Wild Rice Standards Study: Update

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Water Quality Standards

- Fundamental tools of the Clean Water Act
- Three components:
  1. **Beneficial use classifications** for waterbodies
  2. **Numeric and narrative criteria** that protect those beneficial uses
  3. **Nondegradation requirements** to provide extra protection to high quality waters

- Clean Water Act directs states to establish standards; review every three years
Wild Rice Sulfate Standard

- Studies found correlation between lower sulfate and wild rice
- Sulfate standard adopted in 1973 to protect wild rice production
  - “10 mg/L, applicable to water used for production of wild rice during periods when the rice may be susceptible to damage by high sulfate levels”
Implementing the Sulfate Standard

- Additional information needed
- Study protocol developed
- 2011 wild rice standards study legislation:
  - $1.5 million for wild rice standards study from the Clean Water, Land and Legacy Amendment
  - Advisory committee to provide input on study protocol, research results and rulemaking
  - MPCA to initiate rulemaking upon completing the study
Wild Rice Standards Study Advisory Committee

- Kurt Anderson, Minnesota Power (ALLETE), wild rice harvester
- Leonard Anderson, wild rice harvester, citizen
- Sara Barsel, citizen
- Mike Appelwick, Northeast Technical Services
- David Biesboer, University of Minnesota
- Jennifer Engstrom, Minnesota DNR
- Tracy Ekola, Minnesota Environmental Science and Economic Review Board (MESERB)
- Ann Geisen, Minnesota DNR
- Craig Johnson, League of Minnesota Cities
- David Hatchett, Mesabi Mining
- Kathryn Hoffman, Minnesota Center for Environmental Advocacy
- Peter Lee, Lakehead University
- John P. Lenczewski, Minnesota Trout Unlimited
- Paula Maccabee, WaterLegacy
- Joe Mayasich, Western Lake Superior Sanitary District
- Anne Nelson, wild rice harvester, Wetlands and Water Committee of the Sierra Club
- Beth Nelson, Minnesota Cultivated Wild Rice Council
- Frank Ongaro, MiningMinnesota
- Timothy Peterkoski, ArcelorMittal USA, ArcelorMittal Minorca Mine, Hibbing Taconite
- Robert Pillsbury, University of Wisconsin Oshkosh
- Raymie Porter, University of Minnesota
- Robin Richards, ENVIRON International Corporation
- Mike Robertson, Minnesota Chamber of Commerce
- Joel Rohde, Red Lake Nation Foods and Red Lake Department of Natural Resources
- Jon Schneider, Ducks Unlimited
- Nancy Schuldt, Fond du Lac Band of Chippewa
- Robert Shimek, wild rice harvester, member of Red Lake Band
- David Skolasinski, Cliffs Natural Resources
- David Smiga, U.S. Steel
- Rod Ustipak, Minnesota Wild Rice Company, wild rice harvester
- Rachel Walker, Barr Engineering
- Darren Vogt, 1854 Treaty Authority
Wild Rice Standards Study

- Goal: Enhance understanding of the effects of sulfate on wild rice; inform standards evaluation

- Key avenues of investigation:
  - Field survey
  - Laboratory experiments
  - Container experiments

- Any standard modification will be based on multiple information sources
Summary of Key Milestones to Date

- Preliminary field work in 2011
- Advisory Committee formally created
- Completed protocol to guide research (2011)
- RFP in fall/winter 2011, study plan and contracts in spring 2012
- Field work and laboratory experiments in 2012
- Mid-project review & Open House – Feb 28 and March 1, 2013
- Continued experiments/sampling in 2013
Study Status: Field Survey

- 2012: >100 sites sampled
- 2013: 17 sites sampled 3+ times, 20 sites sampled once
- Lab analysis, data review underway
2012 Wild Rice Study Task: Field Data

Surface water
- Na, K, Mg, Ca, Fe
- SO₄, Cl
- Alkalinity, pH, conductivity, Total P, Total N, Ammonia, Nitrate + Nitrite, transparency

Bulk Sediment Chemistry
- Acid-Volatile Sulfide
- Total carbon, nitrogen, sulfur
- Simultaneously-Extracted Metals: Fe, Cu, Zn, Co, Ni, Mn, Mo, Se, As, B

Other Sediment Properties
- Water, organic matter, carbonate content
- Organic grain size
- Wild rice phytolith presence/absence

Porewater
- Sulfide
- Na, K, Mg, Ca, SO₄, Cl
- Total P, Total N, Silica
- Ammonia, Nitrate + Nitrite
- DOC (dissolved organic carbon)
- Fe, Cu, Zn, Co, Ni, Mn, Mo, Se, As, B
Assessing plants at field site
Sediment coring at field site
Use of a Rhizon® artificial root to obtain a sample of porewater integrated over the top 10 cm of sediment.
Sediment Incubation Experiment

- Elevated sulfate over sediments from Partridge River & N. Bay of St. Louis River
- Examined difference in sulfide conversion between summer and winter temperatures
- Lab analysis, data review underway
Container Experiments

- Outdoor wild rice containers with 5 different sulfate treatments
- Sampled monthly, with peepers and adjacent sediment cores
Hydroponic Growth Tests

- Germination Test (50 seeds per jar; 3 jars per treatment)
- Juvenile Seedling Test (In glass test tubes and 700 mL jars)
- Both SO₄ and H₂S tests

![Graph showing growth relative to control and concentration in hydroponic growth medium (Sulfate, sulfide, iron, copper, zinc...)]
Examples of test chambers used for performing the germination tests. If time permits, similar chambers would be used when performing a test with mature seedlings.
Juvenile seedling test.
Juvenile seedling test initiation with sprouting wild rice seed in a Kimax test tube.
Juvenile seedling test showing final growth after approximately 10 days. This method development test was performed to examine effects of different concentrations of growth solutions (Hoagland’s solution).
Next Steps

- Data collection complete at end of 2013, data synthesis and standard review to follow
- “Water Used for Production of Wild Rice” – criteria development
- Permitting activities continue
- Ongoing communication
  - Advisory Committee meetings at least quarterly
  - Web and e-mail updates for interested stakeholders/groups/citizens
Questions?
Thank You!

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