment, easily transported by water, and highly toxic to insects and other aquatic invertebrates. They are proven to have devastating impacts on bees, other pollinators, and other non-target insects. Animals that eat insects can ingest significant quantities of neonicotinoids. Or they may suffer due to loss of their food supply.

Aquatic life benchmarks from published papers and regulatory agencies continue to decline in concentration. These insecticides at the chronic benchmark level, or even lower, can cause serious effects over times of long exposure. The more we know about the impacts of neonicotinoids the worse they seem.

The levels in many parts of Minnesota are already above the EPA's chronic aquatic life benchmarks. "Safe" levels keep dropping as new research emerges. Minnesota can be losing sensitive species without knowing it.

The findings referred to above indicate that there is an immediate need to develop numeric water quality standards for imidacloprid and clothianidin to protect. We strongly encourage the MPCA to protect our aquatic environments from degradation, and our birds, bats and other creatures that rely on aquatic insects from loss of food.

Citations

EPA (2016) Preliminary Aquatic Risk Assessment to Support the Registration Review of Imidacloprid https://downloads.regulations.gov/EPA-HQ-OPP-2008-0844-1086/content.pdf

EPA (2017) Preliminary Aquatic and Non-Pollinator Terrestrial Risk Assessment to Support the Registration Review of Clothianidin
https://downloads.regulations.gov/EPA-HQ-OPP-2011-0865-0242/content.pdf

MDA (2020) Summary of MDA Imidacloprid, Clothianidin, and Thiamethoxam Water Quality Data Collected from Rivers and Streams
https://www.mda.state.mn.us/sites/default/files/docs/2020-12/neonicwqdatasummary_1.pdf

Morrissey, C.A., Mineau, P., Devries, J.H., Sanchez-Bayo, F., Liess, M., Cavallaro, M.C., and Liber, K. 2015. Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: A review. *Environ. International* 74, 291-303

Schmidt, T.S., Miller, J.L., Mahler, B.J., Van Metre, P.C., Nowell, L.H., Sandstrom, M.W., Carlisle, D.M., Moran, P.W., Bradley, P.M. 2022. "Ecological consequences of neonicotinoid mixtures in streams." Science Advances 8(15), eabj8182. https://doi.org/10.1126/sciadv.abj8182.

Tennekes, H.A. 2010a. The significance of the Druckrey–Küpfmüller equation for risk assessment — the toxicity of neonicotinoid insecticides to arthropods is reinforced by exposure time. Toxicology 276, 1-4.

II. **Nitrate**: Protect aquatic life by implementing a strong water quality standard for nitrate.

Nitrate Water Quality Standard

Nitrate pollution of Minnesota surface waters is an increasing problem. Data from the MPCA in 2013 showed a historic (late 1970s to 2011) increase in the concentration of nitrate in rivers from 50% to 268% in almost all rivers monitored except for the northeastern part of Minnesota.
They reported that between 2000 and 2010 maximum nitrate levels exceeded 5mg/L at 48% of monitored sites and exceeded 10mg/L at 27% of monitored sites. They estimated that 72% of the statewide surface water nitrogen was from nonpoint cropland sources.

The MPCA's analysis shows that excess ammonia and nitrate are detrimental to aquatic life. Nitrate/nitrite primarily cause hypoxia, similar to methemoglobinemia in humans. This toxicity is especially seen in freshwater aquatic fish and crayfish.

Minnesota currently has a nitrate water quality standard of 10mg/L for Class 1 drinking water sources and cold-water streams but no nitrate standard for surface waters. The MPCA in October, 2022, published a draft document, Aquatic Life Water Quality Standards Draft Technical Support Document for Nitrate, reviewing nitrate toxicity data in eight taxonomic categories of aquatic animals. They suggested a chronic water quality standard of 5mg/L for Class 2A water and 8mg/L for Class 2B surface water. We strongly support the adoption of these standards to protect aquatic life.

Non-point Source Pollution Concern and Recommendation for Monitoring

We do have concerns with the feasibility of applying this standard. The burden on wastewater treatment plants contributing 9 percent of the nitrate to surface waters, could be substantial. The Nutrient Reduction Strategy (MPCA, 2014) indicates that all new wastewater treatment plants must include treatment units and hydraulic capacity to achieve nutrient reduction as soon as possible.

