

## MPCA's Wild Rice Sulfate Standard Research

### Background

- In 1973 the MPCA promulgated a sulfate standard of 10 mg/L (milligrams per liter) related to wild rice based on field observations in the 1940's that stated rice was generally absent when sulfate levels exceeded 10 mg/L and surmised that was due to sulfate concentrations.
  - o For comparison:
    - City of Virginia, MN drinking water (from an abandoned mine pit) ~60 mg/L
    - EPA's secondary drinking water standard (for taste and odor) = 250 mg/L
    - San Pellegrino =445 mg/L
- In 2011 the MN Legislature appropriated funds to the Minnesota Pollution Control Agency (MPCA) to conduct research regarding the effect of sulfate on wild rice.
- MPCA contracted with the University of Minnesota, research began in 2012 and was complete in December 2013.
- MPCA contracted a group to facilitate a scientific peer review of the MPCA funded research. The panel met in August 2014 and released a report a month later.
- The Minnesota Chamber of Commerce subsequently conducted independent research through Fort Environmental Labs (FEL) to correct the deficiencies identified during the peer review.
- Concurrent to the research process, the MPCA also convened a Wild Rice Advisory Committee, which was comprised of various stakeholders, including Ramboll ENVIRON, an environmental science firm. The committee met over a six-year period to provide input on the wild rice studies and rule.
- The MPCA released a draft proposal in 2016 of wild rice waters and a proposed equation which would calculate a protective sulfate concentration for dischargers.
- Ramboll ENVIRON identified key improvements to the MPCA proposal, using the data produced by MPCA-funded research, which would reduce the error rate of the proposed equation.

### Issues

#### **Sulfate**

- The MPCA's initial hypothesis was that sulfate was the cause of wild rice decline. However, standard toxicity testing conducted by both Dr. Pastor (for MPCA) and FEL (for the MN Chamber) demonstrated that sulfate, in and of itself, does not impede wild rice growth below concentrations of 2,500 mg/L.

#### **Sulfide**

- MPCA then theorized that sulfate may impede wild rice growth by converting to sulfide in low-oxygen conditions in the sediment. So, the MPCA developed a draft equation to regulate sulfate discharges that hinges on a protective sulfide value of 120 µg/L (micrograms per liter).
- However, Dr. Pastor's sulfide toxicity testing was significantly criticized by the MPCA-organized Peer Review Panel. The panel was concerned that the study exposed *the entire plant* to anoxic (low oxygen) conditions and sulfide, putting in place a laboratory condition that would never occur in nature.
  - o The panel recommended seven improvements to make should the research be repeated.

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- The Chamber commissioned FEL to conduct standard toxicity tests that incorporated all seven of the panel recommendations. The FEL results demonstrated that sulfide does not impact wild rice for nine of eleven biological parameters at concentrations up to 12,800 µg/L. The most sensitive endpoint was unaffected by sulfide at concentrations below 1,600 µg/L.
- The FEL tests followed USEPA protocols for conducting toxicity tests including Good Laboratory Practices (GLP), which are required by USEPA to certify toxicity test data for use in development of water quality standards.
- Although the FEL tests were conducted using the Peer Review Panel recommendations, followed GLP, and were rigorously evaluated before being published, the results are not being given proper weight in the rulemaking process.
- Moreover, the concentrations of sulfate and sulfide that have proven to impede the growth of wild rice through laboratory toxicity tests do not exist in the vast majority of Minnesota waters.

### **Other factors**

- The current proposal does not account for impacts from all known wild rice stressors – such as water depth, water clarity, fluctuations in hydrology, invasive species, shoreland development, etc.

### **MPCA proposed equation**

- The MPCA's proposed equation has an error rate of 16%, which means it is wrong 16% of the time. A reduction in the error rate would mean that the equation more closely represents field study observations. Ramboll Environ made two recommendations to improve the equation that results in an error rate of 4%. The recommendations were:
  - to increase the toxic sulfide threshold based on evidence from the MPCA and FEL research, and
  - to adjust the waterbodies included in the dataset used to develop the equation to only include those that are recommended as draft wild rice waters.
- MPCA's proposal to enact a sediment based standard for a water quality criterion has not been done by MPCA or EPA in over 40 years of water quality criteria development. It also relies on a statistical method that has never been used in the development of a water quality standard.
- The data set being utilized for setting the equation includes waters where wild rice does not grow, and has not in the past, and therefore are not listed by MPCA on the draft wild rice waters list.

### **Path Forward**

The FEL research needs to be provided equal, or more, weighting as it followed more stringent scientific protocols and the peer review recommendations. The research was rigorously evaluated prior to publication in a peer review journal. In addition, the MPCA should take into account the two improvements identified by Ramboll ENVIRON that would reduce the error rate of the equation.