Nitrate enters the surface waters in Minnesota primarily through agricultural application of fertilizer and manure to cropland. Water from precipitation or irrigation carries the nitrate to drainage ditches, through tile drains, and by leaching from the cropland surface moving underground to surface waters (MPCA, 2013). Implementation of the nitrate standard will be difficult given that sources of nitrate from agricultural sources are largely unregulated by the Clean Water Act.

Bringing surface waters into compliance will depend on what are now mostly voluntary best management practices by farmers. The Minnesota Department of Agriculture (MDA) has promulgated a Ground Water Protection Rule with mandatory requirements on fertilizer applications in sensitive regions. It is designed to protect drinking water (groundwater), and it probably benefits surface waters in the parts of the state where the Rule applies. However, many of the voluntary practices have been in place for years, but the nitrate concentrations in Minnesota's surface water continue to rise. It seems that these programs are inadequate to address the nitrate problem.

To determine the effectiveness of these voluntary programs, we strongly encourage the MPCA, perhaps in collaboration with MDA, to develop extensive water quality monitoring of discharges from these voluntary programs. For instance, do Certified Farms actually prevent nitrate from flowing into our surface waters? We recommend monitoring at the edges of the fields, at the ends of field tile drain systems, and after rainfall events. Examples of voluntary programs include the MN Agriculture Water

Quality Certification Program, the Agricultural Best Management Practices Loan Program, and the MN Nitrogen Fertilizer Management Plan.

The Clean Water Act may allow the MPCA to take action on some non-point source pollution. The 303(d) Impaired Waters Program and the use of total maximum daily loads (TMDLs) has potential to effect improvements in water quality in water bodies impaired due to point and nonpoint sources of nitrogen. The document, The Clean Water Act and The Challenge of Agricultural Pollution (Laitos & Rickriegle, 2013, p. 1056), states "As a result, the success of any regulatory program for controlling agricultural runoff under the CWA's TMDL program depends entirely on whether a state, exercising its own discretion, wishes to use Section 303(d) to address agricultural NPS pollution." We strongly recommend that the MPCA takes every opportunity to improve Minnesota water quality and compliance with MN Water Quality Standards, in particular, nitrate due to agricultural sources, through the use of the 303(d) Impaired Waters Program and development and enforcement of TMDLs on any water body found in noncompliance with the nitrate water quality standard once promulgated.

Because of the rising levels of nitrogen in Minnesota waters and the accumulating evidence of toxicity to aquatic life we support and encourage the promulgation of new water quality standards for nitrate to protect aquatic life.

III. **Ammonia**: Develop and promulgate a water quality standard for ammonia to protect aquatic life.

Ammonia Water Quality Standard

Ammonia levels are particularly high in surface waters near sources of animal waste. Even though most Minnesotans do not obtain their drinking water from surface waters the excess ammonia has been shown to be detrimental to aquatic life. Ammonia, directly and through acidification of water, is toxic to aquatic animals, particularly fish. It causes asphyxiation and disrupts several metabolic processes reducing feeding activity, fecundity and survivorship of aquatic species. Also, both ammonia and nitrates contribute to water eutrophication by stimulating the proliferation of primary producers (phytoplankton etc) causing fish hypoxia and death. Finally, ammonia contributes to the growth of toxic algae detrimental to human health.

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The current Minnesota standard for ammonia is 16 micrograms/L for Class 2A water and 40 micrograms/L for Class 2B Surface water. The proposed new ammonia standard provided in the Aquatic Life Water Quality Standard for Ammonia Draft Technical Support Document is the same as the 2013 USEPA recommended water quality criteria for ammonia. This will provide an updated and more protective approach to the ammonia water quality standard for freshwater aquatic organisms using equations to determine the standard accounting for the temperature and pH in the water body and specifically related to the habitat.

We strongly approve of the new Feedlot Permit rules and encourage the MPCA to actively enforce them. Because of the rising levels of nitrogen in Minnesota waters and the accumulating evidence of toxicity to aquatic life, we support and encourage of the promulgation of new water quality standards for ammonia consistent with a careful scientific evaluation.

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